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One step forward and three steps back: pros and cons of a flat tax reform*

Paolo Di Caro †, Francesco Figari ‡, Carlo Fiorio§, Marco Manzo ¶, Andrea Riganti‖

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Abstract

We use a rich administrative dataset on individual tax returns from 2008 to 2015 to analyse the behavioural and distributive effects of a flat tax (FT) reform introduced in 2011 for residential property income in Italy replacing the progressive personal income tax. Linking a panel of individual tax data with cadastral property records, and using a difference-in-difference identification strategy, we address five research questions: (i) does the FT increase the probability of declaring a positive rental income to the tax authorities? (ii) does the FT increase the declared tax base? (iii) is the reduced tax burden shared with the tenant? (iv) does the FT affect the overall tax revenue? (v) who are the gainers of the policy? The estimated intention-to-treat effects suggest that the decrease of tax evasion is limited whereas tax burden reduction is large, it is not shared with tenants and it mostly benefits top-income taxpayers. Overall, top 1% of property owners reap about 20% of the overall lost tax revenues.

JEL codes: D12, H24, H25.

Keywords: Flat tax reform, administrative data, tax evasion, income distribution.

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1 Introduction

The fair distribution of the tax burden to fund the welfare system and other public expenditures has always been a key issue in policy making (Diamond and Saez, 2011). Progressive taxation was very popular in the first three decades after the WWII, along with the building of the modern welfare states. Progressive taxation was inspired by a comprehensive income tax system, i.e. including all sources of income in the same tax base, using largely progressive rates.[1] Comprehensive tax systems limit income shifting, but they may reduce efficiency and compliance and introduce large administrative costs.

Since the late 1970s, a new trend has developed aimed at reducing taxation for more elastic income components, such as financial capital income whose mobility has vastly increased, lowering marginal tax rates and reducing the number of tax brackets, in the search for lower inefficiency and complexities. Progressivity has been preserved with an increasing use of tax expenditures. Scandinavian countries and the Netherlands opted for a dual income tax (DIT), i.e. a progressive tax on labour and pension income, but a proportional tax on all capital income. However, the DIT affects vertical equity, especially because income from capital tend to be concentrated in the upper income brackets, and introduces an incentive to shift highly-taxed labour income into less-taxed capital income (Boadway, 2004).

Since the flat tax reform for the United States proposed by Hall and Rabushka (1985), the discussion about proportional as opposed to progressive taxation prompted a heated debate. The expression "flat tax" has been used loosely and flat taxes adoption variability is large. Here we define as flat tax a single strictly positive marginal tax rate on some taxable income.[2]

In the past three decades, a raising number of developing countries adopted flat tax reforms to replace progressive taxation of all income sources with the aim of sustaining growth and employment by reducing tax complexity, improving tax compliance and limiting the potential distortionary effects of existing personal income tax systems (Barrios et al., 2020). The assessment of a flat tax reform on all incomes is complex because a counterfactual is difficult to find and several confounding factors could play a role. For instance, concurrent changes in enforcement might effect tax compliance (Ivanova et al., 2005), changes in row material prices might affect growth in exporting countries and identifying the causal effect of the parametric tax reform may be challenging (Gorodnichenko et al., 2009).

Developed countries have mostly developed FT reform for particular kinds of income, mostly financial capital income (Bach et al., 2021),[3], suggesting that these tax cuts are so effective in enlarging the tax base to possibly "pay for themselves" (Poterba, 2004). However,

[1] Top tax rates in the UK and the US reached 98% and 91% respectively, in some years (Alvaredo et al., 2018).

[2] When applied to labor income it can also include a tax allowance, possibly taking into account the taxpayer's personal circumstances.

[3] FT reform of dividend income were introduced in Italy in 1998, in the US in 2003, in Spain in 2007, in France in 2008 and 2018

these effects should be assessed empirically jointly with their distributional impact (Saez and Zucman, 2019).

In this paper we investigate the effects of the flat tax regime on individual property income introduced in Italy in June 2011 for residential properties (called *Cedolare Secca* in Italian) and here simply called FT henceforth. This FT reform allows property-owners to opt for a single proportional tax rate on taxable rental income instead of being taxed at the existing, progressive personal income tax (PIT) rates. We use a novel administrative dataset produced by the Italian Ministry of Economy and Finance (MEF) collecting information on a random sample of 80,000 anonymous taxpayers with an oversampling of top incomes for year 2014. To all individual taxpayers in this sample, individual tax returns for the years from 2008 to 2015 have also been added. As the reform was introduced for residential property only, by linking tax records with the cadastral administrative archive we are able to disentangle residential from commercial properties, the former and the latter acting as treated and control units, respectively. As the policy was approved in December 2011 and implemented stating in June 2012 and there are strong legal limitations to change a commercial property into residential ones, the treatment assignment is very close to be as random. We anyway tested if any anticipation effect had happened and we reject this assumption. Our analysis is based on more than 800,000 different properties over 7 years. The merge between taxpayers information contained in tax returns and information on properties contained in administrative register data, a novel features of our dataset, has been possible thanks to the exact, anonymous matching of taxpayers in the two data sources by means of the individual personal identification code.

Differently from the DIT, the FT on property income was set at levels lower than the corporate income tax, which was at 27.5% in 2012 and has been reduced to 24% since 2017. This FT reform reduced the tax rate by a great extent assuming to have a very large effect on an allegedly huge tax evasion and aiming at reducing the market price of residential property rents thanks to a shift of tax gain from the owner to the tenant. However, it shares a common feature of most FT reforms: "it has been marked more by rhetoric and assertion than by analysis and evidence" (Keen et al., 2008, p.713). In this paper we address five research questions: (i) does the FT increase the probability of declaring a positive rental income to the tax authorities? (ii) does the FT increase the declared tax base? (iii) is the reduced tax burden shared with the tenant? (iv) does the FT affect the overall tax revenue? (v) who are the gainers of the policy?

Using difference-in-difference over eight years, our intention-to-treat estimates show that at the extensive margin the policy had a positive effect increasing the share of rented properties by 3.8%. This is a sizable effect, although we cannot disentangle what is actual reduction of tax evasion and what is increased supply of newly rented properties. As for the intensive margin, we estimate that the FT reform increased the tax base by 6.6%. However, we do not find any evidence of shift of the tax saving to the tenant, hence no effect reducing the

equilibrium price in the rented-property market. A common feature of the intention-to-treat estimates either at the extensive and at intensive margin is their heterogeneity with respect to the level of income of the owner, being about twice as large for taxpayers in the top percentile as opposed to taxpayers with income below the median. We then show that the increase of tax compliance and tax base is far from repaying the cost of the FT reform. Four years after the FT introduction, with about half of the eligible properties having opted for the FT, it costed between €1.5 and €1.8 billion, close to 10% of the annual national budget, as opposed to the previous progressive PIT. Accounting for the tax gains of all sampled taxpayers, we find that top 1% of property owners reap about 20% of the overall lost tax revenues.

The paper is organised as follows. In the next Section, we discuss the institutional context of our study. In Section 3, we provide information on the data and preliminary statistics. The methodology and the main results of the paper are described in Section 4. Section 4.4 contains the robustness checks, and in Section 5 we estimate both distributive effects and overall impact on tax revenues. Section 6 concludes.

2 The Institutional context

The Italian PIT (also known as IRPEF[4]) is a highly progressive system that allows for the collection of about one third of total tax revenues, summing to over 160 billion euro, i.e. around 10 percent of the Italian gross domestic product. During the period considered (2008-2015) the top national statutory tax rate was set at 43% for incomes above €75,000. The progressivity of PIT is guaranteed by a large set of tax deductions and tax credits. More than 50% of PIT revenues are provided by the top 15% PIT payers, whilst the top 5% of PIT payers contribute to about 35% of total net PIT revenues[5].

As in other developed countries, the PIT base is mostly made of labour and pension income. Income from financial assets is, since 1998, taxed at a proportional tax rate and do not enter the PIT base with the precise aim to reduce the risk of capital outflow, tax avoidance and international fiscal competition. The figurative income of the main residence is tax-free since 2001. Until 2011 rental income from other buildings entered the tax base with a small deduction to account for maintenance costs[6] and, in case declared unrented, only cadastral income was taxed, with cadastral income being on average 90% smaller than rental income.

Starting from mid-2011, owners of rented residential properties are allowed to opt for the FT, i.e. a proportional tax system exempting them from the progressive PIT. The FT applies to income from rented residential properties, excluding income from commercial properties.

[4]IRPEF stands for *Imposta sui Redditi delle Persone Fisiche*.

[5]Detailed statistics on IRPEF revenues since 2008 are available at the MEF website, open data section (`https://www1.finanze.gov.it/finanze/pagina_dichiarazioni/public/dichiarazioni.php`)

[6]The deduction was set at 15% before 2013 and reduced to 5% since 2014.

In addition, as shown in Figure 1, two different rates have been introduced: a reduced one for residential properties rented following regulated territorial agreements[7] and a standard one at 21%. The reduced rate was set at 19% for the first 18 months, than at 15% for 2013 and at 10% since 2014 up to date. The marginal convenience of the FT was the highest for PIT taxpayers whose taxable income before rental income was above €75,000 yearly and the PIT marginal tax rate is 43%, conversely it is the least for PIT taxpayers whose taxable income was below €15,000 per year, where the PIT marginal tax rate was 23%. The only major shortcoming of FT regime are that rents have to remain constant for the whole duration of the contract, whereas rents without the FT has to be updated according to the official yearly inflation rate provided regularly by the Italian national statistical office (ISTAT) and that no deduction for maintenance cost is allowed. Opting for FT regime, property-owners are free from other taxes and duties, such as the registration tax and stamp duty on the contract, which count for about 0.5 to 2 percent of the annual rent, as well as from regional and local additional PIT. Although we are not aware of any sound academic paper providing support for the introduction of FT on rental income, long list of daily journal articles and a lively public debates have induced the policy makers to introduce the FT, claiming that it would have eradicated tax evasion in a market where informality is perceived as widespread, would have induced owners of unrented properties to reconsider their choice and increase the stock of properties in the market enlarging the tax base and allowing the FT to repay its costs, would have reduced the market price of rented properties as an effect of larger supply and of a allegedly likely sharing of tax savings between owners and tenants. [8] Interestingly, during the period considered here (2008-2015), no major tax change was introduced in the PIT.

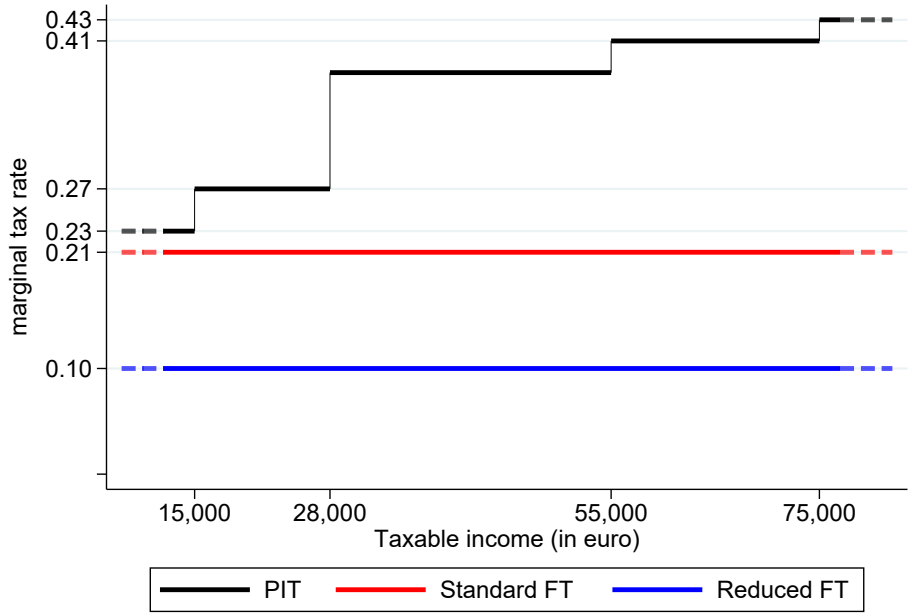
3 The data

The dataset built at the Ministry of Economics and Finance (MEF) for this paper relies on a stratified random sample of 80,000 individual tax forms regarding incomes produced in year 2014. This sample comprises 0.2% of the total Italian individual taxpayers and was built for policy evaluation purposes. It was selected using four stratification variables: type of tax return (forms are different for those who are in employment or in self-employment), geographical area (North-West, North-East, Centre, South), fifteen before-tax income groups and main source of income (e.g. income from employment, from self-employment or pension),

[7] These contracts (*contratti concordati*, in Italian) are regulated by territorial agreements between owners' and tenants' organizations aimed at setting prices lower than those set in the market.

