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Real Estate Prices and the Importance of Bequest Taxation*

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Abstract

In the context of a general equilibrium model with overlapping generations and intergenerational altruism we show that, ceteris paribus, a decrease in taxes on *inter vivos* donations and bequests brings about an increase in real estate prices. This result has relevant policy implications. We test the predictions of our theory exploiting the abolition of bequest and donation taxation that took place in Italy in 2001. We implement this test by using an original and unique dataset on sales, donations and real estate prices for 13 italian cities between 1993 and 2004. Our estimates suggest that, controlling for other explanatory variables, the 2001 abolition of taxation on bequests and donations contributed substantially to the appreciation of Italian residential real estate.

Keywords: bequest tax, donations, real estate

JEL codes: E60, E65, H24

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1 Introduction

This paper investigates the effect of the tax treatment of bequests and *inter vivos* donations on the price of long-lasting assets in general and real estate in particular. This is not just an academic question but it has immediate policy relevance in the current European and American debate. Italy controversially abolished taxation on bequests and donations in 2001. In the US, after President Bush opted for its complete abolition starting from 2010, President Obama is planning to reintroduce it in 2011. Since real estate prices played a central role in several financial crises (including the last one), we should carefully consider all their determinants, including bequest and *inter vivos* donations taxation as this paper suggests.

First, we present a stylized overlapping generations model to illustrate the main mechanism and provide the intuition for why the tax treatment of bequests and *inter vivos* donations (for brevity: bequest tax from now on) can be an important determinant of the price dynamics of long-lived assets in general, and real estate in particular. Then, constructing an original dataset assembling a variety of sources on real estate prices, sales and donations for the 13 largest Italian cities in the period 1993-2004, we provide empirical evidence in support of our view. We use our dataset to exploit the extraordinary opportunity offered by Italy to investigate and test the role of bequest taxation as a determinant of asset pricing.[1]

Bequest taxation in Italy has been in place at non negligible rates until the second half of 2001 and was abolished thereafter. Although the total revenue from this tax is relatively small in all OECD countries and the historical trend is toward its abolition (Bertocchi [4]), the bequest tax in Italy was pretty steep. Given that the threshold of exemption was, roughly, 125K euro (per total estate) until 1999 and 175K euro (per recipient) in 2000, almost any transfer involving residential real estate was affected by the tax.[2] The tax rate on bequest and donations had a progressive structure and ranged from 3% to 27% of the asset value - depending on its size and the presence of family relations between the donor

[1] Constantinides et al [8] point out the potentially important role of bequest for asset pricing in the context of the equity premium puzzle. Bernheim et al. [3] highlight how agents react to tax incentives in the timing of interegenerational transfers. Recently, intergenerational transfers and estate taxation are receiving renewed (theoretical) attention as shown in Kopczuk [18] and Farhi and Werning [9], [10].

[2] Unfortunately, we are unable to provide an exact measure of how many donations and bequests involving residential real estate were below the threshold of exemption, because of lack of disaggregated micro data. There is nonetheless a general consensus that the very vast majority of donations and bequests were subject to the tax, given the average price of apartments in major italian cities.

and the receiver of the donation.[3]

The main contribution of this paper is to link real estate price appreciation to the abolition of bequest and *inter vivos* donation taxation via the sharp increase in the number of donations observed starting from 2001. Figure 1 offers descriptive evidence in support of our claim: we observe that real estate appreciation in Italy first moved into positive territory in 1999, but it received an *additional significant* boost starting from 2001 (darker area in Figure 1), when the number of real estate donations increased by more than 100%. This latter increase, and not the entire period in which real estate appreciated, is what we seek to explain in this paper.

There are three elements suggesting that bequest taxation was particularly important in the context of the Italian residential housing market. First, housing is by far the predominant asset through which inter-generational transfers are carried out. Second, the ratio of real estate donations over real estate market transactions averaged *more than 50%* across the 13 major Italian cities in 2004 (in Palermo, Catania, and Cagliari the number of donations was actually *larger* than market transactions). It is then by all means reasonable to argue that housing donations may have an impact on house prices. Finally, at the national and major cities levels, the number of *inter vivos* donations in residential real estate showed an astonishing increase of more than 100% between 2000 and 2001 as a consequence of the abolition of bequest taxation (Figure 2). If we restrict our attention to the 13 major Italian cities, the number of housing units that were donated jumped from below 15,000 in 2000 to almost 40,000 in 2002. These dynamics are a common feature in all Italian cities (Figure 3) and the drastic change in economic behavior seems to indicate that the effect of the policy change was far from negligible. This observation finds support in Jappelli et al [17]: using the Bank of Italy Survey of Household Income and Wealth (SHIW), they also document a statistically significant increase in the size of the estate being transferred, especially for the richer, due to the abolition of bequest taxation.

The surge in real estate prices has been a global phenomenon until 2007. Between 1997 and 2003 real estate prices in different economies - Australia, France, Ireland, Netherlands, Spain and the United Kingdom - have risen by more than 70 percent while Italy and the US have witnessed increase in excess of 30%.[4] By and large, it is not difficult to rationalize this empirical evidence if one considers that, during this period, basically all these countries experienced sustained economic growth, population growth and low real interest rates.

[3] In the absence of family relations, the relevant tax rate was even higher. See Table 1 in the Appendix and Jappelli et al. [17] for additional details.

[4] IMF, World Economic Outlook, September 2004.

In this group of economies Italy stands as a noticeable exception: although it shared with other countries the reduction of real interest rates due to the euro-zone creation, it experienced very low economic growth and demographic stagnation. Nevertheless, it displayed substantial real estate appreciation. We view this difference as an additional motivation for our enquiry on the specific role of bequest taxation in relation with real estate prices.

