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Property Tax and Property Values: Evidence from the 2012 Italian Tax Reform

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Tommaso Oliviero* and Annalisa Scognamiglio**

Abstract
This paper estimates the impact of property taxes on property values. The unexpected introduction of a new fiscal regime on property taxes in 2012 adopted by the Italian government in December 2011 within the austerity plan to face the sovereign debt crisis ("Manovra Salva Italia") provides an ideal empirical setting. We exploit the cross-sectional variation in the tax rates set by each Italian municipality as the intensity of the treatment. We address the endogeneity problem by instrumenting the tax rate on primary residences with the timing of the elections. As showed by Alesina and Paradisi (2014) municipalities that did not have elections in 2013 set a tax rate about 0.1 percentage points higher than the others. Our results show that in those municipalities there has been a reduction in average property values about 6% higher the others. The effect is attributable to the relative higher property tax rate and provide evidence in favor of the capitalization hypothesis on property values.

Keywords: Immovable property tax, Property values.

JEL Classification: H22, H31, R21.

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Table of contents

1 Introduction

Many scholars and international institutions like the OECD (2010, 2012), the International Monetary Fund (Norregaard, 2013) and the Eurostat (2014) have recently advocated property taxes as an efficient and equitable fiscal remedy to public deficits and as a stimulus to economic recovery after the global financial crisis of 2007-08.[1]

Recurrent taxes on land, dwellings and other 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.

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

This paper estimates the impact of the increase in property taxes occurred in Italy in late 2011 on property values. From mid-2011 Italy faced a sovereign debt crisis which resulted in the collapse of the government in November 2011. The political majority was then substituted by a coalition whose main scope was the introduction of an austerity plan to reduce public debt and avoid fiscal default. The new government went to power on December 4th, 2011 and by the 22nd of December the austerity package was approved by the Italian parliament ("Manovra Salva Italia"). One of the main novelties of the austerity package has been a new fiscal regime on properties with the introduction of a municipal property tax ("Imposta municipale Unica", IMU hereafter). This property tax was represented by two tax rates: one on the main dwelling and one on other residential

[1] As the Eurostat (2014) reports on "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).

properties. The Italian case represents an ideal setting to study the impact of property tax changes on property values for three reasons. First the policy was unexpected. The occurrence of a sovereign debt crises coupled with a policy tax reform were arguably unexpected events which were not taken into account by Italian households. Second, the tax base for the evaluation of immovable property tax is based on historical values (from the land registry of each municipality) which were not updated at market values during the last two decades. This avoids the simultaneity bias that affects the analysis when the tax base is assessed at market values. Third, each Italian municipality was allowed to choose its own tax rate (within bands that will be carefully described in the next section). This feature of the tax reform generates cross-sectional variation that allows to analyze the impact of different changes in property taxes on property values.

We show that an identification strategy based on variation in tax rates across municipality suffers from endogenity problems which show up in a pre-trend analysis. We overcome this issue by using an instrumental variable approach, which exploits variation in the timing of municipal elections. Following Alesina and Paradisi (2014) we show that municipalities that did not have elections in 2013 set a tax rate about 0.1 percentage points higher than those with elections. We provide compelling evidence to assert that the timing of elections represents a valid source of exogenous variation in the property tax rates on the main dwelling. Our results show that in those municipalities there has been a reduction in average property values about 6% higher than in the others. The effect is attributable to the relative higher property tax rate and provide evidence in favor of the capitalization hypothesis on property values.

We contribute to the public economics literature by providing a clear identification to estimate the causal impact of property taxes on property values in a nation-wide empirical setting. Our findings also contribute to the recent debate about the efficiency of the property tax rates. The work by Arnold *et al.* (2011) empirically shows that an increasing role of property taxation relative to other taxes, is welfare enhancing in a macroeconomic perspective. In this paper we abstract from an overall macroeconomic assessment of the property tax reform and we focus on the direct impact on property values. However,

in line with recent micro-evidence (Campbell and Cocco, 2007; Mian *et al.*, 2013), a decrease in house prices may have negatively impacted on aggregate consumption. This mechanism could have possibly reinforced the direct negative consumption effect of the introduction of IMU on households' spending found by Surico and Trezzi (2015).

2 Literature review and conceptual framework

Seminal studies in the literature (Simon, 1943; Netzer, 1966) recognize that property taxes may be reflected in property values. This phenomenon, known as property tax capitalization, can be detected if a property value incorporates the present value of the stream of property tax payments on that property. The degree of tax capitalization naturally depends upon the expectations about future stream of property tax payments, the discount rate, the horizon of the investor. However, empirical tests about the property tax capitalization mechanisms are not obvious as they rely on a number of identifying assumptions. Early seminal studies are based on the analysis of cross-sectional differences in median home value across jurisdictions with different levels of average effective property tax rates (Oates, 1969).[2] He finds that, conditional on observable characteristics, communities with higher property tax liabilities show lower levels of average house prices. The working hypothesis is that in a Tiebout world, the households' location choice, and consequently the local demand for housing, depend on each jurisdiction mix of tax and public spending. To overcome the classical problems of cross-sectional studies, Rosen (1982) investigates the impact of changes in property taxes on changes in house prices between 1978 and 1979 by studying the impact of the introduction of proposition 13 in 1978 in Northern California. Proposition 13effectively reduced nominal property tax rates charged by each municipalities in the metropolitan area of San Francisco. Rosen (1982) exploits the heterogeneous reduction in property tax rates and finds that the average prices increased more in municipalities with higher cuts in tax rates. However this study fails to account for simultaneity