[8] Interestingly, the FT was initially introduced for long lease contracts and for residential properties only, where informal tenancy is more likely. Commercial tenancy is unlikely to be on informal contracts as commercial activities are required to prove regular contract of tenancy and tenants can claim rental costs as business deductible. However, political support has been so large that it was gradually extended to properties with short period leases (i.e. holiday apartments) in 2017 and to commercial properties in 2019. These changes are however irrelevant for our analysis as we focus on the period 2008-2015 only.

Figure 1: Tax rates



Note: Reduced FT rate was 19% from 2011-2012, 15% in 2013 and 10% from 2014.

with an over-representation of top incomes.[9] Using the unique individual taxpayer code, this dataset was complemented with all sampled individuals' tax forms from 2008 to 2015, generating a panel over seven years, comprising three before the FT was introduced (2008-2010) and four after it (2012-2015).[10] The use of administrative data allows a precise description of the underlying population, with no loss of information at the top of the distribution (Atkinson and Brandolini, 2001; Auten and Splinter, 2019) whose taxpayers are often badly represented in standard surveys (Larrimore et al., 2021; Ravallion, 2021). A random sample partly solves the issue but, as the income distribution is heavy-tailed the actual frequency of very large income is small and the sampling probability of this group close to zero, it could still provide an imprecise picture of the actual distribution. Stratified random sampling with over-representation of top incomes solves most issues. We provide more details with respect to validation of our sample in Appendix A.

Tax data provides information on individual characteristics (e.g. age, gender, marital status) and household characteristics (e.g. municipality of residence, family composition), as well as all information submitted for tax purposes to the tax authority including detailed income sources and detailed element of the tax function (e.g tax credits and deductions). We call this panel dataset of individual taxpayers from 2008 to 2015 the "taxpayer dataset".

[9] For a more detailed discussion on the sample construction, including information on the sample procedure and descriptive statistics, see (Di Caro, 2020).

[10] As the FT was approved in December 2010 and implemented in the June 2011, we dropped year 2011 from most of our the analyses as it could not be credibly assigned to the before- nor the after-policy-year group.

In Table 1 we provide some summary statistics for observations contained in it.[11] Panel (a) shows that the process of linking individual tax records overtime using the 2014 tax file has an attrition rate that ranges from a maximum of 9% (between 2009 and 2008) and a minimum of 1.5-2.5% (between 2013 and 2015). This attrition is not random as it affects younger taxpayers more than older ones (panel b) and to a smaller extent women more than men (panel c). In Section 4.4 we will test the robustness of our main empirical results to this attrition using a balanced panel only, concluding that attrition has negligible effect on our results.

Table 1: Descriptive statistics on the "taxpayer dataset", all available years.

Years	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
	(a) Number of individual taxpayers in the sample							
	73,964	74,614	75,596	76,396	77,679	78,732	80,000	78,078
	(b) Age							
Mean	50.7	51.5	52	52.5	53.1	53.7	53.7	54.9
Sd	17.4	17.6	17.8	18	18.2	18.4	18.8	18.5
Min	4	5	6	7	5	6	7	8
Max	99	100	101	102	103	104	105	105
	(c) Female							
Mean	0.465	0.465	0.47	0.469	0.471	0.475	0.478	0.476
Sd	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

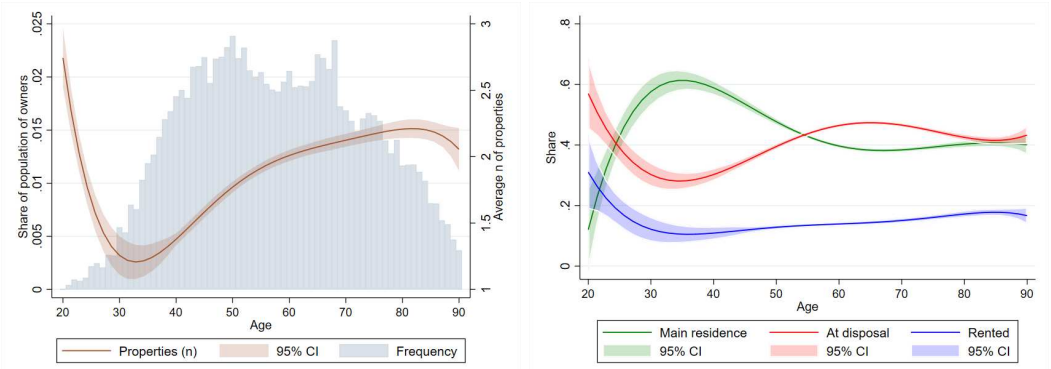
Notes: All estimates are weighted using sampling weights provided. Source: our calculations using MEF data.

Tax returns also provide detailed information on each property owned by each taxpayer. In detail, for every property declared by each taxpayer, we were able to retrieve information on each property's cadastral value, the share of ownership and number of days of possession in the tax year considered, the municipality where the single property is located, the taxable property income and its detailed use, allowing us to group all properties in three main categories, namely main residence, at disposal or unrented and rented. In Figure 2 we present the distribution of owners overlaid with the average number of properties (left panel) and the share of the main use of residential properties (right panel), by age of the owners using all considered years pooled together. It shows that the very few owners in their early twenties have on average a very large number of properties, as compared to other age groups, but the average number of properties decreases rapidly. This might be a consequence of the fact that most 30-year-old or younger owners might have acquired their properties in bulk through donations and inheritance and the average number of properties decreases as new owners, mostly home-owners, enter the group, as confirmed by the increasingly proportion of properties used as main residence for the same cohorts (right panel). Property accumulation

[11] Further descriptive statistics are provided in Appendix B.

increases rapidly for people in their thirties and levels-off at about the age of 40, with over 50% of owners aged between 40 and 65 (left panel). Owners in their early thirties mostly own one building and half of them use it as main residence. The share of building owned as investment, i.e. providing a rental income, constantly raises from about 10% for owners in their early thirties to about 20% for owners in their seventies.

Figure 2: Average number of properties and share of rented properties and frequency of owners, year 2014.



Note: Frequency of owners using single-year age bins (left). Average number of properties and share of main use of properties are depicted using a 5-degree local polynomial smoothing, with 95% confidence intervals (right). Source: our calculation on MEF data.

Although incredibly rich, the "taxpayer dataset" is missing a crucial information for our identification strategy, i.e. the distinguishing of residential as opposed to commercial properties. We need this information because only residential properties were eligible to take advantage of the FT regime (eligible or treated units), whereas all commercial property income had to remain in the progressive PIT base (ineligible or control units). To disentangle commercial from residential properties, we linked tax data with the cadastral registry, using the individual tax code of owners and the cadastral value, the ownership share and municipality of all their owned buildings, which are contained in both the tax and cadastral property records over the period 2008-2015.[12] We will call this dataset the "property dataset".

Among all properties in 2014, we estimate a number of commercial properties that are ineligible to the FT regime, equal to around 3.5 million. The number of residential properties that are eligible to the FT is about ten time as large and, among these, the share of rented properties is 12-13% over the whole period considered (Table 2). The interest in the FT reform was large and constantly increasing since the onset of the policy: one quarter of eligible and rented properties had opted for the FT within the first year of implementation, and within the next four years over fifty percent of rented properties were rented with the

[12] Although not perfect, this matching procedure allows us to classify over 91% of residential vis-a-vis commercial properties, which we use as estimation sample, dropping all remaining observations. Appendix D shows that dropping unclassified properties has a negligible impact on the distribution of our major variables used.

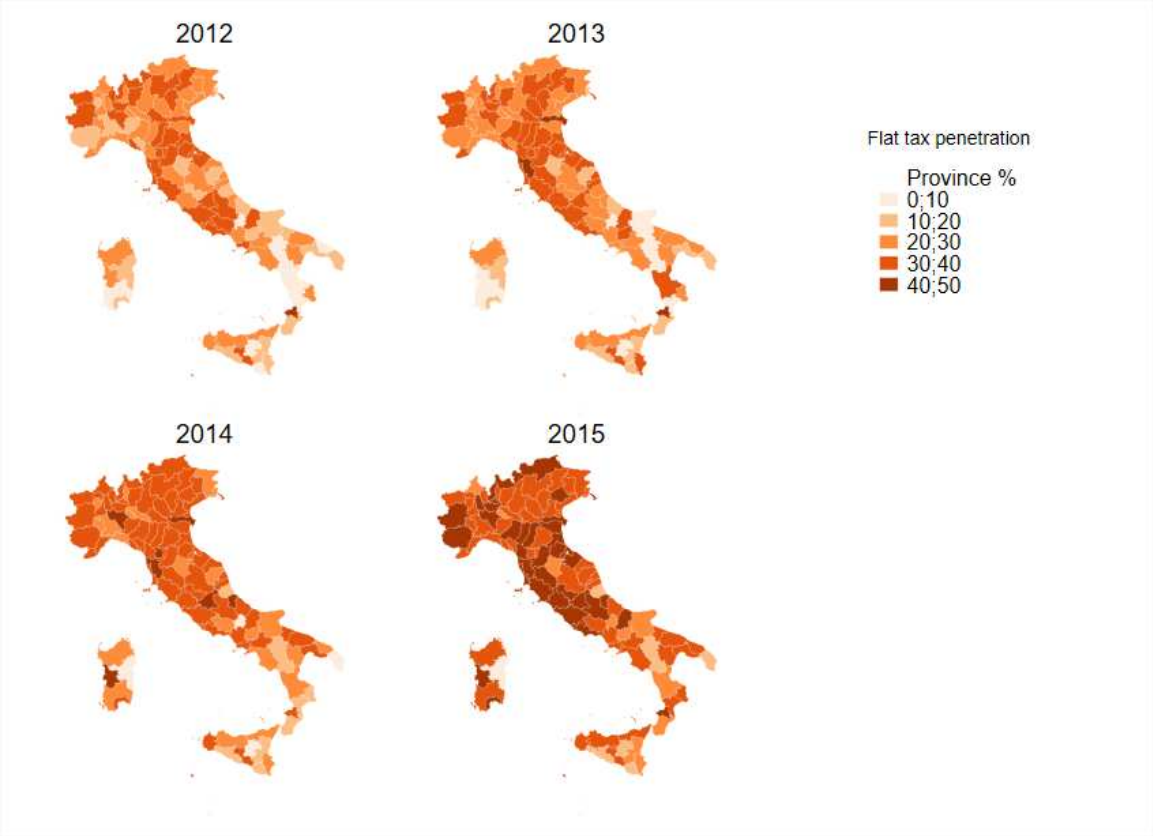
FT regime (Table 2, last column). Although increasing over time, the choice of the FT was not uniform across the country, being lower in the South, the poorest part of the country (Figure 3). This is consistent with the evidence that the FT regime is more convenient the larger is the taxable income and the marginal tax rate of alternative progressive taxation.

