Wealth Taxation and Portfolio Allocation

Ségal Le Guern Herry *

Abstract

This paper investigates how wealth taxation affects households' portfolio choices. Leveraging a major wealth tax reform introduced in 2017 that transformed the French wealth tax into a real estate tax, I estimate the degree of substitution between real estate and financial wealth. To identify causal effects, I use comprehensive administrative-linked income and wealth microdata for France and a difference-in-differences design comparing French residents to non-French residents subject to the wealth tax but not affected by the policy change. Five years after the reform, the stock of real estate held by French taxpayers decreased by an average of 5.5%, with little variation along the wealth distribution. This decrease in real estate is driven by investment rather than owner-occupied housing and is mirrored by a surge in dividend income, consistent with taxpayers reshuffling by selling some of their investment properties in order to invest in stocks. The reduced-form estimates can be converted into a cross-elasticity of 5: a 1 percentage point increase in the tax rate differential between real estate and financial assets leads to a 5% reallocation of households' housing stock to financial capital. Overall, the response is relatively modest, suggesting that taxing real estate relatively more than other assets does not trigger a massive shift in households' portfolio structure.

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1 Introduction

In 2017, a major reform was introduced in France, transforming the wealth tax into a real estate tax. Announced by the future French President Emmanuel Macron during the 2017 presidential election campaign, the goal of this policy was to stimulate economic activity by transforming the French wealth tax into a "tax on the real estate rent", thus excluding all assets financing the "real economy" from the tax base.[1] This unique policy change provides a rare and sharp natural experiment to shed light on the implications of taxing real estate more than other forms of capital, which is at the core of historical and contemporary debates surrouding wealth taxation (George, 1879; Arnott and Stiglitz, 1979; Bonnet et al., 2021; Trannoy and Wasmer, 2022).

In the spirit of the French reform, ownership of real estate is sometimes associated with rent-seeking. According to this view, the stock of housing being relatively fixed, purchasing immovable properties is not a productive investment and as such it generates less positive externalities for the economy than investing in financial assets. In this context, the property tax can act as a corrective tax, incentivizing individuals to reallocate their wealth to sectors seen as more virtuous for the economy. At the same time, the potential revenue from a property tax may be low if taxpayers respond to it by reallocating their portfolio towards financial assets. Regardless of whether the government's objective is to foster investment in financial assets or to efficiently raise revenue, the relative merits of a property tax over a comprehensive wealth tax depends heavily on how households substitute real estate for financial assets in response to taxation, on which there is to date no evidence.

In an attempt to improve our knowledge on this question, this paper estimates for the first time the cross-elasticity between real estate and financial assets. Using comprehensive administrative-linked income and wealth microdata for France, I estimate the degree of substitution between real estate and financial assets in response to a difference in wealth tax rates. My empirical strategy leverages the 2017 French wealth tax reform that removed all financial assets from the wealth tax base while leaving other features of the tax schedule unchanged. I find that there is a reallocation response to differential taxation, but this reallocation is modest in magnitude. My analysis suggests that property taxes are a poor corrective tool to foster investment in financial assets. However, in a setting where the tax base applying to real estate is broad, my results imply that property taxes trigger a modest behavioral response and thus have the potential to efficiently raise revenue.

I estimate households' reallocation in two ways. First, I study how households' stock of real estate evolves around the reform. Second, I circumvent the fact that financial assets are no longer reported after the reform

[1] https://www.lesechos.fr/2017/02/ce-que-propose-macron-pour-reformer-lisf-160452

by focusing on capital income, which remains taxed. In particular, I investigate how income flows generated by real estate and financial assets differentially respond to the policy change. My empirical strategy focuses on households whose real estate exceeds the exemption threshold—1.3 million euros—and who would therefore remain liable to the wealth tax after the reform in the absence of any response.[2] To identify causal effects, I exploit the fact that individuals owning assets in France without being French residents for tax purposes benefited from a full exemption on their financial investment before 2017. As a result, the wealth tax base of non-residents only consists of their French real estate holdings, both before and after 2017. Thus, the reform does not affect their relative incentives to hold housing versus financial assets, in contrast to French taxpayers for whom real estate becomes relatively less profitable. Leveraging this feature of the tax schedule, I estimate the response to the reform by comparing a treated group of French residents to a control group of non-French residents in a difference-in-differences setting. Critically, the reported stock of real estate evolves similarly between the two groups before the policy change, which makes the parallel trend assumption credible and provides support for a causal interpretation of the difference in the post-reform period.

My first finding is that households reallocate their wealth from real estate to financial assets in response to differences in tax rates across the two asset types. My benchmark difference-in-differences estimate indicates that the stock of real estate reported by French taxpayers five years after the reform is 5.5% lower than before the policy change.[3] The evolution of financial capital income received by French taxpayers around the reform confirms the existence of a rebalancing response. Consistent with taxpayers reallocating their wealth towards financial assets, I show that the treated households receive higher financial capital income—mostly dividends—after the reform. Importantly, the real estate tax base after the reform is comprehensive and includes housing assets held both directly and through a corporate vehicle. As a result, the response should be interpreted as a decrease in the amount of real estate owned by taxpayers rather than as a change in the way they hold this asset type.[4]

The estimated average response masks sizeable heterogeneity. First, housing has a dual role, used both as a consumption and an investment good, and each type of housing adjusts differently to the reform. In line with Martínez-Toledano (2022) who studies reshuffling responses to housing busts, I find that taxpayers with a higher share of investment properties in their overall housing wealth engage in a greater degree of

[2]The French wealth tax applies to taxpayers owning more than 1.3 million euros in taxable wealth. Below this threshold, individuals are not subject to the wealth tax.

[3]Importantly, the presence of strong general equilibrium effects leading to decreasing house prices would make the estimated responses difficult to interpret. Indeed, if house prices decrease after 2017, the observed drop in taxable real estate could be partly attributable to a drop in prices rather than to a rebalancing behavior. Reassuringly, the post-reform period coincides with strong house price inflation in France, also affecting high end real estate (Barnes, 2020). This element supports the idea that the wealth tax reform had a modest effect on prices. Moreover, combining the share of French real estate owned by wealth taxpayers before the reform (5% according to Garbinti, Goupille-Lebret and Piketty (2020)) with the fall in their real estate holdings (5.5%), the overall housing stock affected by the reform is negligible. All in all, these elements make the presence of strong general equilibrium effects unlikely.

[4]The most important exception applies to shares of listed companies investing in real estate (SIIC companies). I show in the paper that the evolution in dividends received by wealth taxpayers from SIIC companies does not respond to the policy change.

portfolio rebalancing after the reform. Households whose real estate mainly consists of their primary home do not respond at all. Second, I show that only a minority of taxpayers responds to the reform. To show this, I implement a decomposition exercise and find that after removing from the estimation sample the 20% of taxpayers who decrease the most their real estate after the reform, the difference in the evolution of taxable real estate between French and non-resident taxpayers is no longer significant. In other words, about 20% of households—henceforth referred to as the "active taxpayers"—are responsible for the entire estimated average 5.5% drop in real estate after 2017.[5] This strong heterogeneity is confirmed when looking at capital income. Active taxpayers increase substantially more their financial income than the rest of the treatment group and receive considerably less rental income after the policy change. Finding a small fraction of taxpayers responding to the reform is consistent with the literature on tax incentives for retirement savings, showing that the average response is driven by a minority of active savers while the majority does not react (Attanasio and DeLeire, 2002; Chetty et al., 2014). However, in contrast to this literature that identifies salient characteristics correlated with the responsiveness to tax incentives such as age and level of wealth, active and passive taxpayers in the French context appear relatively similar along most observable characteristics.[6]

The reallocation estimated so far is a response on the intensive margin, relying on taxpayers who report their level of real estate wealth and thus who remain liable to the wealth tax. However, French taxpayers also respond to the reform along the extensive margin, namely by reshuffling in order to locate below the exemption threshold after 2017. My results suggest that almost 9% of the treated group of French taxpayers rebalanced their portfolio in order to own less in real estate than the 1.3 million euros threshold after the policy change. This result is in line with the literature finding strong bunching responses to the wealth tax exemption threshold (Londoño Vélez and Ávila-Mahecha, 2022; Garbinti et al., 2023). This extensive margin response adds up to the response along the intensive margin. Given that taxpayers who locate below the exemption threshold do not have to report how much real estate they own, the response on the extensive margin cannot be used to quantify the magnitude of the reallocation. However, both margins of response affect wealth tax revenues and are accounted for when assessing the revenue impact of the reform.

Second, to compare my results to behavioral responses to wealth taxation estimated in the literature, I translate the rebalancing response into a cross-elasticity between real estate and financial assets. Measuring the cross-elasticity is challenging in most contexts because policy variation affecting real estate and financial assets differently often come together with other changes in the tax schedule making the identification of causal effects difficult. In contrast, the reform leveraged in this paper does not increase the taxation of real

[5] A placebo test shows that doing the same exercise using the pre-reform rather than post-reform evolution in real estate has no effect on the estimated response. It suggests that while taxpayers experiencing a drop in their level of real estate after the reform are mostly French taxpayers, they are relatively evenly distributed across the treatment and the control group before the policy change.

[6] Identifying specific traits shared by the most responsive taxpayers would allow the use of "tagging" (Akerlof, 1978) by the policy-maker and constitutes a fruitful avenue for future research.

estate, thus, incentives to hold this asset are reduced only *relative* to the alternative asset class, namely financial assets. As a result, there is no reason for taxpayers to adjust their level of taxable real estate through under-reporting, offshore evasion or tax avoidance and these channels are unlikely to play a role here.[7] Consequently, it is possible to interpret the observed drop in real estate as a rebalancing response, allowing me to estimate the cross-elasticity between real estate and financial assets.

Focusing first on the intensive margin, I show that the estimated rebalancing response can be converted into a cross-elasticity between real estate and financial wealth of 5. This means that a 1 percentage point increase in the tax rate differential between real estate and financial assets leads to a 5% reallocation of households' housing stock to financial assets. The cross-elasticity obtained here falls on the lower spectrum of available estimates for the elasticity of taxable wealth provided in the literature (Advani and Tarrant, 2021). Moreover, assuming an annual rate of return on wealth of 5%, the cross-elasticity translates into a capital income cross-elasticity of 0.2, a figure that is also lower than the majority of estimates for the taxable income elasticity (Saez, Slemrod and Giertz, 2012). More importantly, the reallocation response to wealth taxation estimated here is significantly lower than findings in the literature examining settings with ample shifting opportunities (Alvaredo and Saez, 2009; Durán-Cabré, Esteller-Moré and Mas-Montserrat, 2019). This highlights the importance of distinguishing the shifting from the real response when interpreting the magnitude of the behavioral response to taxation. Turning to the extensive margin, I show that this channel of response to the reform can be converted into a semi-elasticity of 7. It suggests an increase of 7% in the probability to locate below the exemption threshold following a 1 percentage point increase in the tax rate differential between real estate and financial assets.

Third, in order to assess how efficient property taxes are at raising tax revenues, I estimate the revenue impact of the reallocation response to the 2017 reform. Using the estimated cross-elasticities both along the intensive and the extensive margins, I am able to decompose the drop in wealth tax revenues following the reform into a mechanical and behavioral component. The net wealth tax revenues decreased by approximately 2.8 billion euros due to the reform. I show that portfolio rebalancing is responsible for 300 million euros of tax revenue losses. In other words, the behavioral response is responsible for around 10% of the loss in tax revenues generated by the reform.[8] This result suggests that the effect of the portfolio rebalancing on tax revenue is non-negligible.

This paper contributes to three main strands of the literature. First, there is a growing body of research sudying wealth taxes and how households respond to them (Brülhart et al., 2022; Jakobsen et al., 2020; Zout-

[7] This does not mean that wealth taxpayers do not under-report their assets or engage in offshore evasion or avoidance, but rather that these behaviors are likely orthogonal to the reform.

[8] Importantly, the reallocated assets generate taxable income flows—mainly taxable dividends—that increase overall income tax revenues. Once these fiscal externalities are accounted for, the cost of the reallocation represents about 7% of the revenue losses associated with the 2017 wealth tax reform.

man, 2018; Seim, 2017; Agrawal, Foremny and Martínez-Toledano, 2023; Londoño Vélez and Ávila-Mahecha, 2022; Bach et al., 2020; Ring, 2021; Advani and Tarrant, 2021; Alstadsæter et al., 2022; Garbinti et al., 2023; Dray, Landais and Stantcheva, 2023). This literature identifies portfolio rebalancing as one channel among several others driving behavioral responses to wealth taxation. While the anatomy of the behavioral response greatly influences their interpretation, estimating the contribution of each channel separately is challenging in most contexts. Thanks to the unique policy variation leveraged in this paper, my first contribution is to quantify the portfolio rebalancing response to taxation, isolated from other behavioral adjustments.

However, the interpretation of the response varies greatly depending on whether it is driven by shifting behavior or by real rebalancing adjustment. In the former case, taxpayers would change the way they own real estate without changing the structure of their portfolio while in the latter case, taxpayers sell their housing assets in order to invest in real financial assets such as stocks or bonds. The literature studying how households move their assets across bases in responses to taxes (Alvaredo and Saez, 2009; Durán-Cabré, Esteller-Moré and Mas-Montserrat, 2019; Kopczuk, 2007; Poterba and Weisbenner, 2003; Poterba and Samwick, 2003; Alan et al., 2010; Desai and Dharmapala, 2011; Kontoghiorghes, 2022) has mostly documented the shifting channel and little is known about the real rebalancing channel. My contribution to this second literature is to estimate real rebalancing responses between real estate and financial assets. In the French context, cases of real estate assets becoming exempt from wealth taxation after the reform are rare. Thus, there is limited scope to reduce *taxable* real estate while keeping *total* real estate in taxpayers' portfolio constant.

Finally, my paper relates to the literature on income shifting (Pirttilä and Selin, 2011; Piketty and Saez, 2013; Piketty, Saez and Stantcheva, 2014; Hermle and Peichl, 2018; Waseem, 2018; Jacquet and Lehmann, 2021; Lefebvre, Lehmann and Sicsic, 2022; Bergolo et al., 2022). My contribution is i) to adapt the insights from this literature to the case of asset rebalancing and ii) to study the response of a tax-base with respect to a tax change in another tax base in order to precisely estimate a cross-elasticity.[9]

The rest of the paper proceeds as follows. In section 2, I describe the institutional context and the tax variation introduced by the 2017 wealth tax reform. Section 3 presents the data. In section 4, I estimate the responses to the reform by looking both at variations in real estate ownership and capital income. Then section 5 estimates the cross-elasticity between real estate and financial wealth and assesses the impact of the reform on government revenue. Section 6 concludes.

[9]My paper also directly speaks to a smaller literature studying the economic effects of the 2017 wealth tax reform in France along various dimensions (Bach et al., 2021; Paquier, Schmitt and Sicsic, 2019; Cagé and Guillot, 2021; Le Pouhaër, 2023; France Stratégie, 2023). There exists to date no clear-cut evidence on salient real responses to the policy. I contribute to this literature by showing that French taxpayers reallocated some of their real estate wealth towards financial assets after 2017.

2 Institutional setting

The first progressive annual wealth tax has been been introduced in France in 1982. After being temporarily removed, it was reintroduced in 1989 under the name *Impôt de Solidarité sur la Fortune* (ISF). After 2017, following the election of Emmanuel Macron, the ISF is repealed and replaced by a real estate tax called *Impôt sur la Fortune Immobilière* (IFI). The aim of this section is to illuminate the key institutional details of the wealth tax and of the 2017 reform that I leverage in the analysis. See Appendix section A1 for a more detailed description of wealth taxation in France.

2.1 The Impôt de Solidarité sur la Fortune

The ISF (1989-2017) applied to taxpayers—defined at the tax unit level (household)—with net taxable wealth above an exemption threshold. The exemption threshold has varied over time but was set at 1.3 million euros after 2013 which was around the 99^{th} percentile of the household wealth distribution in France. The tax schedule was progressive with rates ranging from 0.5% to 1.5% for the top tax bracket, above 10 million euros.

The tax base. The tax based was composed of all worldwide assets, above the exemption threshold, owned by French taxpayers on January 1^{st} of the fiscal year. Non-residents could also be liable to the ISF under certain conditions, but specific rules apply (see below). The ISF was a self-assessed tax, meaning that taxpayers had to report the value of their assets themselves. The aim of this tax was originally to be comprehensive, but many exemptions reduced significantly the tax base. Most importantly, business assets of owner-managers were fully exempted.[10] Antiques and artworks were also excluded from the tax base. Besides, the tax value of primary home was set at 70% of its market value. This rate was 25% for woods, forests and rural properties.

The simplified tax returns. From 2011 to 2017, taxpayers with taxable wealth below a certain threshold had only to fill in a simplified wealth tax return.[11] In the simplified return, taxpayers only report total net and gross taxable wealth and specific tax credits. From 2013 to 2017, the simplification threshold is set at 2.57 million euros of taxable wealth. For more details on the simplified wealth tax return rule and its effects, see Garbinti et al. (2023). When studying French taxpayers in the analysis, I focus on households located above this threshold in order to i) observe their portfolio structure and ii) avoid any contamination of my estimates by the repeal of this simplification threshold in 2018.

[10] Business assets are defined as shares in a company, including listed firms, in which the taxpayer undertakes managerial activities as their main activity (from which they receive more than half of their professional income) and in which they hold more than 25% of the capial.

[11] Note that non-residents who do not file an income tax return in France had to fill in a detailed wealth tax return.

2.2 The 2017 wealth tax reform

Shortly after the 2017 election of Emmanuel Macron as the new President of France, the *Impôt de Solidarité sur la Fortune* is replaced by the *Impôt sur la Fortune Immobilière*, a tax on real estate assets. The stated aim was to "incentivize risk taking over rent seeking" by exempting all investment in "productive capital" from the wealth tax. Importantly, the design of the new tax, introduced in 2018, is very similar to the ISF, except in its restriction to real estate wealth. Indeed, most of the features of the ISF such as the tax schedule, the exemption of business assets, the tax ceiling etc. remain unchanged.

In short, the tax base of the IFI is reduced to the French residents' worldwide real estate assets (houses, apartments, land, agricultural land...), held both directly and indirectly.[12] The partial exemptions on primary residence as well as on woods, forests and rural properties are maintained. Like under the ISF, business assets are exempted, which leaves profesional real estate outside of the tax base.[13] Finally, some minor restrictions are introduced regarding the debts that can be deducted from the tax base (see Appendix section A1). In the analysis, I focus on gross wealth rather than net wealth to eliminate the potential effect of these changes. Overall, taxation of real estate under IFI and under ISF is very similar.

It should be noted that the 2017 wealth tax reform came with a second reform aiming to foster private investment which introduced flat-rate taxation of financial capital income at 30%. This reform, which reduced the top marginal tax rate on financial capital income by 10.2 ppt, has been shown to trigger important responses via a surge in dividend payouts from 2018 (Bach et al., 2019). By contributing to enlarge the effective tax rate differential between real estate and financial wealth, this concomitant policy change may have played a role in the portfolio rebalancing observed after 2018. In the analysis, I show that taxpayers not affected by this additional reform—households facing a marginal income tax rate of 30% or below—reallocate their portfolio similarly as their more affected counterparts after 2017. Moreover, this second tax reform is accounted for in the elasticity computation.

2.3 Non-residents

Tax residency is defined at the individual level, as opposed to the household level. An individual will be considered as non-resident if they satisfy the following three conditions: i) their main home is located outside of France, ii) they don't have any significant professionnal activity in France, and iii) they don't have their

[12] The tax base includes shares of companies or partnerships holding real estate assets directly or through a chain of shareholdings as well as the fraction of the redemption value representative of taxable real estate included in accounting units of life insurance or capitalisation contracts. Popular vehicle holding real estate are *Sociétés Civiles Immobilières* (SCI), *Sociétés Civiles de Placements Immobiliers* (SCPI), *Organismes de Placement Collectif Immobilier* (OPCI). In some specific cases, the shares of companies or organisation holding real estate may be excluded from the IFI tax base. See Appendix section A1.

[13] This refers to real estate used to carry out the main professional activity of the taxpayer (agricultural land, medical office etc.). It also includes profesional furnished rentals.

main economic interests in France.[14] All non-residents receiving income originating from France are subject to the income tax in France (in proportion to their income of French origin—conditional on specific tax treaties). Non-residents may also be liable to the wealth tax if they own assets in France. In that case, the same tax schedule as for French residents applies.[15] Under the ISF, however, non-residents benefited from a full exemption on the vast majority of their financial investment (stocks, bonds, deposits, life insurance etc). As a result, notwithstanding some rare exceptions, the wealth tax base of non-residents before the 2017 reform is already restricted to their French real estate holdings.[16] Therefore, the 2017 policy change does not affect their incentives to reallocate their assets away from real estate.

2.4 Policy variation and Marginal Tax Rates

Figure 1 shows the evolution of statutory top marginal wealth tax rates and observed average marginal tax rates of the full population of wealth taxpayers depending on the class of the marginal euro of asset owned and on whether they are French tax residents or not. Panel a) shows the sharp reduction in top statutory marginal wealth tax rate for financial assets held by French residents after the 2017 reform, while the rate for real estate remains constant. Panel b) displays the change in average observed marginal wealth tax rates for French taxpayers for both classes of assets. Due to the progressivity of the wealth tax schedule, the observed average marginal tax rates are lower than top statutory rates. Besides, the observed marginal rate on real estate decreases slightly after the 2017. This is due to the fact that some taxpayers may end up in a lower tax bracket after the reform, once financial assets are removed from the tax base. Panel c) and d) show the evolution of respectively statutory and observed marginal tax rates by asset class for non-residents, which remain stable over the period. The average marginal wealth tax rate on real estate for non-residents is similar in magnitude to what we observe for French residents. As explained above, the rate on financial assets for non-residents is 0% both before and after the reform.

3 Data

I use a newly released administrative longitudinal dataset produced by the French tax authority providing information on the universe of wealth and income tax returns over the 2006-2021 period (2006-2022 for the wealth tax). A unique identifier for each fiscal household and taxpayer allows me to match income to

[14] See https://www.impots.gouv.fr/particulier/suis-je-bien-non-resident

[15] The taxation of non-residents in France is subject to some bilateral tax treaties. For example, a Saudi tax resident will be exempted from the French wealth tax if they directly own enough EU securities.

[16] I provide in the Appendix section A1 details of cases where the exemption on financial investment did not apply. These cases are however rare. I deal with them in the analysis by dropping all non-residents reporting significant financial wealth at any point in the sample period.

wealth tax returns for each household and to follow them from year to year. Technical details about the data processing are provided in Appendix section A2.

Personal income tax returns. The income tax returns (tax form "2042") include information on the components of taxable income for each member of the household as well as some demographics (age, marital status, children...). For each fiscal year t, income tax liabilities are based on income received in year t-1. Importantly for my empirical strategy, the income tax data contain information on the *département* of residence, which is a piece of information I use to identify non-residents.

Wealth tax returns. The wealth tax returns (tax form "2725") provide information on the components of taxable wealth as well as potential tax credits or reductions reported by wealth taxpayers. Thus, unless the taxpayer can fill in a simplified return, the data contain information on the value of primary home, other housing, stocks, deposits... Importantly, when real estate is held indirectly, it is reported together with other indirectly held financial assets.[17] Thus, precise information on indirect ownership of real estate is only accessible after the 2017 reform, when financial wealth is no longer taxed. In 2018, indirect ownership of real estate represents 17% of taxable real estate. I the analysis, I circumvent this issue by focusing on directly held real estate only.[18]

Identification of non-residents. Among income taxpayers, I identify the non-residents via the information on the *département* of residence provided in the income tax files, which appears as "9B3 DRESG" for this group of taxpayers. However, some non-residents own enough assets in France to be liable to the wealth tax but don't receive income of French source and thus do not file any income tax return in France. Since this case only happens for non-residents, this second group is defined as taxpayers filing a wealth but no income tax return in a given year. It should be noted that information on the components of wealth reported by non-resident taxpayers is less reliable than information provided by French residents in their returns.[19] When studying how non-residents' stock of housing wealth evolves over time, I circumvent this issue by using information on their total taxable wealth—which consists of real estate located in France.

Descriptive statistics. Table 1, columns 1 and 2 present descriptive statistics for the full population of wealth taxpayers in France in 2016 and 2018. The choice of 2016 instead of 2017 as reference pre-reform

[17] Under box CE, "autres valeurs mobilières".

[18] Importantly, due to the broad nature of the wealth tax base after the reform that applies both to real estate held directly and indirectly, the policy change does not affect taxpayers' incentive to change the way they hold real estate.

