# Property tax and property values: Evidence from the 2012 Italian Tax Reform *

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**Abstract**

This paper studies the impact of property taxes on house values, exploiting the 2012 Italian tax reform. We use variation in tax rates set by municipalities and instrument it to address the potential endogeneity of tax rates. Our estimates show that an increase of 0.1 percentage points in the tax rate induces a 4.2% reduction of municipal property values in the subsequent two years, consistently with the capitalization of the tax due to the implied drop in housing demand. Higher property tax rates also significantly reduce transaction volumes at municipal level, but do not affect house rentals.

**Keywords:** Immovable property tax, Property values

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# 1 Introduction

Recurrent taxes on land, dwellings and non-residential buildings are typically considered by policy makers less distortionary for investment and labour choices than other taxes (on, e.g., labor and consumption) while representing a stable and predictable source of revenues.[1]

However, the literature acknowledges the distortionary effect of property taxes on the demand for housing and its possible negative effects on property values (Poterba *et al.*, 1991). According to the property tax capitalization hypothesis, property tax liabilities are directly capitalized into equilibrium house prices.

This paper tests the property tax capitalization hypothesis by exploiting the effect of the Italian 2012 tax reform. From mid-2011 Italy faced a sovereign debt crisis which resulted in the resignation of the incumbent government in November 2011,[2] and its replacement by a technocratic government whose main purpose was the introduction of an austerity plan to reduce public debt and avoid fiscal default.[3] The new government went to power on November 16th, 2011 and by the 22nd of December of the same year the Italian parliament approved a comprehensive fiscal austerity plan. One of the main novelties of the austerity plan was a new fiscal regime on real estate property with the introduction of a municipal property tax ("Imposta Municipale Unica", IMU hereafter). The Italian case represents an ideal setting to study the impact of property tax changes on property values for two reasons. First, the policy change was unexpected, being associated with the sudden occurrence of a sovereign debt crisis in mid-2011. Second, each Italian municipality was allowed to choose its own tax rate (within some bounds that will be described in detail in the next section). This feature of the tax reform generates variation in the tax rates across municipalities, which can be used to explore the impact of different tax rates on property and rental values.

We use this source of variation in a difference-in-differences setting and estimate the relationship between municipal property taxes and changes of property and rental values. To

[1] As the Eurostat (2014) reports in "Taxation trends in the European Union": *recurrent taxes on real estate property have attracted increasing attention from policy makers because in many countries where they are low they offer a potential source for increasing revenue, while at the same time they are considered to be the least detrimental to economic growth given the immobility of the tax base (p. 44).*

[2] The government was elected in 2008 and was chaired by the prime minister Silvio Berlusconi

[3] The new government was in charge from November 2011 to April 2013 and was chaired by Mario Monti.

address threats to the identification strategy based on variation in observed tax rates across municipalities, we instrument the tax rates exploiting variation in the timing of municipal elections. Following Alesina and Paradisi (2014), we show that municipalities with elections in 2013 set a tax rate about 0.1 percentage points lower than other municipalities. We provide compelling evidence to support our instrumental variable approach. Although the exclusion restriction cannot be directly tested, we show that: 1) municipalities with and without elections in 2013 do not differ in terms of dynamics of property and rental values before the introduction of the IMU; 2) elections in previous years do not affect the dynamics of property and rental values; 3) municipalities with elections in 2013 do not significantly change local public spending around the elections.

Using 2SLS we find that an increase of 0.1 percentage points in the property tax rate induces a 4.2% drop in municipal property value in the two years subsequent the reform. This estimate is consistent with a full capitalization of the tax on property values. We also show that higher property tax rates reduce the number of housing transactions at municipal level.

Our findings contribute to the public economics literature by providing an estimate of the causal impact of property taxes on property values in a nation-wide setting. Our findings also contribute to the recent debate about the efficiency of the property tax rates. Arnold *et al.* (2011) empirically shows that an increasing role of property taxation relative to other taxes is welfare enhancing in a macroeconomic perspective. However, recent micro-evidence (Campbell and Cocco, 2007; Mian *et al.*, 2013) suggests that a decrease in house prices may have negative effects on aggregate consumption. Even though we do not assess the macroeconomic effect of the Italian tax reform, the implied drop in real estate values that we document may have triggered wealth effects, potentially reinforcing the income effect of the property tax on households' durable spending found by Surico and Trezzi (2015).

The rest of the paper is organized as follows. Section 2 sets our contribution against the backdrop of the relevant literature. Section 3 describes the institutional setting. In Section 4 we describe our data. Section 5 describes evidence based on a difference-in-differences strategy. Section 6 presents our instrumental variable strategy and discusses the validity of the identifying assumptions, while Section 7 reports the corresponding estimates. Section 8

contains a number of robustness checks. Section 9 concludes.

# 2 Literature review

Early studies in the public economics literature (Simon, 1943; Netzer, 1966) argue that property taxes ought to be reflected in property values. This phenomenon, known as property tax capitalization, occurs if property values incorporate the present value of future property tax payments. The degree of tax capitalization depends upon the expectations about future property tax payments, the discount rate and the horizon of the investor.

These studies distinguish two types of capitalization: interjurisdictional and intrajurisdictional capitalization. The first one suggests that, *ceteris paribus*, differences in mean house prices across jurisdictions reflect differences in property tax liabilities; the second one predicts that differences in property tax liabilities are reflected in differences in house prices within the same jurisdiction.

To test the interjurisdictional hypothesis, most studies exploit cross-sectional variation in average effective property tax rates.[4]Oates (1969) analyzes 53 residential municipalities in northeastern New Jersey and finds that, conditional on several observable characteristics, communities with higher effective property tax rates feature lower levels of median house prices. The working hypothesis is that in a Tiebout world, households' location choices, and consequently the local demand for housing, depend on each jurisdiction's mix of tax and public spending. To overcome the typical identification problems of cross-sectional studies, Rosen (1982) investigates the impact of changes in property taxes on changes in house prices between 1978 and 1979. He studies the impact of the introduction of Proposition 13, which effectively reduced the nominal property tax rates charged by each municipality in the metropolitan area of San Francisco. Exploiting the heterogeneous reduction in property tax rates, he finds that average prices increase in municipalities with larger cuts in tax rates relative to other municipalities. However, this study fails to account for the fact that changes in unobserved variables, such as local public spending or housing demand, could have driven the increase in house prices around

[4]The effective property tax rate is defined as the nominal rate times the tax base over the property market value. While effective tax rates provide a more precise measure of the property tax liability than nominal tax rates, their measurement requires knowledge of both the market value and the tax base.

the years of the reform. Other empirical studies test the intrajurisdiction effect of property tax on house market valuation (Yinger *et al.*, 1988). To gain identification of the intrajurisdiction capitalization, the authors exploit changes in the effective tax rate induced by the revaluation of the assessed tax base in seven municipal authorities in Massachussets in the 1970s. Their analysis relies on transaction level data on houses sold both before and after the revaluation.

These studies, together with more recent evidence in the literature, share the common limitation of being based on policy changes that occurred in small metropolitan areas or even within a single municipality. For instance, Haughwout *et al.* (2004) exploits changes in property tax rates in four big US cities (Houston, New York City, and Philadelphia) and finds that balanced budget increases in municipal property tax rates are negatively associated with the municipal property base, measured as the product of prices and quantities in the local housing markets. Kang *et al.* (2015) find a negative impact of increases in property tax rates in southeast Michigan on residential and business property values, whereas (Bai *et al.*, 2014) find mixed evidence: a negative effect in Shanghai and a positive effect in Chongqing. The purpose of this paper is to contribute to this literature with a careful identification strategy, exploiting the broad experimental setting offered by the Italian property tax reform in 2012, which is described in detail below.