Table 2: Number of properties eligible and not eligible for the FT, share of rented among eligible and their share of adoption of FT

	Ineligible properties (Controls, mil.)	Eligible properties (Treated, mil.)	Rented eligible properties (%)	Rented eligible properties with FT (%)
2008	2.66	27.07	13.05	0.00
2009	2.84	28.71	13.08	0.00
2010	2.97	30.20	12.75	0.00
2011	3.16	32.39	12.19	0.00
2012	3.33	33.98	12.48	25.11
2013	3.46	35.18	12.77	30.57
2014	3.54	35.90	12.41	39.81
2015	3.52	35.93	12.25	50.46

Note: Total number of properties are expressed in millions and are provided using frequency weights provided. Source: our calculation using MEF data.

Figure 3: Flat Tax penetration at provincial level



Note: Territorial units (provinces) are define according to the NUTS3 EU nomenclature (`https://ec.europa.eu/eurostat/web/nuts/nuts-maps`). The FT penetration is defined as the share of properties that opted for the FT out of all rented properties. Source: our calculations on MEF data.

4 The intention-to-treat estimation of the intensive and extensive margins and of the tax shifting induced by the FT

4.1 The empirical model

Reducing rental income taxation has several possible effects. First, it increases the cost of alternative use of residential properties, i.e. leaving it unrented. Issues are more complex here, as an officially unrented property might be unofficially rented, i.e. rented without any formal contract, most often to avoid taxation. Informal contract is costly: tenants are not given guarantees of the length of the contract, owners are not guaranteed by the law for receiving payment or reclaiming back their property within a reasonable amount of time if needed or in case the tenant is late with due payments. Unfortunately, our data do not allow us to distinguish between properties that truly provide no income because unrented and properties that are only formally unrented to evade any related tax payment. Hence, we can only estimate the extensive policy effect of the FT policy on the probability of a formally unrented property to become formally rented, providing a check that actual reactions are in line with economic theory and an estimate of the magnitude of the effect. Second, if the extensive margin is positive and owners are more likely to rent their unrented properties, the amount of taxable property income declared by owners should increase, i.e. the policy should increase declared income at the intensive margin. Third, it might have an effect on the equilibrium price on the rental market as the increased disposable income of owners could be passed, to some extent, on tenants, shifting from the former to the latter part of the tax gain.

To estimate the effects of the FT at the extensive margin (EM), at the intensive margin (IM) and the tax shifting (TS) from the owners to the tenants of the FT we estimate a set of linear models all sharing the same main difference-in-difference (DiD) specification exploiting the panel structure of our dataset:

$$y_{pit}^{E} = \alpha^{E} Post_t + \beta^{E} Post_t \times Treat_{pi} + \eta_p^{E} + \epsilon_{pit}^{E}, \tag{1}$$

where $E = \{EM, IM, TS\}$. When studying the EM, y_{bit}^{EM} takes value equal to one if property p owned by individual i is rented in year t and equal to zero otherwise and model (1) is a linear probability model. When studying the IM, y_{bit}^{IM} is the (log) taxable property income of property p owned by individual i in year t. When studying the TS effect of the FT, y_{bit}^{TS} is the change in (log) rental income r in year t with respect to year $t-1$ of property p owned by individual i. In all specifications, $Post_t$ refers to the post-treatment period and takes value one if $t > 2011$ and zero if $t < 2011$,[13] property fixed effects η_p^{E} are included to account for time-invariant characteristics of property p and ϵ_{pit}^{E} is the error term.

[13] Recall that in all our regressions we drop all observations referring to year 2011 as the FT policy was implemented in June 2011.

The variable $Treat_{pi}$ is a dummy variable that indicates whether property p of individual i is a residential property allowing the owner to opt for the FT (thus $Treat_{pi} = 1$), or a commercial property (i.e. $Treat_{pi} = 0$) whose rental income is unaffected by the FT reform and is part of the control group. Although changing the destination of a building property, from commercial to residential, can be possible in some limited cases, it is not an easy task and several conditions should be fulfilled.[14] Some owners might have anticipated the FT reform and might have decided to sell a commercial property to buy a residential one, but the process is not easy and we do not see any evidence of potential anticipation effect, as shown in Appendix C. This allows us to assume that the FT reform is close to a random assignment treatment, where only owners of residential property have been offered the treatment, as opposed to untreated owners of commercial properties. However, as not all building that where offered the FT treatment opted for being treated (as shown in Table 2), the β^{IM} coefficient provides an intention-to-treat (ITT) estimate of the intensive margin of the FT policy.

We augment model described by equation (1) including total individual taxable income in year t, I_{it}:

$$y^E_{bit} = \alpha^E Post_t + \beta^E Post_t \times Treat_{bi} + (Post_t \times Treat_{bit} \times I_{it})'\gamma^E + \eta^E_b + \epsilon^E_{ibt} \qquad (2)$$

We first included income I_{it} as a continuous variable expressed in log terms: the coefficient γ^E shows the effect of the ITT for the marginal change in log-income. We also categorise total individual taxable income in year t I_{it} into five mutually exclusive groups of property income recipients, namely those reporting an income below the median income ($I_{[0,50]}$), those reporting an income between 50^{th} and 75^{th} percentiles ($I_{(50,75]}$), between 75^{th} and 90^{th} percentile ($I_{(75,90]}$), between the 90^{th} and the 99^{th} percentiles ($I_{(90,99]}$), and the top 1% of income earners ($I_{(99,\infty]}$). Categorising the income variable in five groups allows us to investigate possible heterogeneity of the ITT estimation.

4.2 The estimation sample

To estimated models (1) and (2), we use the "property dataset", drop properties that change destination over the period (less than 2% of the whole sample), observations with zero taxable income and properties that could be unambiguously classified as treated or untreated (e.g. garage which could be among treated units only if used as attached to a residential property). The final estimation sample is made of nearly 800-thousand properties, 11.5% are controls and remaining are eligible to be treated (Table 3). Taxable property income is four times larger in control units as opposed to treated units as the latter include residential and at disposal units that are taxed at cadastral values. Yearly rental-income change over

[14] We dropped all properties that experienced a change in destination any time during the 8-year period considered, which correspond to about 1.2% of the whole sample.

the whole period is 2.8%, with treated units on average increasing twice more then controls. Rental probability is nearly four times smaller in treated units than in control units, with large heterogeneity by income group of owners. Heterogeneity by owners income groups is found also in the count of units (Table 4), as owners in the top 1% own on average more than twice as many units as owners in the bottom 50%, and are distributed with large variability and an heavy-tail.

Table 3: Descriptive statistics regarding the full sample of individual properties using years from 2008 to 2010

	Whole sample	Treated	Controls
	(a) Continuous variables		
Tabable property income (thousand)	0.801	0.62	2.697
	(2.01)	(1.175)	(5.288)
Change in log-rental income	0.034	0.036	0.026
	(0.536)	(0.549)	(0.495)
	(b) Categorical variables		
Share rented	0.154	0.123	0.474
Share rented by individuals in $I_{[0,50]}$	0.106	0.086	0.343
Share rented by individuals in $I_{(50,75]}$	0.132	0.107	0.475
Share rented by individuals in $I_{(75,90]}$	0.189	0.152	0.56
Share rented by individuals in $I_{(90,99]}$	0.272	0.217	0.623
Share rented by individuals in $I_{(99,\infty]}$	0.367	0.317	0.626
n obs.	305,541	270,086	35,455

Note: Total number of properties are expressed in millions and are provided using frequency weights provided. Source: our calculation using MEF data.

Table 4: Count of the number of properties for the whole sample, treated and control units, by income groups.

	$I_{[0,50]}$	$I_{(50,75]}$	$I_{(75,90]}$	$I_{(90,99]}$	$I_{(99,\infty]}$	Total
			(a) Whole sample			
Mean	2.9	2.8	3.3	4.3	7	3.1
Sd	2.4	2.5	3.4	5.4	11.3	3.2
Max	107	61	148	306	293	306
			(b) Treated			
Mean	1.7	1.6	1.9	2.4	3.8	1.8
Sd	1.4	1.4	1.8	2.9	6.1	1.8
Max	52	37	94	196	192	196
			(c) Controls			
Mean	1.4	1.5	1.7	2.1	3	1.6
Sd	0.8	1.1	1.3	2.2	3.6	1.4
Max	16	19	22	44	47	47

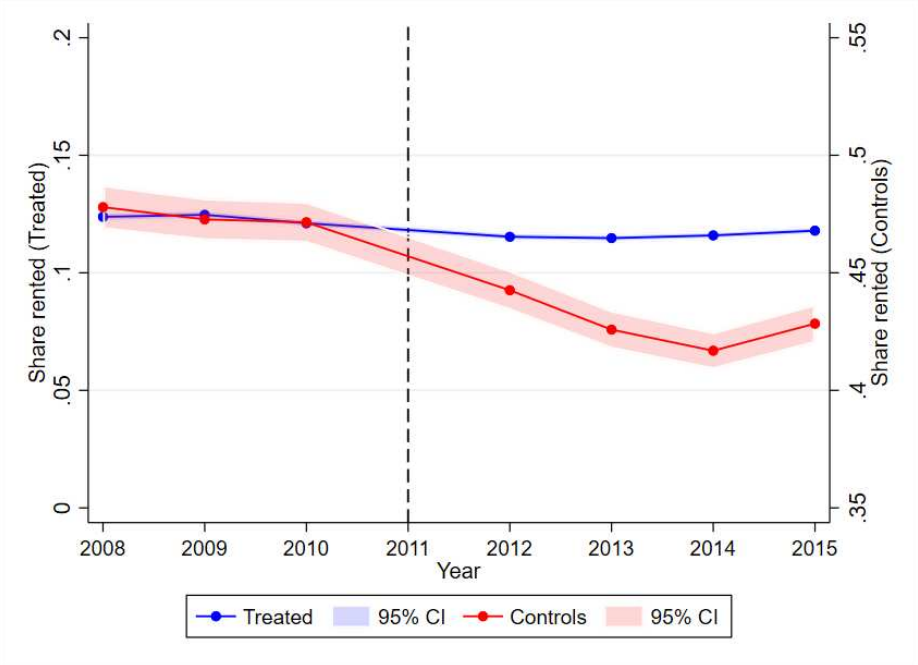
Note: Minimum number of properties is 1 for all income groups.
Source: our calculations using MEF data and frequency weights provided.

4.3 Results

4.3.1 The extensive margin

Our first research question relates to whether the FT increased the probability of renting a property, therefore considering the effect of FT introduction at the extensive margin. To address this question, we estimate model (1) with $E = EM$, i.e. estimating a linear probability model for properties to be rented after the introduction of the FT comparing it with commercial properties, which are non eligible for the FT. A crucial assumption for our DiD identification strategy is the parallel trend assumption of y_{pit}^{EM} before treatment between residential properties (treated units) and commercial properties (control units). As shown in Figure 4, the proportion of rented properties before 2011 for both treat and control groups has a similar trend though with large difference in levels, with commercial properties being about 35 percent more likely to be rented. Remarkably, the proportion of rented properties in the control group sharply decreases after 2011, whilst the proportion of rented properties among the controls remains similar to those in 2007-2010 years, suggesting that the unconditional effect of the FT was positive at the extensive margin.