[19] In the pre-reform period, components of wealth do not add up (i.e. more than 20% difference between every asset and the total) in less than 1.8% of the cases among French taxpayers who file a detailed return, while this share is 24% when looking at non-residents.

year in the paper is made to account for the potential anticipation responses to the reform.[20] On average, ISF taxpayers (2016) are 69 years old. Almost 70% of them receive pension income and about 18% live in Paris. Their average annual taxable income is 150,000 euros and their average taxable wealth is around 2.8 million euros. It is divided between 47% of real estate (including 19% for their primary residence) and 53% of financial assets.[21] Their effective tax rate (wealth tax liabilities after reductions and ceiling relative to net taxable wealth) is 0.32%. The number of wealth taxpayers goes from around 350,000 in 2016 to 130,000 in 2018, the year the reform is implemented. The average taxable wealth decreases to 2.3 million euros because financial wealth stops being taxed but the average taxable income received by IFI taxpayers suggests that they are on average richer than ISF taxpayers (260,000 euros vs. 150,000 euros).

4 The Effect of Wealth Taxes on Portfolio Allocation

The aim of this section is to investigate the extent to which taxpayers reshuffle their portfolio in response to the reform, and to quantify the magnitude of the reshuffling. My main empirical approach is to compare French residents' wealth outcomes to non-residents' in a difference-in-differences design.

4.1 Definition of Treatment and Control Groups

Treatment group I define as treated all households who own enough real estate before 2017 to remain liable to the wealth tax after the reform in the absence of any behavioral response. More specifically, the treated group is composed of taxpayers who i) are liable to the wealth tax all years in 2013, 2014 and 2015, ii) fill in a detailed return at least once over this period and iii) when they fill in a detailed return, report at least 1.3 million euros in directly held taxable real estate net of debts. Since financial and mortgage debts are reported together, I use a conservative definition of net taxable real estate in my preferred specification. In the analysis, I show that defining the treatment group using gross taxable real estate does not change the estimates of portfolio rebalancing.

Control group I define as control the group of non-resident taxpayers liable to the French wealth tax in 2013.[22] As mentioned in subsection 2.3, I remove all non-residents who report any significant taxable fi-

[20] Candidate Emmanuel Macron announced in Februrary 2017 his will to reform the French wealth tax and was elected in April 2017 which was almost two months before the wealth tax return should be submitted (June 15^{th}).

[21] As mentioned above, all wealth taxpayers with net wealth below 2.57 million euros between 2013 and 2017 (3 million euros in 2011 and 2012) don't have to report their wealth by asset type. Thus, the decomposition presented here is based on the wealth structure of households liable to the wealth tax in 2016 as observed in 2010.

[22] As I will discuss later, a strong mean reversion affects the probability for non-residents to pay the wealth tax from one year to another. Using 2013 instead of later years when defining the control group allows me to deal with this issue by adjusting for differential linear pre-trends when estimating the extensive margin responses to the reform. Importantly, estimates of the intensive margin responses, based on a balanced sample of taxpayers remaining liable to the wealth tax all years between 2013 and 2022, are not affected by this choice.

nancial assets any year in my sample period. More specifically, I exclude all non-residents who ever report financial assets representing more than 5% of their taxable wealth, including in 2010, i.e. before the introduction of the simplified reporting requirements. This is a conservative definition of the control group as an important share of these assets is likely to be real estate wrongly reported as financial wealth.[23] This restriction reduces the control group by approximately 30%.

One may be concerned that some shocks will affect non-residents' incentives to acquire French real estate after 2017, which would confound the estimated rebalancing response to the wealth tax reform. Morel and Uri (2021) have studied the origin countries of non-residents owning real estate in France. They show that the rankings of the top 10 most important countries has remain unchanged between 2009 and 2019, alleviating the concern that a shock has strongly affected the investors from one specific country during the period. In the robustness section, I also show that estimating the effect of the reform using an alternative control group composed of French taxpayers leads to very similar results.[24]

Additional restrictions Endogenous switching between groups is a common threat to identification in difference-in-differences settings. In this paper, this can happen through migration responses to the reform, e.g. if non-resident taxpayers migrate to France once financial assets become (wealth) tax free. I deal with this issue in the difference-in-differences specification by restricting my treatment group to households who are never non-residents between 2013 and 2021 and my control group to taxpayers who remain non-residents all years between 2013 and 2021.[25]

Descriptives on the estimation sample Table 1, columns 3 and 4, presents descriptive statistics for the treatment and control groups in 2016. The mean treated taxpayer is on average 73 years old and is twice as likely to live in Paris as the average wealth taxpayer. Their taxable income consists for 45% of wages and pension income and 55% of capital income. They report on average 6 million euros in taxable wealth, slightly more than half of it being real estate and face a 0.54% effective wealth tax rate. Non-residents in the control group are younger than the average wealth taxpayer, 70% of them receive taxable income in France, more than 90% of which is rental income. They own on average 3.3 million euros of taxable wealth (i.e. real estate), 1/4 of which being held indirectly.

[23] As mentioned in the previous section, components of wealth reported by non-resident taxpayers is often not reliable and should threfore be interpreted with caution.

[24] This alternative control group consists of French taxpayers whose main housing asset is their primary home.

[25] The ideal specification would be to condition on pre-reform variables only in order to account for the migration response to the reform. Unfortunately, as noted in Appendix section A2, the fact that taxpayers who migrate sometimes change their fiscal identifyer prevents me from doing it.

4.2 Empirical Strategy

In order to estimate behavioral responses to the 2017 reform, I compare wealth outcomes of French wealth taxpayers to non-residents' in a difference-in-differences setting (DiD). I estimate responses happening both on the extensive and on the intensive margins. In the former case, the goal is to estimate the fraction of treated taxpayers who reallocate their portfolio in order to own less in real estate than the €1.3M exemption threshold and thus who become exempt from wealth taxation. Studying the other margin of response—the intensive margin—amounts to quantify the magnitude of the portfolio reallocation among taxpayers who remain liable to the wealth tax after the policy change. This subsection presents the method used to estimate both margins of response.

Intensive margin response The baseline difference-in-differences specification used to estimate the intensive margin response to the reform is given by:

$$Y_{it} = \sum_{j \neq 2016} \beta_j \cdot Year_{j=t} \cdot Treat_i + \gamma_i + \eta_t + v_{it} \tag{1}$$

Where Y_{it} is a wealth outcome for household i in year t; $Treat_i$ is a binary variable equal to 1 if household i is in the treatment group and 0 if it is in the control group; γ_i is a household fixed effect and η_t is a year fixed effect. Standard errors are clustered at the household level. The coefficient of interest is β_j, which captures the average difference in outcomes between the treatment and control groups in year t. The reference year is 2016 in order to allow me to observe any anticipatory reallocation behavior in 2017. Occasionally, I employ a more compact version of the baseline model presented in equation (1) where all post-reform $Year \cdot Treat$ dummies are replaced by a simple $Post \cdot Treat$ dummy.

The main outcome of interest is taxable real estate (in log) reported by taxpayer i in year t. When studying this outcome, I restrict my treatment group to households who never file the simplified wealth tax return and thus who provide information on their level of housing wealth each year they are subject to the wealth tax. This restriction is not needed for non-residents because their taxable wealth consists of real estate only. As a result, taxable real estate for non residents is defined as gross taxable wealth. When studying the intensive margin response, my preferred specification estimates equation 1 on a balanced sample of taxpayers subject to the wealth tax between 2013 and 2022. Descriptive statistics for this sub-group of treated taxpayers are provided in Appendix table 3 (column 1). I provide in Appendix results based on an unbalanced sample—results are very similar.[26]

[26]This unbalanced panel of taxpayers is composed of 21,338 treated and 1,868 control households vs. 16,023 treated and 1,127 control taxpayers for the balanced panel. The number of observations is different from what is provided in table 1 because the sample of treated households is restricted to taxpayers filing a detailed tax return all years.

The specificity of the 2017 reform, which reduces the incentives for French taxpayers to hold real estate only *relative* to financial assets, makes it possible to interpret any post-reform divergence in taxable real estate between the treated and the control groups as a reallocation response. For the treatment group, taxable real estate is defined as directly held taxable real estate, gross of debts. The key identifying assumption making it possible to interpret the β_j as causal is that the outcomes of the treated French taxpayers and the control non-residents would have evolved similarly in the absence of the 2017 reform. The reported stock of real estate evolves similarly between the two groups before the reform, which provides support for the validity of this assumption.

Extensive margin response Estimating the extensive margin response to the reform amounts to study how the fraction of taxpayers being liable to the wealth tax evolves in both groups around the policy change. If this fraction suddenly drops for the treatment group after 2017, it would indicate that French households react to the policy change by adjusting their real estate holdings in order to locate below the exemption threshold. However, in the French context, simply comparing the evolution in the share of taxpayers liable to the wealth tax in the treatment and control groups is not very informative. To see why, Appendix figure 11 displays the results obtained when estimating equation (1) where Y_{it} is a dummy equal to 1 if taxpayer i is liable to the wealth tax in year t and zero otherwise. The time series graph (left panel) shows how the fraction of wealth taxpayers in both groups evolves between 2013 and 2021, normalized to 0 in 2016. While the series remains relatively constant for the treatment group before the reform, it appears clearly that it decreases linearly for the control group over the same period. As shown in the DiD graph, this differential linear pre-trend makes a direct comparison between the series from both group not very informative. Yet, the fact that the series for the control group does not exhibit any discontinuity at the time of the reform—unlike for French taxpayers—confirms that non-residents can still constitute a meaningful control group here.

A first way to deal with the linear differential pre-trend is to employ a "first difference" specification, namely to estimate equation (1) using $Y_{it} - Y_{it-1}$ instead of Y_{it} as outcome variable. Results are shown in Appendix figures 12a (time series) and 12b (DiD). This specification eliminates the differential pre-trend as the outcome variable evolves now similarly between the two groups before the reform. However, although the results show a clear effect of the reform, interpretating them in order to have a sense of the magnitude of the extensive margin response is challenging. For this reason, my main analysis of the extensive margin response to the reform builds on another specification, which extends the baseline difference-in-differences model by accounting for a linear pre-trend parameter. This model, which has a flavor similar to the one implemented by Jakobsen et al. (2020), is given by:

$$Y_{it} = \sum_{j \neq 2016} \beta_j \cdot Year_{j=t} \cdot Treat_i + \gamma_i + \eta_t + \theta^T \cdot t \cdot Control + v_{it} \quad (2)$$

Where Y_{it} is a dummy variable equal to 1 if taxpayer i is liable to the wealth tax in year t and zero otherwise and θ^T is a linear differential pre-trend identified based 2016 (baseline reference year) and 2015.[27] Similarly to the model presented in equation (1), I occasionally employ a more compact version of equation (2) where all post-reform $Year \cdot Treat$ dummies are replaced by a simple $Post \cdot Treat$ dummy.

4.3 Tax Base and Tax Rate Differential

This subsection documents the evolution of net taxable wealth and marginal tax rate differential between real estate and financial wealth among French taxpayers and non-residents, to gain insights on the magnitude of the tax change.

Figure 2a displays the time series of net taxable wealth for French and non-residents households, normalized to zero in 2016 based on a balanced sample of taxpayers liable to the wealth tax all years between 2013 and 2022.[28] We see that non-residents are on a relatively flatter trend than French taxpayers before the reform. This can be explained by the fact that taxable wealth consists of real estate only for non-residents while for French taxpayers it is both financial and real estate assets. However, French taxpayers experience a sharp drop in 2018 while there is no change around the reform when looking at non-residents. Figure 2b simply displays the estimated β_j from equation (1), referring to the difference between the two series observed in panel A. After five years, taxable wealth in the treatment group has dropped by 45% compared to non-residents in the control group. An important part of this sizeable drop is mechanical and comes from the exclusion of financial assets from the tax base. One of the goal of this paper is to estimate the share of this drop which can be explained by behavioral—i.e. reallocation—responses to the tax change.

Figure 2c shows coefficients estimated from equation (1) where the outcome variable is the difference in marginal tax rates between real estate and financial assets. The difference increases sharply for French taxpayers compared to non-residents after the reform. On average, the difference in marginal tax rate borne by French households after the reform increased by 0.89 percentage points compared to non-residents, which is sizeable. As an illustration, if we assume a 5% rate of return on wealth, this tax difference translates into a $0.89/0.05 \approx 18\%$ gap in capital income tax rate depending on the class of asset generating the income.

Results provided in Figures 2a, 2b and 2c make two points. First, the 2017 reform reduced dramatically the wealth tax base for French taxpayers, but not for non-residents. Second, the wealth tax differential between

[27] Thus, the time fixed effect for 2015 will not be estimated

[28] Results obtained using an unbalanced sample are virtually the same.

real estate and financial assets faced by French households after the reform is sizeable and leads to important incentives for French taxpayers to rebalance their portfolio.

4.4 Extensive Margin Response to the Reform

Taxpayers in the treatment group hold by construction more than 1.3 million euros in taxable real estate before the reform. Thus, they will automatically locate above the wealth tax exemption threshold at 1.3 million euros after the reform in the absence of any reaction to the policy change.[29] Therefore, a sudden drop in the fraction of treated wealth taxpayers after 2017 would indicate the presence of a reshuffling response. This type of response—on the extensive margin—is likely to be prevalent among taxpayers located just above the exemption threshold. Figure 3a displays the percentage of treated taxpayers liable to the French wealth tax over time. By Construction, it is equal to 100% between 2013 and 2015. While the fraction of French households subject to the wealth tax remains very close to 100% in 2016 and 2017, there is a sudden drop of about 7 percentage points in 2018 and the percentage of wealth taxpayers remains around 93% over the entire post-reform period. This figure provides clear evidence that the policy change triggers a response on the extensive margin. Figure 3b, which can be thought of as a simple-difference estimation, normalizes the series from 3a to 0 in 2016. It confirms that the probability to pay the wealth tax among treated taxpayers is flat before the reform and drops by about 7% once the reform is implemented.[30]

I estimate the magnitude of the response using the model presented in equation (2). Figure 3c plots the time series for the treated group as well as the adjusted time series for the control. The two series coincide well between 2013 and 2017 and start to diverge immediately after. The difference in the two series (figure 3d) confirms that extensive margin responses to the 2017 reform are sizeable: on average, the fraction of treated households liable to the wealth tax after the 2017 policy change is lower by 8.8% relative to the control group. This result suggests that almost 9% of the treated taxpayers responded to the tax change by restructuring their portfolio in order to own less than 1.3 million euros in real estate and thus become exempt from wealth taxation.

Importantly, the post-reform period is characterized by a strong house price inflation in France (see Appendix figure 10). Thus, keeping the volume of real estate fixed, households who were just below the exemption threshold in 2018 should be more and more likely to cross again the 1.3 million euros point as the price of their properties increases. Yet, while the fraction of taxpayers liable to the wealth tax in the post-reform period increases for the control group, it does not for the treated group.[31] This phenomenon suggests that

[29] Considering that real estate prices do not decrease over the period and that they do not deplete their wealth by e.g. consuming it.

[30] Given that the percentage of treated taxpayers liable to the wealth tax in 2016 is almost 100%, the estimated coefficients can be interpreted both as a percentage change and a percentage point evolution.

[31] For the control group, the increase is observed once adjusted for the linear pre-trend.

treated taxpayers also respond on the extensive margin dynamically, namely by continuing to adjust their taxable real estate in order to remain below the 1.3 million euros threshold.

Figure 18 shows how extensive margin responses vary by pre-reform level of wealth (18a), income (18b), real estate wealth (18c), share of housing in total wealth (18d), debt (18e) and age (18f). Unsurprisingly, there is a strong wealth and housing wealth gradient and wealthier taxpayers are much less likely to respond on the extensive margin than households located at lower levels of the wealth distribution. This can be explained by the fact that taxpayers in lower quintiles are located close to the exemption threshold and do not need to reshuffle much to locate below it, while households located higher up would need to rebalance massively to suddently own less than 1.3 million euros in real estate. There is also a strong income gradient, which reflects the fact that taxpayers with higher income are also taxpayers with higher level of wealth. Interestingly, the magnitude of the response on the extensive margin is relatively flat for the bottom 80% of the distribution of housing share in total wealth (18d), and are stronger for the top 20%.

4.5 Magnitude of the Reallocation Response to the Reform

The aim of this subsection is to quantify the extent to which taxpayers rebalanced their portfolio away from real estate in response to the reform. To do so, I estimate the difference-in-differences model presented in equation (1) using taxable real estate as the outcome variable and a balanced sample of taxpayers liable to the wealth tax all years between 2013 and 2022. As mentioned in section 4.2, when studying this outcome variable, the treatment group is restricted to households who never file the simplified wealth tax return and thus who provide information on their housing wealth each year.

Figure 4a shows how the reported stock of real estate evolved between 2013 and 2022 for the treated and control groups separately. The stock of real estate evolves strikingly similarly in both groups before the reform and starts to diverge immediately after. Figure 4b, which plots the diff-in-diff coefficients, shows that after three years of gradual decline, the difference in real estate stock between both groups stabilizes and remains flat for the remaining two years. On average, the French taxpayers experienced a decline of 4.4% in their stock of housing wealth compared to the control group in the full post-reform period, with a difference of 5.5% at the end of the period, 5 years after the reform is introduced. The fact that the divergence between the treated and control groups increases gradually over the three years following the reform before stabilizing is consistent with owners of real estate facing liquidity contraints which can translate into a delay between the decision the sell and the actual transaction date. Note that there starts to be a small divergence between the treated and control groups in 2017, the year the reform is voted but not yet introduced. In

the context where selling a housing asset is not an immediate process, this small anticipation effect may be rationalized by a minority of taxpayers starting to sell before the reform in order to benefit from the tax cut on financial wealth immeditately when it enters into force.

Estimates of the rebalancing response to the reform using alternative specifications are provided in the Appendix. Figure 13a displays results based on an unbalanced panel of wealth taxpayers and the baseline log-specification. Results are very similar to those obtained with a balanced panel. Results in Figure 13b are obtained from the estimation of equation (1) using as outcome variable taxable real estate reported by households scaled by the 2013-2015 average.[32] The overall picture is similar but the estimated drop in reported real estate is larger. This is likely due to large values that are common when using scaled specifications (even after winsorizing), which underlines the importance of using log transformations when possible. Figure 13c displays results using taxable real estate in level (euros) as outcome variable. It suggests that five years after the implementation of the reform, the difference in real estate reported by French and non-resident taxpayers is lower by 340,000 euros compared to 2016. Finally, figure 13d displays the diff-in-diff coefficients obtained when the definition of taxable real estate for non-residents is net instead of gross real estate (keeping gross real estate for French taxpayers).[33] The estimated response here is larger. This can be explained by the fact that some restrictions regarding deductible debts are introduced in the 2017 reform (see subsection 2.2), highlighting the importance of using gross instead of net taxable wealth in the preferred specification.

As mentioned in section 2.2, a flat tax of 30% on financial capital income was introduced in 2018. This reform reduced the top marginal tax rate on financial capital income by 10.2ppt—while leaving the taxation of rental income unchanged—and thus contributed to make real estate a less profitable investment relative to financial assets for many taxpayers. In order to show that this concomitant reform is not the main driver behind French taxpayers' portfolio reallocation, I estimate equation (1) on the sample of households not affected by the introduction of the flat tax. These unaffected taxpayers are treated households who face a marginal income tax rate of 30% or below in 2013, 2014 and 2015.[34] Results are displayed in Appendix figure 14a. The reallocation response to the wealth tax change obtained for this sub-group of treated taxpayers is very similar to the baseline results.

Besides, the treatment assignment status in this paper depends on French taxpayers' reported stock of real estate, which is also the outcome variable. This identification strategy may raise the concern that mean reversion is driving part of the estimated drop in real estate reported by French taxpayers after the policy change. The absence of differential pre-trends provides a first compelling element alleviating this concern. To further check that mean reversion is not an issue here, I define alternative treatment groups based on real

[32] Scaled values are winsorized at the 99th percentile of the non-zero distribution.
[33] Remember that Financial and real estate debts are reported together for French taxpayers before the 2017 reform.
[34] Wealth taxpayers benefiting from the tax ceiling are removed.

estate reported in 2011, 2012, 2013 or 2014. Then, I estimate equation (1) using these new treated groups. Results are shown in Appendix figure 14b. The various definitions of the treatment group affect the results very little, providing estimates that align very well with the baseline specification.

4.6 Mechanisms

The aim of this subsection is to investigate the mechanisms behind the average rebalancing response to the reform. First, I show that the average response is driven by a minority of taxpayers who respond massively to the policy change while the rest of the French wealth taxpayers does not reshuffle at all. Then, I exploit the available information on taxpayers' portfolio composition and capital income structure in order to dig deeper into the anatomy of the portfolio reallocation. Finally, I dig further into the heterogeneity of the response.

4.6.1 What proportion of taxpayers responds to the reform?

The analysis conducted in the previous subsections showed that French taxpayers responded to the 2017 wealth tax reform by rebalancing their portfolio away from real estate after the policy change. Yet, despite its immediate relevance for the research question asked in this paper, there is strong uncertainty about the proportion of taxpayers actively responding to the reform. While quantifying the share of taxpayers responding on the extensive margin is straightforward, when focusing on the intensive margin, it is unclear whether a majority of taxpayers sells about 5.5% of their housing assets or whether a minority of households reacts very strongly while the majority does not respond at all.

In order to distinguish between the two scenarios, I implement a decomposition exercise aiming at quantifying the share of taxpayers responsible for the average estimated intensive margin response. First, I compute for each taxpayer the annual change in housing wealth over the full period. More precisely, I estimate for each taxpayer the evolution in their reported real estate from one year to the other by defining Δ_t^{RE} as $\Delta_t^{RE} = \frac{RE_{t-1} - RE_t}{Re_{t-1}}$, where RE_t is taxable real estate in year t. Δ_t^{RE} is an indication of how the stock of housing assets held by a given household has evolved from one year to another. A high positive Δ_t^{RE} for a given taxpayer—in a period of inflation—indicates that they have sold a high share of their housing assets.[35] Then, I rank all taxpayers by their maximum value of Δ_t^{RE} during the post-reform period (2018-2022), defining taxpayers located at the top as the biggest sellers. Finally, I estimate the response to the reform by removing successively the top 5%, the top 10% etc. biggest sellers from the estimation sample—namely both from the treatment and the control group.The estimation sample here consists of my baseline balanced sample of taxpayers who remail liable to the wealth tax over the 2013-2022 period. If the response to the reform is very concentrated among a few treated taxpayers, excluding the biggest sellers should have a strong impact on

[35]The post-reform period is a period of relatively high house price inflation in France, see figure 10.

the overall estimated effect. On the contrary, if the response is more evenly distributed, the biggest sellers should not sell so much more than the average taxpayer, and removing them should have little effect on the estimated response to the policy change. Note that removing the biggest sellers from the treatment and the control groups is a way to ensure that a potential change in the estimated response is not mechanical and rather comes from a concentration of big sellers in one of the groups. Yet, it is important to keep in mind that this exercice builds on post-reform outcomes and should therefore not be thought of as causal.

Figure 5a displays the results of this decomposition task. It appears clearly that aggregate responses to the reform are driven by a minority of "active taxpayers". After removing the top 5% biggest sellers from the estimation sample, the difference in reported real estate between the treated and control in the post-reform period is reduced by approximately 50%. This suggests that most of the biggest real estate sellers in the post-reform period are French taxpayers and account for about 50% of the total estimated effect of the reform. After removing the top 20% from the estimation sample, the difference between French and non-resident taxpayers is not significant anymore. In other words, 20% of taxpayers are responsible for the entire drop in reported real estate observed after the reform.[36] The fact that the biggest real estate sellers after the policy change are French taxpayers and not non-residents confirms the idea that the former group is responding to the reform while the latter is not. To check that this phenomenon is related to the reform, I implement a placebo exercise, in which the biggest sellers are defined based on the pre-reform evolution of real estate holdings (2013-2016). Then, successively removing the top 5%, top 10% etc. biggest pre-reform sellers from the estimation sample, I estimate how real estate evolves around the tax change. Figure 5b shows the results. It appears clearly that removing the biggest pre-reform sellers has very little effect on the estimated response to the policy change, suggesting that they are evenly distributed across the two groups in the pre-reform period.

This decomposition sheds light on a clear distinction between a minority of active taxpayers (the 20% biggest sellers) and a majority of passive ones (the other 80%). It is in line with the literature finding a minority of "active savers" responding to subsidies for retirements accounts while the majority of the population does not actively reacts (Chetty et al., 2014). This result suggests that among the French taxpayers remaining liable to the wealth tax after 2017, a minority responds strongly to the policy change while the average evolution in real estate for the majority is similar to what is observed among non-residents. Interestingly, the tax differential between real estate and financial assets increased to the same degree (0.9 percentage points) for the active taxpayers and the rest of the treated group after the reform. Thus, the heterogeneity in the magnitude of the response cannot be explained by different tax incentives.

This concentration in the response to the reform raises a key question for the policy maker: do active

[36] Among taxpayers remaining liable to the wealth tax.

taxpayers differ from more passive ones in their observable characteristics? The underlying question here is whether the policymaker can make use of "tagging" (Akerlof, 1978) and include these characteristics as arguments in the optimal tax formula. Appendix table 3 , column 2, provides 2016 summary statistics for the group of active taxpayers. Despite some differences, this group of taxpayers is strikingly similar to the group of passive taxpayers (column 3), with the same level of taxable wealth (€6.5 million) and only modest differences in taxable income (€290,000 vs. €310,000) and share of real estate in total portfolio (57% vs. 54%).