There are two main results in our theoretical analysis. First, we prove that the price of housing increases as the tax rate on bequests decreases. Second, we show that a decrease in the tax rate on bequests increases the amount of real estate donations. The intuition behind our results can be conveyed by two distinct reasonings. The first reasoning focuses on the wealth effect connected with a change in bequest and *inter vivos* donation tax. When bequest taxation is decreased/abolished, the old increase the optimal amount of inter-generational transfers to the young. This reallocation of resources from the old to the young has a positive wealth effect on the segment of demand (the youth) that values real estate the most, not only because, as any other asset, it can be resold but also because it provides housing services whose utility is proportional to their lifespan. Thus, the optimal reallocation of resources fostered by a fall in bequest taxation that makes suppliers (old) poorer and demanders (young) relatively richer increases equilibrium real estate prices.

The second intuition is based on a "no arbitrage" reasoning. As the end of his life approaches, an agent has to decide on how to use his assets and housing stock. He can either leave this stock to his offsprings because of an "altruistic" motive or he can sell it on the market and receive the market price. In the first case, he will benefit from the indirect utility coming from his offsprings satisfaction, net of any tax that this transfer may be subject to. In the second case, he will have a stock of wealth that he can use as he likes, including inter-generational money transfers, net of taxation. If the market equilibrium is characterized by the coexistence of donations and resales of houses, it must be the case that the representative agent is indifferent, at the margin, between donating a unit of housing to his offsprings or reselling it in the market for the market price.

When taxes on bequest and donation are abolished, two effects take place. The first effect is a direct one: the marginal benefit of donating increases and so agents adjust their optimal behavior to increase the amount of donations. The second effect is a general equilibrium one related to the no-arbitrage condition: as people donate more of their assets and housing stock, the market price of residential real estate must increase until a new equilibrium price is reached. At the new price the indifference, in utility terms, for the representative agent between resale and donation is restored: the new equilibrium is therefore characterized by a larger number of donations and higher market prices of real estate (and any other long lived asset used to make inter-generational transfers).

Our theoretical perspective is then complemented, in the second part of the paper, with an empirical investigation on the role of bequest and donation taxation. We highlight how its abolition contributed to the Italian real estate price appreciation taking place from 2001, while we also account for its dynamics before 2001. Using an original and unique dataset compiled assembling from a variety of sources data on real estate prices, sales and donations for the 13 largest Italian cities in the period 1993-2004, we find support for our main theoretical predictions: the abolition of taxation on bequests and donations had a positive and sizeable effect on real estate prices, which is statistically significant and robust to a series of additional tests. Given the characteristics of the exogenous (to real estate prices) policy change that we consider, this is, to the best of our knowledge, the *first* paper to provide such evidence.

We view our empirical result to bear important policy implications as the abolition of bequest taxation was primarily intended to benefit young generations who might find it difficult to buy houses at current market prices. Our analysis implies that, taking into account previously neglected general equilibrium effects, the Italian tax reform might actually have hurt the poorest among the young by bringing about an increase in the purchasing cost of houses.[5]

Perhaps not surprisingly, the behavior of real estate prices is the subject of a voluminous literature. A substantial body of (mostly empirical) literature tries to estimate short and long-run macroeconomic determinants of house prices (for a review of recent contributions, see Girouard et al. [12] and Goodhart and Hofmann [15]). Although many of these studies differ with respect to the countries and the time period considered, most of them reach the conclusion that *demand-side factors* such as income, interest rates, and demographic factors related to household formation play a key role for the dynamics of

[5] Our paper shows that easing the fiscal burden through lower bequest taxation might make real estate less affordable. Kopczuk [18] already pointed out that the normative analysis of the inheritance tax is very sensitive to what is assumed regarding the motivation of bequest. In our contribution we do not make any normative claim about the optimal level of bequest taxation. Rather, we put forward a positive investigation that can be generalized to all assets used to make inter-generational transfers. In particular, we believe that it is important to focus on real estate which, besides being the most commonly used asset when inter-generational transfers are involved, also represents a sizeable share of optimal portfolio strategy and a central element of any financial crisis (as documented for instance in Fugazza et al. [11] and Pelizzon and Weber [23]).

house prices. In a set of interesting applications, the fitted values from regressions are then related to the fundamental price which is compared to the actual price to discuss the presence of real estate bubbles as in Mc Carthy and Peach [22], and Terrones [27] (with aggregate data), and Abraham and Hendershott [1], Case and Shiller [7], Himmelberg et al. [21], and Smith and Smith [26] (with regional and city-level data). In a series of papers, Glaeser et al. [13], [14] highlighted the role of regulatory barriers to new constructions and land use restrictions as *supply-side factors* that can help to explain the rise of house prices in the US.

The role of fiscal policy and real estate taxation in affecting house prices has been analyzed by Bruce and Holtz-Eakin [5] and Hendershott and Price [20], who followed the seminal contributions by Poterba [24], [25]. In a recent important contribution Cagetti and De Nardi [6] provide a general account of the welfare implications of abolishing bequest taxation and how they depend on the compensating tax instrument. This approach is still subject though to the limitations in the welfare analysis highlighted by Kopczuk [18]: the specific type of bequest motive assumed affects the welfare implications of bequest taxation. However, none of these contributions address the issue that we raise in this paper: the effect of bequest taxation on the most important of long lived assets, i.e. real estate.

This paper is organized as follows. Section 2 presents the model and the market equilibrium. Section 3 discusses the properties of the equilibrium and the relationship between bequest taxation and real estate prices. Section 4 presents the empirical evidence while Section 5 concludes.