Figure 4: Parallel trend assumption: the extensive margin (y_{pit}^{EM})



Note: The graph shows the proportion of rented properties among residential properties (treated units, in blue) and among commercial properties (control units, in red) between 2007 and 2015. Source: Our calculations using MEF data.

In Table 5 we show estimation results of models presented in Subsection 4.1. In the first column we report the baseline specification (1), with $E = EM$. It shows that the effect of the FT policy increases in the probability of renting a property by 3.8 percentage

points. In the following columns we investigate the heterogeneous effects of the FT on the extensive margin, as in equation (2). We first add the double interaction of treatment, post intervention and log-taxable income ($log(I)$, see column 2) finding that heterogeneity of taxable income is large, as it increases the average effect by a factor of about 7 and a 1% increase income reduces the average extensive margin by 2.6 percentage points. We then replace the log-taxable income with the set of dummy variables described in Subsection 4.1 ($I_{[0,50]}, I_{(50,75]}, I_{(75,90]}, I_{(90,99]}, I_{(99,\infty]}$, see column 3). Results show that the average increase in the probability of renting a residential property after the FT is higher and around 5 percent for owners below the median. Remarkably, we estimate positive and significant coefficients that decreases as income increases. For taxpayers in the top 1% of income among property owners, the willingness to rent properties is about one third as large as that of owners with income below the median. At first sight, this might be surprising as tax gains are the largest for top incomes and can be almost negligible (i.e. 2%) for taxpayers with less than €15,000 of taxable income. However, property income tax evasion is not a free meal, it increases with the number of properties involved, as it requires cash payments and high levels of trust. Taxpayers in the first income group own on average 2.9 properties whereas those in the top one on average have 7 (Table 4, panel a). Owners with several rented properties are more likely to hire a professional for managing them and by introducing a third-party they become more likely to let their properties only with registered contract and to keep them rented, no matter what is the tax regime.

Table 5: Regression, extensive margin

	(1)	(2)	(3)
Post	-0.036***	-0.250***	-0.050***
	(0.005)	(0.090)	(0.012)
Treat × Post	0.038***	0.264***	
	(0.006)	(0.092)	
Treat × Post × log(I)		-0.022**	
		(0.009)	
Treat × Post $\times I_{[0,50]}$			0.049***
			(0.012)
Treat × Post $\times I_{(50,75]}$			0.028***
			(0.008)
Treat × Post $\times I_{(75,90]}$			0.036***
			(0.009)
Treat × Post $\times I_{(90,99]}$			0.035***
			(0.008)
Treat × Post $\times I_{(99,\infty]}$			0.017**
			(0.008)
Constant	0.147***	-0.066***	0.126***
	(0.001)	(0.024)	(0.002)
n obs.	793,488	793,488	793,488

Note: Dependent variable is whether a property is rented or not, as discussed in Subsection 4.1. Property fixed effects are included in all specifications. Moreover, in specification (1) have been included only treatment dummy and a dummy for being in post-policy implementation period, plus their introduction. In specification (2) have been added continuous income plus its interactions with treatment and post intervention dummy. In specification (3) income has been added dividing house-owners into income groups, specifically below median, between median and 75th percentile, between 75th and 90th percentile, between 90th and 99th percentile and above 99th percentile. In all the specifications were calculated robust standard errors. Significance levels: $* \leq .1$, $** \leq .05$, $*** \leq .01$. Source: our calculation using MEF data.

4.3.2 The intensive margin

We now focus on the second research question, namely whether the FT caused an increase in the property income tax base, the intensive margin. Hence, we estimate model (1) with $E = IM$, i.e. with the log of taxable property-income. In Figure 5 we report the average (log) taxable property-income for treated and for control group in the time span considered. Treated properties have on average one-log point lower taxable income. Before 2011 both treated and control groups show a similar and constant trend. Taxable income of control units remain stable whereas that of treated units show a marked increase after the introduction of the FT.

Figure 5: Parallel trend assumption: the intensive margin (y_{pit}^{IM})

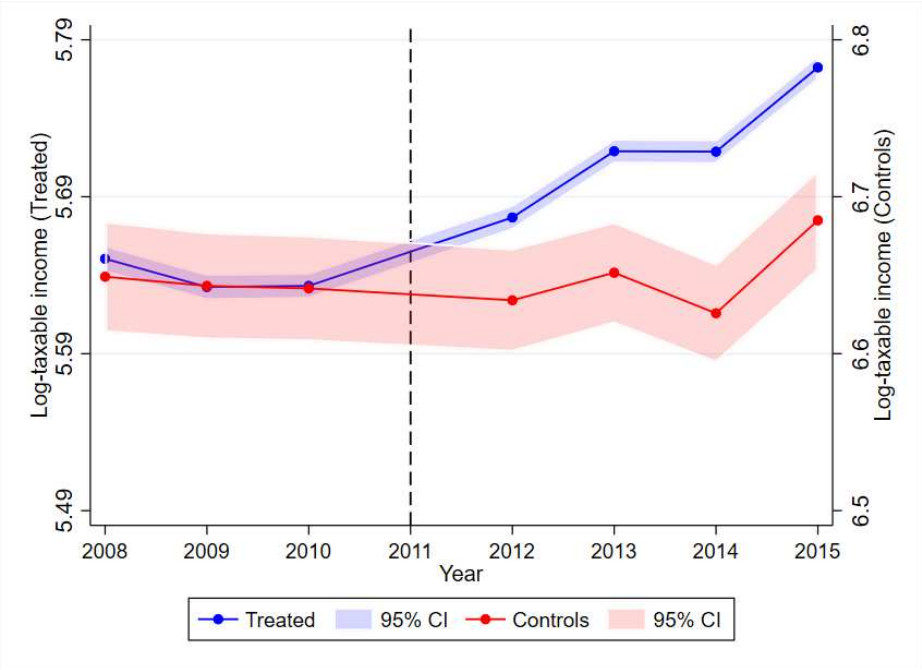


Table 6 shows that the FT has increased property income by 6.6% (column 1) with heterogeneous effects analogous to what found analysing the extensive margin. The elasticity of property-income with respect of total taxable income reduces by about 5.7% after the FT is introduced (column 2). Non-linear heterogeneity shows that income for the bottom half of owners increased by over 9% and by 5% for those who are in the upper part of income distribution. Again, results show that the average increase in taxable income decreases as income increases notwithstanding the fact that advantages coming from reduced taxation is larger as taxable income increases. This suggests that the elasticity of taxable property income is decreasing with taxable income, similarly to what observed in the labour market, implying a large income effect.

Table 6: Regression, intensive margin

	(1)	(2)	(3)
Post	0.053***	-0.740***	-0.003
	(0.013)	(0.240)	(0.030)
Treat × Post	0.066***	0.645***	
	(0.014)	(0.248)	
Treat × Post × log(I)		-0.057**	
		(0.024)	
Treat × Post $\times I_{[0,50]}$			0.094***
			(0.030)
Treat × Post $\times I_{(50,75]}$			0.054***
			(0.020)
Treat × Post $\times I_{(75,90]}$			0.060***
			(0.019)
Treat × Post $\times I_{(90,99]}$			0.058***
			(0.018)
Treat × Post $\times I_{(99,\infty]}$			0.049**
			(0.024)
Constant	5.703***	4.661***	5.604***
	(0.002)	(0.077)	(0.006)
n obs.	793,488	793,488	793,488

Note: Dependent variable is (log of) property taxable income, as discussed in Subsection 4.1. Property fixed effects are included in all specifications. In specification (1) only a dummy for being in post-policy implementation period, plus its interaction with the treatment dummy. In specification (2) an additional interaction with the continous log-taxable income was added. In specification (3), interactions with into income groups were included. All specifications were calculated using robust standard errors. Significance levels: $* \leq .1$, $** \leq .05$, $*** \leq .01$. Source: Our calculations using MEF data.

4.3.3 Tax (gain) shift from the landlord to the tenant

A reduction of the tax burden for rental income following the introduction of the FT replacing the progressive taxation goes immediately into the property owner's pocket. However, the owner might decide to share part of his gain with the tenant (e.g. to show a good attitude to her/his tenant or for increasing confidence) or might face a thicker market due to the higher competition due to an increased supply of properties on the market. In both cases, we should observe a reduction in the before-tax rental income. Our data allow us to test whether rental income changed after the introduction of the FT as we observe each single property overtime, shifting – to some extent – the tax burden gain from the landlord to the tenant. To investigate this third research question, we estimate model (1), with $E = TS$, defining the dependent variable as the yearly change of the (log of) rental income for property p of individual i, i.e. $y_{pit}^{TS} = \Delta log(r_{pi,t,t-1}) = log(r_{pit}) - log(r_{pit-1}) = log(\frac{r_{pit}}{r_{pit-1}})$, where r_{pit} is the rental income for property p, of individual i, at time t.

Focusing on the difference of log-rental income, i.e. dropping all unrented properties, reduces the estimation sample to about 120 thousands observations, which explains the larger confidence intervals as compared to previous figures (Figure 6. The figure shows that control and treated groups have a similar trend before the FT introduction and that the decreasing trend after 2011 is larger for the control group, showing – if any – the opposite of a tax gain shift from the owner to the tenant. This is confirmed also by the empirical estimation (Table 7). A possible explanation of this result is that owners do not share their tax gain with their tenant and, if any, they internalize the fact that the FT prevents automatic adjustment to the inflation rate during the whole contract duration and increase rental prices.

Figure 6: Parallel trend assumption: change in log average rent (y_{pit}^{TS})

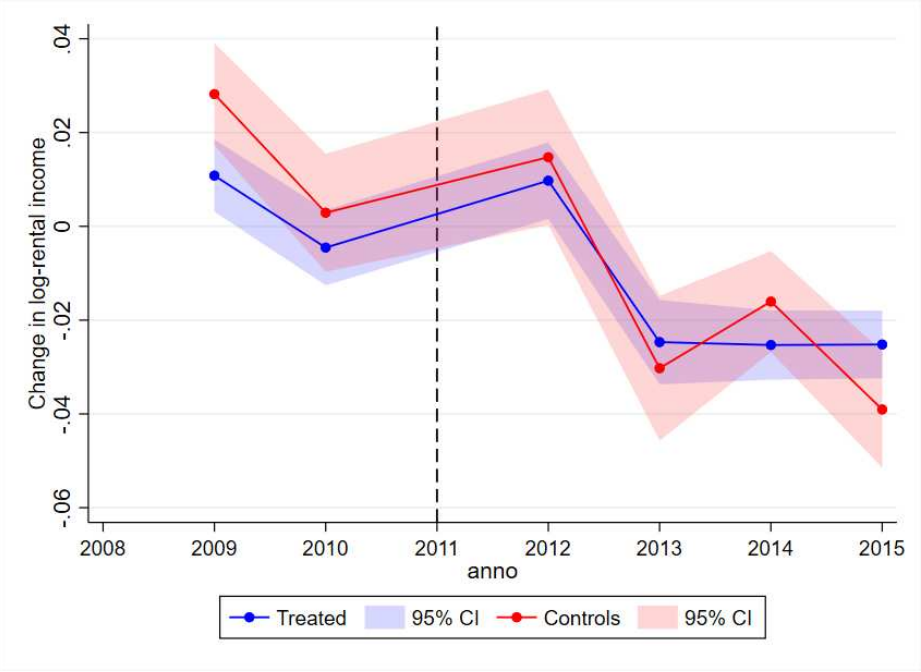


Table 7: Regression, tax shift

	(1)	(2)	(3)
Post	-0.118***	-0.488***	-0.181***
	(0.010)	(0.163)	(0.031)
Treat × Post	0.032***	0.226	
	(0.012)	(0.187)	
Treat × Post × log(I)		-0.018	
		(0.018)	
Treat × Post $\times I[0, 50]$			0.067*
			(0.036)
Treat × Post $\times I(50, 75]$			0.015
			(0.023)
Treat × Post $\times I(75, 90]$			0.030
			(0.025)
Treat × Post $\times I(90, 99]$			0.005
			(0.019)
Treat × Post $\times I(99, \infty]$			0.071***
			(0.027)
Constant	0.059***	-1.367***	-0.074***
	(0.004)	(0.169)	(0.019)
n obs.	123,559	123,559	123,559

Note: Dependent variable is Δ(log of) rent between year t and $t-1$, as discussed in in Subsection 4.1. Individual fixed effects are included in all specifications. Moreover, in specification (1) have been included only treatment dummy and a dummy for being in post-policy implementation period, plus their introduction. In specification (2) have been added continuous income plus its interactions with treatment and post intervention dummy. In specification (3) income has been added dividing house-owners into income groups, specifically below median, between median and 75th percentile, between 75th and 90th percentile, between 90th and 99th percentile and above 99th percentile. In all the specifications were calculated robust standard errors. Significance levels: $* \leq .1$, $** \leq .05$, $*** \leq .01$. Source: our calculation using MEF data.