4.6.2 Anatomy of the reallocation - consumption vs. investment housing

Housing has a dual role. It is used both for consumption (owner-occupied housing) and for investment (tenant-occupied housing). Martínez-Toledano (2022) has shown that larger exposure to housing as a pure investment good—as opposed to consumption good—is a key element explaining differences in portfolio reallocation responses to housing busts. Since both consumption and investment housing are subject to the French wealth tax, the 2017 reform is an ideal design to study whether this finding extends to responses to taxation.

Primary home First, I study the role of primary housing. Primary housing benefits from a 30% wealth tax exemption and is thus reported separately from the rest of housing wealth in the tax returns. As a result, I observe for each taxpayer the reported value of their primary home.[37] In order to test separately the responsiveness of primary residence and non-primary housing to the reform, I compute for each treated taxpayer how much of their real estate wealth is composed of non-primary housing between 2013 and 2015. Then, I build 5 sub-groups of treated taxpayers corresponding to the quintiles of the non-primary housing share distribution. The first quintile corresponds to taxpayers for whom the primary residence represents a sizeable share of their overall housing wealth, while for the last quintile, the primary residence represents a much lower fraction. Then, I estimate the equation (1) separately for each group. Because non-residents report by definition zero primary housing assets in France, I estimate each regression using the full control group of taxpayers. Figure 6a presents the results. There is a clear primary home share gradient in the degree of response to the reform and taxpayers whose real estate welath corresponds approximately to their primary home—the bottom 20% of the distribution—don't respond at all. In contrast, taxpayers for whom the primary residence only represents a small share of their housing wealth reduced their real estate holdings by almost 9%. These results suggest that taxpayers did not respond to the reform by selling their main residence.

[37] The wealth tax returns do not provide information on the value of the primary home if it is held indirectly. However, if a primary residence is held through a company, the owner cannot benefit from the usual 30% tax exemption, which makes this ownership scheme relatively rare for primary residences.

Investment vs. owner-occupied secondary housing Even taxpayers with a low primary housing share may own one or several properties meant for consumption (e.g. leisure house). However, given that the value of secondary housing is reported altogether irrespective of its use, it is not possible to separate consumption from investment secondary housing using the wealth tax returns. To circumenvent this issue, I leverage information on rental income, which is a good indication of how properties are used for. Indeed, if a given taxpayer receives high levels of rental income, they are likely to own properties for investment purposes. On the contrary, if a taxpayer reports large amounts of secondary housing wealth but no rental income, this housing wealth is likely to be owner-occupied secondary housing. To understand better how consumption and investment housing differentially respond to the tax shock, I group treated taxpayers according to whether they receive any rental income before the reform or not and estimate (1) separately for each group.[38] While responses from taxpayers with positive pre-reform rental income are close to the average estimated effect, reactions of taxpayers with zero rental income are not significantly different from zero. Appendix figure 15 performs a variation of this heterogeneity exercise by grouping taxpayers by quintile of their baseline level of rental income and by using alternative definitions of rental income.[39] A rental income gradient is confirmed: the bottom of the distribution rebalances about 2.5% of their real estate, while the drop lies around 7% for the top quintile, confirming that the magnitude of the response is higher among taxpayers owning greater levels of investment housing. Estimates vary very little with the definition of rental income (gross vs. net) and depending on whether taxpayers benefiting from the wealth tax ceiling before the reform are excluded or not.

4.6.3 The evolution of capital income

The focus has so far been on the evolution of housing wealth, assuming that the observed decrease reflected a reallocation of taxpayers' wealth from real estate to financial assets. Unfortunately, households' financial wealth is no longer taxed and thus is not reported after the reform and it is not possible to directly observe the rebalancing from real estate to financial wealth. I circumvent this data limitation by studying the evolution of capital income and investigate how income flows generated by real estate and financial assets differentially respond to the 2017 tax change. I show that active taxpayers—who decreased their real estate holdings—i) receive much less rental income and ii) experience an increase in their financial capital income. This pattern confirms households' portfolio rebalancing between housing and financial assets.

The taxation of financial capital income for non-residents in France is subject to bilateral taxation agree-

[38] Each regression is estimated using the full control group. I exclude households benefiting from the wealth tax ceilings any year between 2013 and 2017. These taxpayers may artificially reduce their taxable income to zero in order to benefit from the ceiling, meaning that their level of rental income is not a good indication of how their properties are used for.

[39] Basline level of rental income are defined as average rental income received by a taxpayers between 2013 and 2015.

ments giving rise to tax credits in many cases. Table 1 shows that financial capital income represents a tiny share of French taxable income for non-residents. As a result, the comparability of taxable income between French and non-residents is quite poor. However, there are many French taxpayers reporting taxable capital income for whom incentives to hold real estate are not modified by the wealth tax reform. Thus, I build a new control group composed of French taxpayers who i) are liable to the wealth tax all years in 2013, 2014 and 2015, ii) file a detailed return at least once over this period and iii) when they file a detailed return, report strictly less than 1.3 million euros in taxable real estate.[40] Because they own less in real estate than the exemption threshold before the reform, most taxpayers in this group stop paying the wealth tax after the reform and thus do not have any incentives to substitute real estate for financial assets. If some members of the new control group remain liable to the wealth tax after 2017 it will attenuate the estimated responses.

It 2018, a flat tax on financial capital income is introduced (see section 2.2). This reform has been shown to trigger important responses via a surge in dividend payouts from 2018 (Bach et al., 2019; Lefebvre et al., 2021). Thus, a difference in dividend payments between the treated and the control group after 2017 could reflect a difference in the response to the introduction of the flat tax rather than a reshuffling response to the wealth tax reform. To isolate the effect of the wealth tax change, I first control for pre-reform level of equity wealth and financial income, interacted with year dummies. Second, Bach et al. (2019) find no effect of the flat tax on capital income other than dividends. Thus, I study the evolution of fixed interest income, which should respond much less to the introduction of the flat tax than dividend income. Third, I estimate each equation separately for the "active taxpayers" (Top 20% bigest sellers) and the rest of the treatment group, composed of more "passive taxpayers". Controlling for the level of pre-reform equity wealth and dividend income, a larger increase in financial capital income from the active taxpayers likely reflects a higher reallocation response to the wealth tax change.

I estimate equation (1)—supplemented with the news controls—for two types of financial capital income, namely dividend and fixed interest income as well as for rental income. Each income type is scaled by its 2013-2015 average and winsorized at the 99th percentile of the distribution of non zero values, following Bach et al. (2019). When looking at the evolution of rental income, I restrict the sample to taxpayers receiving at least 1500 euros in annual rental income once between 2013 and 2015. When considering financial capital income (dividends, interests), I restrict the sample to households receiving at least 1500 euros in annual financial capital income once between 2013 and 2015.

Figures 7 displays the results. Focusing first on rental income, panel 7a shows a continuous drop among

[40] As mentioned in section 3, indirectly held real estate appears in the category "other financial assets" in the wealth tax returns before the reform and thus is reported together with some specific financial assets. Thus, to restrict the new control group to households with strictly less than €1.3M in total real estate, my definition of real estate here is directly held real estate + assets reported in the "other financial assets" category.

active taxpayers after the reform compared to the control group, while the trend remains flat for passive taxpayers. On average, rental income received by the group of active households fell by approximately -18 percentage points compared to the control group; relative to the 2016 outcome mean in levels of 1.16, it represents a -18/1.15 $\approx$ 16% decline in rental income. Given the 2016 average level of rental income among active taxpayers, this effect represents a drop of about 12,000 euros in annual rental income after the reform compared to before. Overall, this graph shows that the evolution of housing wealth held by taxpayers translates into a change in the level of rental income they receive, suggesting that variations in households' portfolio structure is well reflected by changes in their taxable capital income. Moreover, this result is consistent with active taxpayers responding to the reform by selling properties held for investment purposes.

Figure 7b displays the evolution of dividend income. Active taxpayers experience a sharp increase in dividends received after the reform compared to before. On average, dividends reported by active taxpayers increased by about 38% relative to 2016, which translates into a mean annual increase of 14,000 euros. As shown in panel 7c, interest income received by active taxpayers reacts to the reform as well, increasing by 22%, which translates however into a more modest average annual increase in 660 euros.

The fact that the group of passive taxpayers—who do not decrease their stock of real estate post-reform—also receive higher financial capital income after 2017 may rise the concern that the observed response is confounded by the introduction of the flat tax. While ruling out any confounding effect from this concomitant reform is difficult, several elements support the idea that results from figures 7b and 7c should be interpreted as a response to the wealth tax reform. First, observing a reaction from passive taxpayers can be explained by them redirecting their new savings while keeping the composition of their current wealth stock unchanged. Second, figure 7c shows an increase the level of interest income received by treated taxpayers after 2017, while Bach et al. (2019) found no evidence that this income category reacted to the introduction of the flat tax. Finally, to provide further evidence that the observed response reflects the portfolio rebalancing rather than a reaction to the introduction of the flat tax, I estimate how the intensity of the increase in financial income varies depending on the magnitude of the reshuffling as obtained in subsection 4.6.1. More specifically, I investigate how the response varies within the group of active taxpayers, by focusing on i) the top 75% biggest sellers of this group, ii) the top 50% biggest sellers, iii) the top 25% biggest sellers and by comparing their response to the full group of active taxpayers and to the group of passive ones.[41] If the evolution of financial income reflects well the evolution in the stock of financial wealth, we should observe a higher increase in financial income among taxpayers who rebalance the most after the policy change. Appendix figure 17 shows the results obtained from the estimation of the compact version of equation (1) using the

[41] The top 75%, 50% and 25% are defined within the sample of active taxpayers, and thus reflect the top 15%, 10% and 5% of the full treated group.

same three scaled outcome variables (17a) and translating them into percentage increase (17b). Interestingly, there is a clear gradient—especially for dividend income—with a much larger adjustment among taxpayers who rebalance the most.

4.7 Robustness checks

4.7.1 General equilibrium effects of house prices

Wealth taxpayers have to report their real estate holdings at their market value value. Therefore, the stock of real estate reported by taxpayers is affected by housing price fluctuations. A potential concern with the results presented so far is that the reaction of the wealth taxpayers to the 2017 reform could affect house prices, which could in turn have an impact on taxpayers' reported real estate assets. The presence of such general equilibrium effects would make the estimated responses to the reform difficult to interpret. Reassuringly, combining the share of French real estate owned by wealth taxpayers before the reform (5% according to Garbinti, Goupille-Lebret and Piketty (2020)) with the fall in their real estate holdings (5.5%), the overall housing stock affected by the reform is negligible.[42] Moreover, the post-reform period coincides with a strong house price inflation in France (see Appendix figure 10), which is hard to reconcile with large general equilibrium effects associated with the wealth tax reform.

Yet, the French housing market is very heterogeneous and some areas or price segments may have been affected by wealth taxpayers' response to the 2017 reform. To further check that general equilibrium effects are unlikely to have played a strong role here, I study how prices of high-end real estate—more prevalent in portfolios of wealthy taxpayers—have evolved in France around the reform. To do so, I exploit DV3F, an administrative dataset providing information on the universe of property transactions in France between 2012 and 2021. This additional data source allows me to investigate whether the reform significantly depressed housing prices in the most expensive areas by comparing the price evolution in these areas to the average evolution in house prices over the period. Appendix figure 20 displays the evolution of average transactions prices for houses (left panel) and apartments (right panel) in the top 5% most expensive areas (in 2012) and all areas. First, while the evolution is modest between 2013 and 2016, it starts to increase in 2017. Second, after 2017, the price increase is either similar between the top 5% and all areas (houses) or even higher in the most expensive areas (apartments). Being certain that general equilibrium effects did not play any role in the context of the wealth tax reform is challenging. Yet, finding a similar or even higher increase in house prices in the most expensive locations supports the idea that the portfolio reallocation response to the 2017 reform is unlikely to have significantly depressed house prices, even for high-end real estate.

[42] Garbinti, Goupille-Lebret and Piketty (2020) estimate the share of French real estate held by the top 1% of the wealth distribution in France, which corresponds approximately to the population of wealth taxpayers before the reform.

4.7.2 Shifting vs. real rebalancing response

The interpretation of the estimated response to the reform varies greatly depending on whether it comes from a decrease in the amount of real estate owned by taxpayers—real response—or from a change in the way they hold this asset type—shifting response. Shifting strategies are employed by households willing to minimize their tax liabilities without changing their real economic behavior. The literature highlights that such avoidance strategies may be particularly prevalent in some contexts (Advani and Tarrant, 2021), calling for a cautious interpretion of the behavioral response to (wealth) tax changes. Intuitively, the magnitude of the shifting response when studying portfolio rebalancing depends on how broad the tax base is and how easy it is for taxpayers to reduce their taxable assets while keeping their actual holdings of this asset constant. In the French context, cases of real estate assets becoming exempt from wealth taxation after the reform are rare, limiting the scope for such shifting behaviors. The main exception applies to shares of listed companies investing in real estate (SIIC companies).[43] To assess the sensibility of my results to shifting behaviors, I study how dividends paid by such companies—reported separately from other dividends in the tax returns—evolve around the reform.[44] The specification I use is close to the one employed for other capital income types. The outcome variable is scaled by average total rental income (rental income + SIIC dividends) over 2013-2015 and winsorized at the 95th percentile of the distribution of non zero values.[45] Results are provided in Appendix figure 21. The evolution of dividend paid by SIIC companies is flat between 2013 and 2021 both for the active and passive taxpayers. This result supports the idea that real rather than shifting responses are driving the results.

4.7.3 Income vs. substitution effect

The 2017 reform has led to a sizeable reduction in tax liabilities among top French earners (Ben Jelloul et al., 2018). As a result, French taxpayers are richer after the reform than to before. This raises the concern that the estimated responses to the tax change may be partly driven by a revenue effect linked to the drop in tax liabilities. To investigate this potential effect, I study the heterogeneity of the intensive margin responses by quintile of pre-reform level of wealth and income. Results are presented in Appendix figure 16a, (by wealth) and 16b (by income). Interestingly, the relationship between the level of wealth as well as income and the magnitude of the drop in real estate post-reform is relatively flat. This allows me to rule out the concern that estimates of rebalancing responses to the reform are cofounded by large income or wealth effects. Moreover,

[43] Provided the taxpayer owns less than 5% of the shares and vote rights of the company. See Appendix section A1 for details on the wealth tax applying to real estate after 2017.

[44] Dividends paid by SIIC are reported in box 2TS in the income tax returns, contrarily to other dividends which are reported in boxes 2DC and 2DA. A few other items are also reported in box 2TS (including life insurance contracts of less than 8 years) but they are not favorable tax-wise and thus are likely to be relatively rare.

[45] The winsorization at the 99% level provides qualitatively similar estimates that are however less precise, due to the fact that relatively few taxpayers receive SIIC dividends.

the estimation sample consists of very wealthy taxpayers, owning on average more than 6 million euros of taxable wealth. Finding little variation in the magnitude of the reallocation along the wealth distribution provides support for the external validity of the results, suggesting that they are likely to hold for a larger group of taxpayers. The other graphs in Appendix figure 16 show heterogeneity along other dimensions, namely housing wealth (figure 16c), share of housing in total wealth (figure 16d), debt (figure 16e) and age (figure 16f).

4.7.4 Alternative control group

Non-residents are very different from French taxpayers along many dimensions. Given these large differences, a potential concern is that these two groups may be difficult to compare. In order to validate the results presented in section 4.5, I estimate the response to the reform using an alternative control group composed of French taxpayers. Assuming that taxpayers are unlikely to respond to the 2017 reform by selling their primary home, I define this new control group as treated French taxpayers whose housing wealth is primarily due to their main residence. More precisely, the new control group is defined as French taxpayers who i) are liable to the wealth tax all years in 2013, 2014 and 2015, ii) fill in a detailed return at least once over this period and iii) when they fill in a detailed return, report at least 1.3 million euros in directly held taxable real estate net of debts and iv) whose primary home accounts for more than 50% of the value of their total housing wealth. This alternative control group is composed of 2,168 taxpayers. I estimate the response to the reform using equation (1) with the new control group and the original treatment group—reduced from taxpayers that are now in the new control group (13,855 treated taxpayers). Figure 22 presents the results that are very close to the baseline DiD estimates.

Overall this section has shown that French taxpayers responded to the 2017 wealth tax reform by reshuffling their portfolio from real estate to financial assets. This reshuffling response affected the wealth tax base in two ways. First, by reducing the number of taxpayers liable to the wealth tax (the extensive margin response). Second, by reducing the amount of taxable real estate reported by households who continue to be subject from the wealth tax (the intensive margin response).

5 Cross-elasticity estimates and revenue impact

This section leverages the reduced-form estimates of the rebalancing response to the 2017 reform to i) estimate the cross-elasticity between real estate and financial assets and ii) assess the revenue impacts of taxing real estate and financial assets differently. Papers studying behavioral responses to wealth taxation mostly

focus on how the wealth tax base reacts to a change in the wealth tax rate. In contrast to the literature, this paper estimates how taxable real estate reacts to the tax rate differential between real estate and financial assets. This motivates the conceptual framework of asset rebalancing, detailed below.

5.1 Conceptual Framework

I build on Piketty and Saez (2013) and Piketty, Saez and Stantcheva (2014) to develop of simple model of asset rebalancing. Consider an economy with a continuum of individuals of measure one and two sources of wealth, housing (i.e. real estate) and financial wealth. For various reasons, the government may decide to tax different forms of wealth differently.[46] As a result, taxpayers may choose to rebalance part of their wealth from one asset class to the other. For example, some individuals can choose to sell a house used for rental business to invest in stocks.

Define taxable housing wealth of individual i, W_i^H, as potential housing wealth $\bar{W}_i^H$ minus X_i the amount of wealth reallocated from real estate to financial assets. Note that X_i can take both positive and negative values, positive X_i referring to a reallocation from real estate to financial assets and vice versa. Individuals who decide to rebalance part of their portfolio incur a cost $d_i(X)$.[47] Potential housing wealth $\bar{W}_i^H$ reflects individual i's savings decisions and refers to the amount of housing wealth individual i would own in the absence of any portfolio rebalancing (i.e. $X_i(0) = 0$). It is a positive function of the net-of-tax rate on housing wealth $(1 - \tau_H)$. Subsection 4.7.3 has shown that income effects are likely to be limited in the context of the portfolio rebalancing response to the 2017 wealth tax reform. Thus, for simplicity, I abstract from income effects here, meaning that the level of housing wealth held by a given individual is not affected by how much financial assets they own. The amount of wealth individual i reallocates from one tax base to the other (X_i) is a function of the tax rate differential between real estate and on financial assets $\tau_H - \tau_F$. Intuitively, this captures the idea that individuals allocate their wealth across real estate and financial assets depending on both the tax rate applying to each asset and on the rate differential between the two. Aggregating over all individuals, we have:[48]

$$W^H = \bar{W}^H(1 - \tau_H) - X(\tau_H - \tau_F) \tag{3}$$

[46] In the spirit of the French wealth tax reform, the goal may be to foster investment in some sectors of the economy. Another reason is related to the classic Ramsey theory of optimal taxation, which stipulates that lower tax rates should apply to the most elastic goods or factors (Ramsey, 1927; Diamond and Mirrlees, 1971)

[47] Following Piketty and Saez (2013), I assume that $d_i(X)$ is convex and that $d_i(0) = 0$ and $d_i'(0) = 0$ and that $d_i'(X) \lesseqgtr 0$ if and only if $X \lesseqgtr 0$.

[48] Symmetrically, we have for financial assets: $W^F = \bar{W}^F(1 - \tau_F) + X(\tau_H - \tau_F)$

Deriving W^H with respect to $(1-\tau_H)$ and keeping τ_F constant, we get:

$$\frac{\partial W^H}{\partial(1-\tau_H)} = \frac{\partial \bar{W}^H}{\partial(1-\tau_H)} + \frac{\partial X}{\partial(\tau_H - \tau_F)}$$

This equation establishes the link between three elasticities of housing wealth:

1. **The total elasticity** $e = \frac{(1-\tau_H)}{W^H}\frac{\partial W^H}{\partial(1-\tau_H)}$
2. **The savings elasticity** $e_s = \frac{(1-\tau_H)}{\bar{W}^H}\frac{\partial \bar{W}^H}{\partial(1-\tau_H)}$
3. **The cross-elasticity** $e_c = \frac{(1-\tau_H)}{W^H}\frac{\partial X}{\partial(\tau_H-\tau_F)}$

The total elasticity measures the percentage change in taxable real estate in response to a one percent increase in the net-of-tax rate on real estate. The savings elasticity captures how potential real estate reacts to an increase of one percent in the net-of-tax rate on real estate. The cross elasticity can be interpreted as the percentage of real estate assets that is reallocated to financial wealth when the tax differential between the two tax bases increases by 1 percentage point.[49] Note that the cross-elasticity is in fact a semi-elasticity and not strictly speaking an elasticity because it measures how reported real estate reacts when the tax differential increases by 1pp rather than by 1%. By construction, we have $e = \frac{\bar{W^H}}{W^H} \cdot e_s + e_c$. If we start from a situation with no asset reallocation ($\tau_H = \tau_F$), then $\bar{W^H} = W^H$ and we simply have $e = e_s + e_c$. It means that the total elasticity of housing wealth is the sum of the savings elasticity and the cross-elasticity.

Estimating the cross-elasticity between real estate and financial wealth is crucial for three main reasons. First, there may be reasons for a government to prioritize investment in certain sectors of the economy or specific assets over others. The magnitude of the cross-elasticity tells us how efficient taxation is when the government's objective is to reallocate households wealth between real estate and financial assets. Second, in the short run, the savings elasticity e_s is likely to be relatively limited and the overall elasticity of real estate with respect to taxation may therefore depend heavily on the cross-elasticity.[50] Third, as shown in Appendix section A5, the revenue maximizing tax rate on real estate depends heavily on the size of the cross-elasticity. In the extreme case of an infinite cross-elasticity, the revenue maximizing tax rate on real estate and financial assets should be equal and depend on a weighted sum of the savings elasticity on real estate and on financial assets.

[49] As it is usually done in the literature on behavioral responses to wealth taxation, I interpret $\frac{\partial(\tau_H-\tau_F)}{1-\tau_H}$ as a one percentage point increase in the tax rate differential between real estate and financial assets because $(1-\tau_H)$ is close to 1. Strictly speaking, however, the tax rate differential is expressed relative to the net-of-tax rate on real estate.

[50] In the French context, this intuition is supported by Garbinti et al. (2023) who find no bunching at pure tax kink when studying behavioral responses to the wealth tax.

5.2 Estimation of the cross-elasticity: method

For simplicity, the stylized model presented in the previous section defines a single cross-elasticity parameter. However, the French wealth tax exhibits an exemption threshold, implying that wealth taxpayers may respond to the tax differential between real estate and financial assets both along the intensive margin (adjusting the housing stock while remaining liable to the wealth tax) and the extensive margin (reallocating in order to fall below the exemption threshold). While the magnitude of the extensive margin response is very context-dependent and is less informative of the degree of substitution between real estate and financial assets, both margins of response matter for wealth tax revenues.[51] This subsection presents the method used to estimate the cross-elasticity along both margins.

The intensive margin The intensive margin component of the cross-elasticity measures the percentage change in real estate held by wealth taxpayers in response to a one percentage point increase in the tax rate differential between real estate and financial assets. In order to estimate it, I focus on a balanced sample of wealth taxpayers who remain subject to the wealth tax between 2013 and 2022 and use a model similar the compact version of the difference-in-differences model estimated earlier, in which all post-reform year dummies are pooled into one single *Post* dummy. Given that the tax rate differential between real estate and financial assets is endogeneous, I follow the literature and instrument it in a first stage with the interaction term $Treat_i \cdot Post_t$. The first stage and structural equations are respectively given by:

$$\frac{(\tau_{it}^H - \tau_{it}^F)}{(1-\tau_{it}^H)} = \delta \cdot Treat_i \cdot Post_t + \gamma_i + \eta_t + u_{it} \tag{4}$$

$$Y_{it} = -\vartheta_c \frac{(\tau_{it}^H - \tau_{it}^F)}{(1-\tau_{it}^H)} + \gamma_i + \eta_t + v_{it}^H \tag{5}$$

Where ϑ_c is the main parameter of interest in the paper, namely the intensive margin cross-elasticity between real estate and financial assets; $\frac{(\tau_{it}^H - \tau_{it}^F)}{(1-\tau_{it}^H)}$ is the tax rate differential between real estate and financial assets, divided by the net-of-tax rate on real estate; Y_{it} is real estate wealth (W^H) for individual i in year t in log, $Treat_i$ is the treatment dummy and $Post_t$ is a dummy variable equal to 1 for years 2018-2022. Intuitively, I instrument the change in the tax rate differential by treatment/control assignment status.