[2]The effective property tax rate is defined as the nominal rate times the tax base (the property tax payment) 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.

between changes in house values and changes in the tax rates. Although the changes in tax rates have been determined by the introduction of proposition 13, some unobserved variable could have driven the increase in house prices before and after the proposition 13 passed. An increase in house prices before the treatment could have caused an increase in the assessed value of the tax base, making the effects of the nominal tax rate reduction stronger in those communities. Other seminal empirical studies have focused on empirical tests of the within jurisdiction effect (intrajurisdiction) of property tax on house market evaluation (Yinger *et al.*, 1988). The authors analyze the changes in house values caused by the changes in the effective tax rate induced by the revaluation of the assessed tax base by seven municipal authorities in Massachussets in the 70s. Their analysis relies on transaction level data on houses sold twice in the period under investigation, before and after the revaluation. While fascinating, the main limitation of this kind of analysis is related to the simultaneity bias induced by the municipal level policy on both the market value of each single housing unit and on the overall local housing market. These seminal studies, together with more recent evidence in the literature, share the same limitation of being based on policy changes that occurred in small metropolitan areas or even on 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 a significant negative effect of a balanced budget increase in municipal property tax rates on municipal property base, where property base is measured by the product of prices and quantities in the local housing markets. Kang *et al.* (2015) find a negative impact of positive changes in property tax rates in southeast Michigan on residential and business property values, whereas (Bai *et al.*, 2014) find a mixed evidence of the effect of increase in property taxes on home prices with a negative effect in Shanghai and a positive effect in Chongqing. All the above listed studies virtually confirm, regardless of methodology and data limitations, the presence of a tax capitalization on property prices. The scope of this paper is to contribute to this literature with a careful identification strategy and with the analysis of a broad experimental setting, represented by the Italian property tax reform in 2012, which will be described below in detail.

3 Institutional setting

Between 2011 and 2012 Italy witnesses a change in the fiscal regime on property taxes. The major change regards residential property taxes. Prior to 2011, the tax regime on residential properties was dual: 1) the main dwelling (the house where the household has the fiscal residence) was tax exempt unless it belonged to the category of luxury residences; 2) the other residential properties were subject to the local tax rate ("Imposta comunale sugli immobili", ICI thereafter). The tax base for the ICI was represented by the land registry value that was defined as an estimate of what the rental value of the property would have been in 1988-1989. From middle 2011, Italy has been hit by a tremendous sovereign debt crisis. This crisis lead to the resignation of the prime minister, Mr Berlusconi, in November 2011 and the birth of a coalition government lead by Mr. Monti in the same month. The first initiative of the new government was a fiscal consolidation plan with the objective of lowering the pressure by financial markets on government bond yields. The fiscal reform contained in the "Manovra Salva Italia" [3] brought about a major change in the fiscal regime on residential properties, with the abolishment of the ICI and the introduction of a municipal property tax (IMU). The IMU system introduced three main innovations with respect to the previous regime: 1) the main dwelling, irrespective of the category, was included in the tax base; 2) the tax base, represented by the land registry value, was scaled up by a factor of 1.6; [4]; 3) the basic tax rate was set equal to 0.4% (IMU PRIN hereafter) of the land registry value (multiplied by 1.6) on the main dwelling and to 0.76% (IMU OTHER hereafter) of the land registry value (multiplied by 1.6). Each municipality was allowed to modify the Imu Prin within a +/-0.2 percentage points band and the Imu Other within a +/-0.3 percentage points band. The local authority had to deliberate on the approved tax rates by October 2012, otherwise the basic rate applied. Furthermore, the government set the basic deduction of 200 euros on the tax paid on the main dwelling plus additional 50 euros per household

[3] Literally translated: "Save Italy Reform"

[4] This scaling up was homogenous for all municipalities.

member less than 26 (up to a max deduction of 400 euros).[5]

Insert Figure 1 here

Figure 1 shows the total revenues from property taxes from all Italian municipalities from 2009 to 2013. The revenues from the property tax on the main dwelling were about 1 billion euro between 2009-2011 and jumped to about 4.2 billions in 2012 as a result of the reform. The IMU PRIN was abolished in 2013 but the fiscal pressure on the main dwelling remained constant between 2013 and 2014 with the introduction of a new tax on local services. Total revenues from the property tax on other residential properties was equal to about 8.2 billions between 2009 and 2011 and jumped to a level of 10.5 billions in 2012 and remained stable in 2013. Part of the revenues from property taxes in 2012 has been devoted by municipal authorities to the reduction of local fiscal deficits (as showed by (Surico and Trezzi, 2015) and confirmed by our analysis); however half of the revenues from the tax on other residential properties in 2012 has been transferred to the central government to reduce the fiscal deficit.

4 Data

We use semestral data on residential property values and rental prices per square meter from 2010 to 2013 for all Italian municipalities. The source is the Italian Real Estate Market Observatory (OMI hereafter), an agency that belongs to the Italian Fiscal Autority (Agenzie delle Entrate) within the Ministry of Finance. The OMI produces semestral estimates of real estate market values and rents that rely on transaction data (recorded by the Agenzia delle Entrate for fiscal purposes) and surveys on local housing markets conducted among real estate agents.[6] Information on property tax rates, together with the deductions, set by each municipality in 2012 is provided by the Institute for Local

[5]Municipalities were allowed to modify also the level of the deductions. In our sample only 1.7% of the municipalities modified the deduction. Within this group, 22 municipalities set the deduction at a level that covered the full payment of the tax on the main dwelling. In these cases we consider a tax rate for the Imu Prin equal to zero. In the other cases (111 municipalities) the average deduction has been set equal to 300 euros instead of 200. In a robustness check we exclude those municipalities and show that results are unaffected.