4.4 Robustness analysis

Readers may argue that our results depend on the particular composition of the sample. Our data was built starting from a random sample of taxpayers in 2014 but it is not necessarily a representative sample of the population of taxpayers over the whole period considered. Some taxpayer may have disappeared by 2014 or conversely be present only from 2014 on wards and the average analysis by treated and control properties might mask relevant entry and exit in the pool of property owners because properties are sold and purchased over time. Other readers might argue that current income can be very unstable overtime as people get sacked and lose their main income source, they get promoted and might change the income group that we defined above, shading doubts on the heterogeneity of our results, namely columns (2) and (3) of tables 5, 6 and 7.

To address the first set of concerns we estimated previous models on a balanced data set, i.e. including only those observations that have always been in the sample over the entire period 2008-2015. This reduces the estimated sample by a large extent, by nearly 50%. To address the second set of concerns we use a proxy of permanent taxable income obtained as the average of taxable income over the whole period and all available years for all taxpayers and estimate model 2 only.

Table 8 shows robustness checks for the EM. Using the balanced sample, results presented in panel (a) are about the same as in the full sample and significance of coefficients remains very large except for the top 1% income group, which is now not statistically different from zero. Using permanent income, panel (b) shows that heterogeneity is also largely confirmed. Table 9 provides evidence that results are robust also for the intensive margin using both the balanced sample and the permanent taxable income measure. Table 10 for the tax shift confirms the average positive effect of the FT policy suggesting no tax gain shift from the owner to the tenant and even an increase of rents most likely because of the removal of the CPI automatic indexation of rents. Evidence on heterogeneous effects, which was already shaky using the whole sample, are proven not to be very robust, both in the balanced panel and using the permanent income measure.

Table 8: Robustness checks of the extensive margin, balanced sample and permanent income

	(a) Balanced sample			(b) Permanent Income	
	(1)	(2)	(3)	(2)	(3)
Post	-0.036***	-0.186**	-0.048***	-0.216**	-0.049***
	(0.006)	(0.083)	(0.013)	(0.106)	(0.013)
Treat × Post	0.037***	0.213**		0.218**	
	(0.006)	(0.087)		(0.108)	
Treat × Post × log(I)		-0.017**		-0.018*	
		(0.008)		(0.010)	
Treat × Post × $I_{[0,50]}$			0.048***		0.047***
			(0.013)		(0.013)
Treat × Post × $I_{(50,75]}$			0.029***		0.038***
			(0.010)		(0.009)
Treat × Post × $I_{(75,90]}$			0.045***		0.025***
			(0.011)		(0.009)
Treat × Post × $I_{(90,99]}$			0.026***		0.038***
			(0.009)		(0.008)
Treat × Post × $I_{(99,\infty]}$			0.016		0.024***
			(0.010)		(0.008)
Constant	0.154***	-0.053	0.131***	0.147***	0.147***
	(0.001)	(0.034)	(0.002)	(0.001)	(0.001)
n obs.	406,152	406,152	406,152	793,488	793,488

Note: Dependent variable is whether a property is rented or not, as discussed in Subsection 4.1. Property fixed effects are included in all specifications. Moreover, in specifications (1) have been included only treatment dummy and a dummy for being in post-policy implementation period, plus their introduction. In specifications (2) have been added continuous income plus its interactions with treatment and post intervention dummy. In specifications (3) income has been added dividing house-owners into income groups, specifically below median, between median and 75th percentile, between 75th and 90th percentile, between 90th and 99th percentile and above 99th percentile. In all the specifications were calculated robust standard errors. Significance levels: $* \leq .1$, $** \leq .05$, $*** \leq .01$. Source: our calculation using MEF data.

Table 9: Robustness checks of the intensive margin, balanced sample and permanent income

	(a) Balanced sample			(b) Permanent Income	
	(1)	(2)	(3)	(2)	(3)
Post	0.055***	-0.524***	0.004	-0.618**	0.003
	(0.010)	(0.141)	(0.020)	(0.292)	(0.032)
Treat × Post	0.047***	0.458***		0.562*	
	(0.011)	(0.151)		(0.301)	
Treat × Post × log(I)		-0.040***		-0.048*	
		(0.014)		(0.029)	
Treat × Post $\times I_{[0,50]}$			0.077***		0.089***
			(0.020)		(0.033)
Treat × Post $\times I_{(50,75]}$			0.043*		0.071***
			(0.022)		(0.023)
Treat × Post $\times I_{(75,90]}$			0.038*		0.037*
			(0.022)		(0.021)
Treat × Post $\times I_{(90,99]}$			0.039**		0.067***
			(0.020)		(0.018)
Treat × Post $\times I_{(99,\infty]}$			0.039*		0.065***
			(0.022)		(0.021)
Constant	5.829***	4.996***	5.733***	5.703***	5.703***
	(0.002)	(0.081)	(0.005)	(0.002)	(0.002)
n obs.	406,152	406,152	406,152	793,488	793,488

Note: Dependent variable is (log of) property taxable income, as discussed in Subsection 4.1. Property fixed effects are included in all specifications. Moreover, in specifications (1) have been included only treatment dummy and a dummy for being in post-policy implementation period, plus their introduction. In specifications (2) have been added continuous income plus its interactions with treatment and post intervention dummy. In specifications (3) income has been added dividing house-owners into income groups, specifically below median, between median and 75th percentile, between 75th and 90th percentile, between 90th and 99th percentile and above 99th percentile. In all the specifications were calculated robust standard errors. Significance levels: $* \leq .1$, $** \leq .05$, $*** \leq .01$. Source: our calculation using MEF data.

Table 10: Robustness checks of the tax shift, balanced sample and permanent income

	(a) Balanced sample			(b) Permanent Income	
	(1)	(2)	(3)	(2)	(3)
Post	-0.086***	-0.566***	-0.163***	-0.198	-0.147***
	(0.011)	(0.184)	(0.034)	(0.151)	(0.033)
Treat × Post	0.026**	0.334		0.068	
	(0.012)	(0.205)		(0.172)	
Treat × Post × log(I)		-0.029		-0.003	
		(0.019)		(0.016)	
Treat × Post $\times I[0,50]$			0.083**		0.056
			(0.037)		(0.037)
Treat × Post $\times I(50,75]$			-0.003		0.013
			(0.021)		(0.023)
Treat × Post $\times I(75,90]$			0.023		0.027
			(0.027)		(0.024)
Treat × Post $\times I(90,99]$			0.008		0.022
			(0.020)		(0.019)
Treat × Post $\times I(99,\infty]$			0.012		0.068***
			(0.021)		(0.021)
Constant	0.031***	-1.307***	-0.085***	0.059***	0.059***
	(0.004)	(0.192)	(0.019)	(0.004)	(0.004)
n obs.	73,170	73,170	73,170	123,559	123,559

Note: Dependent variable is Δ(log of) rent between year t and $t-1$, as discussed in in Subsection 4.1. Individual fixed effects are included in all specifications. Moreover, in specifications (1) have been included only treatment dummy and a dummy for being in post-policy implementation period, plus their introduction. In specifications (2) have been added continuous income plus its interactions with treatment and post intervention dummy. In specifications (3) income has been added dividing house-owners into income groups, specifically below median, between median and 75th percentile, between 75th and 90th percentile, between 90th and 99th percentile and above 99th percentile. In all the specifications were calculated robust standard errors. Significance levels: $* \leq .1$, $** \leq .05$, $*** \leq .01$. Source: our calculation using MEF data.

5 Distributive effects and overall impact on tax revenues

So far, we showed that the FT, by replacing the progressive taxation with a significant reduction of marginal tax rate at most levels of incomes, increased the number of rented properties and the tax base. Is the tax gain uniformly distributed among the population of taxpayers? What is the overall effect of this policy on public finances and, in particular, is the increased taxable income sufficient to reduce the loss of public revenues due to reducing the average tax rate? To provide an answer to this question, we consider only personal income components that were included in the personal income taxation (PIT) before the introduction of the FT, i.e. we ignore financial capital income. Hence, the overall personal taxable income of individual i at time t is defined as:

$$Y_{i,t} = YR^{C}_{i,t} + YR^{NC}_{i,t} + YC_{i,t} + YO_{i,t} \tag{3}$$

which is the sum of residential property income that opted for the FT ($YR^{C}_{i,t}$, where C stands for compliant to the FT), of residential property income that remained in the progressive PIT ($YR^{NC}_{i,t}$, where NC stands for not compliant to the FT), of commercial property income ($YC_{i,t}$, not eligible for FT, namely properties belonging to the control group) and of other personal income ($YO_{i,t}$ e.g. labor and pension income, not eligible for FT).

The tax revenue composition from individual i changed over time. Before 2011, when the FT had not yet been introduced, all residential property income entered the progressive taxation (i.e. $YR^{C}_{i,t} = 0$) and total PIT was equal to:

$$T_{i,t|t<2011} = \tau(YR^{NC}_{i,t} + YC_{i,t} + YO_{i,t}). \tag{4}$$

After the introduction of the FT, some residential property income moved from the progressive taxation to the FT (i.e. $YR^{C}_{i,t} > 0$) and total PIT became:

$$T_{i,t|t>2011} = \tau(YR^{NC}_{i,t} + YC_{i,t} + YO_{i,t}) + \xi \cdot YR^{C}_{i,t} \tag{5}$$

where τ is the tax function to compute the Italian progressive personal income tax (IRPEF) and ξ is the proportional flat tax rate.[15]

To assess the effect of the FT on total tax revenues we would need a counterfactual, i.e. what would have been the tax revenues after 2011 had the FT not been introduced. We do not observe it but, using previous results, we can simulate it. From the analysis of the FT at the intensive margin, we estimated an average increase of the tax base on treated income (i.e. total residential property income $YR^{C}_{i,t} + YR^{NC}_{i,t}$) by income groups equal to $\beta^{IM} + I'_{it}\gamma^{IM}$, using notation introduced in (3). Hence we simulate the individual counterfactual taxable

[15] The notation $\xi \cdot YR^{C}_{i,t}$ simplifies the real FT tax calculation for notational purposes only, as the coefficient ξ takes either the standard or the reduce FT rate, depending on the type of tenancy contract signed.

income after the introduction of the FT as:

$$Y^S_{i,t|t>2011} = \frac{YR^C_{i,t} + YR^{NC}_{i,t}}{1 + \beta^{IM} + I'_{it}\gamma^{IM}} + YC_{i,t} + YO_{i,t} \tag{6}$$

and the simulated amount of taxes paid had the FT not been introduced as:

$$T^S_{i,t|t>2011} = \tau \left(\frac{YR^{NC}_{i,t}}{1 + \beta^{IM} + I'_{it}\gamma^{IM}} + YC_{i,t} + YO_{i,t} \right) + \xi \cdot \frac{YR^C_{i,t}}{1 + \beta^{IM} + I'_{it}\gamma^{IM}} \tag{7}$$

Hence, to assess the effect of FT reform we estimate four distinct counterfactual scenarios. The first two assume that the FT is removed and all residential property income returns under the progressive tax scheme.