Is there a savings response to the 2017 reform? The 2017 reform is a close to ideal natural experiment to estimate the cross-elasticity between real estate and financial wealth because it removed financial assets from the tax base, thus decreasing the rate on this asset class to 0%, while the rules for the taxation of real

[51] The magnitude of the extensive margin response may depend a lot on e.g. the distribution of taxable wealth, the change in the marginal tax rate or the location of the exemption threshold.

estate remained unchanged. However, given the progressivity of the wealth tax schedule and the fact that the reform automatically reduced the taxable wealth of households owning financial assets, some taxpayers ended up in a lower marginal tax bracket after the policy change. Thus, the reform also indirectly decreased the marginal tax rate on real estate wealth for some French taxpayers.[52] In the structural equation 5, for ϑ_c to be unbiased, all elements in v_{it} should be uncorrelated with the regressors. If the savings elasticity e_s is strictly positive and the tax differential is correlated to the net-of-tax rate on real estate (i.e. $(\tau_H - \tau_F)$ is correlated with $(1 - \tau_H)$), the estimated ϑ_c will be downward biased and thus should be considered as a lower bound for the true cross-elasticity. In practice, it is difficult for individuals to promptly adjust their stock of wealth by only changing their savings behavior, and the savings response is thus unlikely to strongly affect $\bar{W^H}$ in the short run.

However, the savings response may matter in the longer-run. In order to investigate the relevance of this issue for the elasticity estimated here, I study a sub-category of the treatment group composed of wealth taxpayers benefiting from the tax ceiling between 2013 and 2017. The tax ceiling is a mechanism limiting the amount of (income + wealth) tax liabilities a household has to pay to 75% of their taxable income. Thus, taxpayers benefiting from the ceiling between 2013 and 2017 face a 0% marginal tax rate on their wealth during this period. As a result, the reform does not change the tax rate they face on financial wealth (which remains at 0%) but increases dramatically the rate on real estate which in turn sharply reduces the incentives to hold this type of asset both through the savings channel and the rebalancing channel. As a way to test for the size of the savings elasticity—and of the potential bias—, I estimate the cross-elasticity between real estate and financial assets for the group of taxpayers benefiting from the tax ceiling between 2013 and 2017. Obtaining a cross-elasticity close in magnitude to the the one estimated previously would suggest that e_s is indeed likely to be small in the short run, while a large difference between the two would be a sign of significant savings responses to the reform.

The extensive margin As documented in section 4.4, the extensive margin response to the 2017 policy change is sizeable, highliting the importance of estimating the extensive margin (semi-)elasticity in the French context. Similarly to the method used when focusing on the intensive margin response, the extensive margin semi-elasticity is estimated following a 2SLS procedure where the first stage and structural equations are given by 4 and 5. The outcome variable Y_{it} is now a binary outcome variable equal to one if the taxpayer is liable to the wealth tax and zero otherwise. There are two important differences in the way the elasticity is estimated here compared to the method used when focusing on the intensive margin response. First, the

[52] While the decrease in the marginal tax rate on real estate is very small when looking all wealth taxpayers (see figure 1b), it decreased on average by 1/4 percentage point when focusing on the treatment group (see Appendix figure 19a). Note that the rate for non-residents in the control group does not change, (figure 19b).

change in the tax rate differential is zero for taxpayers who respond on the extensive margin because the wealth tax rate for them is zero. Thus, I compute the hypothetical change in the tax rate differential based on the amount of real estate owned in 2016. In other words, τ_H in the post-reform period is equivalent to the wealth tax rate a taxpayer would face if they had maintained their real estate level since 2016. Second, to make the computation of the semi-elasticity as transparent as possible, I estimate it based on the sample of French taxpayers only, allowing me to get rid of the linear differential pretrend in the equation.[53] As shown in section 4.4, this specification provides a conservative estimate of the extensive margin response to the reform (7% vs. 9%), and the resulting semi-elasticity should therefore be considered as a lower bound of the true elasticity.

5.3 Estimation of the cross-elasticity: results

Table 2 presents estimates of the intensive and extensive margin elasticities. Each time, the elasticity is expressed with respect to the wealth tax rate differential $(\tau_{it}^H - \tau_{it}^F)$ and with respect to the capital income tax rate differential $(\tau_{it}^H - \tau_{it}^F)R$ assuming a gross rate of return of $R = 5\%$ on real estate and financial assets.[54]

Baseline intensive margin elasticity As shown in column (1), the baseline cross-elasticity between real estate and financial wealth is equal to 4.93 (s.e.=0.99). In economic terms, a cross-elasticity of 4.9 means that 4.9% of taxable real estate is reallocated towards financial assets in response to a 1 percentage point increase in the wealth tax rate differential between the two asset classes. Translating it into an elasticity with respect to the tax rate differential on capital income, we obtain a capital income cross-elasticity of 0.20 (s.e.=0.04). In column (2), I estimate the cross-elasticity when accounting for the introduction of the flat tax on financial capital income in 2018 (see section 2.2 for details).[55] Given that the introduction of the flat tax increases the tax differential between real estate and financial assets, the estimated cross-elasticity, equal to 2.77 (s.e.=0.55), is mechanically lower.

Column (5) of table 2 displays the cross-elasticity estimated based on the group of French taxpayers benefiting from the wealth tax ceiling between 2013 and 2017. This group of taxpayers experiences a sizeable increase in the marginal tax rate on real estate. Thus, it can be used as a test for whether the rate on real estate is important *per se* or if it matters primarily *relative* to the tax rate on financial assets. In other words, it provides insights on whether the savings channel plays an important role in the estimated short-run responses to the reform. Finding a very large cross-elasticity would suggest that in the short run, taxpayers

[53] Thus, this elasticity is estimated without the control group.

[54] Note that the tax rate differential is normalized by $(1 - \tau_{it}^H)$ in each specification

[55] When computing the marginal income tax rate by asset, I assume that the marginal euro earned is taxed according to the income tax schedule either for the whole period (real estate) or until 2017 (financial wealth). After 2017, I apply the 30% tax rate on financial assets for taxpayers located above the 30% marginal tax bracket. When translating the income tax rate into a wealth tax rate, I assume a 5% rate of return on wealth.

react not only to the tax differential but also to the tax rate in itself. Reassuringly, the estimated elasticity for this group is equal to 6.17 (s.e.=1.48), which is very close in magnitude and not significatively different from the one estimated on the full treatment group. The absolute change in marginal tax rate on real estate being much higher for this group than for the full treatment group ($\approx$ 1 pps vs. 0.2 pp), this result mitigates the concern that savings responses to the 2017 reform play a key role here.

Comparison with other studies To the best of my knowledge, this paper is the first to estimate the cross-elasticity between real estate and financial assets, which means that there is no clear point of comparison with other studies. However, there is a growing strand of research estimating the aggregate elasticity of taxable wealth with respect to the net-of-tax rate, which can serve as a benchmark. This literature has not converged on the relevant estimate, but in a recent review, Advani and Tarrant (2021) consider that in a context of a well-designed wealth tax, the elasticity of taxable wealth is likely to lie in the region of 7-17 after a period of 4-8 years. It means that a 1 percentage point increase in the wealth tax rate leads to a reduction of 7%-17% in the level of wealth reported by taxpayers.[56] See figure 8 for a more comprehensive comparison of my cross-elasticity estimate to the available estimates of the taxable wealth elasticity found in the literature. All in all, this comparison suggests that the cross-elasticity obtained in the French context lies in the range of reasonable estimates of taxable wealth elasticities found in the literature, but tends to be at the lower end of the available estimates. While French households have strong incentives to restructure their portfolio from real estate to financial assets in response to the tax differential, they do not engage is a massive reallocation.

More importantly, the reallocation response to wealth taxation estimated here is much lower in magnitude than what the literature finds when studying settings with ample shifting opportunities (Alvaredo and Saez, 2009) or reallocation behavior between assets that are close substitutes (Durán-Cabré, Esteller-Moré and Mas-Montserrat, 2019). Exploiting a 1994 wealth tax reform in Spain which introduced an exemption for some closely held stocks but not others, Alvaredo and Saez (2009) find evidence of very large cross-base responses and show that the fraction of exempted closely held stocks jumped from 1/3 to 2/3. Using a back of the envelope calculation, we can translate the estimated effect into a cross-elasticity of 25, which is five time larger than the cross-elasticity between real estate and financial wealth estimated in this paper.[57] Responses to this Spanish reform can be interpreted as pure shifting, where the tax base changes but the structure of households' portfolio remain mostly unchanged. Exploiting micro data and a more recent Spanish reform,

[56] Strictly speaking, the elasticity of taxable wealth is expressed with respect to the net-of-tax rate $1-\tau$. It measures the percentage change in reported wealth in response to a 1% increase in the share of wealth kept by an individual after tax. However, as wealth tax rates are generally close to 1%, the elasticity can also be interpreted as the evolution of reported wealth in response to a 1 percentage point increase in the wealth tax rate. It means that the elasticity with respect to the net-of-tax rate can be interpreted as a semi-elasticity with respect to the wealth tax rate.

[57] The elasticity is computed based on table 1, column 1 of their paper and obtained by dividing the evolution of taxable stocks (-20%) by the average tax differencial for the top 1% (0.8%). It is a conservative estimate abstracting from the growth of the economy during the period.

Durán-Cabré, Esteller-Moré and Mas-Montserrat (2019) find a high degree of substitution between different types of financial assets, showing that wealth taxpayers decreased massively their stakes in (highly taxed) unlisted shares and business assets while they more than doubled the share of tax-favored listed shares and investment funds in their portfolio.[58] Two key insights emerge from the comparison with this literature. First, it is crucial to distinguish the shifting from the real response when interpreting the magnitude of the reallocation response to taxation. Second, there seems to be a much higher degree of substitution between different types of financial assets than between real estate and financial capital.

The special role of primary residence Finding less rebalancing between real estate and financial wealth than across various types of financial assets is consistent with the idea that households' holdings of real estate are partly constrained by their consumption demand for housing services (Flavin and Yamashita, 2002). In order to abstract from the constraint imposed to portfolio reallocation by the consumption role of real estate, I estimate the cross-elasticity between non-primary housing (i.e. total housing minus primary residence) and financial wealth. As shown in column (4), the estimated cross-elasticity is equal to 6.78 (s.e.=1.03). Finding a higher elasticity when abstracting from the specific role of primary residence is in line with Martínez-Toledano (2022), who finds a larger reshuffling response to housing busts among households more exposed to investment housing.

Baseline extensive margin semi-elasticity As shown in column (6), the extensive margin semi-elasticity is equal to 7.07 (s.e.=0.18). It suggests that a 1 percentage point increase in the wealth tax rate differential between real estate and financial assets leads to an increase of 7% in the probability to locate below the exemption threshold by owning less than 1.3 million euros in real estate. This number is large and suggests that in the presence of an exemption threshold, the response on the extensive margin greatly contributes to the reduction of the tax base.

5.4 Revenue impact of the rebalancing response

Method Assuming first a unique cross-elasticity parameter as in section 5.1, a decrease in the tax rate on financial assets—keeping the tax rate on real estate unchanged—triggers a reallocation response that reduces the stock of taxable real estate by $dW^H = -e_c \cdot W^H \cdot \frac{d(\tau_H - \tau_F)}{(1-\tau_H)}$.[59] A change in taxable real estate dW^H reduces real estate tax revenue by $\tau_H dW^H$. As a result, the change in wealth—i.e. real estate— tax revenues due to the reallocation response to the 2017 reform can be expressed as:

[58] The authors find that a 1 percentage point increase in the 2011 average wealth tax rate led to a rise in the overall share of listed equity and investment funds in taxpayers' portfolio by 115%.

[59] In reality, due to the progressive nature of the French wealth tax schedule, the reform decreased the marginal wealth tax rate on real estate for some taxpayers. For simplicity, I abstract from this feature here but discuss the effect of this issue in the next section.

$$dB = -\tau_H \cdot e_c \cdot W^H \cdot \frac{d(\tau_H - \tau_F)}{(1-\tau_H)} \tag{6}$$

Then, decomposing the total cross-elasticity e_c into an intensive margin elasticity and an extensive semi-elasticity, the revenue impact of the reallocation response is equal to:

$$dB = -\frac{d(\tau_H - \tau_F)}{(1-\tau_H)}[\tau_H \cdot \underbrace{\vartheta_c}_{\text{Intensive}} + \tau_H \cdot \overbrace{\eta_c}^{\text{Extensive}}] \cdot W^H \tag{7}$$

Where ϑ_c is the intensive margin elasticity and η_c the extensive margin semi-elasticity. This decomposition has a similar flavor to the decomposition of the income shifting response from Waseem (2018) and Bergolo et al. (2022). Importantly, as stressed in Bergolo et al. (2022), the relevant tax rate for the extensive margin response is the average tax rate while it is the marginal tax rate that matters for the intensive margin response. Yet, while this simplified model assumes a linear wealth tax rate, the French wealth tax exhibits a progressive schedule, so the marginal and average tax rates do not coincide. This element is accounted for in the empirical analysis, which will consider respectively the marginal and average tax rate for the intensive and extensive margin responses.

Impact of the reallocation on wealth tax revenues Total wealth tax revenue is the product of the tax base, W and the average wealth tax rate τ. In order to account for the progressivity of the wealth tax schedule, the average wealth tax rate τ is weighted by taxpayers' level of taxable wealth. We get:

$$T = \tau W \tag{8}$$

Before the reform, W is the sum of financial wealth W^F and housing wealth W^H, while after the reform, it only consists of housing wealth. In the absence of behavioral responses, mechanical changes in tax revenues due to the reform consist of two elements. First, financial wealth is no longer part of the tax base and thus generates no tax revenue any more. Second, the stock of real estate subject to the wealth tax also mechanically decreases for two reasons: i) housing assets held by taxpayers who own less than 1.3 million euros in housing at the time of the reform are no longer taxed and ii) given the progressivity of the tax schedule, the narrower tax base after the reform decreases the marginal and thus the average tax rate on real estate. Combining these elements, mechanical changes in tax revenues, holding housing wealth constant, are given by:

$$dM = -W^F \tau^F - W^H_{low} \cdot \tau^H - W^H_{high} d\tau^H \tag{9}$$

Where W^F is the stock of financial wealth excluded from the tax base; W^H_{low} the stock of real estate held by

households owning less than 1.3 million euros of that asset before the reform; W^H_{high} the stock of real estate held by taxpayers who own more in real estate than the exemption threshold and who would therefore remain liable to the wealth tax after the policy change in the absence of response. The tax rates τ^F and τ^H are defined each year as the average effective wealth tax rate on each asset weighted by taxable wealth, $d\tau^H$ is the tax rate difference relative to 2017—capturing the effect of the reform on the average marginal tax rate on real estate.

Combining equations 9 and 7, I decompose the post-2017 drop in wealth tax revenues into a mechanical and a behavioral component based on 2017 values of W^H and W^F.[60] When estimating the behavioral component of the revenue impact, $\frac{d(\tau_H - \tau_F)}{(1-\tau_H)}$ is the change in the tax rate differential across assets relative to 2017. Figure 9 shows the evolution of wealth tax revenues accruing from French taxpayers between 2013 and 2022, decomposing the post-2017 drop into a mechanical and a behavioral component. The observed drop in net wealth tax revenues between 2017 and 2018 equals 2.8 billion euros.[61] The mechanical part of this drop represents 2.5 billion euros, while an additional decrease of 300 million euros is due to behavioral adjustments to the reform. The reallocation response to the 2017 wealth tax reform thus accounts for about 10% of the tax revenues losses associated with the reform.[62]

Fiscal externalities As shown in Figure 7, real estate reallocated to financial assets leads to higher financial capital income reported by wealth taxpayers. Thus, the reallocation decreases wealth tax revenues but increases income tax revenues, which creates a fiscal externality mitigating the negative revenue impact of the behavioral response. Accounting for fiscal externalities is challenging because they depend on the type of asset owned but also on the income flows they generate and on the marginal income tax rate faced by the owner. I make an attempt towards estimating the tax revenue generated by the reallocated assets in Appendix section A5. After accounting for these fiscal externalities, revenue losses associated to the portfolio rebalancing are reduced to 200 million euros. Due to the difficulty of this exercise, this result should however be interpreted with some care. Nevertheless, the effective tax rate on real estate assets faced by French wealth taxpayers after the reform is much higher than that on financial assets.[63] Thus, it is implausible that the fiscal externalities have offset the wealth tax revenue losses associated with the reallocation response to the reform.

[60] Two features of the wealth tax data mentioned in section 3 don't allow me to directly observed W^H and W^F. These two elements are i) the existence of simplified tax returns for taxpayers owning less than 2.57 million euros and ii) the fact that indirectly held real estate is reported together with some financial assets before the reform. Thus, I infer W^H and W^F based on reasonable assumptions, detailed in Appendix section A5.

[61] These estimates exclude non-residents taxpayers. A Senate report shows that total wealth tax revenues decreased by 2.9 billion euros between 2017 and 2018.

[62] Using the revenues actually collected in 2018, we obtain that the reallocation response reduced wealth tax revenues in 2018 by 27%.

[63] France Stratégie (2021) shows that the effective marginal tax rate on real estate is more than twice as large as that on financial assets for French wealth taxpayers in 2019 (figure 12, panel d)

Dicussion on the welfare effect of taxing real estate more than financial assets All in all, what can we say about the welfare impact of taxing real estate more than other forms of capital? A central result in public economics is that once the externalities are accounted for and under plausible assumptions, the elasticity of the tax base is a sufficient statistic to measure the welfare impacts and efficiency costs of a tax change (Saez, Slemrod and Giertz, 2012). Thus, the welfare effect of taxing real estate more than financial assets depends on the elasticity of each tax base, namely the real estate and financial wealth tax base, on which there is still strong uncertainty. However, in the short-run, the elasticity of each tax base is likely to depend strongly on the cross-elasticity between real estate and financial assets.[64] Thus, the short-run welfare impact of taxing real estate more than financial assets likely depends greatly on the cross-elasticity between the two asset classes and can be well approximated by dB, the effect of the rebalancing behavior for tax revenue.[65] Following Saez, Slemrod and Giertz (2012), the marginal excess burden per euro of extra taxes forgone on financial assets can be defined as $dB/(dB + dM)$. This ratio refers to the share of the behavioral response in the overall revenue effect of the tax change. It is equal to 0.1 when focusing on wealth tax revenue only and to 0.07 when accounting for the fiscal externality. This means that for each extra euro of taxes forgone on financial assets—keeping taxes on real estate constant—, the government imposes an extra cost of 0.07 euro on taxpayers. Note that this estimation relies on the assumption that the cross-elasticity reflects the real estate and financial assets elasticities. In the presence of a strong savings response to taxation, the welfare effect of taxing real estate more than financial assets is likely to be different.

Overall, this section provides two key insights. First, the cross-elasticity between real estate and financial wealth is strictly positive, but modest in magnitude and lower than most existing estimates of taxable wealth elasticities found in the literature. Second, the revenue impact of portfolio rebalancing behaviors is non-negligible, although not massive.

6 Conclusion

Debates on the desirability of wealth taxes embody the well-known tradeoff between equity and efficiency. On the one hand, as the ownership of real estate is less concentrated than the ownership of financial wealth, taxing real estate more than other forms of capital has a cost in terms of equity. On the other hand, if financial assets are more elastic to taxes or more productive for the economy than real estate, there may be large

[64] These elasticities also depend on a potential migration response. The available evidence suggests a positive but limited effect of the 2017 reform on migration (France Stratégie, 2023).

[65] An important assumption for this result to hold is that there is no income effect. While it is difficult to formally rule out the presence of strong income effect, figures 16a and 16b show that the magnitude of the reallocation is relatively flat along the income and the wealth distribution, supporting the idea that income effects of modest, if any.

efficiency costs in taxing financial capital. In the face of this trade-off, one may ask whether a progressive property tax could work as a compromise. This tax would apply to real estate only but would counterbalance the equity cost of taxing this asset by exhibiting a progressive schedule.

However, a progressive property tax cannot work if wealthy taxpayers respond to it by rebalancing their wealth towards alternative asset classes. The French wealth tax reform of 2017, which transformed a progressive wealth tax into a progressive property tax, is an ideal setting to investigate this question. By leveraging the 2017 reform in order to estimate the cross-elasticity between real estate and financial assets, this paper shows that the reallocation response to a progressive property tax is overall modest, even at the top of the wealth distribution. This new result suggests that progressive property taxes may have a useful role to play in future tax systems.

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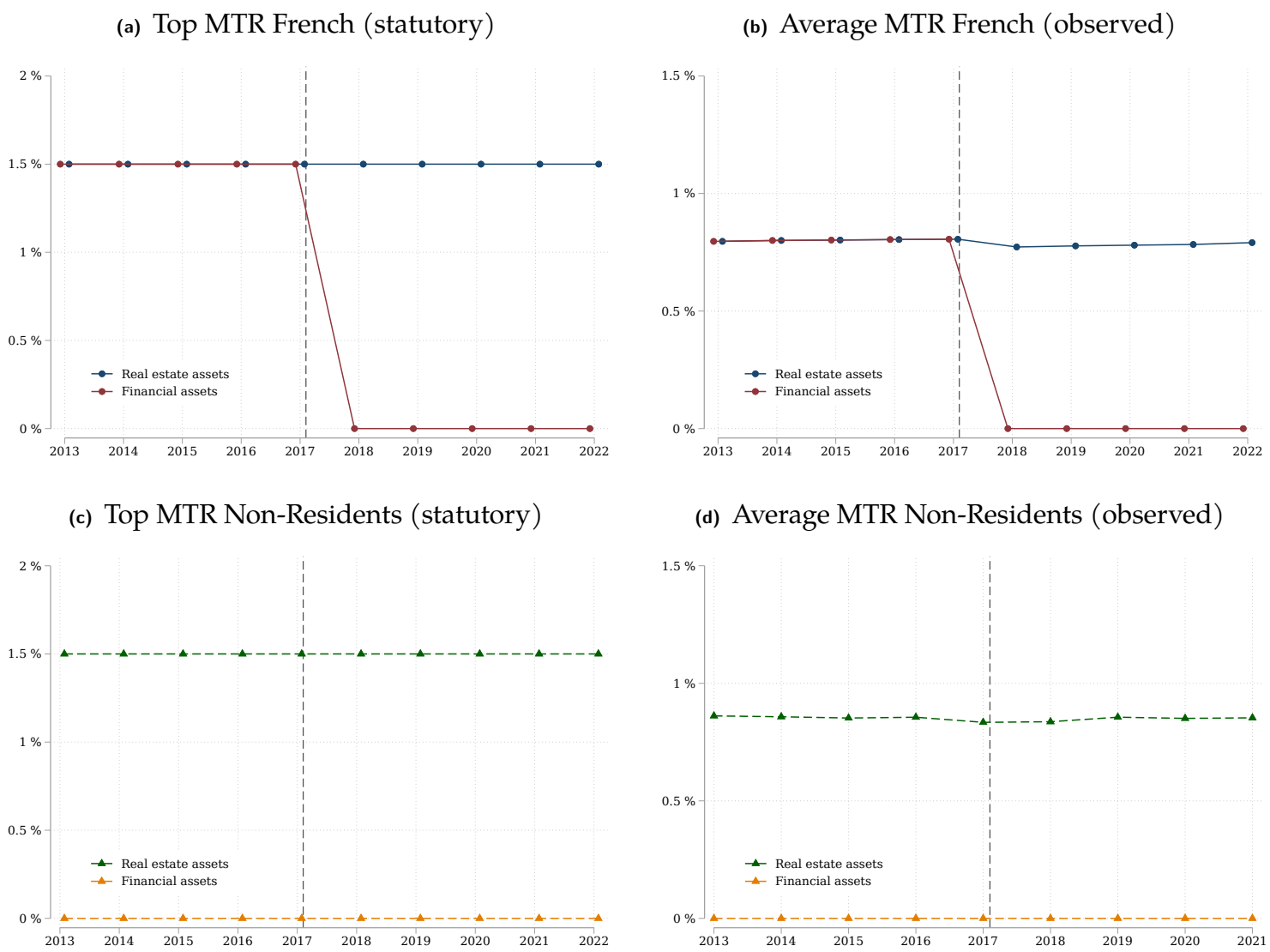

Figure 1: Observed and Statutory Marginal Tax Rates

Notes: This figure shows the evolution of marginal tax rates by asset class and residence status. Panel a) and c) display statutory top marginal wealth tax rates for French and non-resident taxpayers, respectively. Panel b) and d) show observed average marginal tax rate for French and non-residents liable to the wealth tax. By definition, statutory and observed tax rates for real estate and financial assets held by French residents are similar before the 2017 reform. For non-residents, the graphs display marginal tax rates on real estate held in France. Some exceptions to the wealth tax exemption on financial investment for non-residents exist, but they are rare (see Appendix section A1).