# 3 Institutional setting

On December 6, 2011 Italy introduced a major change of the fiscal regime on real estate property. Prior to the 2011 reform, the tax regime on residential property was dual: 1) the main dwelling (the house where the household has its fiscal residence) was tax exempt unless it was a luxury residence; 2) other residential properties were subject to a local tax rate ("Imposta comunale sugli immobili", ICI hereafter).

Starting in mid-2011, Italy was hit by a tremendous sovereign debt crisis. This crisis led to the resignation of the prime minister in November 2011 and the birth of a technocratic government in the same month. The first initiative of the new government was the adoption of a fiscal consolidation plan with the objective of lowering financial markets' pressure on

government bond yields. The fiscal reform contained in this plan included a major change in the fiscal regime on residential properties, whereby the ICI was replaced by a new property tax (IMU). The IMU system introduces three main innovations with respect to the previous regime: 1) the main dwelling, irrespective of the category, is included in the tax base; 2) the tax base is defined as the land registry value multiplied by a factor of 1.6;[5] 3) the tax rate on the main residence (*Imu Prin* hereafter) is set equal to 0.4% and the tax rate on the secondary houses (*Imu Sec* hereafter) is set equal to 0.76%. Each municipality is allowed to modify the *Imu Prin* within a +/-0.2 percentage points band and the *Imu Sec* within a +/-0.3 percentage points band, by the end of October 2012. Furthermore, the law established a 200 euro deduction on the tax paid on the main dwelling plus additional 50 euros per household member younger than 26 (up to a maximum deduction of 400 euro).[6] As a result of the reform, total revenues from property taxes on the main dwelling increased from about 1 billion euro between 2009 and 2011 to about 4.2 billions euro in 2012. Total revenues from property taxes on other residential properties rose from about 8.2 billions euro between 2009 and 2011 to about 10.5 billions euro in 2012. Half of these revenues was transferred to the central government.

Although at the time of the introduction the government labeled the new tax system as an "experiment", it was understood to be a persistent regime change since the Italian legal system does not allow experimental policies. The labeling was chosen mostly to assuage the unpopularity of the property tax, which in fact was significantly reduced for the main dwellings in 2013 by the new elected government. In 2014 the *Imu Prin* was abolished and replaced by a new local tax on services ("Tributo per i Servizi Indivisibili", TASI). Despite the change in name, however, the new tax resembled the IMU both in terms of tax base and rates;[7] in fact, as documented by Messina and Savegnago (2014), total fiscal revenues on primary residences remained substantially unchanged in 2012 and in 2014. Therefore, to all practical effects, the tax change was not transitory. Indeed so it was perceived by Italian households in 2012

[5]The land registry value is an estimate of what the rental value of the property was in 1988-1989.

[6]Municipalities are allowed to modify the level of deductions. In our sample only 1.7% of the municipalities opt for a deduction different from the national level. Within this group, 22 municipalities set the deduction at a level that covers the full payment of the tax bill on the main dwelling. In these cases we set *Imu Prin* equal to zero. In the other cases (111 municipalities) the deduction is set equal to 300 euros instead of 200. In a robustness check we exclude municipalities which set a different deduction relative to the national level and the results (not shown for brevity) are unaffected.

[7]The rates of TASI in 2014 were set between 0.1% and 2.5% with no deductions.

when they were asked about their expectations about the duration of the IMU by the Survey of Household Income and Wealth (SHIW).[8] 79% of the households assessed the probability of the removal of IMU to be smaller or equal to 50%; 33% of the households assessed this probability to be zero, and only 7% of the households said to be certain that the IMU would be abolished within the subsequent 5 years. These figures provide evidence that in 2012 most households believed that the increase in property taxes would last for at least five years, and only few of them that the increase in property taxes would be transitory.

# 4 Data

Our primary source of data is the Italian Real Estate Market Observatory (OMI hereafter), an agency that belongs to the Italian Fiscal Authority (Agenzie delle Entrate) within the Ministry of Finance. The OMI divides each Italian municipality into areas with homogenous real estate markets and for each of them provides semestral estimates of property and rental values of different categories of real estates -i.e. residential buildings, offices etc., and, within each category, for various maintenance states -i.e. excellent, normal and bad. These estimates rely on transaction data, complemented by surveys on local housing market conditions conducted among real estate agents.[9] In our analysis we select data for residential buildings in the time window spanning four semesters before and after the introduction of the tax reform (from 2010 to 2013). To avoid issues stemming from differences in the quality composition of residential buildings, we focus on properties whose maintenance state is classified as normal.[10]. Finally, we average semestral values for each Italian municipality, so as to obtain a panel dataset of average quality-homogenous residential buildings market and rental values for each semester from 2010 to 2013. We merge it with data on property tax rates and deductions chosen by each Italian municipality in 2012 after the tax reform (as reported by the Institute for Local Finance and Economy) and obtain a final sample of 7680 Italian municipalities. For descriptive analysis

[8]The survey question was: "In your opinion, which is the probability that the Municipal Property Tax (IMU) will be abolished within the next 5 years and not replaced by another similar tax?".

[9]If transaction volumes are not large enough to produce precise estimates of market values, the OMI imputes the data.

[10]Residential buildings with maintenance state classified as normal represent the largest share of total residential buildings in Italy; accordingly, in the OMI database, real estates with normal maintenance state are about 90% of total observations

we add information on municipal demographic characteristics drawn from the 2011 Population and Housing Census from the national institute for statistics (ISTAT) and collect data on municipal balance sheets and timing of elections provided by the Ministry of the Interior. Table 1 reports summary statistics for our working dataset.

***Insert Table 1 here***

The average municipal residential property value is worth 1055 euros per square meter with standard deviation of about 577. The average property tax rate on the main residence (*Imu Prin*) is 4.2 permil (0.42%) and the average property tax rate on secondary properties (*Imu Sec*) is 8.47 permil (0.847%). About 64% of the municipalities set *Imu Prin* equal to 0.4% (the statutory tax rate), whereas 42% of them set *Imu Sec* equal to the statutory level of 0.76%. 28% of the municipalities chose to increase *Imu Prin* above the statutory level (in this group of municipalities the average *Imu Prin* was about 0.5%) against a fraction of 57% of municipalities that increased *Imu Sec* above the statutory level (the average *Imu Sec* for this group was about 0.91%). The fraction of municipalities setting *Imu Prin* (*Imu Sec*) below the statutory level is only 8% (2%).

Italian municipalities have an average population of 8 thousand, with a large standard deviation (44480.73). The average homeownership rate is 76%, while renting households are on average 12% of total households. On average there are 1.7 houses per household and the share of empty residential houses over total residential houses is 30%. Residential buildings have an average age of about 40 years.

The municipal public expenditure per capita is about 1600 euros per year; average expenditure is slightly above revenues denoting that municipal fiscal budgets are, on average, balanced.

Figure 1 plots the histogram of the difference between the average of the logarithm of property values in the four semesters that follow the introduction of the IMU (2012H1-2013H2) and the average of the logarithm of property values in the four semesters that precedes it (2010H1-2011H2):

$$\frac{1}{4}\sum_{t=2012H1}^{2013H2} log(P_{it}) - \frac{1}{4}\sum_{t=2010H1}^{2011H2} log(P_{it})$$

where $P_{it}$ indicates property values per square meter in municipality $i$ at time $t$.

***Insert Figure 1 here***

Around the time of the reform the average decrease in property values was about 2.5%, with a considerable cross-sectional variability (standard deviation is about 6%). The scope of our empirical analysis is to establish a causal link between the drop in property values and the increase in property taxes.