[6]Survey data is used whenever transaction volumes are not large enough to produce precise estimates.

Finance and Economy (IFEL hereafter).[7] We add information on municipal demographic characteristics from the 2011 Population and Housing Census and data on municipal balance sheets and elections provided by the Ministry of the Interior. By the 2011 Census there were 8092 municipalities in Italy. In our sample we keep municipalities for which we have information both on residential property values and property tax rates, for a total of 7682 municipalities. Table 1 reports summary statistics for our working dataset.

Insert Table 1 here

The average municipal residential property value per square meter has mean and standard deviation of about 1057 and 577. The average property tax rate on the main residence in 2012 has been set equal to about 0.43% while the rate on secondary houses equal to 0.84%. The average size of Italian municipalities is of about 8 thousand people with a very large dispersion. The ratio of families living in houses they own is about 76% while the ratio of families living in houses they rent is 12%. Residential buildings represent, on average, the 86% of total buildings of which about 70% is occupied by homeowners. The municipal public expenditure per capita is about 1600 euros per year; average expenditure is slightly above revenues denoting that municipalities are, on average, incurring in fiscal deficits. The revenues from property taxes, over the period 2009-2013, represent about 10% of total local revenues.

4.1 Cross sectional variation in IMU rates and property prices and rents

In this subsection we focus on the cross sectional variation in IMU tax rates and property prices in our sample. For the sake of clarity we divide our sample into nine groups according to their choice of the IMU rates. The nine groups represent all possible combinations of increase (labeled with H), decrease (labeled with L) or left unchanged (labeled with M) of the Imu tax rate on the main dwelling (labeled with P) or the other residential properties (labeled with O). The statistics in table 2 show that, on average, both prop-

[7] It is a foundation that belongs to the Association of Italian Munipalities (ANCI).

erty tax rates have been raised relative to the basic statutory level, with more variation in Imu rate on other residential properties. About 64% of the municipalities opted for the national tax rate for primary houses, whereas 58% of the municipalities opted for a different tax rate on other houses.

Insert Table 2 here

In table 3 we summarize the average property prices and rents in the nine groups defined above, before and after the policy change in 2012. The pre-2012 average levels refer to the period 2009:II-2011:II, while the period post-2012 refers to the 2012:I and 2013:II. At a first look, the differences in the averages suggest that house prices decreased most in the groups that increased both Imu rates, while decreased less, or remained virtually unchanged in the other groups.

Insert Table 3 here

The next section develops an empirical analysis that aims at identifying the causal effects of property taxes on property values.

5 Empirical analysis

We investigate the impact of the property tax on house prices using the following difference in difference specification:

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

where we regress the logarithm of the average house value in municipality i at time t on the tax rate, T_i, interacted with $Post_t$, a dummy that takes value equal to one after the introduction of the IMU system (2012 and 2013), and a set of controls. We control for any unobserved time-invariant characteristic and any common shock that may affect both house prices and tax rates by including a full set of municipality fixed effects, α_i, and a full set of semester-by-year fixed effects, λ_t.

Insert Table 4 here

The main coefficient of interest in this regression is β, which captures the relationship between the change in house prices and the variation in property taxes across municipalities after the introduction of the IMU system. Table 4 reports the estimated coefficient for the log of house prices from equation 1 for different models: column (1) uses variation in the tax rate on principal residences (Imu Prin), whereas column (2) uses variation in the tax rate on other residential houses (Imu Other). Finally, column (3) extends the model in equation 1 by considering both Imu Prin and Imu Other as regressors. All models include both municipality and time fixed effects. The estimates in table 4 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 0.9% drop in house prices, whereas the same increase in the tax rate on secondary houses is associated with a 0.2% drop in house prices. When including both taxes (column (3)), only the coefficient on primary taxes is significant and the point estimate is remarkably similar to the point estimate in column (1). Table 5 reports the estimated β from equation 1 using the logarithm of rents per square meter as the outcome variable.

Insert Table 5 here

The results in table 5 mirror the results presented in table 5: a 0.1 percentage point increase in Imu Prin is associated with a 0.8% drop in rents per square meter.

In order to give a causal interpretation to the coefficients shown in tables 4 and 5, the municipalities need to be on parallel trends absent the treatment or the differences in trends need not to be related to the intensity of the treatment. If the variation in tax rates across municipalities are, for example, induced by different local economic conditions, which are reflected in different trends in house prices, then the coefficients presented above are not capturing the causal impact of the Imu on the intensive margin. Although this assumption cannot be tested directly, we test whether the evolution of the outcome is associated to the tax rates in the period before the introduction of Imu. To this purpose we estimate the following regression:

$$log(y_{it}) = \alpha_i + \lambda_t + \sum_{\tau=2009H2}^{2011H1} \beta_\tau T_i \mathbf{1}(t=\tau) + \sum_{\tau=2012H1}^{2013H2} \beta_\tau T_i \mathbf{1}(t=\tau) + \epsilon_{it} \quad (2)$$

where, differently from equation 1), γ_t are time-varying coefficients for the relationship between the outcome and the tax rate, normalized relative to the second half of 2011. Figure 2 represents four plots. Each one reports the estimate from the above regression; each coefficient is normalized with respect to the estimated $\gamma_{t=5}$, where 5 is the second semester of 2011 (immediately before the introduction of the tax).