2 The Economy: Set Up

We present our analysis in the context of a production economy with overlapping generations living for two periods. We define generation t to be the set of individuals of unit measure, endowed with one unit of labor, L_t. Generation t is born at the beginning of period t and leaves the economy at the end of period $t+1$. Every generation consumes one non-durable good in each period of life: c_{1t} units when young and c_{2t} units when old. In addition to these goods, each generation chooses when young how much (durable) housing services, H_t, to enjoy during her lifetime. Generation t utility function Υ_t is defined as follows:

$$
\begin{aligned}
\Upsilon_t &= U_t + \rho U_{t+1} \\
U_t &= u(c_{1t}) + u(c_{2t}) + v(H_t) \\
u',\ v' &> 0;\ u'',\ v'' < 0 \\
0 &< \rho \leq 1
\end{aligned} \tag{1}
$$

where $u(\cdot)$ and $v(\cdot)$ denote the utility derived from consumption of non-durable goods and housing services respectively, and ρ labels inter-generational altruism.[6] In maximizing (1), generation t faces two budget constraints:

$$c_{1t} = w_t - s_t + p_t \left[(1-\tau) H_{t-1}^{don} - H_t^{mkt} \right] + (1-\tau) D_{t-1} - i_t^H \tag{2}$$

$$c_{2t} = s_t R_{t+1} + p_{t+1} H_t^{sale} - D_t \tag{3}$$

where w_t represents labor income, s_t savings, R_{t+1} the interest factor (one plus the interest rate) on savings at $t+1$, p_t the housing price in the private market, H_{t-1}^{don} the amount of housing services that generation t receives from generation $t-1$, H_t^{mkt} the amount of housing purchased by generation t in period t, H_t^{sale} the amount of housing sold by generation t when old in period $t+1$, i_t^H is generation t investment in housing and D_t the amount of consumption good donated by generation t to generation $t+1$ in period $t+1$ (which we call "money").

The government levies a bequest tax on any type of inter-generational donation. Therefore, transfer of housing and "money" between generations is charged a proportional tax of $0 \leq \tau \leq 1$.[7] We will assume that the revenue of the bequest tax raised by the government - indeed quite small in reality - is used to finance public consumption, without affecting the utility derived from private consumption.[8]

Although the interpretation may seem completely standard, the reader should notice how equation (2) is set up. H_t^{mkt} represents the actual *net* amount of housing that generation t acquires through inter-generational transfers and private markets in period

[6] The additive form of Υ_t and U_t allows us to get a closed form solution of the model but is not essential to our results. In fact, any preferences' structure *a la* Barro [2] where a generation utility is an increasing and monotonic function of the entire next generation utility would replicate our qualitative results.

[7] Bequest is taxed in the same way no matter what its form is (housing or "money"). This feature is common to developed fiscal system and applies in particular to the Italian case whose evidence we will study.

[8] This assumption is introduced only for the sake of simplicity. In fact, our main results might be affected only if the *largest share* of the tax revenue were transferred to the elder generations, which is unlikely to be the case in practice.

t. Therefore generation t must satisfy the following additional constraints on housing services:

$$H_t \leq H_t^{mkt} + H_t^{new} \tag{4}$$

where H_t^{new} represents the supply of newly produced housing services as a function of generation t investment in housing, i_t^H.

The interpretation of equation (4) is that consumption of housing services by generation t can not exceed the sum of what is purchased in private markets and what is independently built. Moreover generation t is subject to:

$$H_t^{sale} + H_t^{don} \leq H_t(1-\delta) \tag{5}$$

where δ represents the depreciation of housing services consumed by generation t. The intuition for (5) is that, when generation t becomes old, it must decide how to allocate its depreciated stock of housing services, $H_t(1-\delta)$, in period $t+1$ between donation to generation $t+1$ and resale in private markets.

The economy is endowed with two production functions. The first one produces housing services out of non-durable goods and satisfies the law of diminishing returns:[9]

$$H_t^{new} = f(i_t^H)$$
$$f' > 0, \ f'' < 0$$

We assume that housing produced by one generation becomes part of housing consumption of that same generation.

The production function of the non-durable good displays constant returns of scale in capital, K_t, and labor, L_t, and satisfies the law of diminishing returns to single factors:

$$\begin{gathered} Y_t = G(K_t, L_t) \\ G_K > 0, \ G_L > 0 \\ G_{KK} < 0, \ G_{LL} < 0 \end{gathered} \tag{6}$$

Capital is created at no cost from period t consumption good and is employed to produce $t+1$ non durable consumption good. Without loss of generality, capital fully depreciates from one period to the next and so capital accumulation follows:

$$K_{t+1} = I_t \tag{7}$$

[9] Equivalently we could assume that housing displays constant returns to scale and employs both capital and labor (in fixed supply in the economy).

It is convenient to express aggregate production in (t-generation) per capita terms exploiting constant returns to scale assumption and the fact that $L_t = 1$, $\forall t$:

$$y_t = g(k_t)$$
$$g' > 0,\ g'' < 0$$

where y_t and k_t are output and capital in period t expressed in per capita terms. Thus the law of motion of the economy (7) can be rewritten in per capita terms as:

$$k_{t+1} = i_t \tag{8}$$

where the level of capital per capita in period $t+1$, k_{t+1}, is a function of investment per capita in period t, i_t.

2.1 Market Equilibrium

Definition 1 (Market equilibrium) *The market equilibrium is a choice vector* (c_{1t}, c_{2t}, i_t, i_t^H, H_t, H_t^{sale}, H_t^{don}, H_t^{mkt}, D_t) *and a price vector* (p_t, R_{t+1}, w_t) *such that:*

(i) Agents optimize:

$$\left(c_{1t}, c_{2t}, i_t, i_t^H, H_t, H_t^{sale}, H_t^{don}, H_t^{mkt}, D_t\right) \epsilon \arg\max \Upsilon_t$$
$$s.t.\ (2),\ (3),\ (4),\ (5),\ \forall t$$

(ii) The goods' market clears:

$$c_{1t} + c_{2t-1} + i_t^H + i_t + T_t = g(k_t) \tag{9}$$

where

$$T_t = \tau\left(p_t H_{t-1}^{don} + D_{t-1}\right) \tag{10}$$

represents the tax revenues raised by the government, in order to finance public consumption.

(iii) The housing market clears:

$$H_t^{mkt} = H_{t-1}^{sale} + H_{t-1}^{don} \tag{11}$$

We can exploit the conditions above to find the two dynamic equations that describe the evolution of the housing stock and the capital stock of the economy. First, we observe that, rearranging (11) and (5), we get:

$$H_t^{mkt} = H_{t-1}^{sale} + H_{t-1}^{don} = H_{t-1}(1-\delta)$$

and thus:

$$H_t^{mkt} + H_t^{new} = H_t^{mkt} + f\left(i_t^H\right) = H_t = H_{t-1}(1-\delta) + f\left(i_t^H\right) \tag{12}$$

which means that the stock of housing for generation t, H_t, is the sum of what was resold on the market by generation $t-1$, H_{t-1}^{sale}, what was inherited by generation t from generation $t-1$, H_{t-1}^{don}, and what was produced through housing investment by generation t, $f\left(i_t^H\right)$. Equation (12) fully describes the dynamics of the housing stock of the economy.