	All wealth taxpayers		Treatment	Control
	2016	2018	2016	2016
	(1)	(2)	(3)	(4)
Age	69	69	73	64
% Married	57	54	59	41
% Living in paris	18	25	35	0
% Retirees	69	65	77	1
% Wage Earners	34	35	30	2
% Income taxpayers	98	95	98	70
Gross income	151,965	260,095	258,775	47,229
Pension benefits (%)	41	32	33	1
Wages (%)	18	17	12	1
Rental income (%)	27	39	41	94
Financial capital income (%)	13	12	13	4
Net taxable wealth	2,780,591	2,332,374	5,955,411	3,253,931
Housing assets (%)	47	83	55	74
incl. Primary residence (%)	19	25	14	4
Financial assets incl. indirectly held real estate (%)	53	17	45	26
Liabilities (%)	4	3	4	2
% benefited from tax ceiling	3	0	9	0
Wealth tax	11,415	9,770	34,698	19,897
Wealth tax rate (%)	0.32	0.32	0.54	0.43
Number of tax units	350,855	132,687	25,364	1,567

Table 1: Baseline Summary Statistics - 2016 and 2018

Notes: This table presents descriptive statistics for all ISF taxpayers in 2016 (column 1), all IFI taxpayers in 2018 (column 2) and for the treatment and control groups in 2016 (columns 3 and 4, respectively). In 2016, taxpayers with net taxable wealth below 2.57 million euros don't have to report their wealth by asset type. In column (1), the wealth decomposition is therefore based on the portfolio structure of 2016 wealth taxpayers observed in 2010, before the implementation of the simplification threshold. The wealth decomposition in columns (3) and (4) is based on taxpayers who fill in the detailed returns (95% for the treatment group and 51% for the control group).

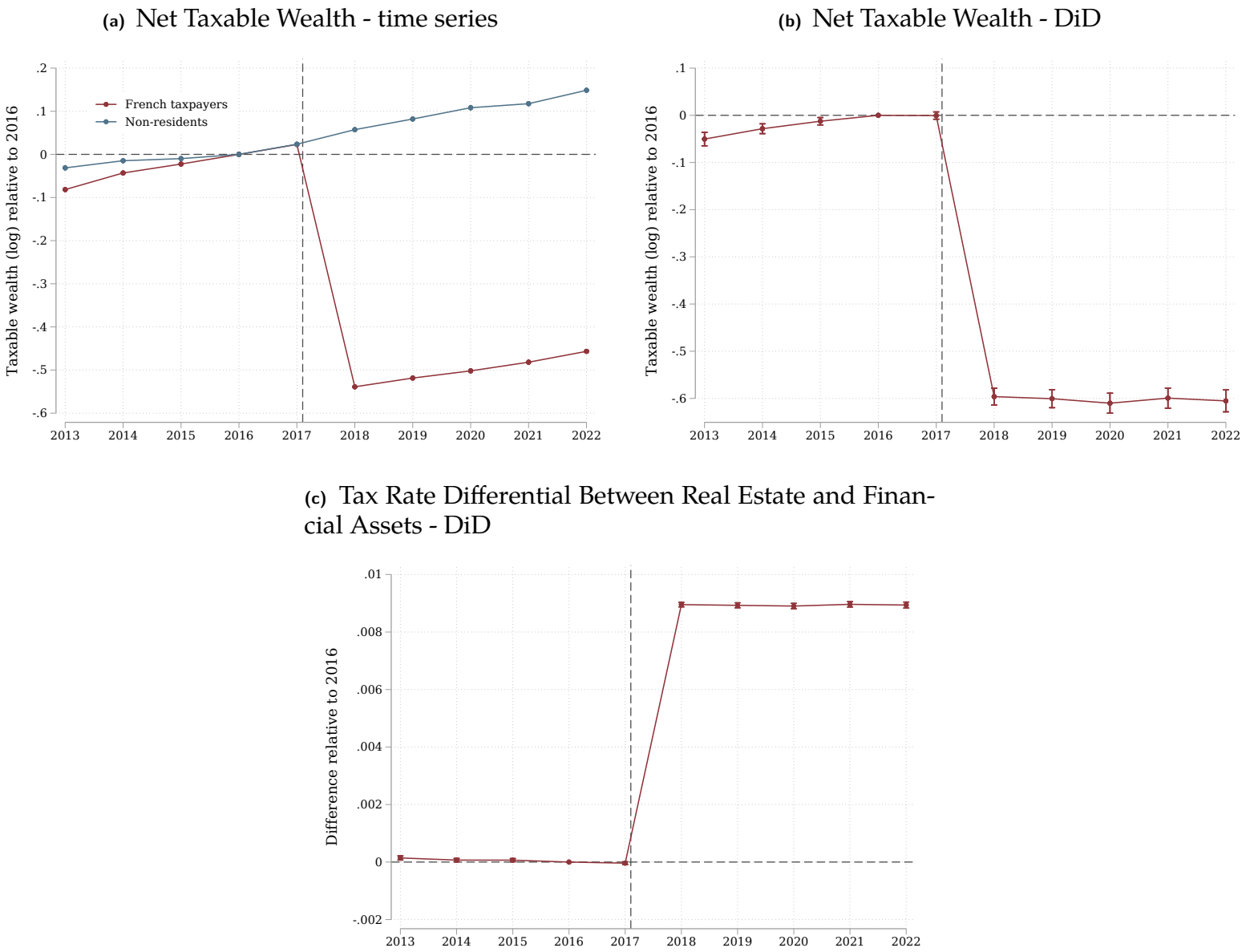

Figure 2: First Stage - Tax Base and Tax Rates

Notes: This figure shows the evolution of the wealth tax base and of the tax differential between real estate and financial assets before and after the reform. Panel a) presents the time series of the taxable wealth (in logs) for French and non-resident taxpayers, normalized to 0 in 2016. Panel b) shows coefficients obtained by estimating equation (1), using taxable wealth (in logs) as outcome variable. Panel c) plots the coefficients obtained from equation (1), comparing French to non-resident taxpayers, using as outcome variable the difference in marginal wealth tax rate between real estate and financial assets. The coefficients are obtained from a balanced sample of wealth taxpayers.

Figure 3: Extensive Margin Responses to the 2017 Wealth Tax Reform

Notes: This figure displays the estimated extensive margin response to the 2017 reform. Panel a) displays the fraction of treated taxpayers liable to the wealth tax between 2013 and 2022. By construction, the fraction is 100% between 2013 and 2015. Panel b) shows the series from panel a) normalized to 0 in 2016. The two last figures are obtained from the estimation of equation (2) where the outcome variable is a dummy equal to one if a taxpayer is liable to the wealth tax in a given year and zero otherwise. Panel c) shows times series, where the time series for the non-residents accounts for a linear pre-trend parameter. Panel d) displays the difference-in-differences coefficients. On average, the fraction of treated households liable to the wealth tax after the 2017 policy change is lower by 8.8% relative to the control group.

(a) Taxable Real Estate - time series

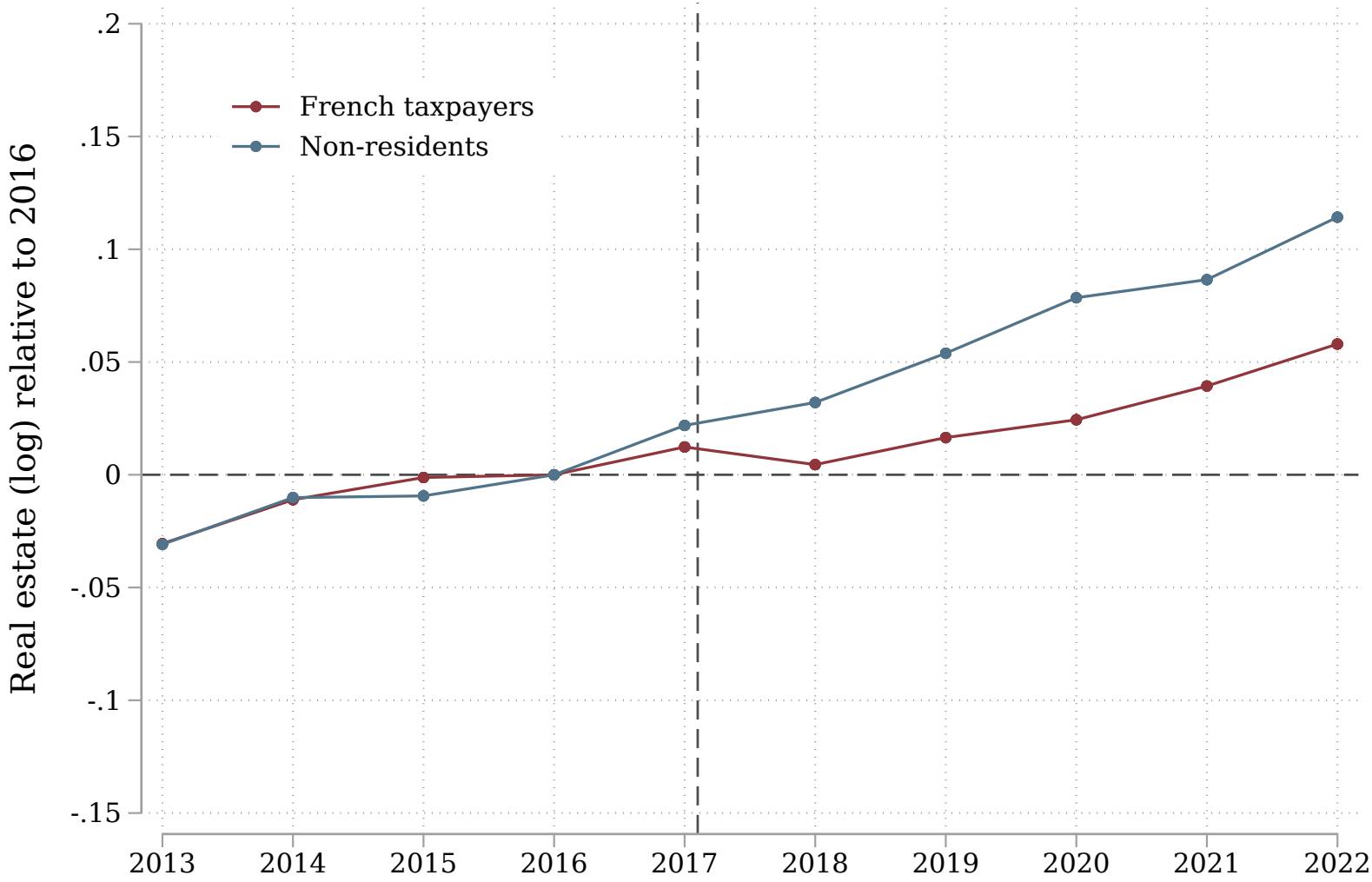

Figure 4: Average Responses to the 2017 Wealth Tax Reform

Notes: This figure shows the evolution of the stock of real estate held by French vs. non-resident taxpayers between 2013 and 2022. It shows the time series of taxable real estate (in log). The stock of real estate evolves strikingly similarly between the two groups before the reform and starts to diverge immediately after. This figure is obtained from a balanced sample of French and non-resident taxpayers. The treated group of French taxpayers is restricted to households who never file the simplified wealth tax return.

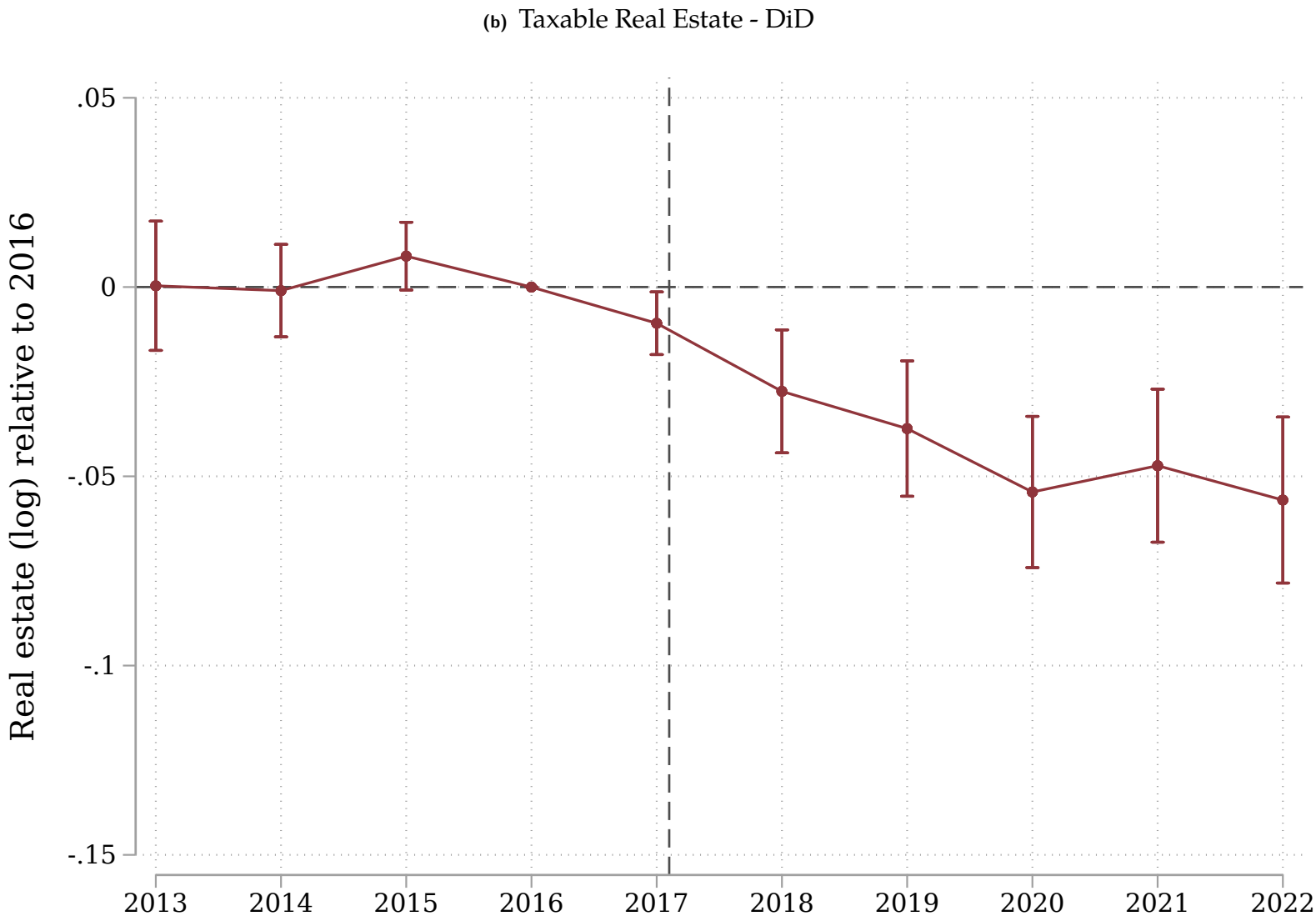

Figure 4: Average Responses to the 2017 Wealth Tax Reform

Notes: This figure shows the evolution of the stock of real estate held by French vs. non-resident taxpayers between 2013 and 2022. It displays coefficients obtained from equation (1). On average, the French taxpayers experienced a decline of 4.4% in their stock of housing wealth compared to the control group in the post-reform period, with a difference of 5.5% in 2022, five years after the reform is introduced. The figure is obtained from a balanced sample of French and non-resident taxpayers. The treated group of French taxpayers is restricted to households who never file the simplified wealth tax return.

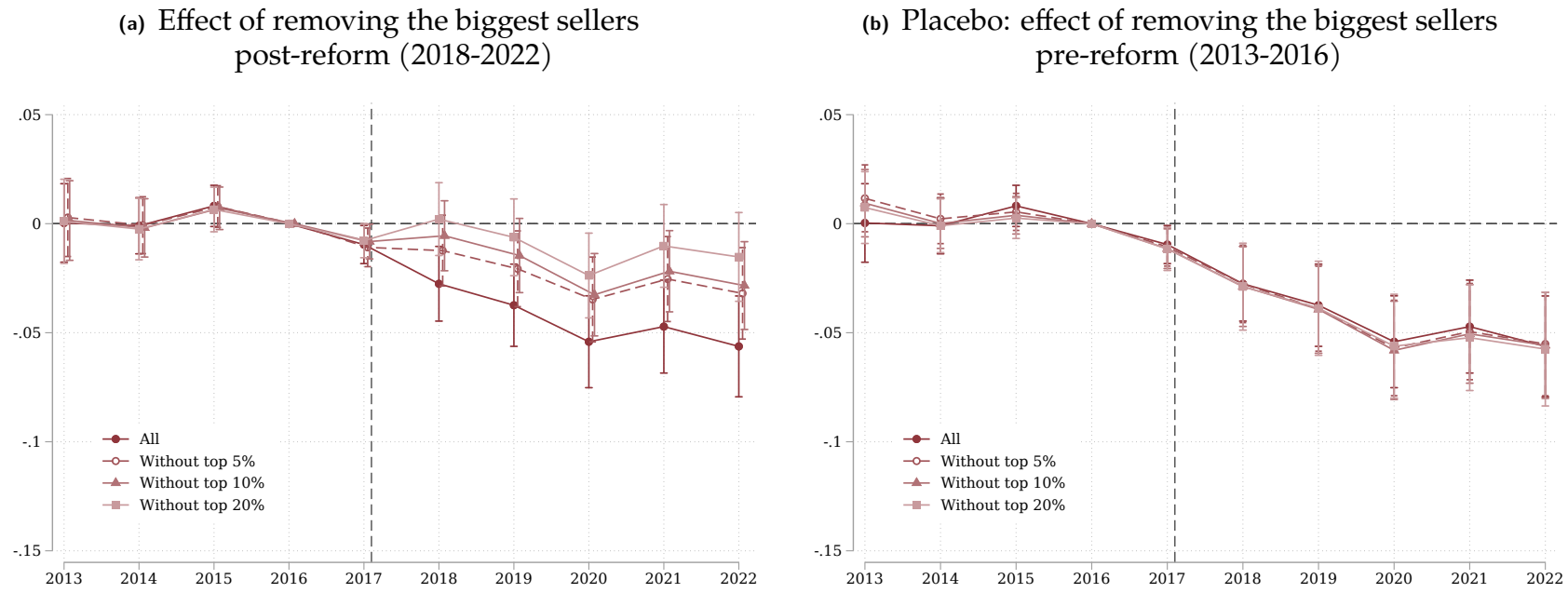

Figure 5: Taxable Real Estate - Decomposition exercise

Notes: Panel a) of this figure displays estimates of the rebalancing response to the reform by removing successively the 5%, 10% etc. biggest real estate sellers from the estimation sample. The biggest sellers are defined as the taxpayers who experience the highest year-to-year decrease in their real estate holdings after the reform (2018-2022). When removing the top 20% biggest sellers from the estimation sample, the difference in reported real estate between the French and non-residents is no longer significant. Panel b) is a placebo. It defines the biggest sellers based on the pre-reform evolution in real estate (2013-2016). In contrast to what happens after the reform, the graph shows that the pre-reform biggest sellers are relatively evenly distributed across the treatment and the control groups.

Figure 6: Consumption vs. Investment Housing

Notes: This figure shows the heterogeneity in the response to the 2017 reform by level of pre-reform non-primary home share and rental income (2013-2015 average). Non-primary home share is defined as the average share of total housing wealth that is not primary housing between 2013 and 2015. Pre-reform rental income refers to the 2013-2015 average level of net rental income received by taxpayers. Each graph displays coefficients obtained from the estimation of equation (1). Panel a) show results by level of pre-reform non-primary home share. Taxpayers located at the top of the distribution (p80-p100) hold a high share of their housing assets in the form of investment properties. Panel b) shows the heterogeneity in responses to the 2017 from taxpayers with no pre-reform rental income vs. taxpayers with positive rental income.

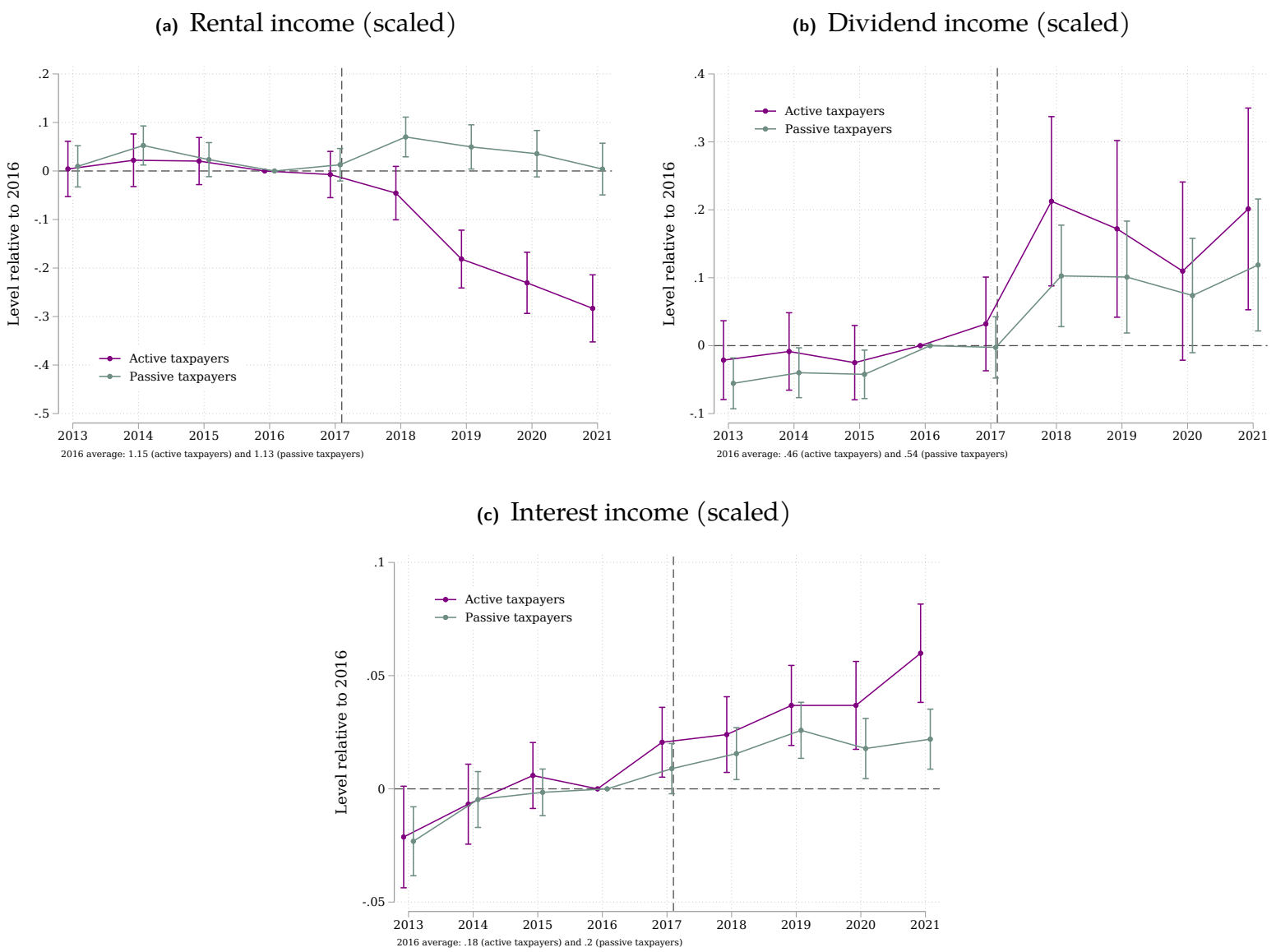

Figure 7: Capital Income Responses to the 2017 Wealth Tax Reform

Notes: This figure shows the evolution of various types of capital income received by taxpayers from the treatment group relative to a control group of French taxpayers who own less in real estate than the exemption threshold before the reform. Coefficients are estimated separately for the top 20% biggest real estate sellers ("active taxpayers") and the rest ("passive taxpayers"). Each outcome variable is scaled by its 2013-2015 average and winsorized at the 99th percentile of the distribution of non zero values, following Bach et al. (2019). In panel a) the sample is restricted to households receiving at least 1500 euros in annual rental income once between 2013 and 2015. In panel b) and c), the sample is restricted to households receiving at least 1500 euros in annual financial capital income once between 2013 and 2015.