Insert Figure 2 here

The top left plot in figure 2 shows the estimated γ coefficients (together with 95% confidence intervals) from equation 2 when T_i is the tax rate on the primary house in municipality i, whereas the top right plot shows the estimated γ coefficients when T_i is the tax rate on the other residential properties. From the top left plot it is clear that the evolution of the outcome in the pre-period is systematically related to the cross-sectional variation in the tax rate on the primary house, whereas there is no evidence of pre-trends in the top right plot. The bottom left and the bottom right plots show, respectively, the time-varying coefficients of Imu Prim and Imu Other in a model which includes both the tax rate on the primary house and the tax rate on the secondary house. The results mirror those shown in the top plots in figure 2.

Insert Figure 3 here

Figure 3 shows that the estimated *gamma* coefficients when the outcome variable is the logarithm of rents per square meter, respectively for Imu Prim and Imu Other, follow a similar pattern as for house prices: there is evidence of pre-trends in rents that are related to the cross-sectional variation in Imu Prim.

Overall, figures 2 and 3 show that the estimates in tables 5 and 6 cannot be interpreted as causal and are potentially driven by pre-existing differences in trends. In order to overcome the problem of endogeneity of the property tax rates, in the next section, we will perform an instrumental variable approach.

6 Instrumental variable approach

In this section we address the endoegenity problem highlighted above by providing an instrumental variable approach. The idea is to instrument the Imu Prin by using the exogenous variation in the timing of elections across Italian municipalities. Following Alesina and Paradisi (2014), we argue that the year of occurrence of municipal elections is randomly assigned in Italy; they show that on average municipalities that had election in 2013 set an average Imu Prim tax rate significantly lower than the other municipalities. Interestingly, while the timing of elections significantly impacted on the tax rate on the main dwelling, it does not correlate with the tax rate set on other residential properties. The timing of elections provide the ideal exogenous variation on the Imu Prim that is orthogonal to the Imu Other. We show the relation between the Imu rates on the main and other residential properties and having had elections in 2013 by estimating the following regression:

$$T_i \cdot Post_{2011} = \alpha_i + \lambda_t + \beta \cdot Election_i \cdot Post_{2011} + \epsilon_{it} \tag{3}$$

where T_i is equal to Imu Prim or Imu Other, and Election is a dummy variable that takes value equal to 1 if the municipality had elections in 2013 and 0 otherwise. Estimates for the equation 4 are provided in table 6. They show that municipalities that had elections in 2013 set an Imu Prim about 0.11% lower than the others whereas the Imu Other tax rate is not significantly different from the other municipalities. This equation represents our first stage regression in the IV strategy. Before turning to the second stage estimation results, we discuss the validity of our instrumental variable approach. The identifying assumptions are 1) that the average evolution of the outcome for the group of municipalities without elections in 2013 provides a valid counterfactual for what would have been the evolution of the outcome absent the variation in Imu Prim, and 2) that having elections in 2013 only impacts house prices through its effect on the Imu Prin tax rate. This exclusion restriction assumption can not be tested directly, but we can provide compelling evidence that validate our identification strategy by analyzing the

relation between elections and our outcome of interest along three dimensions: 1) we can show the covariates' balance among the two groups; 2) by the mean of an event-study type of analysis we can show that elections are not related to pre-trends in house prices and rents; 3) we show that elections are not affecting house prices through changes in public expenditure or tax revenues at municipal level.

6.1 Covariates' balance

In this subsection we show that our treatment and control group are comparable in terms of observables pre-treatment. This statistical analysis is important for two reasons. First of all it validates the assumption that the timing of elections is random. Second, we exclude that there is some sort of selection on the gains from the decrease in the Imu Prim; in other words, we want to be re-assured that the timing of elections does not relate to different characteristics of the housing market which would suggest the presence of different elasticities with respect to the property tax rate.

Insert Table 7 here

Table 7 reproduces the summary statistics of table 1 separately for municipalities with and without elections in 2013. From the summary statistics it is clear that elections involved a small fraction of municipalities (653 in our sample). However, municipalities with elections are quite comparable in terms of demographics, housing market characteristics and budget variables. The average property Imu Prim tax rate differs across groups, whereas the Imu Other tax rate is about the same.

6.2 Reduced form of election on house prices and rents

In this subsection we analyze the reduced form impact of having elections in 2013 on house prices and rents. The aim of this analysis is twofold. First, we show that trends in house prices and rents do not differ significantly between municipalities with and without elections in 2013. Second we show that, there is a reduced form impact of elections in

2013 on house prices in 2012. Our identifying assumption is that this effect comes only through the difference in Imu Prin. We run the following event-study type of analysis:

$$log(y_{it}) = \alpha_i + \lambda_t + \sum_{\tau=2009H2}^{2011H1} \beta_\tau Election_i \mathbf{1}(t=\tau) + \sum_{\tau=2012H1}^{2013H2} \beta_\tau Election_i \mathbf{1}(t=\tau) + \epsilon_{it} \quad (4)$$

where, differently from equation 2), γ_t are time-varying coefficients for the relationship between the outcome and the dummy Election. Figure 4 plots the estimate from the above regression where the outcome is the log of prices per square meter and the estimates with the outcome variable being the log of rents per square meter. Each coefficient is normalized with respect to the estimated $\gamma_{t=5}$, where 5 is the second semester of 2011. The graphical analysis reveals that the pre-trend in house prices is not statistically different from zero. There is never, instead, a significant relation between rents and elections in 2013.