Second, by (9), we have:

$$c_{1t} + i_t^H + T_t + i_t = g(k_t) - c_{2t-1} \tag{13}$$

Using equation (3), it yields:

$$s_{t-1}R_t = g(k_t) - w_t = c_{2t-1} + D_{t-1} - p_t H_{t-1}^{sale}$$

so that equation (13) becomes:

$$i_t = w_t + D_{t-1} - p_t H_{t-1}^{sale} - c_{1t} - i_t^H - T_t$$

and, substituting for (8), (10), we find:

$$k_{t+1} = w_t - c_{1t} + D_{t-1} - p_t H_{t-1}^{sale} - i_t^H - \tau\left(p_t H_{t-1}^{don} + D_{t-1}\right)$$

and by (2) and (11)

$$k_{t+1} = s_t \tag{14}$$

where future capital stock is equal to current private savings since there is full depreciation of capital. This completes the description of the dynamic evolution of the aggregate variables of the economy.[10]

3 The Equilibrium Price of Real Estate

Solving the maximization problem for generation t and substituting the FOCs with respect to H_t^{mkt} and H_t^{sale} into the FOC with respect to H_t we obtain:

$$v'(H_t) = p_t u'(c_{1t}) - p_{t+1}u'(c_{2t})(1-\delta) \tag{15}$$

[10] The assumption that capital fully depreciates has no effect on the qualitative implications of our analysis.If we relaxed this assumption, the old would end up selling and/or donating it to the young as they will do with the stock of housing. The same implications that our analysis draws for housing could then be extended to capital, but they would still hold.

This equation has a very simple interpretation: it states that generation t equalizes the marginal benefit of consuming an additional unit of housing to its marginal cost measured by the difference between the utility weighted cost of purchasing housing - $p_t u'(c_{1t})$ - and the utility weighted benefit of reselling it when old, net of depreciation - $p_{t+1}u'(c_{2t})(1-\delta)$.

A similar equation may be derived with respect to the optimal amount of donation, substituting the FOC with respect to H_t^{don} into the FOC with respect to H_t:

$$v'(H_t) = p_t u'(c_{1t}) - p_{t+1}(1-\tau) \cdot \rho \cdot u'(c_{1t+1})(1-\delta) \tag{16}$$

Equation (16) can be interpreted as the equality between the marginal benefit of consuming an additional unit of housing and the marginal cost measured by the difference between the utility weighted cost of purchasing housing - $[p_t u'(c_{1t})]$ - and the utility weighted benefit of donating it to generation $t+1$ net of taxation and depreciation - $[(1-\tau)\rho \cdot p_{t+1}u'(c_{1t+1})(1-\delta)]$.

Joining (15) and (16), it is easy to observe that, in equilibrium, each old generation will choose consumption and the level of donation so that its marginal utility equates the marginal utility of consumption of the following generation, accounting for the degree of inter-generational altruism (ρ) and bequest taxation (τ):

$$u'(c_{2t}) = (1-\tau) \cdot \rho \cdot u'(c_{1t+1}). \tag{17}$$

Equation (17) shows that generation t may find it optimal to decrease its consumption when old allowing for larger inter-generational transfers. Moreover, comparing equation (17) with the FOC with respect to s_t,

$$u'(c_{1t}) = R_{t+1}u'(c_{2t}), \tag{18}$$

it obtains:

$$\frac{u'(c_{1t})}{u'(c_{1t+1})} = (1-\tau) \cdot \rho \cdot R_{t+1}. \tag{19}$$

Equation (19) is interesting because it helps understanding the dynamic behavior of the economy. Since $R_{t+1} \geqslant 1$ and $(1-\tau)\rho \leqslant 1$, the right-hand side could be larger, equal or smaller than one. If $[(1-\tau) \cdot \rho \cdot R_{t+1}] > 1$, this would imply that consumption when young increases from one generation to the next. Vice-versa, if $[(1-\tau) \cdot \rho \cdot R_{t+1}] < 1$ then it would decrease from one generation to the following one. In order to fully exploit equation (19), we define the steady state of the economy:

Definition 2 (Steady state) *The steady state of the economy is defined by constant allocations across generations:*

$$c_{1t} = c_{1t+1} = c_1, \forall t$$
$$c_{2t} = c_{2t+1} = c_2, \forall t$$
$$H_t = H, \forall t$$

Given our stationary environment, we can safely focus on the stationary steady state of the economy. Since R_{t+1} is an endogenous price - the relative price of consumption when young over consumption when old -, in the steady state it must adjust so that $\frac{u'(c_{1t})}{u'(c_{1t+1})} = 1$. By (19) and (18), we have:

$$R = \frac{1}{(1-\tau)\cdot\rho} \tag{20}$$

By (15) and (18), the steady-state equilibrium price of housing p becomes:

$$p = \frac{v'(H)}{\rho \cdot u'(c_1)\left[1 - \frac{(1-\delta)}{R}\right]} \tag{21}$$

and so, by (20):

$$p = \frac{v'(H)}{u'(c_1)\left[1 - (1-\tau)\cdot\rho(1-\delta)\right]} \tag{22}$$

which is the same expression that we could have derived using equation (16). The resulting steady state real estate price, p, can be used - joining FOCs with respect to i_t^H and H_t^{mkt} - to determine the steady state level of housing investment, i^H:

$$p = \frac{1}{f'(i^H)} \tag{23}$$

To fully characterize the steady-state real estate price, we can state the following proposition:

Proposition 1 (Housing price) *In steady state, the price of housing, p:*

1. *increases as the tax rate on bequests, τ, decreases;*
2. *increases as housing depreciation, δ, decreases;*
3. *increases as the level of inter-generational altruism, ρ, increases if the substitution effect (weakly) dominates the income effect.*