	Baseline Intensive margin			Non-primary housing	Tax cap 2013-2017	Baseline Extensive margin
	(1)	(2)	(3)	(4)	(5)	(6)
Elasticity w.r.t. $(\tau_H - \tau_F)$	4.93	2.77	2.77	6.78	6.17	7.07
	[0.99]	[0.55]	[0.55]	[1.03]	[1.48]	[0.18]
Elasticity w.r.t. $(\tau_H - \tau_F)$R	0.20	0.07	0.06	0.28	0.24	0.29
	[0.04]	[0.01]	[0.01]	[0.04]	[0.06]	[0.01]
Flat tax	No	Yes	Yes	No	No	No
Property tax	No	No	Yes	No	No	No
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
N treated Households	16,023	16,023	16,023	16,023	698	25,364

Table 2: Cross-Elasticity Estimates

Notes: This table displays estimates of the cross-elasticity between real estate and financial assets both along the intensive margin (columns 1-5) and the extensive margin (column 6). The estimation method follows a 2SLS precedure in which the tax rate differential is instrumented based on the pre-reform assignment status. The intensive margin elasticity is estimated using a balanced sample of taxpayers liable to the wealth tax all years between 2013 and 2022. Column 1) displays the baseline cross-elasticity between real estate and financial assets with respect to wealth tax differential. The coefficient of 4.9 (rounded to 5) means that 5% of households' stock of real estate is reallocated to financial assets in response to a 1 percentage point increase in the wealth tax rate differential between the two asset classes. Column 2) computes the cross-elasticity when accounting for the introduction of the flat tax at 30% on financial capital income simultaneously to the wealth tax reform. The estimated elasticity is lower by a factor of 2. Column 3) displays the estimated elasticity when accounting for the French property tax ("tax foncière"), assuming that the share of the property tax liabilities represents 1.5% of households' taxable income (André and Meslin, 2021). Column 4) shows the estimated cross-elasticity when focusing on non-primary housing—likely to be more elastic to taxation. In Column 5), the treatment group is restricted to French households who benefit from the wealth tax ceiling all years between 2013 and 2017. This group experiences both an increase in the tax differential between real estate and financial assets and a large increase in the marginal tax rate on real estate after the reform. The elasticity estimated based on this subsample of treated taxpayers serves as a test for whether the rate on real estate is important *per se* or if it matters primarily *relative* to the tax rate on financial assets. Column 6) displays the extensive margin-semi elasticity. It is estimated based on the sample of French taxpayers only. The tax rate differential is predicted using pre-reform level of real estate.

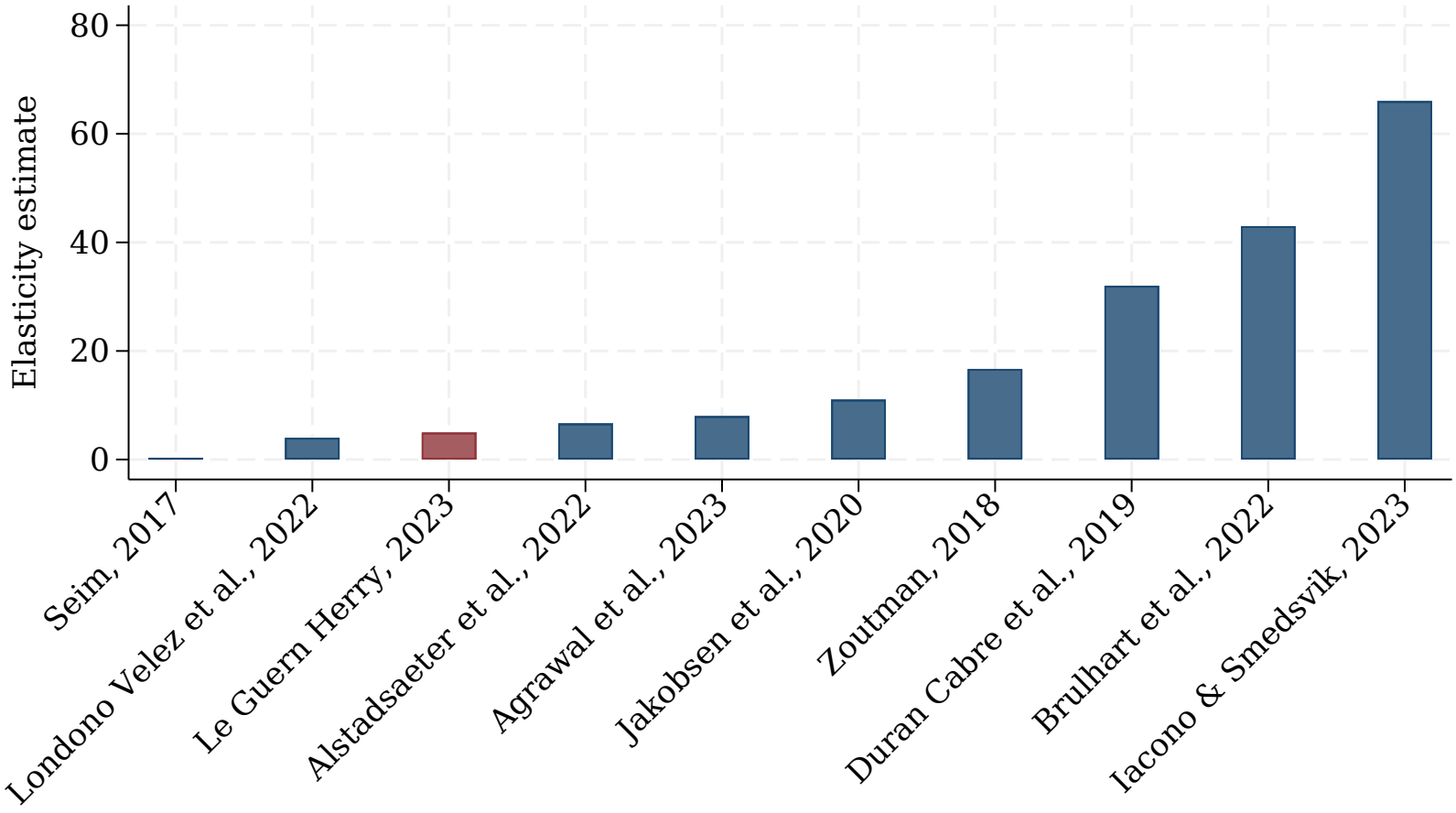

Figure 8: Comparison between the baseline cross-elasticity estimate and available estimates of the taxable wealth elasticity.

Notes: This figure compares the baseline cross-elasticity estimated in this paper (Table 2 column 1) to available estimates of the taxable wealth elasticity found in the literature. The cross-elasticity between real estate and financial assets is on average significantly lower than elasticities of taxable wealth found in the literature.

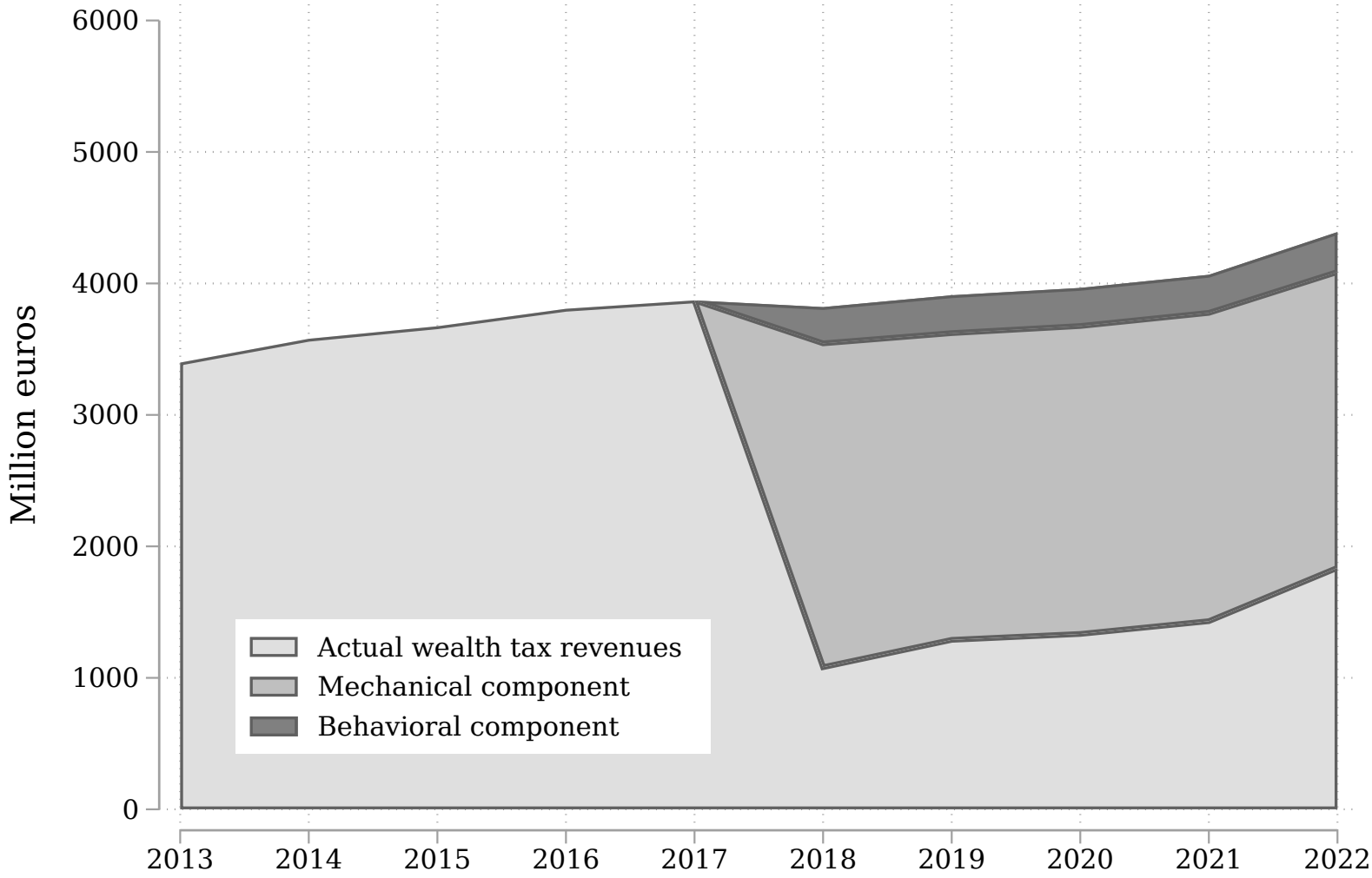

Figure 9: Decomposition of the Wealth Tax Revenue Losses Associated with the 2017 Reform

Notes: This figure shows the evolution of wealth tax revenues in France between 2013 and 2022 and decomposes the post-2017 drop into a mechanical and a behavioral component, following the method detailed in section 5.4. The observed drop in net wealth tax revenues between 2017 and 2018 equals 2.8 billion euros. The mechanical part of this drop represent 2.5 billion euros, while an additional decrease of 300 million euros is due to the reallocation response to the reform. This figure abstracts from the wealth tax liabilities of non-resident taxpayers. While the wealth tax revenues in 2018 amount to 1.1 billion euros in this figure, they reach 1.3 billion euros in total that year.

Appendix

A1. Wealth taxation in France

The Impôt de Solidarité sur la Fortune

The deductibility of debts. Debts existing on January 1^{st} of the tax year that have been contracted by the taxpayer can be deducted from the tax base, provided that they are related to assets subject to the wealth tax.[66] This excludes debts related to business assets or artworks. If a debt relates to a partially exempted asset, the amount deductible is proportional to the fraction of the the asset subject to the tax (e.g. 70% for primary home). Fiscal debts (personal income tax, inheritance tax, wealth tax, property tax and some social security contributions) can also be deducted.

The wealth tax cap. There exists a ceiling mechanism that limits the total amount of income and wealth tax liabilities a taxpayers has to pay relative to their net taxable income. This percentage was 70% when the mechanism was first introduced and was set to 75% from 2013 onwards. It means that after 2013, a taxpayer cannot pay as income and wealth taxes for a given year t more than 75% of the taxable income they received in year t-1. This mechanism is still in force today.

The 2017 reform

Real estate excluded from IFI tax base. First, assets that qualify as business wealth are exempted. This refers to real assets assigned to the industrial, commercial, craft, agricultural or professional activity of the company owning them. In case of mixed real estate assets (used both for business and privately), the share of the asset's value not used for the professional activity is taxed. Second, certain shares of companies or organisations holding real estate may be exempted from wealth taxation. Three types of shares fall in this category. First, when a taxpayer owns less than 5% of the shares and voting rights in a listed real estate investment company (e.g. *Sociétés d'Investissement Immobilier Cotées*). Second, when a taxpayer owns less than 10% of the shares and voting rights of a company whose activity is industrial, commercial, craft, agricultural or liberal. Third, for some types of collective investment undertakings when i) the taxpayer owns less than 10% of rights of the collective investment undertaking, and ii) the assets of the undertaking for collective investment consist of less than 20% of taxable real estate. Third, real estate held in specific trusts. Properties held through a trust are in most cases subject to IFI, except for i) irrevocable trusts which solely benefit certain charities and ii) pension trusts under a pension scheme set up by a company for its employees. More details can be found in Dupas (2020).

[66] Note however that the capital and interests from a consumption loan can be deducted from the tax base.

Changes in the deductibility of debts. The 2017 reform introduces a ceiling to the amount of debt deductible from the wealth tax base. This affects taxpayers with a taxable wealth above 5 million euros and an amount of debt exceeding 60% of their taxable capital value. For these taxpayers, only 50% of the balance of the loan is deductible above the 60% threshold. For example, if a taxpayer owns 10 million euros in taxable wealth with a mortgage of 8 million euros, the the 60% threshold is 6 million euros. Above 6 million euros, only 50% of the debts is deductible (50% of 2 million euros = 1 million euros). The total amount of deductible debt will be 6 million euros + 1 million euros = 7 million euros, instead of 8 million euros before the reform. Besides, the entire capital of in fine loans could be deducted from the ISF tax base.[67] After the 2017 reform, the amount deductible is subject to a digressive deduction over the duration of the contract. Finally, some taxes remain part of the deductible fiscal debts (property tax, wealth tax, tax on empty dwellings) but some others are excluded (personal income tax, social security contributions).

Wealth taxation of non-residents

Taxation of real estate. Before and after the 2017 reform, real estate wealth owned by non-residents in France is subject to the wealth tax—above the 1.3 million euros exemption threshold. In the case of indirect ownership, only shares of real estate companies (when more than 50% of the company's assets is composed of French real estate) or shares in companies in which their stake exceeds 50% were subject to the ISF. After the 2017 reform, all company shares are subject to IFI, in proportion to the share of real estate owned (with an exemption for shareholdings below 10% in operational companies). This rule change seems however to have little effect for the non-residents used as a control group in the analysis, as the share of indirectly held real estate for this sample of taxpayers lies between 26% and 29% during the whole 2013-2022 period.[68]

Taxation of financial assets. Even before 2018, the non-residents benefited from a full wealth tax exemption on the financial assets they owned in France (provided that these assets were linked to a company located in France). However, this rule did not apply to shares that represented a *substantial participation* in a French company, which generally refers to investors owning more than 10% of a firm's capital. In most cases, participations between 10% and 25% only would be subject to the wealth tax, as the shares above the 25% of capital ownership threshold would typically qualify as business assets. I exclude non-residents owning more than 5% of their gross wealth in the form of financial assets from my estimation sample in order to ensure that the foreign investors composing the control group are not affected by the 2017 reform.

[67] Types of debt when the repayment of the capital happens at the end of the contract.

[68] Among non-residents for which I can observe the portfolio structure all years, thus among non-residents who never fill in a simplified return (40% of the control group).

A2. Data Processing

Handling changes of fiscal identifiers The panel structure of the data used in this paper makes it possible to follow taxpayers from year to year. A unique tax identifier is assigned to each household as well as to each spouse within the household. Importantly, when the household structure changes (divorce, marriage etc.) as well as when a household changes their *département* of residence, the tax identifier also changes. Although it is not systematic, this also applies when households migrate.[69] Thus, some individuals appear in several fiscal households in a given year. To follow the maximum number of taxpayers over time, I use the first spouse identifier ("spi1_c") instead of the household identifier, take the max of wealth variables and the sum of income variables reported by the household(s) of an individual in a given year. This allows me to take care of cases for which the income or wealth reported by a given household is split or missing in a given year simply because they move out of their département of residence during the year. Note that it also allows me to follow some non-residents who migrate to France (when the individual identifier is unchanged).

Handling inconsistencies between ISF and IFI data This paper is based on two separate wealth tax datasets. The first one is the ISF dataset ("isf_ifi_2006_2020_casd"), which includes ISF tax returns (2006-2017) and has been extended to 2020. The second one is the IFI dataset ("panel_ifi_2023_diff_complet"), covering wealth tax returns after the reform only (2018-2022). During the years over which both datasets overlap (2018-2020), a small minority of taxpayers appear in one dataset as wealth taxpayer in a given year but not in the other. Unfortunately, non-residents are overrepresented in this population of taxpayers not consistently appearing in both datasets. Correspondence with the French tax administration about this issue led to a release of a new IFI dataset including some non-residents who were previously missing for some years. Yet, about 1.5% of households appearing in the ISF data as wealth taxpayers at least once between 2018 and 2020 are not recorded as being subject to the wealth tax in the IFI data over the period, and this share reaches 10.5% for non-residents. I take care of this data limitation in the analysis by removing wealth taxpayers in 2017 who experience a "hole" of up to two years in their history of tax payments after 2017. More precisely, I remove taxpayers liable to the wealth tax in 2017 and 2019 but not in 2018, and taxpayers liable to the wealth tax in 2017 and 2020 but not in 2018 and 2019.[70] Importantly, my main estimates of the portfolio rebalancing response to the 2017 reform—based on a balanced sample of wealth taxpayers—are by construction not affected by this restriction.

[69] Note that in the case of migration, the individual tax identifier may also change.

[70] Results are unchanged when transforming the restriction to taxpayers liable to the wealth tax in year t-1 and t+1 but not in t and taxpayers liable to the wealth tax in t-1 and t+2 but not t and t+1.

A4. Recovering the revenue maximizing tax rate on real estate

This section translates the insights from Piketty and Saez (2013) to the context of asset rebalancing. The goal is to illustrate the importance of the cross-elasticity when assessing the optimal rate on real estate and financial assets. For this purpose, I base of the model developed in section 5.1 in order to express the revenue maximizing linear tax rate on real estate wealth for three values of the cross-elasticity. First, when the cross-elasticity is equal to zero, i.e. there is no rebalancing between the two asset classes, the tax revenue function on real estate wealth is defined as $\tau_H \rightarrow \tau_H W^H(1-\tau_H)$. It has an inversed U-shape, corresponding to the well known Laffer curve. The revenue maximizing tax rate on real estate τ_H^* is such that $\bar{W}^H(1-\tau_H) - \tau_H \frac{\partial \bar{W}^H}{\partial(1-\tau_H)} = 0$, i.e. $\frac{\tau_H}{1-\tau_H} e_s = 1$. Hence, τ_H^* can be written as:

$$\tau_H^* = \frac{1}{1+e_s}$$

In this case, the revenue maximizing rate only depends on the savings elasticity. This formula is the standard Ramsey inverse elasticity rule: the higher the savings responses to taxation, the lower the optimal rate. Second, once we allow for cross-base responses to taxation, tax revenues depend on τ_H, the tax rate on housing but also on τ_F, which is the rate at which the reallocated real estate assets will be taxed. The tax revenue function becomes $\tau_H \rightarrow \tau_H W^H(1-\tau_H, \tau_F) + \tau_F X(\tau_H - \tau_F)$, which is increasing in τ_H and in τ_F. For a given τ_F, the rate maximizing tax revenues is:

$$\tau_H^* = \frac{1+\tau_F e_c}{1+e}$$

With $e = \frac{\bar{W^H}}{W^H} \cdot e_s + e_c$. Note that if τ_F is equal to zero, we have $\tau_H^* = \frac{1}{1+e}$ which is the standard revenue maximizing rate. Third, in the limit case where e_c is infinite, and savings elasticities for both real estate and financial assets are finite, the revenue maximizing rates for real estate and financial assets are equal and defined as:

$$\tau_H^* = \tau_F^* = \frac{1}{1+\bar{e}}$$

With $\bar{e}$ the average savings elasticity of real estate and financial assets weighted by the level of each asset. These results highlight the fact that taxpayers' reallocation behaviors bring the optimal tax rates on real estate and financial assets closer together relative to the standard inverse elasticity rule. When the cross-elasticity is very large, the optimal tax rate on real estate and financial assets should be close even if the savings elasticities on both assets are different. This exercise highlights the importance of accounting for the

cross-elasticity between assets when deriving optimal wealth tax rates.

A5. Revenue impact of the reallocation responses - further elements

Infering total taxable real estate and financial wealth before 2018 Two features of the wealth tax data mentioned in section 3 make W^H and W^F not directly observable. First, when real estate is held indirectly, it is reported together with other indirectly held financial assets—under box "CE" of the wealth tax return. Thus, precise information on indirect ownership of real estate is only accessible after 2017, when financial wealth is no longer taxed. When investigating the reallocation response, I deal with this limitation by focusing on directly held real estate. However, determining the level of indirectly held real estate is necessary to decompose the revenue impact of the wealth tax change. To do this, I base on the period when this piece of information is available, namely between 2018 and 2022. I then proceed in three steps. First, I compute the ratio of indirectly over directly owned real estate for all wealth taxpayers after 2018. Second, I winsorize this ratio at the 5th and 95th percentiles, and take the average of non-zero values. Third, I impute indirectly held real estate before the reform by multiplying the computed ratio by current values of directly held real estate.[71] The underlying assumption is that the share share of indirectly held real estate in total housing wealth is the same before and after the reform.[72]

Second, from 2011 to 2017, taxpayers with taxable wealth below a certain threshold—set at 2.57 million euro after 2013—had only to file a simplified wealth tax return. In the simplified return, taxpayers only report total net and gross taxable wealth without breaking it down by asset type. In order to estimate W^H and W^F, I circumvent this limitation by exploiting information reported in 2010, before the introduction of the simplified reporting requirements. In particular, I compute for each taxpayer with taxable wealth between 1.3 million euros and 2.57 million euros the ratio of real estate over total taxable wealth in 2010. Then, I impute the amount of taxable real estate for people filing the simplified tax return by multiplying this second ratio by their level of taxable wealth each year. The asusmption made here is that the average share of real estate in total wealth remains constant between 2010 and 2017.

Based on infered values of real estate, 141,000 wealth taxpayers are estimated to own more than 1.3 million euros in real estate in 2017. This estimate, combined with the extensive margin response to the reform ($\approx$ 7%), precisely predicts the number of wealth taxpayers in 2018 (132,000), suggesting that W^H and W^F are well approximated.

[71] I replace imputed indirectly held real estate by zero if box "CE" is zero for a given taxpayer. I account for the fact that households liable to the wealth tax after 2017 own more real estate on average than wealth taxpayers before the reform by replacing imputed indirectly owned real estate by zero if directly held real estate is below 800,000 euros.

[72] Note that the reform did not change taxpayers' incentives to hold their taxable real estate directly or indirectly. Thus, the post-reform share of indirectly held real estate should be close to its pre-reform value. The share of directly held real estate among non-residents, whose tax base consists of real estate only, is constant throughout the 2013-2022 period.

Estimating the fiscal externalities The reallocation response to the reform generates some fiscal externalities that matter for overall government revenues. For simplicity, I restrict the fiscal externalities to the capital income tax revenue generated by the reallocated assets.[73] Empirically, as shown in Figure 7, real estate reallocated to financial assets leads to higher financial capital income reported by wealth taxpayers. Thus, reallocated real estate decreases wealth tax revenues but increases income tax revenues, mitigating the negative revenue impact of the response. Conceptually, the fiscal externality is a function of the intensive margin response only. Indeed, the extensive margin response does not provide information on the magnitude of the reallocation and thus on the amount of real estate reallocated to financial assets. Expressing the tax rate on financial income in terms of an effective tax rate on financial assets τ_F, the change in total tax revenue due to the reallocation behavior becomes:

$$dB = -\frac{d(\tau_H - \tau_F)}{(1-\tau_H)}[\tau_H \cdot \vartheta_c - \tau_F \cdot \vartheta_c + \tau_H \cdot \eta_c] \cdot W^H \tag{10}$$

It depends on the intensive and extensive elasticities as well as on the tax rates on housing and financial assets, τ_H and τ_F. I make an attempt towards estimating the fiscal externality by focusing on taxes associated with dividend and interest income and proceed in two steps. First, I estimate the increase (in euros) in dividend and interests received by wealth taxpayers resulting from rebalancing responses to the reform. For this purpose, I combine the percentage increase in dividend and interests received after the reform (shown in figure 17) with average dividend and interests reported in 2016 by all wealth taxpayers. Second, I compute income tax revenues resulting from the rebalancing responses by applying to the estimated increase in dividend and interests the 30% flat tax rate and by multiplying this number by the population of wealth taxpayers in 2018. The resulting fiscal externality is equal to 96 million euros. This exercise should be considered as a first attempt to account for the increase in capital income tax revenues associated with the rebalancing behavior and the resulting fiscal externality should be interpreted with some caution.

[73] Estimating the fiscal externalities is challenging because it requires to focus on the tax payments of households buying and selling the assets and to study the effect of the reallocation on all tax bases. In the French context, the reallocation behavior affects the level of taxable wealth, but also rental income, capital gains, and income flows generated by the newly acquired financial assets. For example, if rental income is taxed at a progressive rate, who sells and buys the real estate matters for the assessment of the fiscal externality. For simplicity, I assume that the tax revenue coming from rental income is not affected by the reallocation, which implies that the marginal income tax of the sellers is assumed to be the same as that of the buyers.