6.3 Municipal budget cycle

Having municipal elections may not be orthogonal to the level of local public spending. Public spending may in fact increase before elections and decrease after elections for political economy reasons. This fiscal cycle, if capitalized into house prices or rents, would represent a violation of our exclusion restriction assumption. In order to tackle this issue, we collect municipal balance sheets data and show that municipalities with elections in 2013 did not increase public spending or decrease tax revenues before 2012. In order to perform this analysis, we run the following regression model:

$$log(y_{it}) = \alpha_i + \lambda_t + \sum_{\tau=2009}^{2010} \beta_\tau Election_i \mathbf{1}(t=\tau) + \sum_{\tau=2012}^{2013} \beta_\tau Election_i \mathbf{1}(t=\tau) + \epsilon_{it} \quad (5)$$

where γ_t are time-varying coefficients for the relationship between the outcome and the dummy Election. We estimate the regression model in equation 5 considering four different outcomes: total public expenditure at municipal level, total revenues at munic-

ipal level, total revenues from property taxes on the main dwelling, total revenues from property taxed on other residential properties. Results from the regression analysis are reported graphically in figure 5. The graphical analysis reveals that there is no correlation between having elections in 2013 and changes in municipal fiscal budgets. Not surprisingly, the only difference regards the time series behavior of the revenues from property taxes on the main dwelling. Municipalities with elections set a lower property tax rates and collected less revenues. This result also validate that difference in nominal property taxes have been related to differences in revenues and consequently reflect difference in effective property tax liabilities.

6.4 Second stage analysis

In this section we show the results from the IV empirical strategy. Table 8 shows the estimation results by comparing IV estimates for house prices and rents with the OLS estimates in columns (1) of tables 4 and 5. Our final result is that the 0.1% difference in the Imu Prim between municipalities with and without elections translated in an average deflation in house prices between 2012 and 2013 of about 6%. We do not find any effect on rents. This result qualitatively confirm the property tax capitalization hypothesis. Our IV estimate is significantly bigger that the OLS estimate. The reason may be that towns with elections in 2013 did not increase the property taxes because they were expecting a big negative effect from doing it. If so, the compliers may be represented by municipalities with stronger reaction of local housing demand to property taxes. Moreover, we provide a reduced form estimate of the impact of increases in property tax rates on house prices which potentially includes a feedback effect on house prices via general equilibrium adjustments (e.g.: reduction in demand due to the negative income effect induced by higher taxes).

7 Conclusion

In this paper we provide an empirical assessment of the property tax capitalization hypothesis by analyzing the impact of a national tax policy reform occurred in Italy in late 2011. The municipal level cross-sectional variation in property tax rates allows to study the presence of an inter-jurisdictional capitalization mechanism. In our setting the treated unit is in fact represented by the local demand for housing. By using an instrumental variable approach, we account for the endogeneity of the property tax rate, and we find a strong negative effect of property taxes on the main dwelling on property market values. Our contribution is to identify a causal link between property taxes and property values. However our estimate can be interpreted as the difference in market devaluation of properties due to differences in property tax changes on the main dwelling but does not provide an estimate of the overall capitalization effect of the policy reform. A structural model approach is arguably needed in order to provide such estimate.

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A Figures

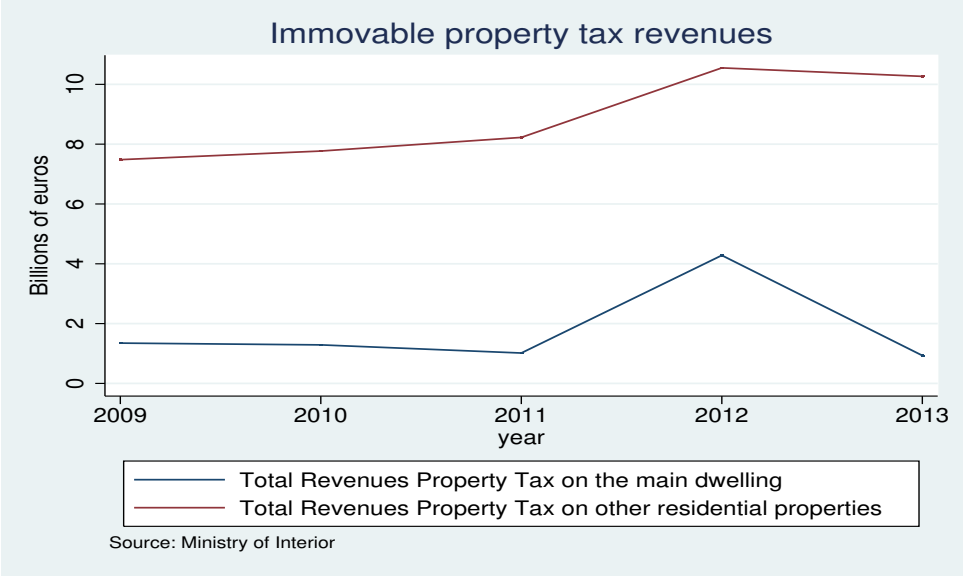

Figure 1: *Immovable Property Tax Revenues are calculated as the sum of revenues from the tax on primary and secondary houses for all municipalities in our sample in each year (source: Ministry of Interior)*