Proof. See Appendix for proof of (2) and (3). ■

Here we find it worthwhile to illustrate the simple proof for (1). In the case of a decrease in τ, one needs to consider its effect on the interest rate. First, by (20), a decrease in τ decreases the real interest rate R in steady state. If the substitution effect dominates the income effect, a decrease in the real interest rate increases young age consumption c_1, and decreases marginal utility of consumption of the young, $u'(c_1)$. Rearranging (22) into the following:

$$\frac{p \cdot u'(c_1)}{v'(H)} = \frac{1}{[1 - (1 - \tau) \cdot \rho(1 - \delta)]} \tag{24}$$

we observe that, as τ decreases, $\left(\frac{p \cdot u'(c_1)}{v'(H)}\right)$ must increase for (24) to be satisfied. Since $u'(c_1)$ decreases, something else must adjust to increase the ratio $\left(\frac{p \cdot u'(c_1)}{v'(H)}\right)$. Assume, by contradiction, that only $v'(H)$ decreases but p remains unchanged. This implies that H increases. But this is only possible, by (12),if i^H also increases. Then $f'(i^H)$ must decrease and, by (23), p thus increases in steady state, contradicting the assumption that only $v'(H)$ decreases.

The main result of Proposition 1 is that lower bequest taxes increase the steady-state price of housing. The intuition is based on a "no arbitrage" argument. Once it has been enjoyed by the generation that owns it, housing can be employed in two ways: it can either be sold on the market at given price p or it can be transferred to the following generation. In equilibrium, the two uses must yield the same marginal utility, otherwise only one use - the one delivering more utility - would be observed. As bequest taxation decreases, the benefit of inter-generational transfers increases. Therefore, old agents become more willing to bequeath and less willing to sell their houses on the market. The increase in donation and bequest delivers a positive wealth effect on the young generation that raises equilibrium prices. The rise in the real estate price, p, continues until the utility that the old enjoy by selling houses on the market equalizes the one enjoyed by transferring it to the following generation, net of bequest taxes. Therefore we can state the following corollary to Proposition 1:

Corollary 1 *In steady state, a decrease in the tax rate on bequests, τ, strictly increases the total amount of equilibrium donation ($H_t^{don} + D_t$) and, almost surely, the amount of real estate donation, (H_t^{don}).*

The qualification "almost surely" comes from the fact that the increase in donation resulting from the reduction of the bequest tax may take place in any combination of money or real estate. Although it is theoretically conceivable that only money donation will react to the tax change, this is only one possible allocation in a continuum of equilibria and it has, therefore, measure zero.[11]

It is interesting to notice that, while the implications of Proposition 1 and its Corollary apply quite naturally to real estate, they can be extended to a variety of assets. In fact, the same observations could be drawn on the price of *any financial asset* that exceeds the life-span of a generation and may thus be used for inter-generational transfers.[12]

4 Empirical Analysis

In this section we bring our analysis to the data testing the effect on real estate prices of the abolition of bequest taxation. We do so by asking the following question: if, as our model implies, the abolition of the bequest tax has increased, *ceteris paribus*, the steady-state level of real estate prices, can we find in the Italian empirical evidence an acceleration of real estate appreciation that started in 2001 and is linked to the tax change?

To this end, we use a unique dataset built by combining a variety of sources, two of which are proprietary (real estate prices and donations) and were not available before. We focus on (proprietary) prices (per squared meter) of urban *residential* real estate units in the 13 major Italian cities over time. These cities together represent slightly more than 15% of the current Italian population. We combine economic and demographic data about Italy, European real estate price data and data from the Italian Ministry of the Economy and Public Finances regarding residential real estate donations. Data have annual frequency and are disaggregated by city to build a panel dataset covering the period 1993-2004 which includes the year (2001) when bequest and donation taxation was abolished. All variables are netted of CPI inflation and should be considered as real (additional information on

[11] For a study of the transitional dynamics of bequest behavior between the two steady states, we can refer to Grossmann and Poutvaara [16], who study these in a different but very related setup.

[12] We are aware that additional mechanisms could affect the behavior of real estate prices. For instance, if the tax rate on bequests, τ, is sufficiently steep, it may tend to depress real estate prices because of forced sales to pay taxes within a short period of time after death. Moreover, after the abolition of bequest taxation, there could be a smaller number of houses availabe in the market, especially if the recipient chooses to over-consume housing services because of the bequest. Finally, if we extended our analysis to the case of heterogenous houses, we might find a particularly large increase of prices for homes in desirable neighborhoods where they are more likely to be bequeathed from one generation to the next one. These mechanisms, if anything, would actually reinforce our main prediction that a decrease in bequest taxation induces an increase in real estate prices. This is the reason why we chose to simplify the analysis and not incorporate them in the model.

the dataset are available in the Data Description in the Appendix).

We test the main predictions of this paper about the relationship between taxation of bequests and *inter vivos* donations and real estate prices, as stated in Proposition 1 and its Corollary. Although these propositions predict a discrete increase in the price level of housing once bequest taxation is abolished, in our empirical strategy we test whether there was an acceleration in the *rate of growth* of real estate prices after the tax change. This seems a natural strategy in order to bring our stylized model to the data. In fact, prices are likely to take some time to reach the new equilibrium in the residential real estate market, where several frictions exist.

Since our dataset covers slightly more than a decade and *inter vivos* donations react much faster than bequests but are taxed in the same way, we will focus on the former to show the effect of this kind of taxation on real estate prices. As we already discussed, the main prediction of the theory that we put forward is that the abolition of bequest and donation taxation brought about an increase in real estate prices. We start by the preliminary test:

$$\Delta p_{it} = \alpha_i + \beta \cdot time + \gamma \cdot Tax + \varepsilon_{it}$$

where the dependent variable Δp_{it} represents the real growth rate in the price of residential housing (per squared-meter) in city i between year t and $t-1$, α_i are time-invariant city-level fixed effects, $time$ is the time trend and Tax is a time dummy taking value 1 in all years when bequest and donation taxation was abolished (year $\geq$ 2001).