# 5 Difference-in-Differences estimates

In this section we investigate the relationship between property taxes chosen by municipalities and changes in property and rental values. The aim of this section is to provide *prima facie* evidence based on difference-in-differences estimates and discuss their limitations. We estimate the following equation:

$$y_{it} = \alpha_i + \lambda_t + \beta T_i \times Post_t + \epsilon_{it} \tag{1}$$

where $y_{it}$ is either the logarithm of property values per square meter or the logarithm of rental values per square meter in municipality $i$ at time $t$; $T_i$ is either the *Imu Prin* set in 2012 or the *Imu Sec* set in 2012 or both; $Post_t$ is a dummy that takes value equal to one after the introduction of the IMU system (2012 and 2013) and zero in the previous two years (2010 and 2011). The model in equation (1) includes a full set of municipality fixed effects, $\alpha_i$, to control for any unobserved time-invariant difference across municipalities, and a full set of time fixed effects, $\lambda_t$, to control for any shock common to all municipalities.

***Insert Table 2 here***

The main coefficient of interest in equation (1) is $\beta$, which captures the relationship between the change in property (or rental) values and the variation in property taxes across municipalities after the introduction of the IMU system. Table 2 reports the estimated $\beta$ coefficients from equation (1). The specification in column (1) includes the tax rate on principal residences (*Imu Prin*), whereas in column (2) the variable $T_i$ is the tax rate on other residential properties (*Imu Sec*). Finally, column (3) extends the model of equation (1) by including both *Imu Prin* and *Imu*

*Sec*. The estimates in Table 2 show a negative and significant relation between house prices and property taxes. A 0.1 percentage points increase in the tax rate on primary houses is associated with a 0.8% drop in property values, whereas a 0.1 percentage points increase in the tax rate on secondary houses is associated with a drop in property values of 0.2%. When including both tax rates (column (3)), only the coefficient of *Imu Prin* remains statistically significant and the point estimate is remarkably similar to the point estimate in column (1).

Table 3 reports the estimated $\beta$ from equation (1) using the logarithm of rental values per square meter as the outcome variable.

***Insert Table 3 here***

The estimated relationship between changes in rental values per square meter and *Imu Prin* is similar to the estimates in Table 2: a 0.1 percentage points increase in *Imu Prin* is associated with a 0.7% drop in rental values per square meter. The relationship between rental values and *Imu Sec* appears stronger than the relationship between property values and *Imu Sec*: a 0.1 percentage points increase in *Imu Sec* is associated with a 0.3% drop in rental values per square meter.

The evidence reported in Tables 2 and 3 suggests that higher property tax rates are associated with a drop in both property and rental values, with a stronger and more significant impact of *Imu Prin*. However, it does not necessarily provide a reliable estimate of the causal impact of property taxes on property and rental values. Property tax rates are the result of municipalities' choices, which can be correlated with observable or unobservable differences across municipalities that directly affect the dynamics of property and rental values. A causal interpretation of those estimates is possible under the assumption that the evolution of property and rental values in municipalities with average tax rates provides a valid counterfactual for what would be the evolution of property and rental values in other municipalities had they set the same tax rate. In other words, municipalities need to be on parallel trends absent the treatment, and heterogeneity in the effect of property taxes needs be orthogonal to the variation in tax rates. Although this assumption cannot be tested directly, the evolution of property and rental values before the introduction of IMU can be of some guidance. If, for instance, the variation in tax rates across municipalities is related to differences in local economic conditions, this will be

reflected in different dynamics of the real estate market already before the introduction of IMU. To test this hypothesis we estimate the following equation:

$$y_{it} = \alpha_i + \lambda_t + \sum_{\tau=2010H1}^{2013H2} \gamma_\tau T_i \times \mathbf{1}(t = \tau) + \epsilon_{it} \tag{2}$$

where, differently from equation (1), $\gamma_\tau$ are time-varying coefficients for the relationship between property or rental values and the tax rate. Figure 2 shows the estimates of $\gamma_\tau$ in equation (2), normalized with respect to the second semester of 2011. Each plot corresponds to a different definition of $T_i$.

***Insert Figure 2 here***

The top-left plot in Figure 2 shows the estimated $\gamma$ coefficients (together with 95% confidence intervals) from equation (2) when $T_i$ is the *Imu Prin* in municipality $i$, whereas the top-right plot shows the estimated $\gamma$ coefficients when $T_i$ is the *Imu Sec*. The bottom-left and the bottom-right plots show, respectively, the time-varying coefficients of *Imu Prin* and *Imu Sec* in a model that includes both tax rates. The top-left plot highlights that the evolution of the outcome in the pre-period is systematically related to the cross-sectional variation in the *Imu Prin*, which is evidence of pre-trends, whereas there is no such evidence in the top-right plot.

***Insert Figure 3 here***

Figure 3 shows the estimated $\gamma$ coefficients from equation (2) with $y_i$ defined as the logarithm of rental values per square meter. The plots in Figure 3 show a very similar pattern as for property values: there is evidence of different pre-trends in rental values that are related to the cross-sectional variation in *Imu Prin*.

Overall, Figures 2 and 3 indicate that a causal interpretation of the estimates in Tables 2 and 3 is unwarranted. The existence of different dynamics of property and rental values across municipalities before the introduction of IMU is likely driven by differences in pre-existing economic conditions at municipal level that are jointly correlated with the choice of high property tax rates and decreasing trends in property and rental values.

Identifying the variation that is driving contemporaneously the property tax rates and the dynamics of property and rental values, and accounting for it, is not an easy way in this context. To solve the endogeneity problem, in the following sections, we propose and adopt an instrumental variable approach.

# 6 Identification

In this section we address the endogeneity problem highlighted above using an instrumental variable approach. We instrument variation in *Imu Prin* across municipalities using variation in the timing of municipal elections. Recall from Section 3 that municipalities were allowed to choose tax rates different from the statutory level until October 2012, whereas statutory rates applied in those that did not deliberate on tax rates by the deadline. In 2012 municipal elections took place in June, so that municipalities with elections in that year could deliberate on property tax rates after the elections. Municipalities with elections in 2013, instead, were required to choose property tax rates before the elections took place.Alesina and Paradisi (2014) show that these municipalities chose a significantly lower tax rate on primary residences (*Imu Prin*) than other municipalities, whereas the timing of elections does not correlate with the tax rate set on other residential properties. We estimate the relationship between property tax rates and municipal elections in 2013 using the following model:

$$T_i = \alpha + \beta Election2013_i + \epsilon_i \tag{3}$$

where $T_i$ is either *Imu Prin* or *Imu Sec*, and $Election2013_i$ is a dummy variable that takes value equal to 1 if municipality $i$ had elections in 2013 and 0 otherwise. Table 4 shows that municipalities with elections in 2013 set *Imu Prin* about 0.014 percentage points lower than other municipalities, whereas their chosen *Imu Sec* was not significantly different from other municipalities.

***Insert Table 4 here***

This evidence can be rationalized by a political economy argument: in order not to lose political support before an election, incumbent local governments have an incentive not to increase the

property tax rates above the statutory level dictated by the central government; in this respect, given the high levels of homeownership rate in Italian municipalities, the property tax on the main dwelling represents the most salient of the two tax rates. Consistently, we find that having municipal elections in 2013 significantly affected the level of the *Imu Prin* while did not affect the choice of *Imu Sec*. We use the occurrence of municipal elections in 2013 as an instrument for the *Imu Prin*.