A4. Additional figures and tables

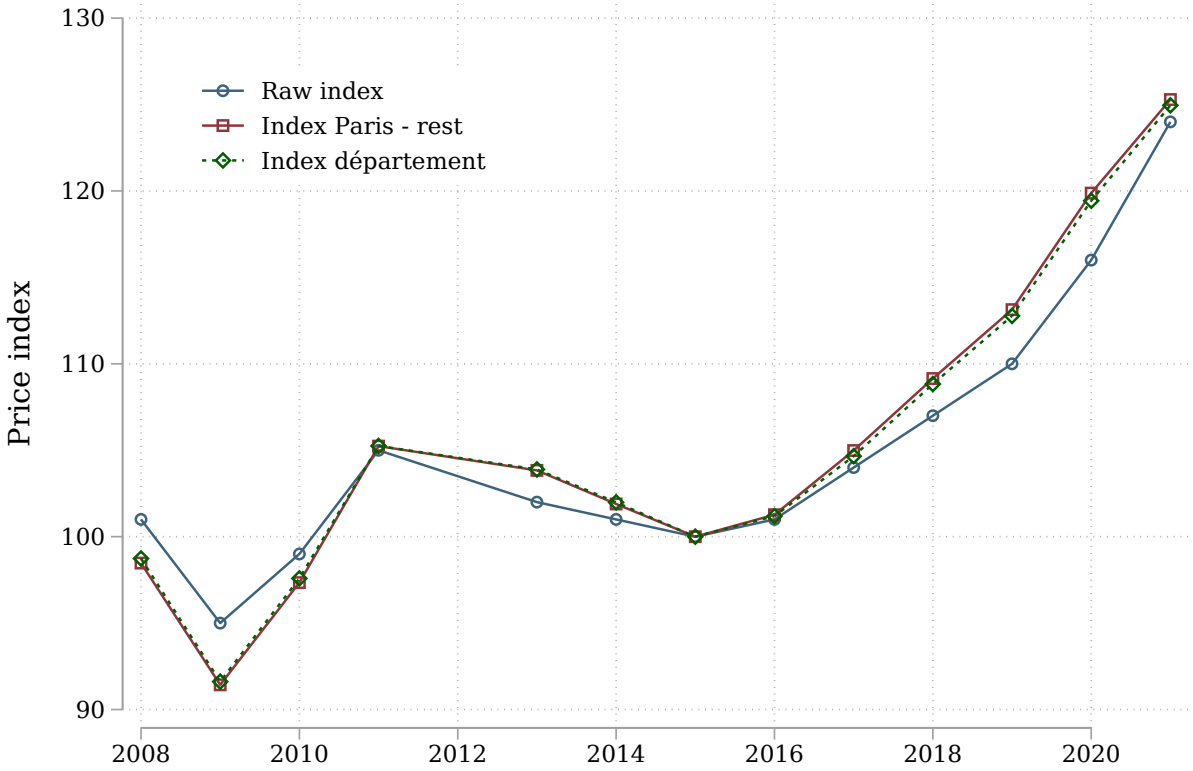

Figure 10: House Price Evolution in France

Notes: This figure displays the evolution of house prices in France over the 2008-2021 period, index 100 in 2015 from the "Indice the prix des logements INSEE". The blue line displays the raw price evolution. The red line shows the price evolution weighted by the relative share of wealth taxpayers in Paris and the rest of France and the price evolution in these two geographic areas. The green line shows the price evolution weighted by the relative share of wealth taxpayers by departement and the price evolution in these two geographic areas.

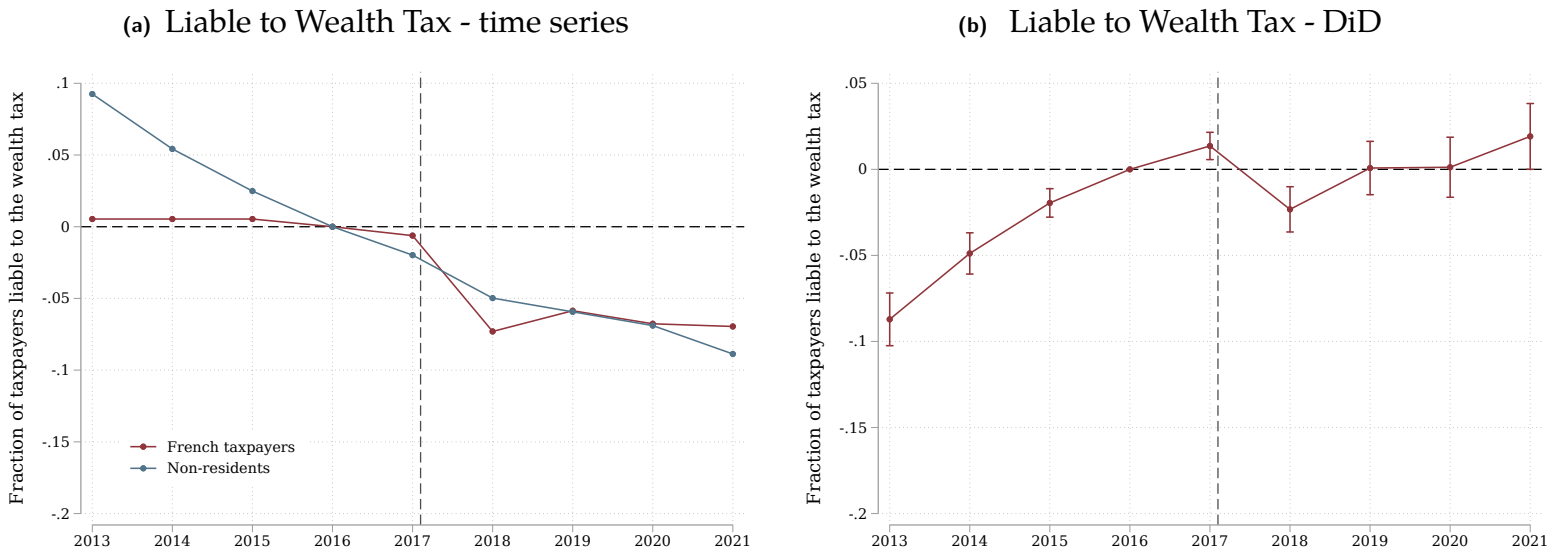

Figure 11: Extensive Margin Responses to the Reform - Differential pre-trends

Notes: This figure displays the coefficients estimated from equation (1) where the outcome variable Y_{it} is a dummy equal to one when taxpayer i is liable to the wealth tax in year t. Panel a) shows time series coefficients while panel b) displays the difference-in-difference estimates. The linear differential pre-trend makes the direct comparison between the French and non-residents not very informative. Figure 3 shows results when the differential pre-trend is accounted for. estimated extensive margin response to the 2017 reform.

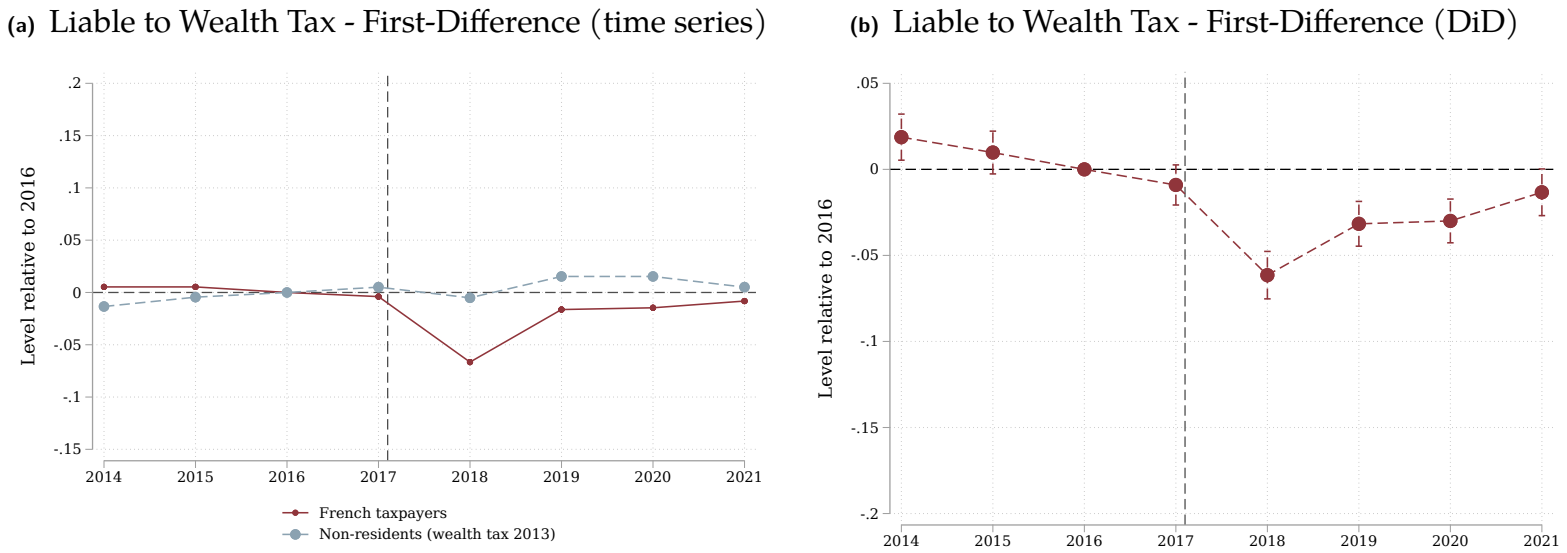

Figure 12: Extensive Margin Responses to the 2017 Wealth Tax Reform

Notes: This figure shows how the probability to be liable to the wealth tax varies among the French and non-resident taxpayers between 2013 and 2021. Panel a) and b) show coefficients estimated using equation (1) based on the treatment group and non-residents liable to the wealth tax in 2013 and using $Y_{it} - Y_{it-1}$ as outcome variable (with Y_{it} a dummy for being liable to the wealth tax in year t). Panel a) displays the time series and panel b) shows the difference-in-differences estimates.

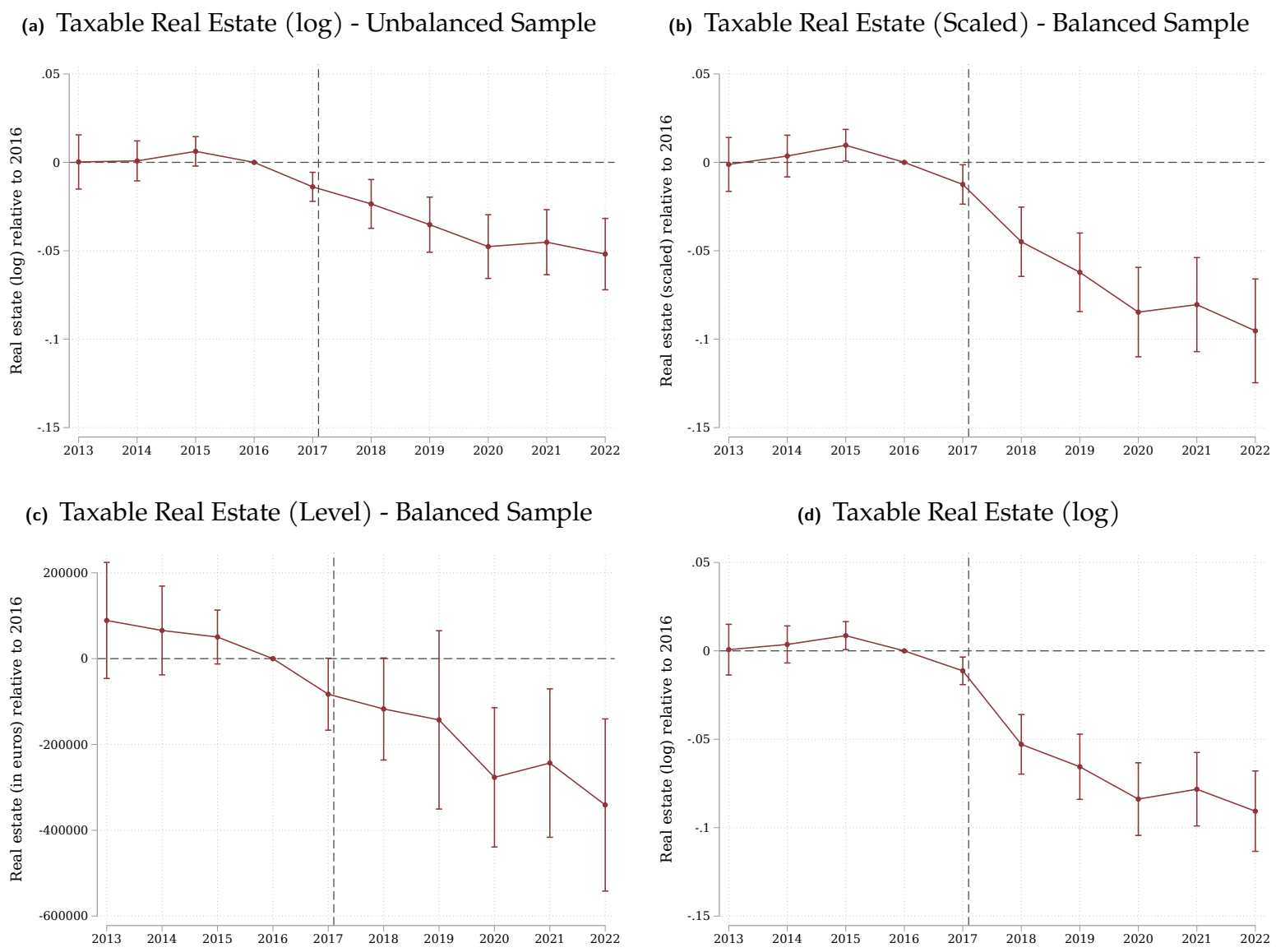

Figure 13: Further Estimates of Portfolio Rebalancing Responses to the 2017 Wealth Tax Reform

Notes: This figure shows the diff-in-diff coefficients obtained from equation (1) using alternative specifications. Panel a) estimates responses on an unbalanced sample of wealth taxpayers. Panel b) displays the diff-in-diff coefficients obtained using as outcome variable taxable real estate scaled by 2013-2015 average (winsorized at the 99th percentile of the non-zero values distribution). In panel c), the outcome variable is taxable real estate in level. In Panel d), the definition of taxable real estate for non-residents is net taxable wealth instead of gross taxable wealth.

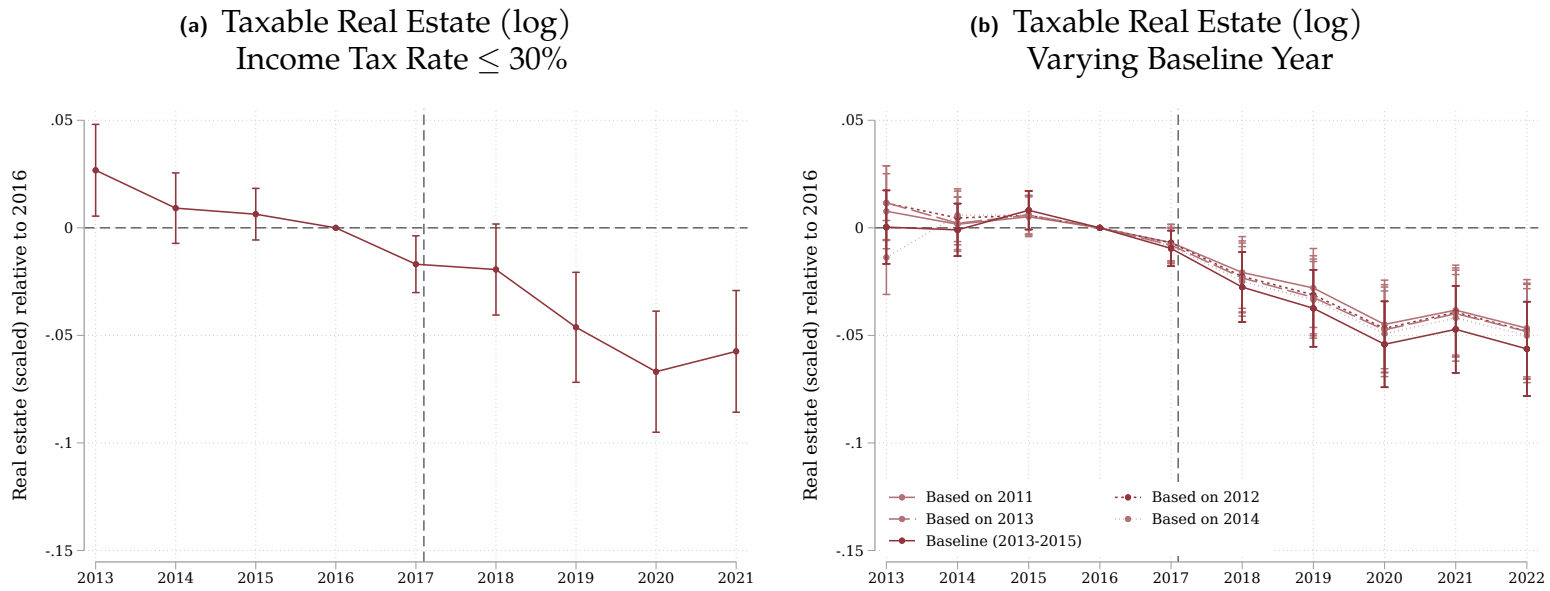

Figure 14: Response to the 2017 Wealth Tax Reform - Robustness Checks

Notes: This figure shows the diff-in-diff coefficients obtained from equation (1) using alternative definitions of the treatment group. Panel a) estimates responses for treated taxpayers who face a top marginal income tax rate equal or below 30% all years between 2013 and 2015. These taxpayers are not affected by the introduction of the flat tax on financial capital income in 2018. Panel b) displays the diff-in-diff coefficients obtained with the baseline treatment and with alternative treatment groups defined based on real estate reported in 2011, 2012, 2013 or 2014. For all specification the control group is the baseline control group.

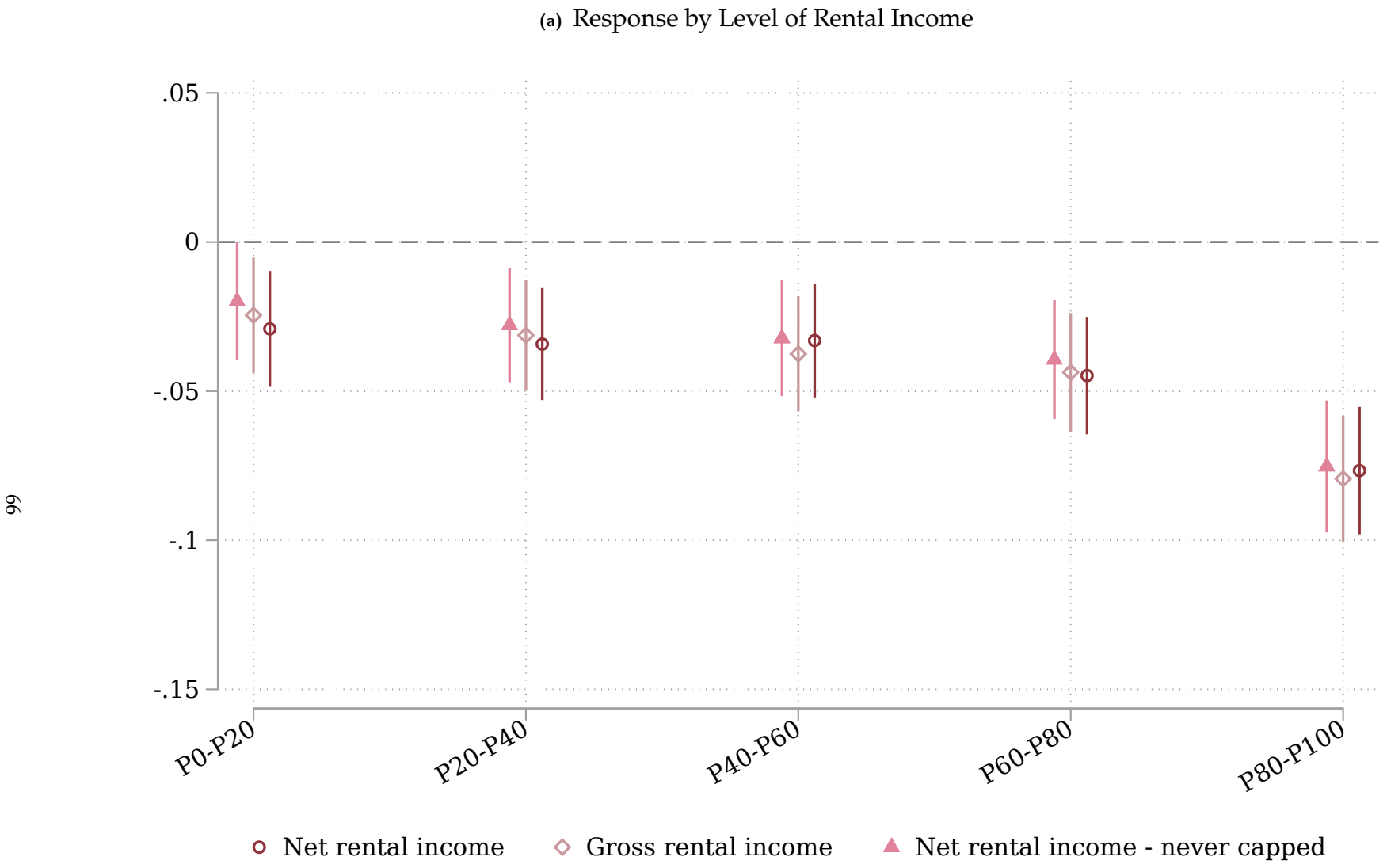

Figure 15: Consumption vs. Investment Housing - Further Results

Notes: This figure shows the heterogeneity in the response to the 2017 reform by level of pre-reform rental income (average over 2013-2015 period). Each regression is estimated using the full control group. The figures groups taxpayers according to different definitions of rental income, namely net rental income (baseline, circles), gross rental income (squares) and net rental income after removing taxpayers benefiting from the tax ceiling before the reform (triangles).

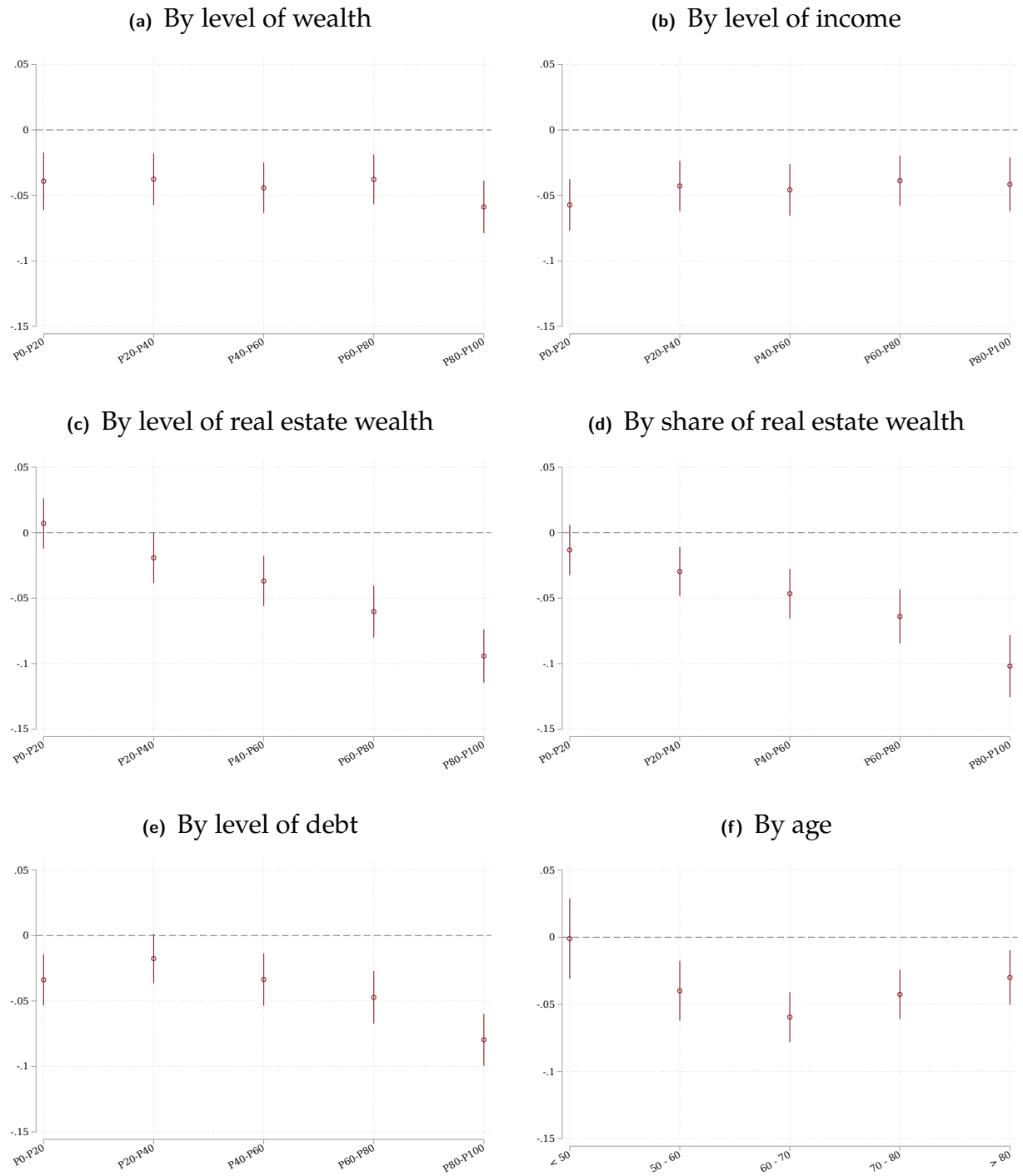

Figure 16: Reallocation Responses to the Reform - Heterogeneity

Notes: This figure shows the heterogeneity in the response to the 2017 policy change, ranking treated taxpayers by quintiles of various pre-reform distributions (2013-2015 average). More specifically, taxpayers are ranked by level of pre-reform taxable wealth (panel a), taxable income (panel b), real estate wealth (panel c), share of real estate in total wealth (panel d), and share of debt in total wealth (e). Panel f) displays results for different age groups, based on 2016 age information. Each regression estimates the compact version of equation (1) using the full control group of non-residents.