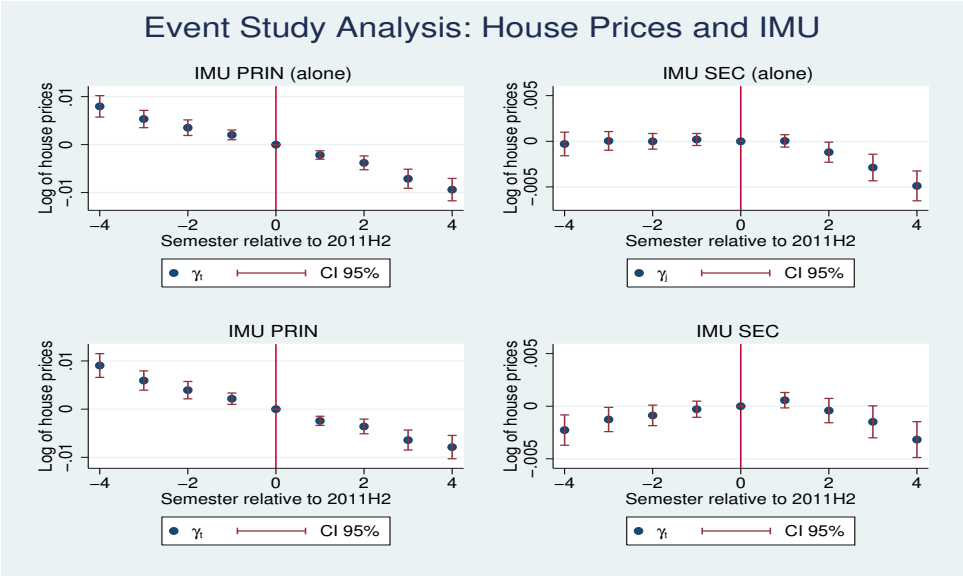

Figure 2: *This figure plots the pre-trend analysis for house prices.The top left plot shows the evolution of the relationship between log house prices and the tax rate on primary house (as in 2012). The top right plot shows the dynamics in the relationship between log house prices and the tax rate on secondary houses as determined in 2012. 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 allows for both. All coefficients are normalized relative to the second semester of 2011, so they can be interpreted as the association between the change in log house prices from semester t to the second half of 2011 and the tax rates set in 2012.*

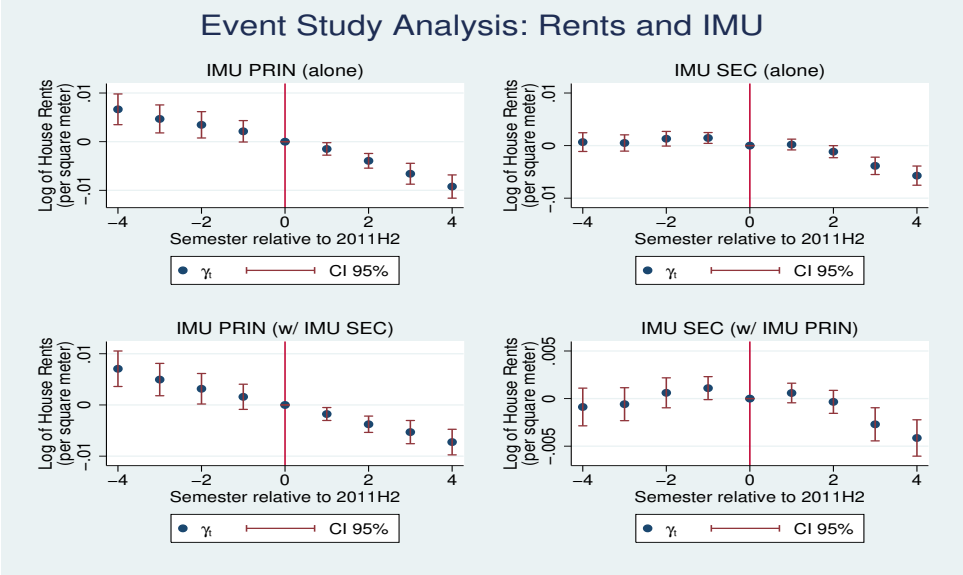

Figure 3: *This figure plots the pre-trend analysis for rents. The plots respectively show the relationship between log house rents and the tax rate on primary and secondary houses, in a regression that allows for time-varying coefficients on both tax rate. All coefficients are normalized relative to the second semester of 2011, so they can be interpreted as the association between the change in log house prices from semester t to the second half of 2011 and the tax rates set in 2012*