Table 2 suggests that there was an acceleration in real estate appreciation that started from 2001, the year when bequest and donation taxation was abolished. Although the abolition of bequest taxation included little more than two months in 2001, the evidence supports the view that its effect was far from negligible as the increase in the number of bequests was in excess of 100% (see Figure 2). This is most likely due to the fact that the government elected in 2001 made it very clear that it would have abolished bequest and donation taxation and, therefore, individuals most likely postponed their donations to the last part of 2001.[13]

According to our theoretical analysis, the effect of the abolition of bequest taxation is channeled to real estate prices via the surge in the number of donations. Specifically,

[13] It is also quite unlikely that this policy change simply legalized donations that were previously hidden through cash transfers after housing sales. The reason is two-fold. First, the increase in the number of donations is so large that it seems unlikely that the government would have allowed so much tax evasion that was so easy to discover given traceability of financial transactions. Second, if one argues that individuals could easily evade bequest taxation, it is very puzzling that, before the tax abolition, 1/3 of all residential units transacted in Italy was in fact donated.

our model predicts that, *ceteris paribus*, the rise in donations is one of the reasons for the acceleration in real estate price growth that started in 2001. This prediction is going to be investigated in the remaining of this section. The general equilibrium analysis in Section 3 provides guidance in the empirical strategy to study the effect of bequest tax on the rate of growth of real estate prices.[14] When bequest taxation is abolished, agents reallocate a sizeable share of their housing stock towards donations and bequests. The size of this reallocation in turn affects the extent of real estate appreciation.

A preview of our empirical strategy is as follows. We use a two-stage estimation strategy in our panel (fixed effect) regression. In the first stage, we regress the number of donations, market sales and the level of real estate investment on a set of instruments, including the Tax dummy (Tax), and additional controls. In the second stage, we use our estimates to assess the effect of each of these three factors on real estate prices. Formally, we want to estimate:

$$\Delta p_{it} = \alpha_i + \beta^D \cdot H_{it}^{don} + \beta^S \cdot H_{it}^{sale} + \beta^I \cdot \Delta i_t^H / Y_t + \beta \cdot (Controls)_{it} + u_{it} \qquad (25)$$

where, following Proposition 1 and its Corollary, Δp_{it} is determined by the number of donations, H_{it}^{don}, and market sales, H_{it}^{sale}, *per 100 inhabitants* taking place in city i and year t and involving residential real estate units only, and by $\Delta i_t^H / Y_t$, the national growth rate of physical investment in residential real estate (over GDP) between year t and $t-1$.

Endogeneity is clearly the main problem of this specification, since the number of sales and donations and the level of investment are likely to respond to residential real estate appreciation. In order to tackle this problem, we instrument the three variables, H_{it}^{don}, H_{it}^{sale} and $\Delta i_t^H / Y_t$, by the following set of exogenous demographic and macroeconomic variables: r_t is the (national level) average interest rate on house mortgages in year t, Δw_{it} is the growth rate of per capita employees' compensation in city i between year t and $t-1$, $\Delta\left(Res < 25/Res > 65\right)_{it}$, the change in the ratio of under 25 resident and over 65 resident in city i between year t and $t-1$, and (obviously) Tax.[15]

There are good reasons to believe these instruments are exogenous and not weak. First, r_t is the average borrowing interest rate on house mortgages in Italy in year t: it depends (very closely) on exogenous monetary policy and is unlikely to have an effect on real estate price growth that does not go through sales, donations and investment. Moreover, the inclusion of this variable also allows to capture the effect of the introduction of the euro

[14] See the discussion after Proposition 1.

[15] Notice that the rate r_t - a borrowing rate - is not the same as R_t in the model of Sections 2 and 3. R_t represents the rate of return of investing in assets different from real estate. In fact, R_t in our empirical strategy is represented by the annual return on the stock market, R_t^{equity}.

in Italy. The mortgage interest rate is an especially good instrument as home equity is unavailable and the liberalization of mortgage refinancing took place only after the period under scrutiny. Therefore, a reduction in the interest rate on mortgages is likely to affect real estate prices *only if* individuals take advantage of it by purchasing (H_{it}^{sale}) or building ($\Delta i_t^H / Y_t$) additional real estate. Δw_{it} depends on productivity and bargaining dynamics. The change in the number of young over old residents, $\Delta \left(Res < 25 / Res > 65 \right)_{it}$, is also likely to be exogenous. Both salary and demographic dynamics seem to affect real estate prices only insofar as they affect market exchanges and investment in the housing market. Finally, the time dummy Tax depends on exogenous tax decisions and its effect on real estate prices, as the model argues, is channeled through the number of donations (H_{it}^{don}). We will focus on this last instrument, which is crucial to test the implication of this study.

We also introduce the relevant additional controls such as R_t^{equity}, the Italian stock market (cum dividend) real annual return between year t and year $t-1$, $(NetCapInflow/Y)_t$, capital inflows (net of the change in international reserves) over GDP in year t and ΔPop_{it}, the population growth rate in city i between year t and $t-1$. The inclusion of net capital inflows, $(NetCapInflow/Y)_t$, from the financial account of the balance of payments deserves a specific comment. Between November 1st, 2001 and February 28th, 2002 the Italian government provided a tax shield which allowed all funds held abroad by Italian residents to re-enter the country under a very favorable tax treatment. Since these inflows may have had an effect on real estate appreciation, it is important to include net capital inflows among the set of control variables in our regression.[16]

Tables 3a and 3b show the results of our empirical analysis. Consistently with our theory, the first stage of the regression displayed in Table 3a shows that the abolition of bequest and donation taxation had a positive and significant effect on the number of donations but negative on the number of real estate sales. As intergenerational transfers made through donations become cheaper (i.e. less taxed), agents reallocate their housing stock away from the market and toward donations. All remaining coefficients have an intuitive interpretation: the real interest rate on mortgages - an indicator of credit availability - has a negative effect on both investment in the real estate sector and the number of market transactions; a relatively younger population, i.e. a larger $\Delta \left(Res < 25 / Res > 65 \right)$, increases market transactions and decreases the number of donations; an increase in labor income, $\Delta w_{it}(percapita)$, increases market transactions but decreases the number of donations as would be expected in the case of rationally altruistic agents, capital inflows and population growth have a positive effect on the level of real estate investment, while they

[16] City dummies are also included in the estimation although their coefficients are omitted in the tables.

had no statistically significant effect of market transactions and donations. The *F-tests* on the first stage lean toward the view that the chosen instruments are not weak.