*A priori*, we expect the *Imu Prin* to have a stronger effect on property values than the *Imu Sec*. The reason is that, given that very high level of homeownership in Italy, the marginal buyer is more likely to be a potential homeowner, and the relevant tax rate to be the one on primary houses, rather than the *Imu Sec*. The sign of the effect of *Imu Prin* on rental values, instead, is theoretically ambiguous. Higher tax rates on the main dwelling may induce an increase in demand for renting thus creating an upward pressure on rental prices; however, if rental and property values are linked by a no-arbitrage relation, lower property values could result also in lower rental values.

The purpose of this section is to discuss the validity of our identification strategy based on instrumental variable. We assume that the timing of municipal elections was independent of the dynamics in property and rental values, and that municipal elections affected the dynamics of property and rental values only through their impact on the *Imu Prin*. Although the exclusion restriction assumption cannot be tested directly, to provide compelling evidence in support of our identification strategy we show that: 1) covariates are balanced between municipalities with and without elections in 2013; 2) municipalities with elections in 2013 do not have different dynamics of property and rental values before 2012; 3) using 2010 and 2011 property values data, contemporaneous (in 2011) and future elections (in 2012) do not directly impact the growth rate of property prices and rents; 4) elections in 2013 are not related to changes in local public expenditure between 2011 and 2012.

## 6.1 Covariates' balance

To provide evidence in support of our identification strategy, we first show that municipalities with and without elections in 2013 are comparable in terms of observable characteristics in the

pre-reform period.

***Insert Table 5 here***

Table 5 reproduces the summary statistics of Table 1 separately for municipalities with and without elections in 2013. Municipal elections in 2013 involved 654 municipalities. Among municipalities with elections in 2013, we identify 58 municipalities where elections had been held in 2011 or 2012 and we treat them as if they had no elections in 2013.[11] Municipalities with elections show lower average property and rental values. The two groups of municipalities are comparable in terms of demographics, housing market characteristics and budget variables. However, there is a significant difference in average resident population and homeownership rate across the two groups. There is no significant difference in the share of renters, which suggests that the main difference across the two groups regards the size of homeowners relative to households living in houses as occupiers (for example due to social housing). In Section 8 we provide evidence that such differences across municipalities do not drive our results. In particular, we show that our main results are unaffected by the inclusion of population (or homeownership) quartile dummies interacted with time effects.

## 6.2 Event-study analysis of the impact of elections in 2013

We analyze the reduced form impact of having elections in 2013 on property and rental values. The aim of this analysis is twofold. First, to show that, before the introduction of the IMU, the dynamics of property and rental values does not differ significantly between municipalities with and without elections in 2013. Second, to show that elections in 2013 had a significant impact on property values in 2012. To this purpose, we estimate the following event-study regression:

$$y_{it} = \alpha_i + \lambda_t + \sum_{\tau=2010H1}^{2013H2} \gamma_\tau Election2013_i \mathbf{1}(t=\tau) + \epsilon_{it} \tag{4}$$

[11] Municipalities are required to determine the IMU tax rates by October 2012. If elections in 2013 are not expected in October 2012 (because previous elections were held in the same year or the year before) there is no reason to believe that property tax rates should be lower in these municipalities relative to the ones that do not have elections in 2013.

where $\gamma_\tau$ are time-varying coefficients for the relationship between the outcome and the dummy $Election2013$; the estimates are normalized relative to the second semester of 2011. Figure 4 plots the estimates of equation (3) for the log of property values (left plot) and of rental values (right plot).

***Insert Figure 4 here***

The figure reveals that the dynamics of property and rental values before 2012 did not differ significantly between municipalities with and without elections in 2013. Furthermore, Figure 4 shows that having elections in 2013 had a significant reduced-form impact on property values, whereas it had no significant impact on rental values. To the extent that changes in rental values reflect changes in municipal level amenities, this evidence also provides support to the assumption that elections have no impact on municipalities along this dimension.

## 6.3 Exclusion restriction

In order to use elections in 2013 as an instrument for *Imu Prin*, we need to impose the exclusion restriction assumption that the 2013 municipal elections impacted the dynamics of property and rental values only through their effect on property taxes. To support the validity of this assumption we show first that elections held before 2013 did not directly affect the dynamics of property and rental values, and, second, we show that municipal elections in 2013 did not affect local public spending trends.

To show that elections in previous years did not significantly impact the dynamics of property and rental values, we restrict the sample to 2010 and 2011 and estimate the following equations:

$$y_{it} = \alpha_i^s + \lambda_t^s + \beta^s Election_i^s \cdot 1\left[year = 2011\right]_t + \epsilon_{it}^s \tag{5}$$

where $y_{it}$ is either the logarithm of property or rental values per square meter, and $Election_i^s$ is a dummy variable for elections with $s \in 2011,\ 2012$. The rationale for this analysis is to show that, in the years immediately before the introduction of the IMU, neither contemporaneous elections (elections held in 2011) nor one year lead elections (elections held in 2012) directly

impacted the average growth rate of property and rental values. Indeed, the estimated coefficients $\beta^{2011}$ and $\beta^{2012}$ from equation (4), reported in Table 6, are both not significantly different from zero.

***Insert Table 6 here***

One potential concern is that municipal elections may induce increases in local public spending in the years preceding the elections. For instance, public spending may increase before elections and decrease after elections for political economy motives. If public spending is increasing in the years preceding the elections, and it is capitalized into house property or rental values, we could observe rising prices which are related to the election-fiscal cycle rather than to the difference in the *Imu Prin*. In order to account for this, we collect municipal balance sheets data and show that municipalities with elections in 2013 do not increase public spending before 2012 relative to others. In order to perform this analysis, we estimate the following model:

$$LPS_{it} = \alpha_i + \lambda_t + \sum_{\tau=2009}^{2013} \beta_\tau Election2013_i \times \mathbf{1}(t = \tau) + \epsilon_{it} \tag{6}$$

where $LPS$ is the total municipal public spending per capita, $\beta_\tau$ are time-varying coefficients for the relationship between the outcome and elections in 2013. Results from the estimation of equation (5) are reported in Figure 5. The figure reveals that there is no correlation between having elections in 2013 and changes in municipal expenditure per capita in 2012. In 2013 we observe a relative drop in public expenditure per capita for municipalities with elections. This is possibly due to the lower level of fiscal revenues from *Imu Prin* in 2012. However, if anything, this effect would go against our main result of an increase in property values for municipalities with elections in 2013 relative to the others.

***Insert Figure 5 here***

# 7 IV estimates

In this section we show the results from the empirical strategy highlighted above. Table 7 reports the reduced form estimate of the impact of elections in 2013 on the logarithm of property and rental values per square meter (columns (1) and (3) respectively), and the 2SLS results (columns (2) and (4)). We find a strongly significant effect of *Imu Prin* on property values, and no statistically significant effect on rents. The average causal response is -4.2%, that is, a 0.1 percentage points increase in the *Imu Prin* translates in an average drop in property values of 4.2% for municipalities whose *Imu Prin* is affected by elections in 2013.

***Insert Table 7 here***

This result supports the property tax capitalization hypothesis: it suggests that, for a house worth 1000 euros per square meter, a 0.1 percentage points increase in *Imu Prin* induces a drop in value of 42 euros per square meter. The drop of 42 euros is consistent with full capitalization of the tax liability at a discount rate of 2.4%.[12] [13]

The estimated impact of *Imu Prin* on rental values in Table 7, columns (2) and (4), is instead not statistically significant. If property values represent the present discounted values of future rents, net of tax liabilities, this last result confirms that the effect of *Imu Prin* on property values is exclusively due to a capitalization mechanism.

One caveat from the straight interpretation of our estimate as the pure semi-elasticity of property values to the property tax is that higher levels of the *Imu Prin* may affect local property values not only through capitalization, but also via other channels such as the local aggregate demand for durable goods (Surico and Trezzi, 2015).