Scenario 1 (S_1) We assume that the FT is removed and there is no reaction of owners, i.e. the increase of the tax base because of the FT is there to stay; in other words, the due tax is as in (7), with $\beta^{IM} + I'_{it}\gamma^{IM} = 0$.

Scenario 2 (S_2) We assume that removing the FT there is an immediate and exact reaction of owners who roll back to before 2011 and wipe out their decision to increase their tax base (returning to the informal market or re-taking their property out of the rental market). Under Scenario 2, the due tax is as in (7), with $\beta^{IM} + I'_{it}\gamma^{IM} = \widehat{\beta}^{IM} + I'_{it}\widehat{\gamma}^{IM}$ as in Table 6, column 3.

The last two simulations are strictly connected with current debate in Italy about PIT reform. According to some political parties, all income from wealth, regardless of it being from financial or real asset, should be taxed at the same rate. Supporters of this proposal argue that this would increase the homogeneity of capital income taxation, opponents argue that this would further reduce the PIT base at the benefit of *rentiers*, causing either a reduction of public services and transfers or an increased taxation on labour and pension income. In the last two simulations, we assume that the FT is not an option as opposed to PIT but replaces it, as long as property income is concerned. In these last two simulations, we assume that there is no further reaction of owners, i.e. taxable income is equal to the actual one. Hence,

Scenario 3 (S_3) We assume that FT is expanded to all property income, regardless of it being for residential or commercial use and PIT base exempts all capital income. Rental income from properties let with regulated contracts will all be taxed at the current reduced rate (10%), those let with other types of contract at the current standard rate (21%).

Scenario 4 (S_4) differs from $S3$ only for the standard rate adopted, which is set at 23%, which is the rate currently under discussion at the Italian Parliament.

We compute the total change in tax revenues for each scenario as the difference between actual and counterfactual individual taxes aggregated over the whole population:

$$\Delta_t T^S = \sum_{i=1}^{N} \left(T_{i,t} - T_{i,t}^S \right), \text{ for } S = \{S1, S2, S3, S4\}, \tag{8}$$

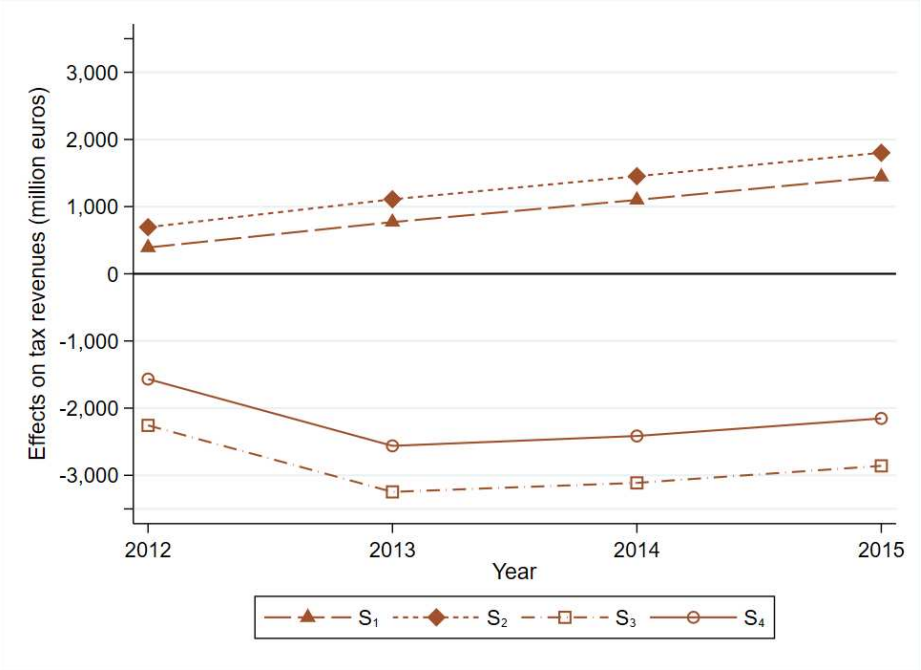
where N is the population size and $T_{i,t}$ is the actual tax payment of individual i in year t.

Figure 7 shows differential results of these four simulations contrasting them with actual total income tax revenue and actual property income tax revenue. It shows that property income since the introduction of the FT provided a bit less than 8% of all tax revenues, corresponding to about €11 billion. Simulating the removal of the FT (simulations S_1 and S_2), we would increase tax revenues by over 10% (13% and 16% for S_1 and S_2, respectively) in 2015 and this share is clearly increasing with the increase of the FT adoption. We also contrast the simulated effect of extending the FT, which has an even larger effect on actual property income tax revenues. Although extending the FT to commercial property income has no effect on tax evasion as it is negligible on commercial contracts and although it seems that for various reasons (e.g. to claim tax expenditures in the PIT) some taxpayers still prefer using the PIT as opposed to the FT, extending the FT holding the reduced tax rate and adopting the 21% standard tax rate would cost about one quarter of actual property income tax revenue under Scenario 3 and only slightly less, about about one fifth, under Scenario 4, which replaces standard FT rate at 23%.

We also aim to analyse distributive effect of these scenarios. In Figure 8 we plot the average change in due tax by removing the FT according to Scenarios S_1 and S_2 for the average taxpayer in each income group as defined in Section 4 and over the 2012-2015 period. It shows that if FT were removed in case of no reaction of owners, on average the top 1% of property owner taxpayers would pay nearly €1,200 more if FT were removed, the next 9% of taxpayers (i.e. those between the 90th and the 99th percentile) would pay around €350 more and the rest of the population would just pay on average few euros more. This holds true also when considering Scenario S_2, which represent average tax change if FT were removed with exact and immediate reaction of owners as a consequence. Differences are higher for those in the upper part of income property owners' distribution and close to 0 for those below 75^{th} percentile. This is particularly interesting as we can interpret changes in average due tax as the opposite of the effect that has followed FT introduction, showing us that those who benefit more from this policy are those with higher property income, whilst for the three quarter of income distribution changes are irrelevant.

We deepen our analysis showing the distributive effects of the FT under Scenarios S_1 and S_2 since its introduction plotting the average aggregate due tax change by income groups and the cumulative due tax change of each group in figure 8. The latter, depicted with a red line connecting the average cumulative due tax change, is a discretized version of a Lorenz curve of FT revenue changes if FT were removed. It shows that the introduction of the

Figure 7: Simulation of difference scenarios and effects on tax revenues (million €)

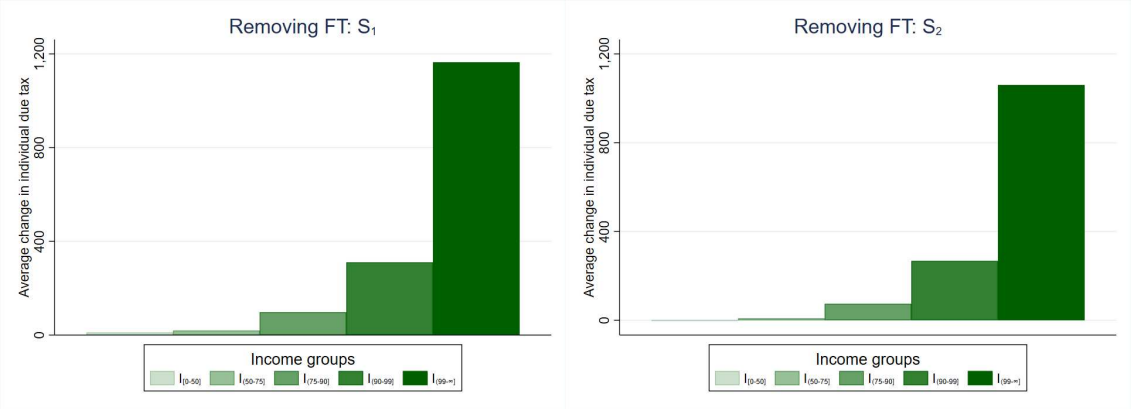


Note: The graph shows the differential results between each of the four simulations and actual total income tax revenue and actual property income tax revenue between 2012 and 2015. Scenario S_1 assumes that FT is removed and all property incomes return into the PIT with no further reaction of owners, S_2 that FT is removed but owners react returning to before-FT declaration behavior, S_3 that FT is extended to all property income with a standard 21% rate exempting all property incomes from PIT and S_4 as the latter with a standard 23% tax rate. All statistics are in million euro. Source: Our calculations using MEF data.

FT replacing PIT generated a revenue loss that translated into a private gain for the upper part of the taxpayers' income distribution, as approximately 20% of the overall tax change benefited the top 1% and about 60% of all tax reduction went in the pocket of the top 10% of property income taxpayers.

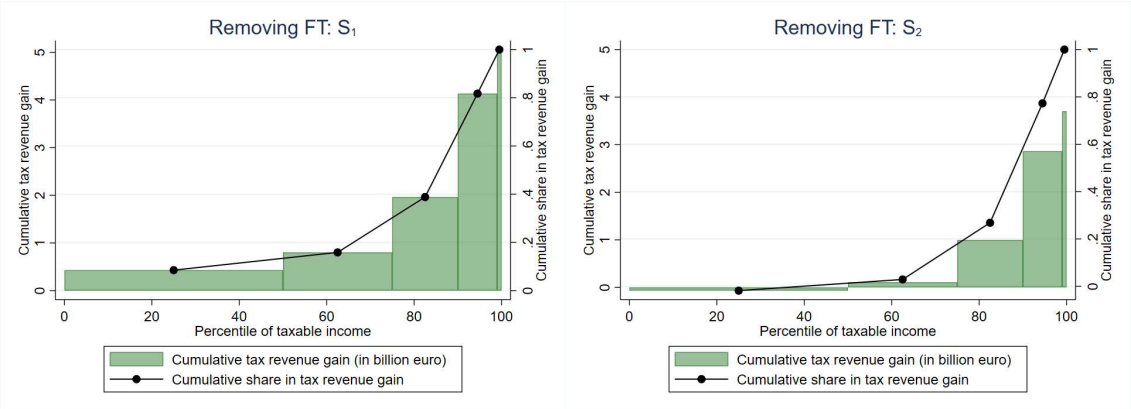
In figures 10 and 11 we provide evidences for redistributive effects of counterfactual scenarios S_3 and S_4 for the average (Fig. 10) or cumulative (Fig. 9) change in due tax by expanding the FT. Indeed, FT expansion would lower average due tax by 2-2.5 thousand €for those in the top 1% of property income distribution and about 500€for those in the next 9% of taxpayers (between the 90^{th} and the 99^{th} percentile). Consistently with what we have shown in figure 8, changes in due tax would be negligible for those below 75^{th} of income distribution. From a distributive point of view, even in this case the top 1% (10%) of property income taxpayers would benefit of around 20% (60%) of the overall tax change.