Tables 3b displays the second stage of the regression and shows that the number of donations has a statistically significant effect on real estate price growth. Two main remarks are worthwhile mentioning here. First, not surprisingly, we find that demand (H_{it}^{sale} and H_{it}^{don}) and supply ($\Delta i_t^H/Y_t$) factors have a statistically significant effect on the dynamics of residential real estate prices. Second, donations (which are typically between 5% and 80% of the number of market transactions in our dataset, depending on the city and year) have a particularly strong effect on real estate price growth, especially if compared with market transactions. We find that, on average, if 1 more resident every 100 in a given city and year receives a donation of a unit of residential real estate - indeed a very large increase -, the market price would rise by roughly 20%.

Although we consider regressing the change in real estate prices on the yearly flows of residential real estate donations and market transactions as the most accurate test of our model, our empirical results turn out to be robust to the possibility that the growth of real estate prices responds to the change in the number of donations and market transactions and not to their annual flows. Specifically, we regress a slightly modified version of (25):

$$\Delta p_{it} = \alpha_i + \beta \cdot (\Delta H_{it}^{don} - \Delta H_{it}^{sale}) + \beta^I \cdot \Delta i_t^H / Y_t + \beta \cdot (Controls)_{it} + u_{it} \qquad (26)$$

where instead of the the number of donations, H_{it}^{don}, and market sales, H_{it}^{sale}, we introduce as explanatory variable the difference between the change in the number of donations and market transactions, $(\Delta H_{it}^{don} - \Delta H_{it}^{sale})$. Consistently with our theory, we find that real estate price tend to increase when donations grow faster than market transactions. We address the endogeneity of regressor $(\Delta H_{it}^{don} - \Delta H_{it}^{sale})$, as in the case of regression (25), by instrumenting $(\Delta H_{it}^{don} - \Delta H_{it}^{sale})$ with the real interest rate, r_t,the change in proportion of young relative to old people in given year and city, $\Delta \left(Res < 25/Res > 65\right)_{it}$, and the "bequest tax" time dummy, Tax. The reader can refer to the beginning of this section for a discussion of why we believe that these are appropriate instruments. First and second stages are reported in Table 4a and 4b in the appendix.

It could be argued that the abolition of bequest taxation had a statistically insignificant effect on the price dynamics of newly built residential units, since the units being donated are typically "used", i.e. pre-existing units. To this end, we replicate the empirical exercise considered in (25) using as dependent variable the real growth in the price of "newly built" residential real estate in the different cities of the sample, Δp_{it}^{NEW}. Results are reported in Table 5 and turn out to be in line with those of Table 3b. This is not surprising since, in equilibrium, the price of new and "used" real estate units must move in the same direction: the difference in their prices can only be a premium (in the levels) due to the different qualities of the same asset (real estate).

We conduct two additional checks of the robustness of our results. First, we address the concern that our central instrument, i.e. the Tax dummy variable, is capturing some other *time* effect that was present before and is not related to the abolition of bequest taxation. We do so by repeating the exercise in (25) but introducing different "placebo" time dummies taking value equal to one starting from years before and after 2001. The second stage R-squares reported in Table 6 show that the time dummy capturing the *actual* tax change, i.e. Tax, provides a better (or comparable) fit than the two alternative "placebo".

Second, since we are unable to apply a difference-in-difference analysis because the abolition of bequest and donation taxation was introduced in all Italian cities and regions at the same time, we address the concern that our regression is capturing some general, Europe-wide or time *trend* toward real estate appreciation. If this were the case, the significance of our Tax dummy variable could be a result of this sector or time specific effect only. We thus perform the same empirical estimation of equation (25) but we add the real growth rate in real estate prices in EU-15[17], $\Delta p_t - EU15$, as control variable. If there was just a time trend effect, $\Delta p_t - EU15$ would be likely to absorb it as real estate prices in Europe has been growing continuously during the time span of our analysis. The two stages of this enriched regression are displayed in Tables 7a and 7b. This would make the Tax dummy not significant in the first stage (Table 7a) and take away the significance of H_{it}^{don} in the second stage (Table 7b) or, at least, reduce their effects substantially. As it can be checked by comparing the two set of estimates (Tables 3a and 3b and Tables 7a and 7b), almost no difference in the point estimates emerges. Moreover, both Tax and H_{it}^{don} remain statistically significant, even after the introduction of the additional control $\Delta p_t - EU15$. This is reassuring as it makes hard to claim that our results are just capturing a time trend effect.

Moreover, we report in Figure 4 the average (cross-city) residuals of regression (25) including and excluding $\Delta p_t - EU15$. It is interesting to notice that the additional variable does not seem to improve the fit of the model in the years around the abolition of bequest taxation. This is particularly important because, as real estate appreciation started in 1999 in Italy, one could be concerned that our Tax dummy is only capturing an underlying European trend toward real estate appreciation. This does not seem to be case as Tax

[17] Source: Eurostat. Data are available only starting from 1997.

retains its explanatory power even after the introduction of $\Delta p_t - EU15$.