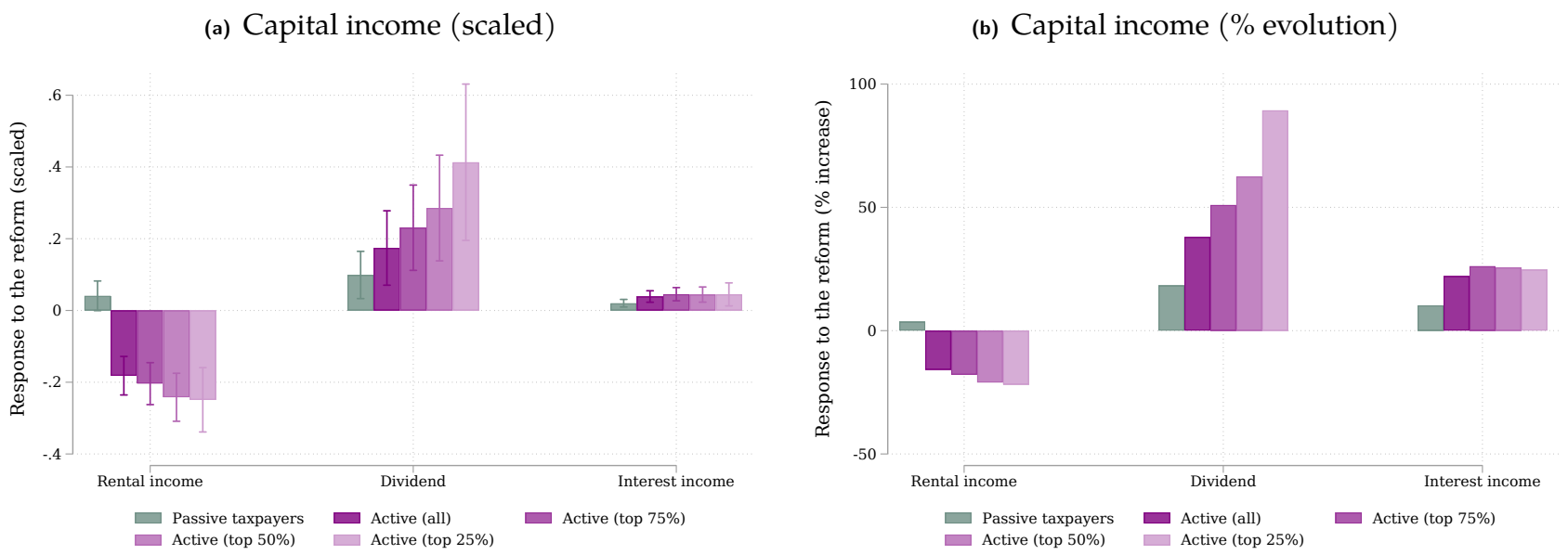

Figure 17: Capital Income Responses to the 2017 Wealth Tax Reform

Notes: This figure shows the evolution of various types of capital income estimated with the compact version of equation (1) for five sub-categories of the treatment group relative to a control group of French taxpayers who own less than €1.3M in real estate before the reform. The five sub-categories of the treatment group are i) the full group of active taxpayers (the biggest real estate sellers), ii) the top 75% biggest sellers within the active taxpayers, iii) the top 50% biggest sellers within the active taxpayers, iv) the top 25% within the active taxpayers and v) the passive taxpayers (i.e. the other treated taxpayers). Outcome variables in panel a) are scaled by their 2013-2015 average. Panel b) translates the estimates into percentage changes (coefficient / 2016 average * 100).

	Balanced sample	Active taxpayers	Passive taxpayers	Extensive	French control
	(1)	(2)	(3)	(4)	(5)
Age	70	70	70	77	70
% Married	64	60	65	47	59
% Living in paris	35	28	38	28	10
% Retirees	75	76	75	85	72
% Wage Earners	35	34	36	19	34
% Income taxpayers	100	100	100	100	98
Gross income	307,958	287,002	312,831	155,890	167,553
Pension benefits (%)	31	30	32	41	42
Wages (%)	14	12	14	7	15
Rental income (%)	40	43	40	37	20
Financial capital income (%)	14	14	14	13	22
Net taxable wealth	6,602,742	6,751,956	6,568,044	4,605,756	3,872,926
Housing assets (%)	54	57	54	53	17
incl. Primary residence (%)	14	13	14	13	8
Financial assets incl. indirectly held real estate (%)	46	43	47	47	75
Liabilities (%)	5	5	4	3	3
% benefited from tax ceiling	9	10	9	8	9
Wealth tax	38,803	40,842	38,329	25,045	16,774
Wealth tax rate (%)	0.55	0.55	0.55	0.50	0.42
Number of tax units	16,023	3,023	13,000	2,516	10,528

Table 3: Baseline Summary Statistics - Sub-Groups of French Taxpayers

Notes: This table is a variation of table 1 and presents 2016 descriptive statistics for four sub-categories of the treatment group (columns 1-4) as well as for French wealth taxpayers in 2016 used as a control group in section 4.6.3. The first of the four sub-categories is the baseline sample used for the estimation of the intensive margin response, namely the balanced sample of French taxpayers liable to the wealth tax all years between 2013 and 2022 who never file a simplified tax return (column 1). The next two sub-categories are sub-groups of this sample, composed of the "active" taxpayers engaging in portfolio rebalancing (column 2) and of the "passive" taxpayers (column 3). Column (4) refers to taxpayers from the treatment group who become exempt from wealth taxation after the refor, while remaining liable to the income tax (thus excluding people who stop paying the wealth tax because of death). The wealth decomposition in all columns is based on taxpayers who fill in the detailed wealth tax return in 2016.

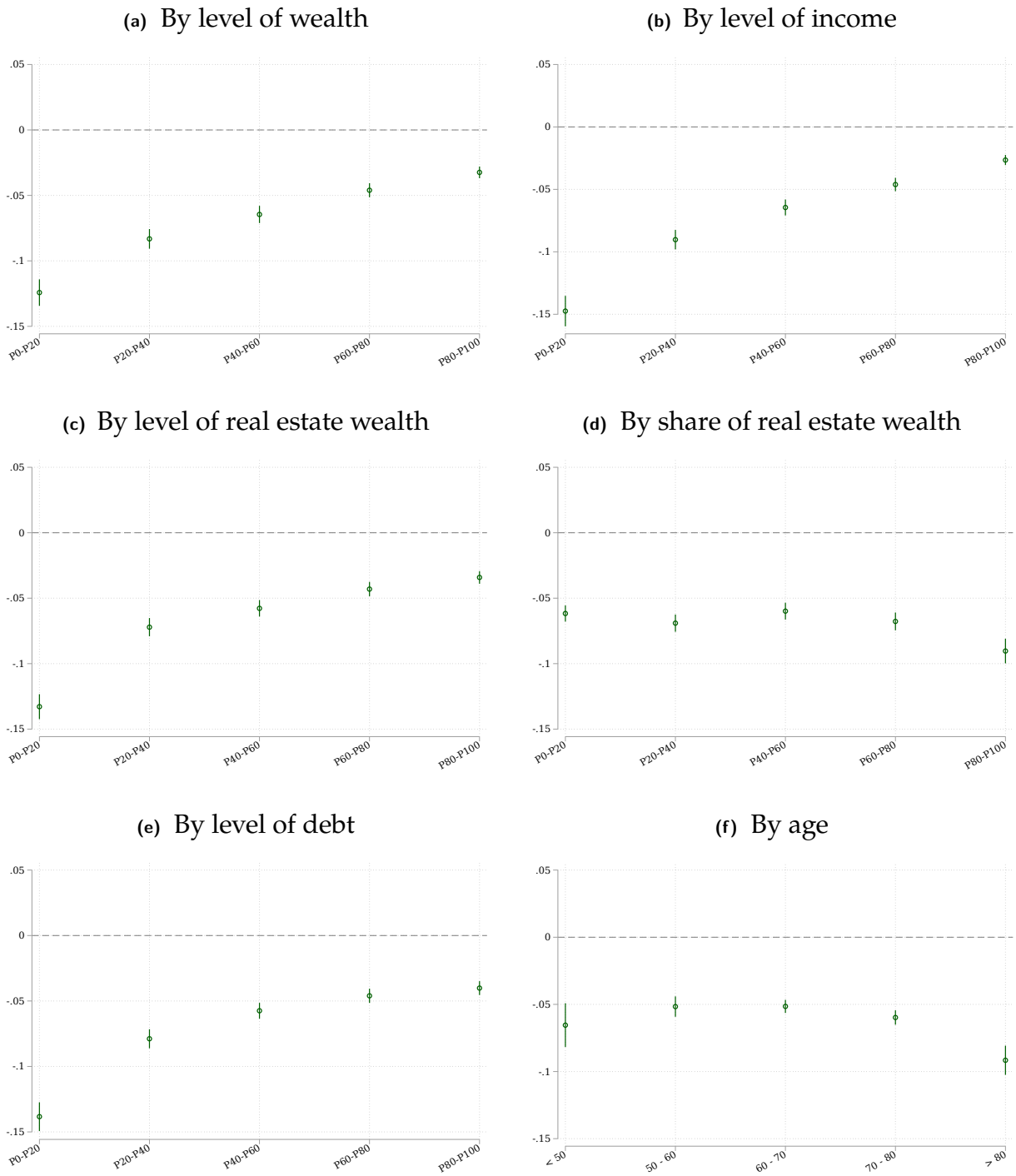

Figure 18: Extensive Margin Responses to the Reform - Heterogeneity

Notes: This figure shows the heterogeneity in the response to the 2017 policy change along the extensive margin, ranking treated taxpayers by quintiles of various pre-reform distributions (2013-2015 average). More specifically, taxpayers are ranked by level of pre-reform taxable wealth (panel a), taxable income (panel b), real estate wealth (panel c), share of real estate in total wealth (panel d), and share of debt in total wealth (e). Panel f) displays results for different age groups, based on 2016 age information. Each regression estimates the compact version of equation (2).

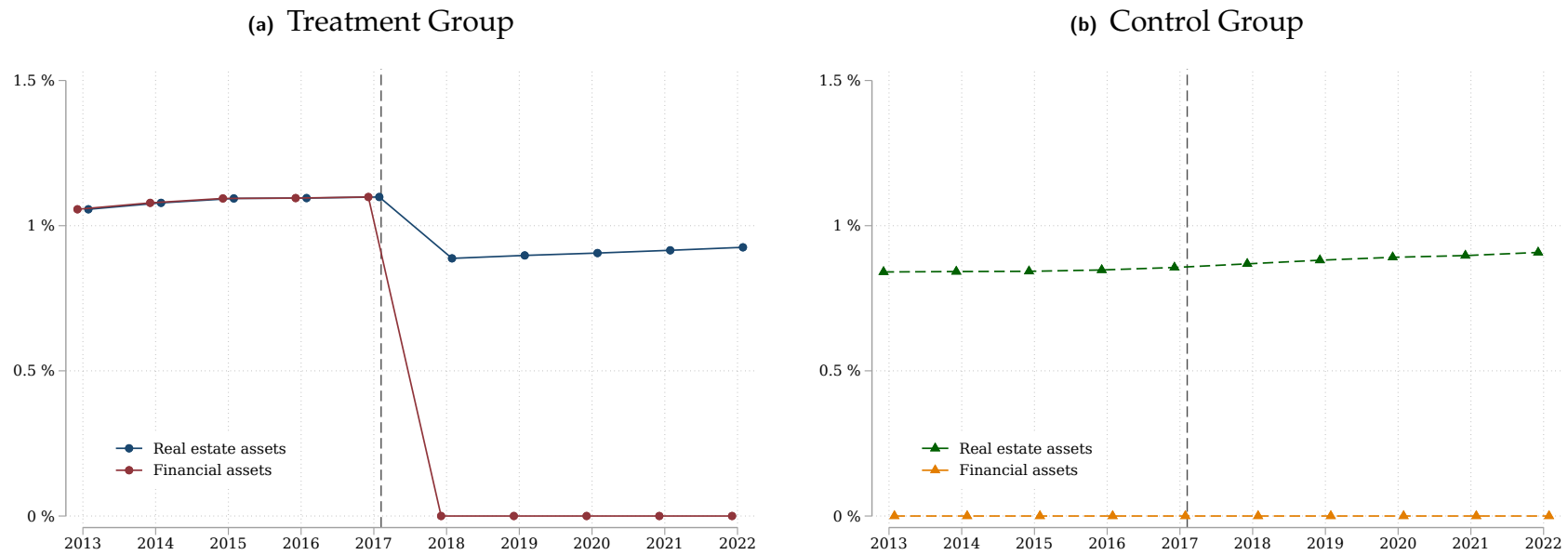

Figure 19: Observed Marginal Tax Rate by Asset Class in the Estimation Sample

Notes: This figure shows the observed average marginal tax rate on real estate and financial assets for the treatment group (panel a) and the control group (panel b) between 2013 and 2022. The difference in marginal tax rate between real estate and financial assets increases sharply for the treatment group while it remains constant for the control group. Given the progressivity of the French wealth tax schedule and the fact that the reform automatically reduced the taxable wealth of French households owning financial assets, some treated taxpayers end up in a lower marginal tax bracket after the policy change. This translates into a drop of ≈ 2 percentage points in the observed marginal tax rate on real estate in the treatment group, as shown in panel a).

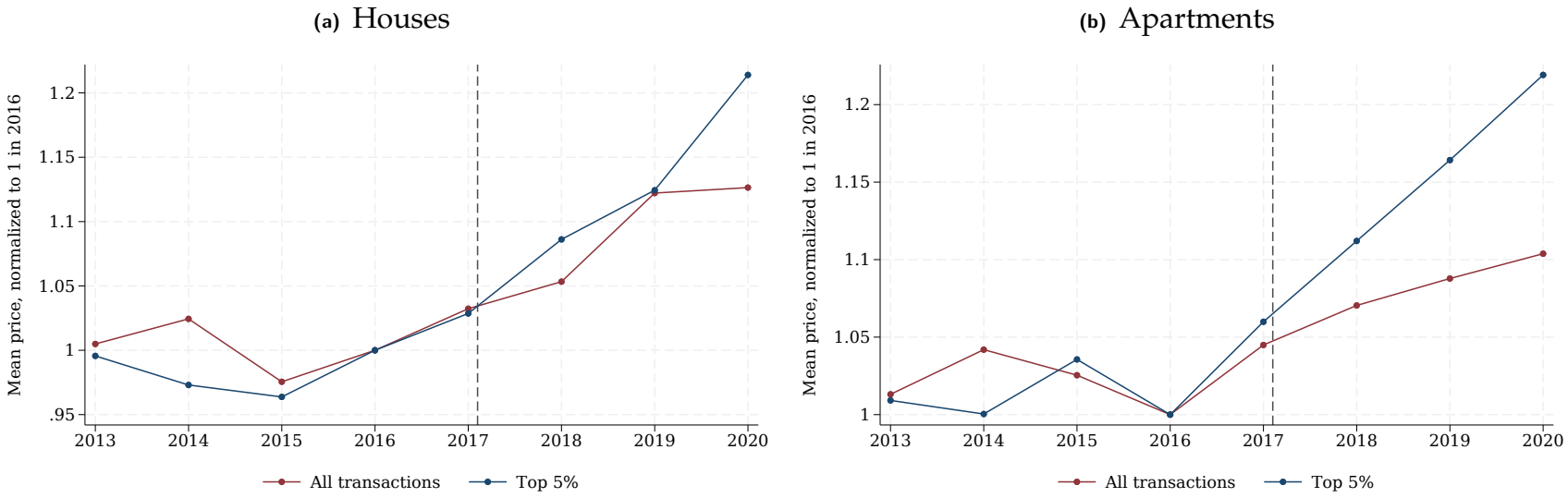

Figure 20: Average prices of property transactions - top 5% vs. all transactions

Notes: This figure exploits the administrative dataset DV3F providing information on the universe of property transactions in France between 2012 and 2021. It compares the evolution of average transaction prices in the top 5% most expensive areas in 2012 to all areas. Panel a) shows the average price evolution for houses while panel b) displays the evolution for apartments.

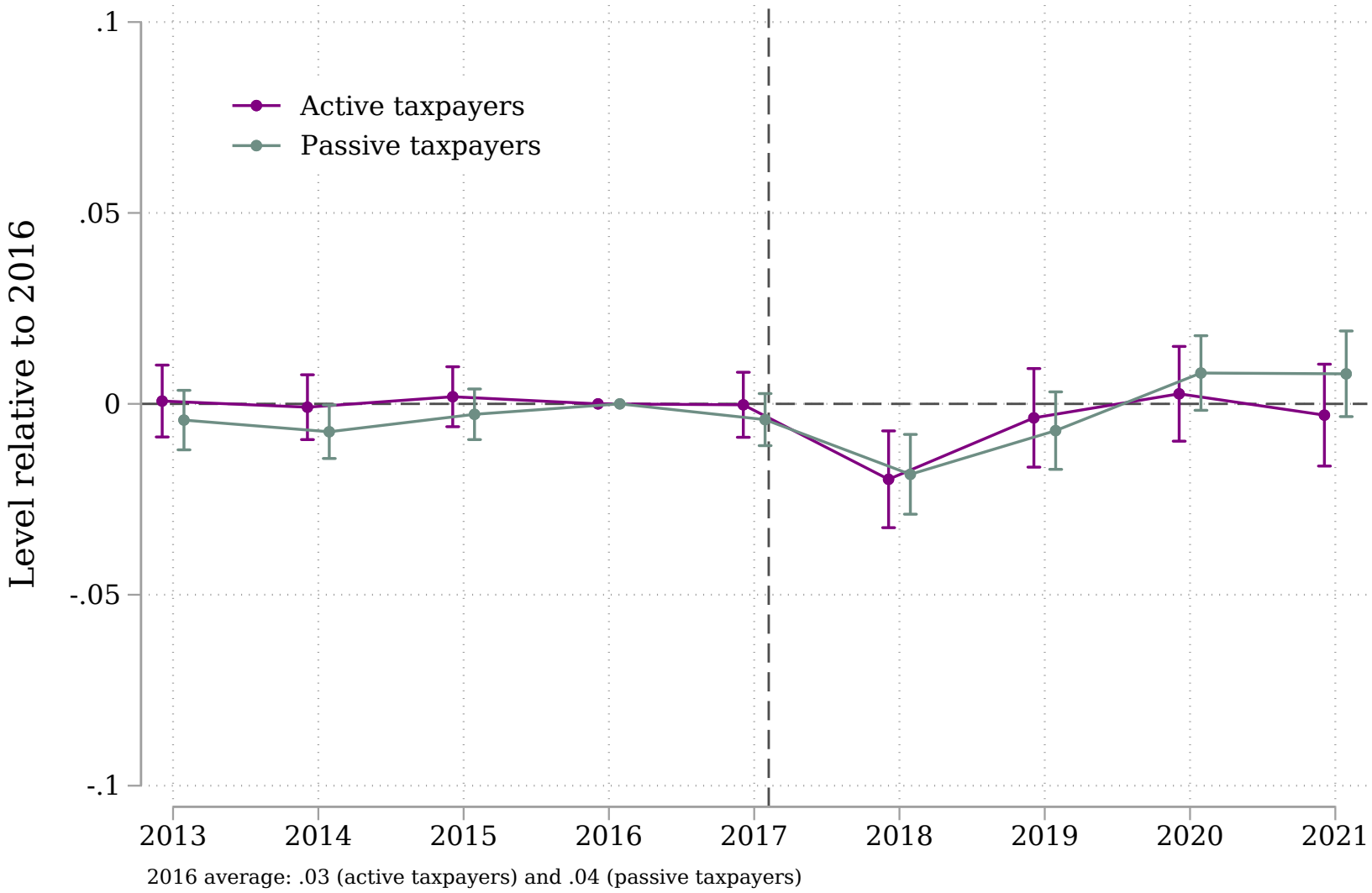

Figure 21: Response to the 2017 Wealth Tax Reform - SIIC dividends (scaled)

Notes: This figure shows the evolution of dividends from listed real estate companies (*Sociétés d'Investissement Immobilier Cotée* - SIIC) received by taxpayers from the treatment group relative to a control group of French taxpayers who own less in real estate than the exemption threshold before the reform. Coefficients are estimated separately for the top 20% biggest real estate sellers ("active taxpayers") and the rest ("passive taxpayers"). The outcome variable is scaled by average total rental income (rental income + SIIC dividends) over 2013-2015 and winsorized at the 95th percentile of the distribution of non zero values. The sample is restricted to households receiving at least 1500 euros in annual financial capital income once between 2013 and 2015.

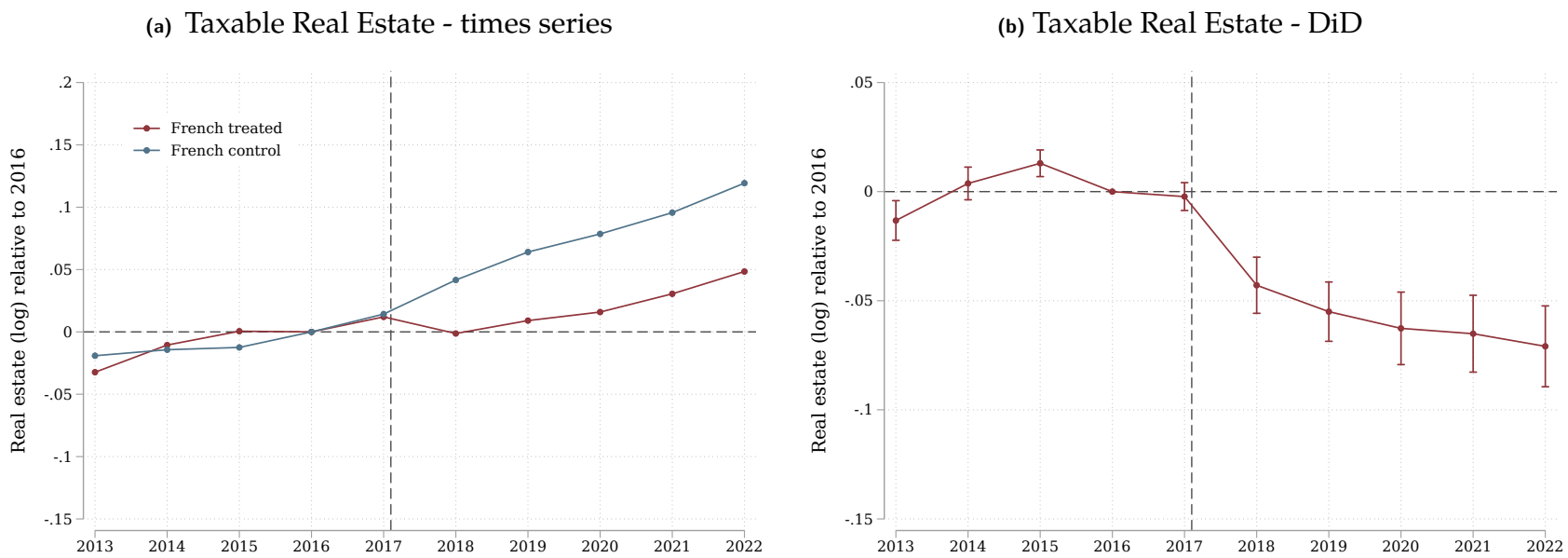

Figure 22: Response to the 2017 Wealth Tax Reform - Alternative Control Group

Notes: This figure shows the diff-in-diff coefficients obtained from the estimation of equation (1) on a balanced sample of wealth taxpayers using an alternative definition of the control group. This new control group consists of 2,168 French taxpayers who i) are liable to the wealth tax all years in 2013, 2014 and 2015, ii) fill in a detailed return at least once over this period and iii) when they fill in a detailed return, report at least 1.3 million euros in directly held taxable real estate net of debts and iv) whose primary home accounts for more than 50% of the value of their total housing wealth. The treatment groups is defined as the original treatment group reduced from taxpayers that are now in the new control group (13,855 taxpayers). Panel a) shows the times series while panel b) displays the DiD coefficients.