Figure 8: Distribution of the change in tax revenues by removing the FT, by average taxpayer in each income groups over the whole period, in euro.



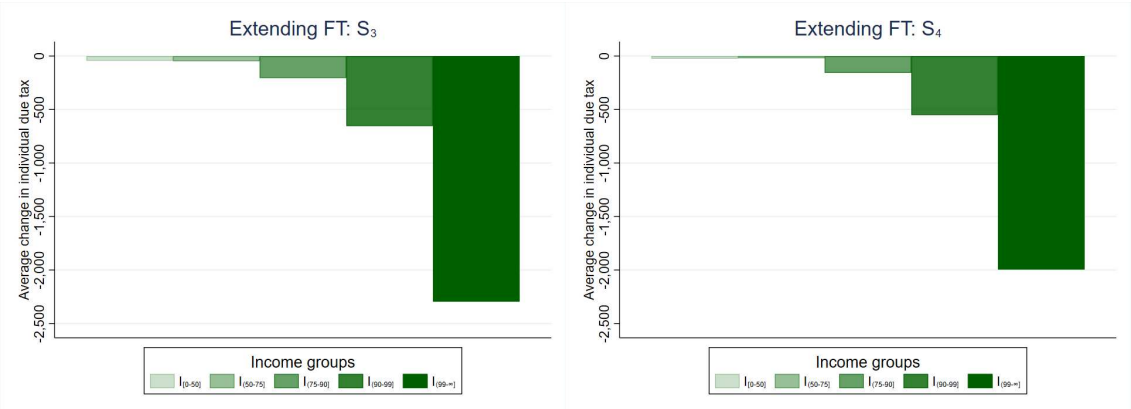
Note: values in euro, 2012-2015. Source: Our calculations using MEF data.

Figure 9: Distribution of the change in tax revenues by removing the FT, by average taxpayer in each income groups over the whole period, in euro.



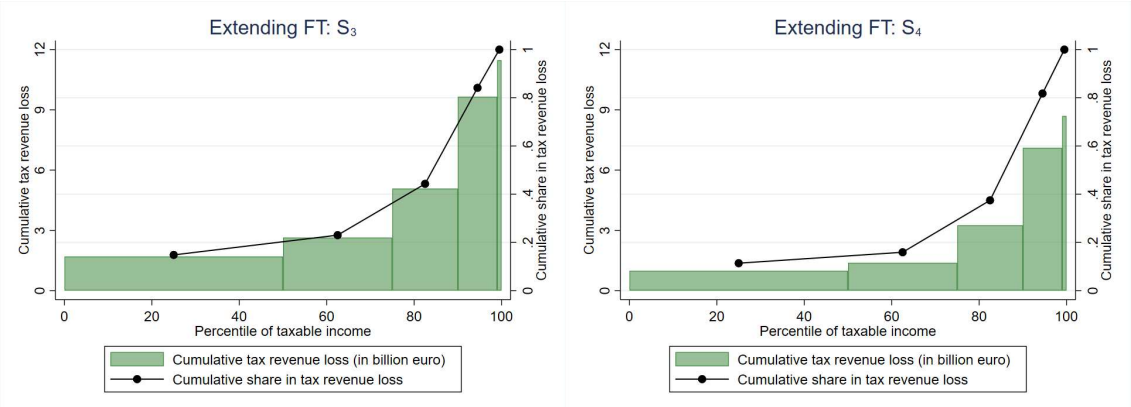
Note: values in euro, 2012-2015. Source: Our calculations using MEF data.

Figure 10: Distribution of the change in tax revenues by expanding the FT, by average taxpayer in each income groups over the whole period, in euro.



Note: values in euro, 2012-2015. Source: Our calculations using MEF data.

Figure 11: Distribution of the change in tax revenues by expanding the FT, by average taxpayer in each income groups over the whole period, in euro.



Note: values in euro, 2012-2015. Source: Our calculations using MEF data.

6 Conclusions

Reforming the tax system is one of the priorities in the agenda of many governments worldwide, particularly where there is need of raising tax revenues for financing the post Covid-19 recovery and promoting a fairer, sustainable and growth-friendly taxation. In different countries, and at different time, there is political support in promoting the adoption of proportional flat-tax rates instead of current progressive income taxation, at least for some source of income, mostly capital income. Frequently, such support is not motivated by empirical research results. In this study, we provide new evidence on the overall consequences of an actual flat-rate tax reform on property income that was introduced in Italy in 2011 for residential property income. Our results suggest that there are more cons than pros following the adoption of flat tax in a developed country. In particular, we find that the positive behavioural compliance effects of a tax reduction, at both the extensive (i.e. newly rented properties) and intensive (i.e. rise of tax declared income) margin, are not sufficient to counterbalance the adverse revenue and distributive effects of flat tax reforms. This raises equity concerns as the raise of tax compliance is mostly due to taxpayers at the bottom of income distribution, while high-income taxpayers show the major tax cut advantages after the reform. There are two main policy implications from our study. First, the evaluation of flat-tax rate reforms needs to take into account the overall consequences (behavioural, distributive, revenue) of tax reductions in combination. Second, the usage of micro administrative data is a powerful tool for answering the questions posed by policymakers with a good approximation of the reality.

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A Validation of the "taxpayer dataset"

The stratified random sample built by the MEF for 2014 tax year and described in Section 3 efficiently provides a precise description of the whole distribution by oversampling small groups such as large top incomes and providing corresponding sampling weights. To show this, we use the provided weights and compute the sample distribution against the distribution of the universe of the 2014 tax forms by before-tax income groups, as published in the MEF web site (`https://www1.finanze.gov.it/finanze/pagina_dichiarazioni/public/dichiarazioni.php`) for a set of relevant variables, such as before-tax income (Figure 12), number of taxpayers in each income class (Figure 13) and net amount of paid taxes (Figure 14). They show that the stratified tax data sample is very close to the actual 2014 population of tax record in all the three validation exercises. These figures also show the average sampling weight by income class, log-transformed to increase legibility, showing that the high representativeness of the top income group is obtained by much larger sampling probability weights.

Figure 12: Validation of before-tax income sample distribution and average log-sampling weights by income groups, tax year 2014.

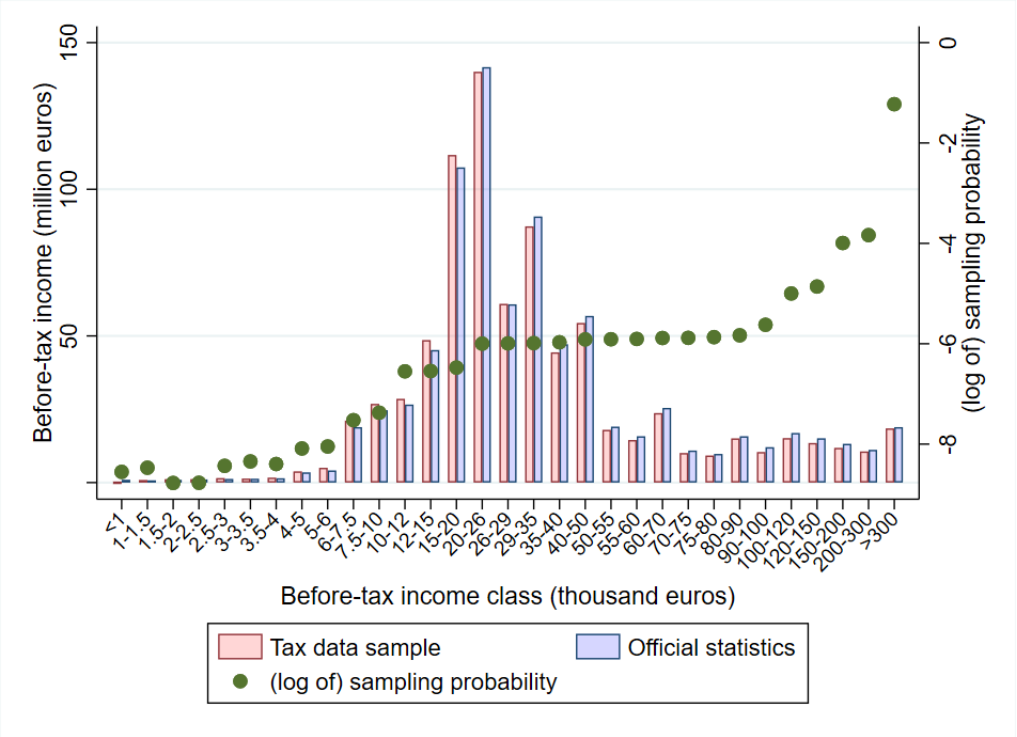


Figure 13: Validation of before-tax number of taxpayers distribution and average log-sampling weights by income groups, tax year 2014.

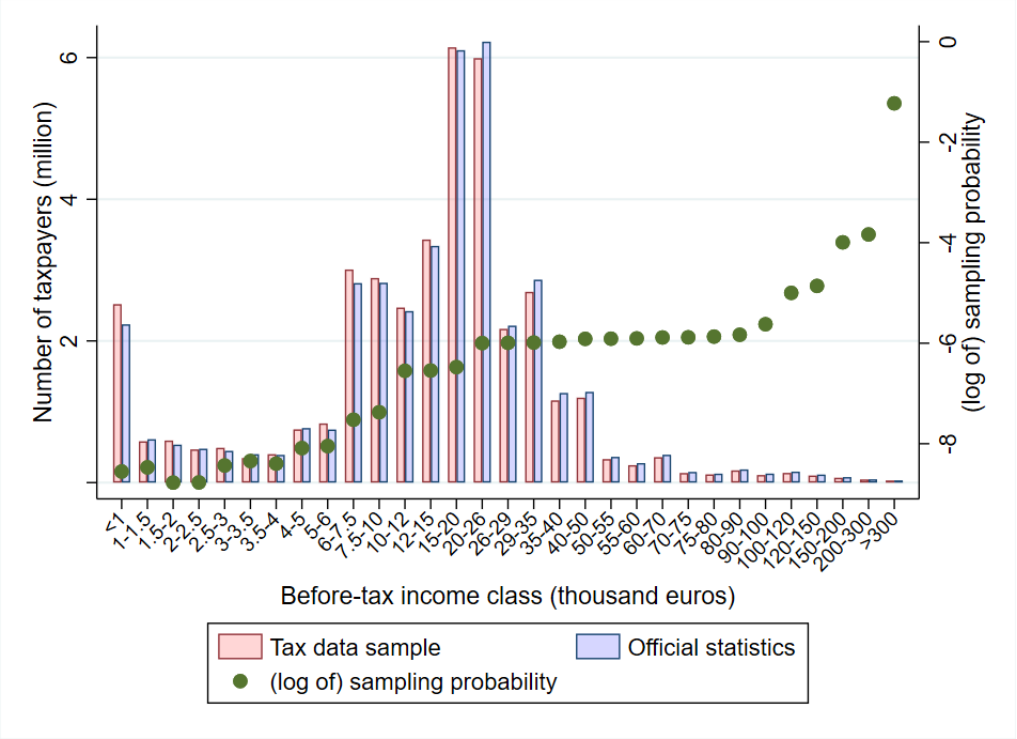
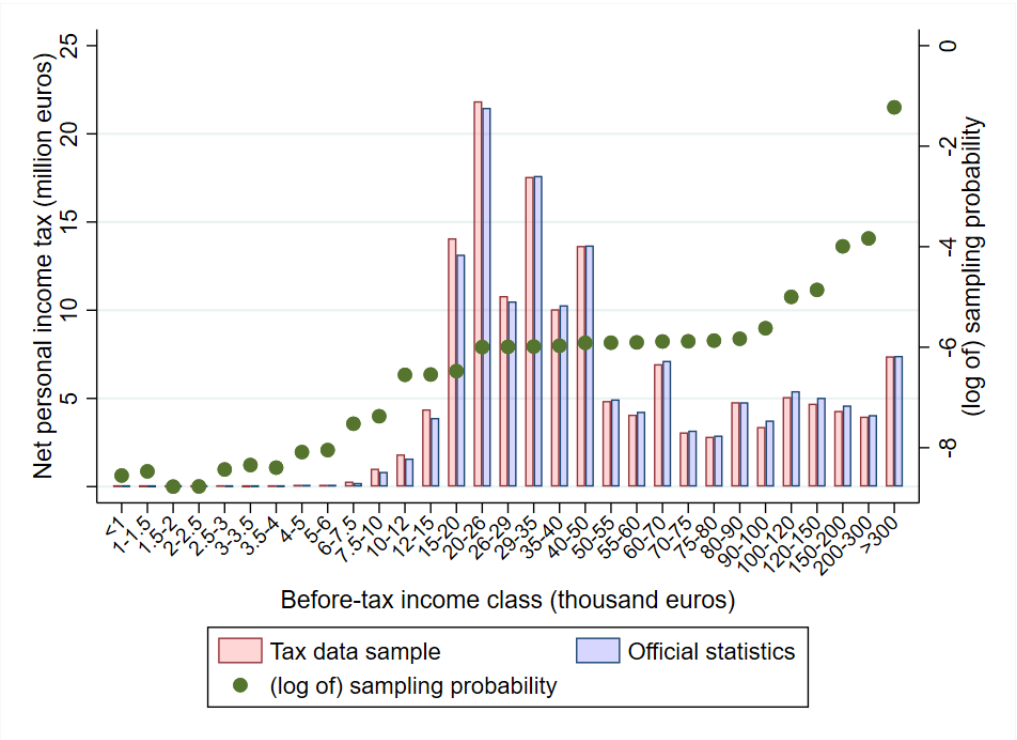