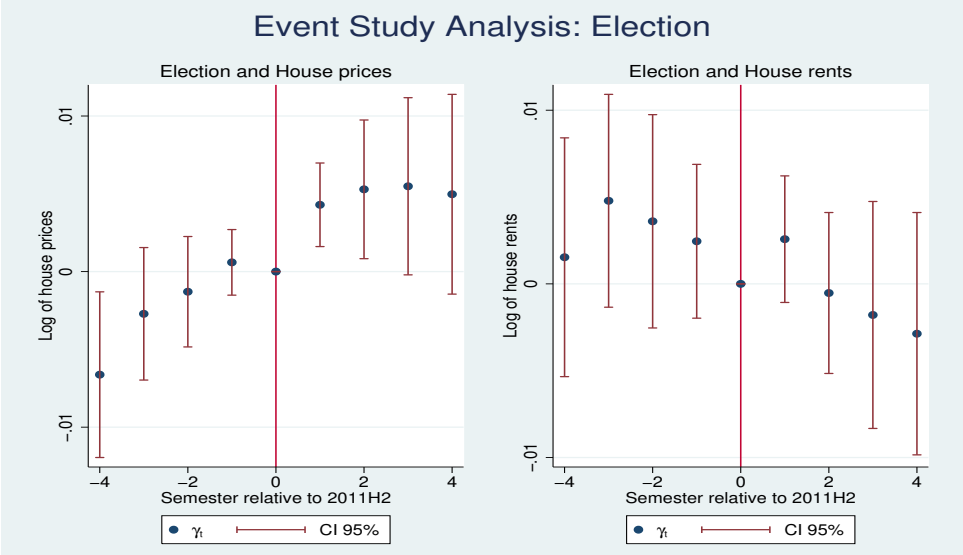

Figure 4: *This figure plots the time-varying reduced-form estimate of the impact of elections in 2013 on house prices and rents.*

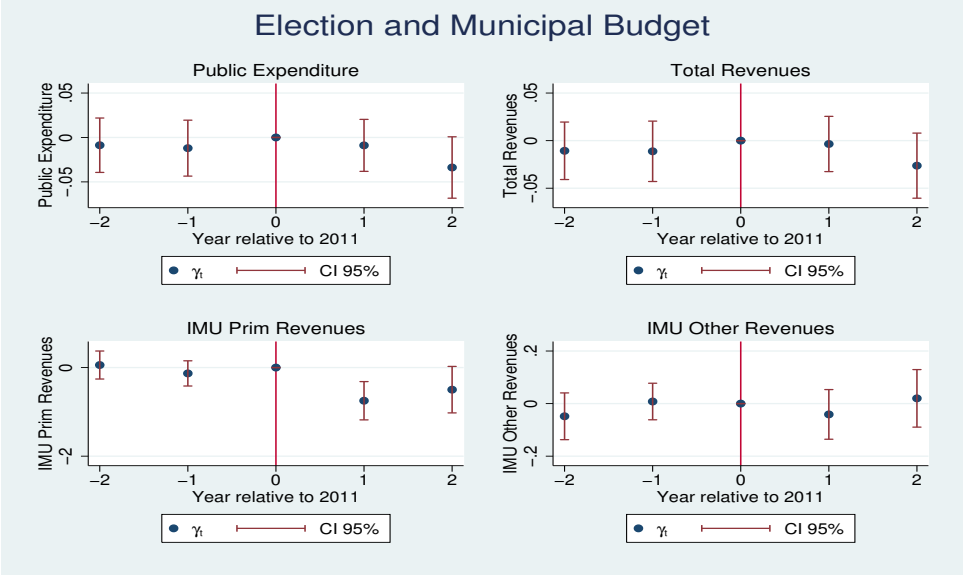

Figure 5: *This figure plots the time-varying reduced-form estimate of the impact of elections in 2013 on municipal budget level variables.*

B Tables

Table 1: Summary Statistics

	Mean	Standard Deviation	Observations
Price and Rents per square meter 2009-2013 (OMI)			
Price per square meter	1057.14	577.83	68101
Rent per square meter	3.66	1.85	65318
Property tax rates in 2012 (IFEL)			
Imu Tax Rate Prim 2012	4.20	0.74	68146
Imu Tax Rate Other 2012	8.47	1.05	68146
Demographic and Housing Characteristics 2011 (Census)			
Total Population	8115.26	44786.90	68146
Families less/equal 2 components (over tot)	0.60	0.09	68146
Families more than 4 components (over tot)	0.05	0.03	68146
Employment (over pop 15-64)	0.61	0.10	68146
Employment (over working pop)	0.90	0.06	68146
College graduates to pop	0.07	0.03	68146
Foreign Pop (share of tot)	0.06	0.04	68146
Home owners	0.76	0.07	68146
Renting households	0.12	0.06	68146
Residential buildings (over tot)	0.86	0.08	68146
Houses occupied by resident (over tot)	0.70	0.20	68146
Municipal Fiscal Budget Data 2009-2013 (Ministry of Interior)			
Municipal Total Expenditure per capita	1607.72	1867.39	65615
Municipal Total Revenues per capita	1600.57	1851.37	65615
Municipal Property Tax Revenues per capita	168.48	197.76	65613

Values of house prices and rents per square meter are averaged over the period 2009-2013 and are expressed in euros. Municipal Fiscal Budget Data are at annual frequency, averaged over the period 2009-2013 and expressed in euros.

Table 2: Average Tax rates by groups

	HP-HO	HP-MO	HP-LO	MP-HO	MP-MO	MP-LO	LP-HO	LP-MO	LP-LO
Imu Tax Rate Prim 2012	5.076	5.065	4.856	4	4	4	2.853	2.558	2.570
	(0.0106)	(0.0325)	(0.111)	(.)	(.)	(.)	(0.0429)	(0.0545)	(0.0730)
Imu Tax Rate Other 2012	9.182	7.600	6.256	9.158	7.600	6.354	9.352	7.600	5.970
	(0.0186)	(.)	(0.257)	(0.0177)	(.)	(0.134)	(0.0472)	(.)	(0.111)
N	1998	199	9	2097	2849	39	292	178	88

Standard errors in parentheses.