The 2SLS estimate reported in Table 7 is significantly larger that the OLS estimate reported in Table 2. Notice that our estimate cannot be interpreted as the average effect of the *Imu Prin* on property values, but as the differential impact of a 0.1 percentage points difference in the *Imu Prin* on property values for municipalities that changed the property tax rate *because* they

[12] In the given example, the yearly tax liability per square meter is 1 euro, that is 0.1% of 1000; 42 euros equals $\frac{1}{0.024}$.

[13] The average real interest rate in the period 2002-2016, calculated as the difference between the 10-year government bond yield and the annual inflation measured by the consumer price index (source: Federal Reserve Economic Data), is about 2.4%; we computed the average starting from 2002 as in this year Italy joined the European Monetary Union and, consequently, yields are more comparable.

had elections in 2013. We could hypothesize that those municipalities are the ones where the local demand for housing is more sensitive to changes in the property tax rates. Indeed, municipalities where the incumbent local governments change their choice of *Imu Prin* depending on the electoral cycle are likely to be those where there are the strongest political economy motives, i.e. increasing the tax is expected to have large negative effects on the housing market and on political consensus.

To corroborate the evidence of a capitalization mechanism we also study the impact of changes in residential property taxes on the transaction volumes of residential houses. As a measure of transaction volumes we use the OMI index of housing market intensity: the number of transacted houses in a given year and municipality over the total housing stock of the municipality.

***Insert Table 8 here***

Results in column (1) of Table 8 show that, after the introduction of IMU, municipalities with elections in 2013 feature an increase in housing market intensity relative to municipalities without elections in 2013. The 2SLS results in column (2) show that a 0.1 percentage points increase in *Imu Prin* led to a reduction in housing market intensity of 0.28 percentage points, which is economically significant (from Table 1, the average value of the housing market intensity index is 1.28).

Taken together, the evidence of a joint reduction in equilibrium property prices and transaction volumes confirms that the negative impact of the introduction of the IMU reflects a drop in local demand for residential properties.

# 8 Robustness

## 8.1 Spillovers across municipalities

In the analysis conducted so far we assume that there are no spillovers across neighboring municipalities: potential homebuyers do not switch out of municipalities with higher property tax rates to nearby municipalities with low tax rates. In presence of such spillovers, the estimates

based on the comparison between municipalities with and without elections in 2013 may be biased. Suppose there are two neighboring municipalities, one with elections and one without elections in 2013. The incumbent local government in the municipality with elections sets lower property tax rates, while the incumbent government of the other municipality does not. If households living in the municipalities without elections move to the municipality with elections to exploit the lower tax rates, this would negatively affect property values in the municipality without elections. In such a case, our estimate could be partially driven by the difference between the increase in property values in municipalities with elections and the decrease in municipalities without elections, due to spillovers. This would lead to an overestimate of the true positive effect of having elections in 2013 on property prices and transaction volumes; in other words, municipalities without elections would not provide a valid counterfactual for what would be the evolution of property values in municipalities with elections, absent the treatment.

To mitigate this concern, we repeat the analysis described in the previous section excluding all municipalities that are adjacent to those with elections in 2013 and have no elections themselves. Table 9 reports the reduced form (RF) and the 2SLS estimates obtained using this subsample of municipalities for property and rental values and housing market transaction volumes. The results do not differ from those obtained on the full sample, indicating that our baseline estimates are not affected by spillovers across neighboring municipalities.

***Insert Table 9 here***

## 8.2 Differences between municipalities with and without elections in 2013

As highlighted in Section 4, Italian municipalities are highly heterogeneous in terms of population. Furthermore, Table 10 shows that the average population and the homeownership rates of municipalities with and without elections in 2013 are significantly different. One may suspect that the positive reduced form impact of having elections in 2013 on the trend of property values may be partially driven by city size or homeownership rate. To account for the heterogeneous dynamics of property values along these dimensions, we repeat our instrumental variable analysis allowing for population specific time effects, that is, we include in the baseline regression municipal population quartile dummies interacted with time dummies. The results, reported in

Table 10, are very similar to those described in Section 7. We can thus disregard the concern that heterogeneity in city size drives our results.

***Insert Table 10 here***

Following a similar reasoning, we repeat our main estimation by including homeownership quartile dummies interacted with time dummies. Results in Table 11 confirm that our main estimates are unaffected by this difference between municipalities.

***Insert Table 11 here***

# 9 Conclusions

In this paper we provide an empirical assessment of the property tax capitalization hypothesis by analyzing the impact of a national property tax reform that occurred in Italy in 2012 on property and rental values and transaction volumes. The cross-sectional variation municipal property tax rates allows to study the presence of inter-jurisdictional capitalization.

We present *prima facie* evidence of the relationship between property and rental values and property taxes chosen by municipalities in a difference-in-differences setting and show the endogeneity concerns related to this strategy. To account for the endogeneity issues, we instrument variation in property taxes across municipalities. Following Alesina and Paradisi (2014), we show that municipalities with elections in 2013 chose lower property tax rates relative to other municipalities and provide compelling evidence in favor of the exclusion restriction hypothesis.

The 2SLS results show that a 0.1 percentage point increase in the tax rate on primary residences induces a 4.2% reduction of property values among compliers (i.e. municipalities that modify their choice of property tax rates according to whether or not they have elections in 2013), whereas there is no significant impact on rental values. Furthermore, transaction volumes are negatively affected by higher tax rates, thus suggesting that our estimates are indeed capturing a reduction of the local demand of real estate.

Back of envelope calculations show that discount rate that is compatible with the full capitalization of the property tax rate is 2.4%, a level that is in line with the Italian average real interest rate observed in the last decade.

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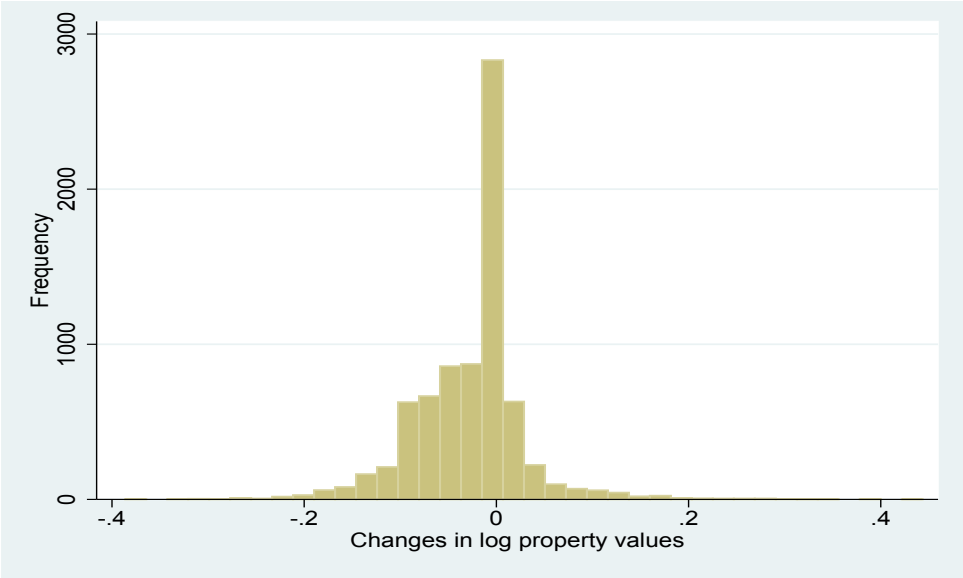
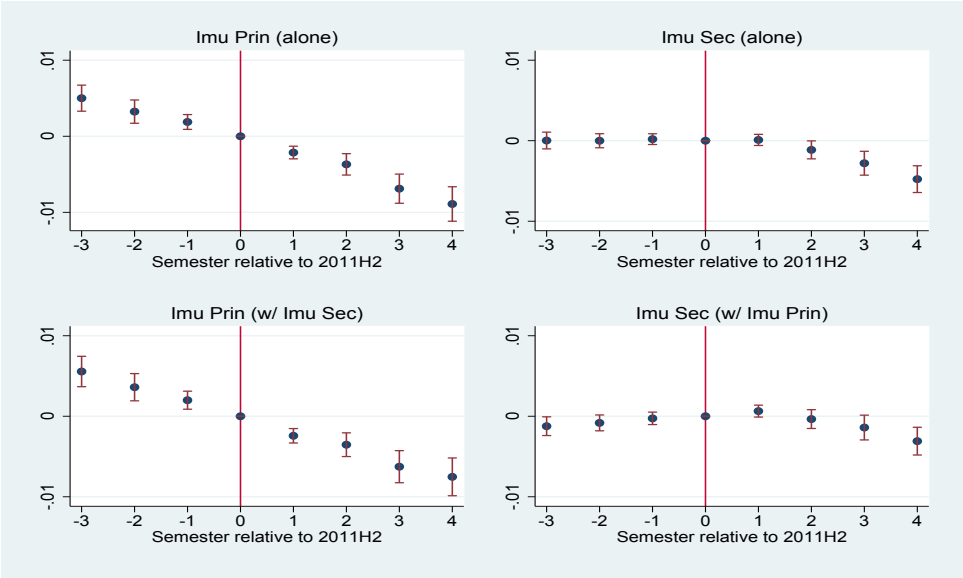
Figure 1
Changes of property values after the reform