Figure 14: Validation of net PIT sample distribution and average log-sampling weights by income groups, tax year 2014.



B Additional descriptive statistics

In Table 11 we present further descriptive statistics, continuing what presented in the main text in Table 1. All statistics related to monetary values are shown ignoring zero values. Average taxable income is around €20,000 with a standard deviation about twice as large and a heavy tail (panel d). Taxable property income included in the PIT tax base is on average between €1.5-1.7 with standard deviation more than three times as large (panel e). The following three panels show some statistics on all property income in FT (panel f), disentangling the subgroup of those entitled to the standard tax rate (panel g) and to the reduced rate (panel h). The average taxable property income in FT is large, between 8 and 9 thousand euros, as a consequence of the fact that the FT can be applied to actual rental income only, whereas PIT include figurative income from unrented properties and main residence, which are based on cadastral values and typically largely underestimated with respect to actual market values. The last panel shows some statistics for number of properties of taxpayers among property owners. The distribution shows an average number of buildings around three but with a heavy tail with taxpayers with nearly 100-times more building than the average owner.

Table 11: Descriptive statistics on the "taxpayer dataset", all available years. Continuing from Table 1

Years	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
				continuing from Table 1				
				(d) Taxable income				
Mean	20.20	20.23	20.33	20.39	20.47	20.44	19.91	21.03
Sd	31.19	30.38	31.38	34.45	34.09	35.57	35.42	37.54
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	28,927.34	40,897.00	48,180.79	37,827.80	44,049.12	58,914.79	48,636.18	58,498.55
n obs.	72,116	72,591	73,499	74,557	75,620	76,324	75,645	75,865
				(e) Taxable property income in PIT				
Mean	1.62	1.68	1.70	1.56	1.59	1.67	1.61	1.55
Sd	5.39	5.51	5.67	4.94	5.11	5.49	5.43	5.30
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	860.05	862.19	885.99	989.83	1,071.80	1,267.59	1,220.70	1,071.46
n obs.	42,966	44,366	45,866	47,397	49,078	49,975	50,816	50,538
				(f) Taxable property income in FT				
Mean				8.44	7.53	6.78	6.27	6.21
Sd				14.10	12.70	11.19	10.24	9.78
Min				0.07	0.01	0.01	0.01	0.03
Max				542.59	597.18	541.82	562.62	585.63
n obs.				2,838	3,868	4,825	5,918	6,715
				(g) Taxable property income in FT, standard rate				
Mean				8.00	7.29	6.58	6.19	5.94
Sd				13.11	11.87	10.47	9.68	9.14
Min				0.07	0.00	0.00	0.01	0.01
Max				496.91	535.69	541.82	562.62	585.63
n obs.				2,607	3,559	4,373	5,160	5,664
				(h) Taxable property income in FT, reduced rate				
Mean				9.25	7.64	6.56	5.07	5.75
Sd				13.74	12.53	10.89	8.87	8.61
Min				0.15	0.08	0.04	0.06	0.03
Max				193.64	209.52	274.51	427.73	425.18
n obs.				411	531	736	1,184	1,618
				(i) Number of properties				
Mean	2.9	3	3	3.1	3.1	3.1	3.2	3.2
Sd	3	3.1	3.1	3.2	3.2	3.3	3.4	3.3
Min	1	1	1	1	1	1	1	1
Max	260	260	306	272	274	281	293	283
n obs.	42,977	44,381	45,895	47,559	49,302	50,276	51,197	51,006

Notes: Income statistics are computed using values larger than zero only. All estimates are weighted using sampling weights provided. Monetary values are in thousand euros. Source: our calculations using MEF data.

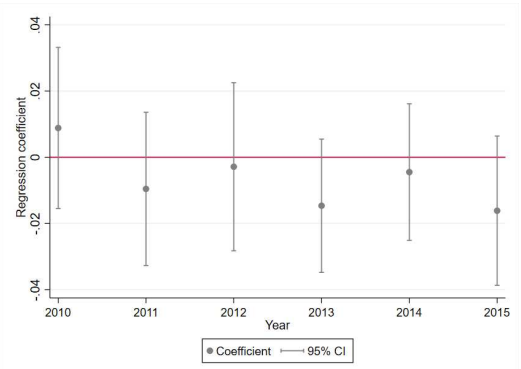
C Anticipation and posticipation

Some owners might have anticipated the FT reform and might have decided to increase their stock of residential properties by selling a commercial property or other real or financial assets. In addition, some may have decided, after FT introduction, to increase the stock of residential properties after realizing the convenience of the FT in terms of overall taxation savings. To test this, let us indicate with $\mathbb{1}_{pit}$ a generic property p that has been in possession of individual i in year t and as N_{it} the overall number of properties of individual i in year t, i.e. $N_{it} = \sum_{p:1}^{P} \mathbb{1}_{pit}$. Let us also define $N_{it,treated}$ as the number of residential (treated) properties owned by individual i in year t. We aim to test whether the acquisition/selling of a property is influenced by its eligibility for FT regime before and after FT introduction. Hence, we estimate the following:

$$N_{it} = \theta_0 + \theta_1 N_{i,t-1} + (N_{i,t-1,treated} \times Year_t)'\theta_2 + \eta_p + \epsilon_{pit} \tag{9}$$

where $Year_t$ represent year fixed-effects and η_p represent property fixed effects. The coefficient θ_1 associated to $N_{i,t-1}$ represent the auto-correlation term between the individual number of properties. In case of no effect we expect that $\forall t : \theta_{2t} = 0$. Results for θ_2 coming from (9) are reported in Figure 15. We do not see any change in acquisition pattern when including interactions between eligibility conditions and year fixed effects.

Figure 15: Coefficients for year and number of properties interaction



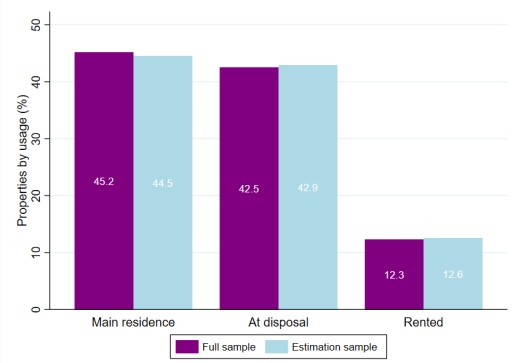
Note: Displayed coefficients refer to θ_2 as in equation 9 and indicates the effect of the number of residential properties owned by individual i in year $t-1$ on the overall number of properties that has been acquired, sold or kept from last year. Property fixed effects are included. In all the specifications were calculated robust standard errors. Source: our calculation using MEF data.

D Attrition due to the matching of tax and cadastral records

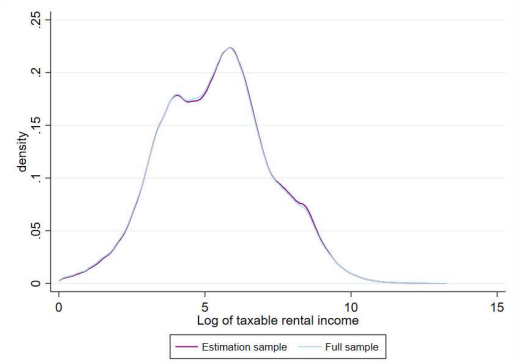
As already described in Section 3, the "taxpayer dataset" contains information on individual and household characteristics as well as information submitted for tax purposes to the tax authority over the period 2008-2015. Tax returns also provide detailed information on each building owned by each taxpayer, i.e. for every property declared by each taxpayer, we were able to retrieve information on properties. Unfortunately, this dataset is missing the identification of residential as opposed to non-residential, or commercial, properties. Without this information it would be impossible to estimate the effect of FT as only residential properties were eligible to take advantage of the FT regime, as all commercial property income had to remain in the progressive PIT base. To disentangle commercial from residential properties, we linked tax data with the cadastral registry, using the individual tax code of owners and all their owned buildings using the cadastral value, the ownership share and municipality, which is contained in both the tax and cadastral property records over the period 2008-2015 to built the dataset we called the "property dataset". We classified over 91% of residential *vis-a-vis* commercial properties, which we use as estimation sample, dropping all remaining observations. We show here in figure 16 that dropping unclassified properties has a negligible impact on the distribution of our major variables used. In particular, the distribution of usage of properties between main residence, free at disposal or rented (panel a) is very similar in the estimation sample and in the full sample. Analogously, both the distribution of log-taxable property income and of log-cadastral income are nearly overlapped, while the major change, despite negligible, is observable in change in log-rental income, as variability in the estimation sample is higher than in the full sample.

Figure 16: Attrition analysis

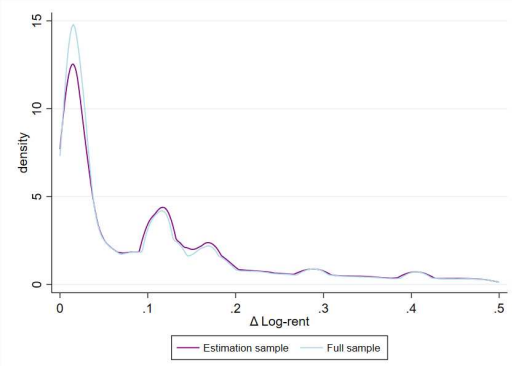
(a) Properties by usage



(b) Log-taxable income



(c) Change in log-rental income



(d) Log-cadastral income