Table 3: Average Prices and rents per square meter, pre and post 2012, by group

	HP-HO	HP-MO	HP-LO	MP-HO	MP-MO	MP-LO	LP-HO	LP-MO	LP-LO
					PRE 2012				
Price per square meter	1125.5	978.7	809.9	1158.5	946.3	913.0	1493.2	955.0	848.1
	(5.012)	(13.93)	(46.93)	(5.949)	(4.290)	(38.75)	(33.35)	(25.10)	(36.57)
Rent per square meter	3.966	3.528	2.811	3.945	3.190	2.822	4.898	3.329	2.749
	(0.0183)	(0.0529)	(0.131)	(0.0194)	(0.0135)	(0.102)	(0.0916)	(0.0838)	(0.102)
N	9361	824	45	9917	13395	190	1379	844	418
					POST 2012				
Price per square meter	1085.3	942.7	801.5	1130.2	928.1	917.9	1487.5	954.9	849.2
	(5.309)	(13.80)	(50.85)	(6.426)	(4.712)	(43.90)	(37.40)	(28.43)	(41.18)
Rent per square meter	3.814	3.470	2.825	3.846	3.117	2.825	4.862	3.323	2.729
	(0.0189)	(0.0522)	(0.146)	(0.0210)	(0.0147)	(0.116)	(0.101)	(0.0955)	(0.114)
N	1998	199	9	2097	2849	39	292	178	88

Standard errors in parentheses

Table 4: Estimation results: the effects on prices

	(1)	(2)	(3)
	Log of price per square meter		
Imu Prim*Post	-0.00935***		-0.00926***
	(0.00106)		(0.00114)
Imu Other*Post		-0.00221***	-0.000193
		(0.000696)	(0.000747)
Municipality and Time fixed effects	Y	Y	Y
N	68101	68101	68101
adj. R^2	0.990	0.990	0.990

Standard errors clustered at municipality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Differences-in-differences estimates using the Imu as the intensity of the treatment. Post takes value equal to 1 from 2012 onwards.

Table 5: Estimation results: the effects on rents

	(1)	(2)	(3)
	Log of rent per square meter		
Imu Prim*Post	-0.00866***		-0.00784***
	(0.00145)		(0.00157)
Imu Other*Post		-0.00340***	-0.00169*
		(0.000916)	(0.000988)
Fixed and Time effects	Y	Y	Y
N	65318	65318	65318
adj. R^2	0.985	0.985	0.985

Standard errors clustered at municipality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Differences-in-differences estimates using the Imu as the intensity of the treatment. Post takes value equal to 1 from 2012 onwards.

Table 6: First stage regression

	IMU PRIM	IMU OTHER
Election · Post	-0.117***	-0.0173
	(0.0342)	(0.0490)
N	68138	68138
adj. R^2	0.970	0.985
Fixed and Time effects	Y	Y

Standard errors clustered at municipality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
$Post_{2011}$ refers to the years 2012 and 2013.

Table 7: Covariates' balance

	Election			No Election		
	Mean	Standard Deviation	Observations	Mean	Standard Deviation	Observations
Price and Rents per square meter 2009-2013 (OMI)						
Price per square meter	1018.13	626.33	5823	1060.81	572.98	62270
Rent per square meter	3.52	2.00	5678	3.67	1.84	59632
Property tax rates in 2012 (IFEL)						
Tax Rate Prim 2012	4.10	0.84	5826	4.21	0.73	62312
Tax Rate Sec 2012	8.46	1.21	5826	8.48	1.04	62312
Demographic and Housing Characteristics 2011 (Census)						
Total Population	14613.66	104750.85	5826	7508.56	34111.37	62312
Families less/equal 2 components (over tot)	0.58	0.09	5826	0.60	0.09	62312
Families more than 4 components (over tot)	0.06	0.03	5826	0.05	0.03	62312
Employment (over pop 15-64)	0.56	0.10	5826	0.62	0.09	62312
Employment (over working pop)	0.86	0.07	5826	0.90	0.06	62312
College graduates to pop	0.08	0.03	5826	0.07	0.03	62312
Foreign Pop (share of tot)	0.05	0.04	5826	0.06	0.04	62312
Home owners	0.75	0.07	5826	0.76	0.07	62312
Renting households	0.12	0.07	5826	0.12	0.06	62312
Residential buildings (over tot)	0.84	0.08	5826	0.86	0.08	62312
Houses occupied by residents (over tot)	0.69	0.19	5826	0.70	0.21	62312
Municipal Fiscal Budget Data 2009-2013 (Ministry of Interior)						
Municipal Total Expenditure per capita	1569.79	1333.80	5588	1611.25	1909.46	60027
Municipal Total Revenues per capita	1573.65	1337.68	5588	1603.08	1892.10	60027
Municipal Property Tax Revenues per capita	162.04	254.55	5588	169.08	191.61	60025

Values of house prices and rents per square meter are averaged over the period 2009-2013 and are expressed in euros. Municipal Fiscal Budget Data are at annual frequency, averaged over the period 2009-2013 and expressed in euros.

Table 8: Estimation results: instrumental variable approach

	OLS	IV	OLS	IV
	Log of price per square meter		Log of rent per square meter	
Imu Prim*Post	-0.00935***	-0.0596**	-0.00866***	0.0248
	(0.000459)	(0.0271)	(0.000586)	(0.0291)
Constant	6.871***		1.206***	
	(0.00199)		(0.00254)	
N	68101	68089	65318	65310
adj. R^2	0.990	0.970	0.985	0.985

Standard errors clustered at municipality level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.