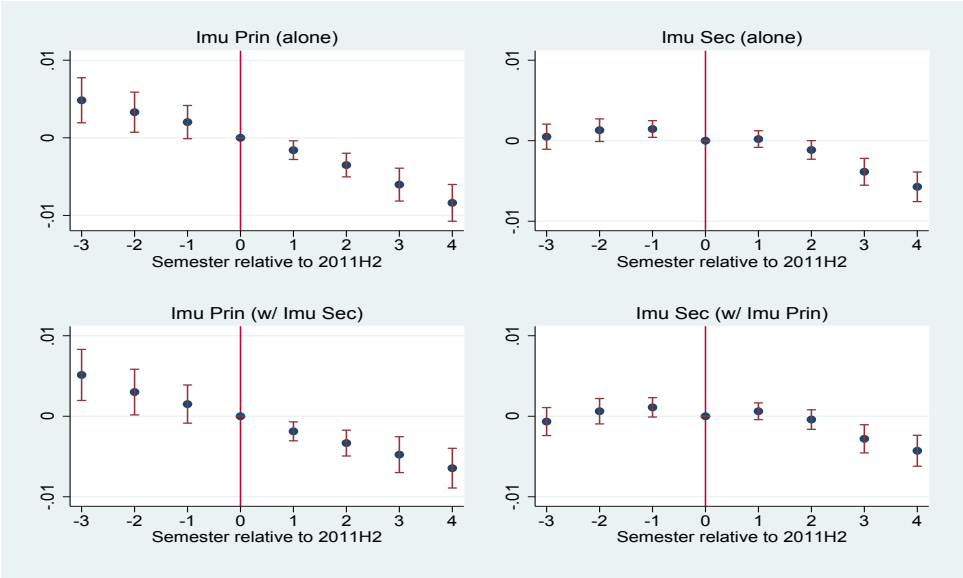

Note. This figure plots the histogram of the change between the average logarithm of property values in the four quarters that followed the introduction of the IMU and the average in the four quarters that preceded it.

Figure 2
Dynamics of property values



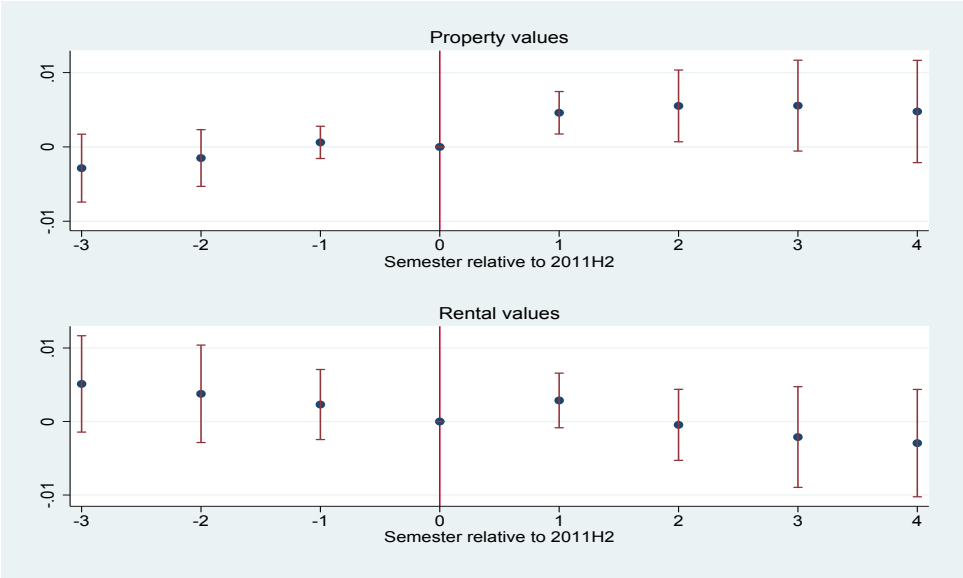

Note. This figure plots the pattern of the $\gamma_\tau$ coefficients from estimating (2) for the log of property values with different tax rates. The capped lines show the 95 percent confidence interval on each coefficient relative to the reference semester (second semester of 2011). The top-left plot shows the dynamic relationship between log house prices and the tax rate on primary houses (*Imu Prin*). The top-right plot shows the dynamic relationship between log house prices and the tax rate on secondary houses (*Imu Sec*). The bottom-left and bottom right plots respectively show the relationship between log house prices and the tax rate on primary and secondary houses, in a regression that includes both tax rates.

Figure 3
Dynamics of rental values



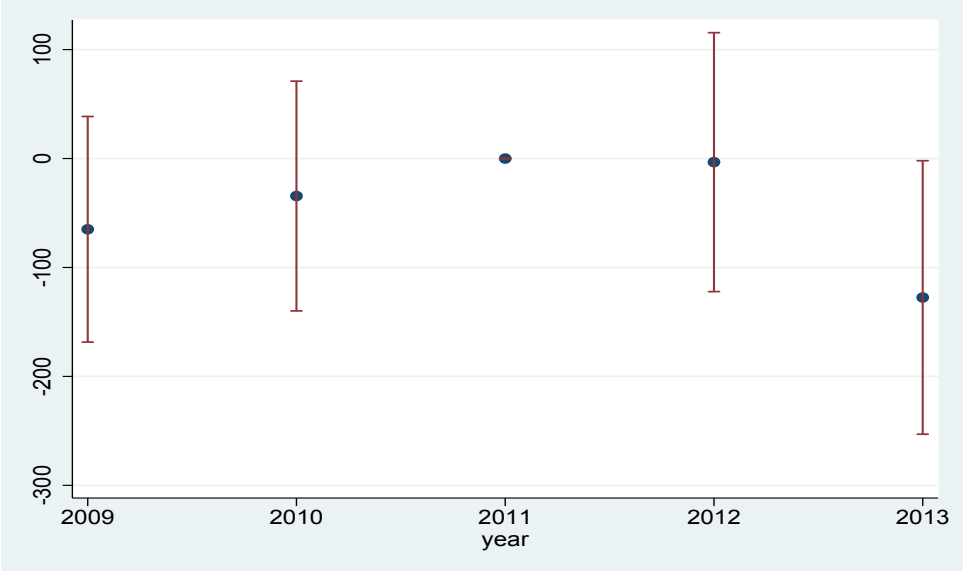

Note. This figure plots the pattern of the $\gamma_\tau$ coefficients from estimating (2) for the log of rental values with different tax rates. The capped lines show the 95 percent confidence interval on each coefficient relative to the reference semester (second semester of 2011). The top-left plot shows the evolution of the relationship between log rents and the tax rate on primary houses (*Imu Prin*). The top-right plot shows the dynamics in the relationship between log of rents and the tax rate on secondary houses (*Imu Sec*). The bottom-left and bottom-right plots respectively show the relationship between log of rents and the tax rate on primary and secondary houses, in a regression that that includes both tax rates.

Figure 4
Dynamics of property and rental values and 2013 municipal elections




Note. This figure plots the pattern of the $\gamma_\tau$ coefficients from estimating (4) for property and rental values. The capped lines show the 95 percent confidence interval on each coefficient relative to the reference semester (second semester of 2011). The left plot reports estimates for property values and the right plot reports estimates for rental values.

Figure 5
Dynamics of local public spending and 2013 municipal elections




Note. This figure plots the time-varying reduced-form estimate of the impact of elections in 2013 on public expenditure per capita i.e. the $\beta_\tau$ coefficients from estimating (5). The capped lines show the 95 percent confidence interval on each coefficient relative to the reference semester (second semester of 2011).

Table 1
Summary Statistics

| | Mean | Standard Deviation | Observations |
|---|---|---|---|
| **Property and rental values and transaction volumes 2010-2013 (OMI)** | | | |
| Property value per square meter | 1055.61 | 577.85 | 60688 |
| Rental value per square meter | 3.65 | 1.85 | 58212 |
| Transaction volumes over housing stock (%) | 1.28 | 0.89 | 53315 |
| **Property tax rates in 2012 (IFEL)** | | | |
| *Imu Prin* | 4.20 | 0.74 | 7680 |
| *Imu Sec* | 8.47 | 1.05 | 7680 |
| **Demographic and Housing Characteristics 2011 (Census)** | | | |
| Resident population | 8079.81 | 44486.43 | 7680 |
| College graduates over population | 0.07 | 0.03 | 7680 |
| Homeownership rate | 0.76 | 0.07 | 7680 |
| Share of renting households | 0.12 | 0.06 | 7680 |
| Houses per household | 1.68 | 1.18 | 7680 |
| Empty houses over total | 0.30 | 0.21 | 7680 |
| Average age of residential buildings | 43.20 | 8.66 | 7680 |
| **Municipal Fiscal Budget Data 2010-2013 (Ministry of Interior)** | | | |
| Municipal Public Expenditure per capita | 1598.38 | 1880.32 | 29335 |
| Municipal Total Revenues per capita | 1592.47 | 1863.44 | 29335 |

Values of property and rental values per square meter are at semestral frequency, averaged over the period 2010-2013 and are expressed in euros. *Imu Prin* and *Imu Sec* are in permil. Demographic and Housing characteristics are measured in 2011: resident population is the number of residents living in the municipality; college graduates are the residents with a college degree; homeownership rate is measured as the share of resident households living in a house they own relative to all households living in the municipality as home-owners, renters or occupiers; share of renters is the share of resident household living in a house they rent relative to all households; houses per household is the share of residential houses relative to the number of the resident households; empty houses over total is the share of houses that are not occupied; average age of residential houses is the average number of years of the building where the house is located up to 2011.Municipal Fiscal Budget Data are at annual frequency, averaged over the period 2010-2013 and expressed in euros.

Table 2
*Prima facie* evidence: property values per square meter

| | (1) | (2) | (3) |
|---|---|---|---|
| | Log of property per square meter | | |
| *Imu Prin* * Post | -0.008*** | | -0.008*** |
| | (0.001) | | (0.001) |
| *Imu Sec* * Post | | -0.002*** | -0.000 |
| | | (0.001) | (0.001) |
| Observations | 60688 | 60688 | 60688 |
| Municipality and Time fixed effects | Y | Y | Y |

Difference-in-differences estimates using *Imu Prin* and/or *Imu Sec* as the intensity of the treatment. The *Imu Prin* and *Imu Sec* are measured in permil. Post is a dummy variable which takes value equal to 1 from 2012 onwards.
Standard errors clustered at municipality level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3
*Prima facie* evidence: rental values per square meter

| | (1) | (2) | (3) |
|---|---|---|---|
| | Log of rental value per square meter | | |
| *Imu Prin* * Post | -0.007*** | | -0.006*** |
| | (0.001) | | (0.001) |
| *Imu Sec* * Post | | -0.003*** | -0.002** |
| | | (0.001) | (0.001) |
| Observations | 58212 | 58212 | 58212 |
| Municipality and Time fixed effects | Y | Y | Y |

Difference-in-differences estimates using *Imu Prin* and/or *Imu Sec* as the intensity of the treatment. The *Imu Prin* and *Imu Sec* are measured in permil. Post is a dummy variable which takes value equal to 1 from 2012 onwards.
Standard errors clustered at municipality level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4
First stage regression

| | (1) | (2) |
|---|---|---|
| | *Imu Prin* | *Imu Sec* |
| Election in 2013 | -0.142*** | -0.069 |
| | (0.035) | (0.050) |
| Constant | 4.214*** | 8.477*** |
| | (0.009) | (0.012) |
| Observations | 7680 | 7680 |

The table shows OLS estimate for the cross-section of municipalities in our sample. In column (1) the dependent variable is the *Imu Prin* (measured in permil). In column (2) the dependent variable is the *Imu Sec* (measured in permil). Election in 2013 is a dummy variable which takes value equal to 1 if the municipality has municipal elections in 2013 and zero otherwise.
Standard errors are robust.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5
Covariates' balance

| | Election in 2013 | | No Election in 2013 | | |
|---|---|---|---|---|---|
| | Mean | Observations | Mean | Observations | Difference |
| **Property and rental values per square meter 2010-2011 (OMI)** | | | | | |
| Property value per square meter | 1008.51 | 2355 | 1074.03 | 27799 | 65.52*** |
| Rental value per square meter | 3.51 | 2299 | 3.71 | 26626 | 0.20*** |
| Transaction volumes over housing stock (%) | 1.41 | 2167 | 1.54 | 24291 | 0.13*** |
| **Property tax rates in 2012 (IFEL)** | | | | | |
| *Imu Prin* 2012 | 4.07 | 596 | 4.21 | 7084 | 0.14*** |
| *Imu Sec* 2012 | 8.41 | 596 | 8.48 | 7084 | 0.07 |
| **Demographic and Housing Characteristics 2011 (Census)** | | | | | |
| Resident population | 14650.55 | 596 | 7526.99 | 7084 | -7123.57*** |
| College graduates over population | 0.07 | 596 | 0.07 | 7084 | -0.00 |
| Homeownership rate | 0.75 | 596 | 0.76 | 7084 | 0.01*** |
| Share of renting households | 0.12 | 596 | 0.12 | 7084 | 0.00 |
| Houses per household | 1.63 | 596 | 1.68 | 7084 | 0.05 |
| Empty houses over total | 0.30 | 596 | 0.30 | 7084 | -0.00 |
| Average age of residential buildings | 43.28 | 596 | 43.19 | 7084 | -0.09 |
| **Municipal Fiscal Budget Data 2010-2011 (Ministry of Interior)** | | | | | |
| Municipal Public Expenditure per capita | 1610.39 | 1150 | 1617.22 | 13501 | 6.83 |
| Municipal Total Revenues per capita | 1603.43 | 1150 | 1604.68 | 13501 | 1.25 |

Values of property and rental values per square meter are at semestral frequency, averaged over the period 2010-2011 and are expressed in euros. *Imu Prin* and *Imu Sec* are in permil. Demographic and Housing characteristics are measured in 2011: resident population is the number of residents living in the municipality; college graduates are the residents with a college degree; homeownership rate is measured as the share of resident households living in a house they own relative to all households living in the municipality as home-owners, renters or occupiers; share of renters is the share of resident household living in a house they rent relative to all households; houses per household is the share of residential houses relative to the number of the resident households; empty houses over total is the share of houses that are not occupied; average age of residential houses is the average number of years of the building where the house is located up to 2011.Municipal Fiscal Budget Data are at annual frequency, averaged over the period 2010-2011 and expressed in euros.

Table 6
Exclusion restriction test: elections in 2012 and 2011

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Log of property value per square meter | | Log of rental value per square meter | |
| Election2012 * Post(2011) | 0.002 | | -0.000 | |
| | (0.001) | | (0.002) | |
| Election2011 * Post(2011) | | -0.001 | | -0.002 |
| | | (0.001) | | (0.002) |
| Observations | 15005 | 15005 | 14388 | 14388 |
| Municipality and Time fixed effects | Y | Y | Y | Y |

Sample period: 2010:2 and 2011:1. Election2012 is a dummy variable which takes value equal to 1 if the municipality has municipal elections in 2012 and zero otherwise. Election2011 is a dummy variable which takes value equal to 1 if the municipality has municipal elections in 2011 and zero otherwise. Post(2011) is a dummy variable which takes value equal to 1 in 2011 and 0 in 2010.
Standard errors clustered at municipality level in parentheses.
$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

Table 7
Instrumental variable results

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | RF | 2SLS | RF | 2SLS |
| | Log of property value per square meter | | Log of rental value per square meter | |
| Election 2013 * Post | 0.006** | | -0.003 | |
| | (0.003) | | (0.003) | |
| *Imu Prin* * Post | | -0.042** | | 0.023 |
| | | (0.020) | | (0.024) |
| Observations | 60688 | 60684 | 58212 | 58211 |
| Municipality and Time fixed effects | Y | Y | Y | Y |

Columns (1) and (3) report the reduced form impact of having elections in 2013 respectively on the log of property value per square meter and the log of rental value per square meter. Columns (2) and (4) report the two stage least square (2SLS) estimates. Election2013 is a dummy variable which takes value equal to 1 if the municipality has municipal elections in 2013 and zero otherwise. The *Imu Prin* is measured in permil. Post is a dummy variable which takes value equal to 1 in 2012 and 2013 and 0 otherwise.
Standard errors clustered at municipality level in parentheses.
$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

Table 8
The impact of *Imu Prin* on housing market transaction volumes

| | (1) | (2) |
|---|---|---|
| | RF | 2SLS |
| | Transaction volumes over housing stock (%) | |
| Election 2013 * Post | 0.047** | |
| | (0.021) | |
| *Imu Prin* * Post | | -0.274** |
| | | (0.132) |
| Observations | 53315 | 53314 |
| Municipality and Time fixed effects | Y | Y |

Column (1) reports the reduced form impact of having elections in 2013 on transaction volumes. Column (2) reports the results for the two stage least square (2SLS) estimate. Election2013 is a dummy variable which takes value equal to 1 if the municipality had municipal elections in 2013 and zero otherwise. The *Imu Prin* is measured in permil. Post is a dummy variable which takes value equal to 1 in 2012 and 2013 and 0 otherwise.
Standard errors clustered at municipality level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9
Robustness I: excluding municipalities adjacent to municipalities with elections in 2013

| | (1) RF | (2) 2SLS | (3) RF | (4) 2SLS | (5) RF | (6) 2SLS |
|---|---|---|---|---|---|---|
| | Log of property value per square meter | | Log of rental value per square meter | | Transaction volumes over housing stock (%) | |
| Election2013 * Post | 0.007*** | | -0.005 | | 0.052** | |
| | (0.003) | | (0.003) | | (0.022) | |
| *Imu Prin* * Post | | -0.049** | | 0.033 | | -0.308** |
| | | (0.022) | | (0.025) | | (0.139) |
| Observations | 42413 | 42411 | 40481 | 40480 | 36548 | 36548 |
| Municipality and Time fixed effects | Y | Y | Y | Y | Y | Y |

Estimates in this table are obtained using a sample that excludes municipalities that are adjacent to municipalities with elections in 2013. Columns (1), (3) and (5) report the reduced form impact of having elections in 2013 respectively on the log of property value per square meter, the log of rental value per square meter and the transaction volumes. Columns (2), (4) and (6) report the 2SLS estimates. Election2013 is a dummy variable which takes value equal to 1 if the municipality had municipal elections in 2013 and zero otherwise. The *Imu Prin* is measured in permil. Post is a dummy variable which takes value equal to 1 in 2012 and 2013 and 0 otherwise.
Standard errors clustered at municipality level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10
Robustness II: including population per time fixed effects

| | (1) RF | (2) 2SLS | (3) RF | (4) 2SLS | (5) RF | (6) 2SLS |
|---|---|---|---|---|---|---|
| | Log of property value per square meter | | Log of rental value per square meter | | Transaction volumes over housing stock (%) | |
| Election 2013 * Post | 0.006** | | -0.002 | | 0.071*** | |
| | (0.003) | | (0.004) | | (0.022) | |
| *Imu Prin* * Post | | -0.038** | | 0.012 | | -0.374*** |
| | | (0.017) | | (0.020) | | (0.125) |
| Observations | 60688 | 60684 | 58212 | 58211 | 53315 | 53314 |
| Municipality and Size · Time fixed effects | Y | Y | Y | Y | Y | Y |

Columns (1), (3) and (5) report the reduced form impact of having elections in 2013 respectively on the log of property value per square meter, the log of rental value per square meter and the transaction volumes. Columns (2), (4) and (6) report the 2SLS estimates. Election2013 is a dummy variable which takes value equal to 1 if the municipality had municipal elections in 2013 and zero otherwise. The *Imu Prin* is measured in permil. Post is a dummy variable which takes value equal to 1 in 2012 and 2013 and 0 otherwise. All specifications include population quartile dummies interacted with time dummies. Standard errors clustered at municipality level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 11
Robustness III: including homeownership per time fixed effects

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | RF | 2SLS | RF | 2SLS | RF | 2SLS |
| | Log of property value per square meter | | Log of rental value per square meter | | Transaction volumes over housing stock (%) | |
| Election 2013 * Post | 0.006** | | -0.003 | | 0.040* | |
| | (0.003) | | (0.004) | | (0.023) | |
| *Imu Prin* * Post | | -0.042** | | 0.024 | | -0.245* |
| | | (0.021) | | (0.024) | | (0.133) |
| Observations | 60688 | 60684 | 58212 | 58211 | 53315 | 53314 |
| Municipality and Homeownership · Time fixed effects | Y | Y | Y | Y | Y | Y |

Columns (1), (3) and (5) report the reduced form impact of having elections in 2013 respectively on the log of property value per square meter, the log of rental value per square meter and the transaction volumes. Columns (2), (4) and (6) report the results for the two stage least square (2SLS) estimate. Election in 2013 is a dummy variable which takes value equal to 1 if the municipality had municipal elections in 2013 and zero otherwise. The *Imu Prin* is measured in permil. Post is a dummy variable which takes value equal to 1 in 2012 and 2013 and 0 otherwise. All specifications include homeownership quartile dummies interacted with time dummies. Standard errors clustered at municipality level in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.