We finally employ the constructed dataset and the estimates of (25) to provide a possible evaluation of the city-level effect of the abolition of bequest and donation taxation. This can be done by exploiting the fact that different cities displayed different reactions in terms of market transactions and donations to the abolition of bequest and donation taxation at the national level. To estimate the real estate price appreciation due to the tax change alone, we compute the change in prices predicted by the change in the three instrumented variables due to the policy shock. Formally:

$$\begin{aligned}\widehat{\Delta p}_{i2001\text{Tax Change}} &= \widehat{\beta^D}_{IV} \cdot \widehat{\gamma}^D_{TAX} \cdot \Delta_{2001}\left(H^{don}_{it}\right) + +\widehat{\beta^S}_{IV} \cdot \widehat{\gamma}^S_{TAX} \cdot \Delta_{2001}\left(H^{sale}_{it}\right) \\ &+\widehat{\beta^I}_{IV} \cdot \widehat{\gamma}^I_{TAX} \cdot \Delta_{2001}\left(\Delta i^H_t / Y_t\right)\end{aligned} \quad (27)$$

where $\Delta_{2001} X_{it} = X_{i2001} - X_{i2000}$, i.e. the change in variable X at city level between year 2001 and 2000, $\widehat{\beta^j}_{IV}$, $j = D, S, I$ are second stage coefficients estimated in equation (25) and $\widehat{\gamma}^j_{TAX}$, $j = D, S, I$, are the first stage estimates for the coefficients of the tax dummy, Tax, on the three instrumented variables. The city level estimates are above 10% supporting the claim that changes in bequest and donation taxation have important effects on the prices of assets used to make inter-generational transfers. All results are reported in Table 8.

5 Conclusions

This paper develops a theoretical and empirical investigation of the relationship between the fiscal treatment of bequests and *inter vivos* donations and the price dynamics of long-lasting assets in general and real estate in particular.

From a theoretical point of view, we show that, in a general equilibrium perspective, changes in the level of taxation on bequests and donations affect real estate prices. To put it shortly, as the market equilibrium for real estate is characterized by the coexistence of donations and resales of houses, it must be the case that the marginal agent is indifferent between donation and resale of housing. When taxes on bequest and donations are lowered, two effects take place. First, the marginal benefit of donating increases so that the amount of donations increases (direct effect). Second, as more and more people donate their housing stock, the market price of residential real estate *increases* until a new equilibrium is reached where the marginal utilities of resales and donations are equalized (general equilibrium effect).

From an empirical point of view, we test our theoretical predictions by exploiting a unique *policy shock* (i.e. the abolition of bequest and donation taxation which took place in Italy in 2001) through an original dataset on real estate sales, donations and prices at city level. By focusing on such rare policy change, this is to the best of our knowledge the *first* paper in the literature to document the effect of bequest and donation taxation on real estate prices. In particular, we find strong supporting empirical evidence that the abolition of taxation on bequests and donations had a significant and sizeable positive effect on real estate prices, on top of what can be explained by macroeconomic and demographic factors. This result is robust to a set of different specifications.

Real estate had a central role in the current global financial crisis and we should pay special attention to any fiscal and tax policy that may affect its price, especially when this effect is the result of an unexpected general equilibrium mechanism and it is sizeable, as this study of the Italian case suggests. After all, real estate may still remain "the root of all evil" in future financial and economic crises.

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6 Appendix

6.1 Agents' optimization

The solution to the problem in section 2 is equivalent to the maximization of the following Lagrangian function, $\mathcal{L}$:

$$\mathcal{L} = U_t + \rho U_{t+1} + \mu((1-\delta)H_t - H_t^{sale} - H_t^{don}) + \lambda(H_t^{mkt} + f(i_t^H) - H_t)$$

where μ and λ represent the multipliers on constraints (5) and (4) respectively. We substitute c_{1t} and c_{2t} according to (2) and (3). The relevant first order conditions are:

$$u'(c_{1t}) = R_{t+1}u'(c_{2t}) \tag{s_t}$$

$$v'(H_t) = \lambda - \mu(1-\delta) \tag{H_t}$$

$$p_t u'(c_{1t}) = \lambda \tag{H_t^{mkt}}$$

$$p_{t+1}u'(c_{2t}) = \mu \tag{H_t^{sale}}$$

$$(1-\tau)p_{t+1} \cdot \rho u'(c_{1t+1}) = \mu \qquad (H_t^{don})$$

$$(1-\tau) \cdot \rho u'(c_{1t+1}) = u'(c_{2t}) \qquad (D_t)$$

$$\lambda f\,'(i_t^H) = u'(c_{1t}) \qquad (i_t^H)$$

6.2 Proof of Proposition 1

(2). Assume that δ increases. Then, by (22):

$$p > \frac{v'(H)}{u'(c_1)\left[1-(1-\tau)\cdot\rho(1-\delta)\right]}$$

and nobody would buy housing since the marginal cost is higher than the marginal benefit. But then p must fall and so, by (23), i^H also decreases. Thus, by (12), H decreases while, by (2), c_1 (weakly) increases delivering a new housing price p below the original one.

(3). By (20), an increase in ρ decreases r. If the substitution effect dominates the income effect, a decrease in the real interest rate decreases $u'(c_1)$. By (24), we get that, as ρ increases, $\left(\frac{p \cdot u'(c_1)}{v'(H)}\right)$ must increase for (22) to be satisfied. Since $u'(c_1)$ decreases, something else must adjust. Assume, by contradiction, that $v'(H)$ decreases alone. This implies that H increases. But this is only possible, by (12), if i^H also increases. Then, by (23), $f'(i^H)$ decreases and p must increase, contradicting the initial assumption.

6.3 Tables and Figures

Bequest and Inter-Vivos Donation Taxation in Italy

	Tax Base	**Exemption**	**Tax**	
Law 346/1990	Total	Total Estate	Brackets	Rate (%)
Bequest Tax (BT)	Donor Estate	$\leq$ 125K Euro	125K-175K	3
			175K-250K	7
		Higher tax	250K-400K	10
		on non relative	400K-750K	15
		recipients	750K-1500K	22
			>1500K	27
Law 342/2000	Estate Received	Individual	Spouse	4%
Exemption	by Each Recipient	Share Estate	Direct Relatives	4%
Threshold		$\leq$ 175K Euro	Relatives $\leq$ 4th Degree	6%
Increased			Others	8%
Law 383/2001				
Abolition BT				

Table 1

Panel - FE	Δp_{it}
Tax	2.824*
	(1.41)
time	1.13**
	(0.218)
Observations	156
R-squared (overall)	0.54
SE in parentheses	*City* Dummies
	α omitted
* significant at 5%	** significant at 1%

Table 2

IV-Estimation	$\Delta i_t^H/Y_t$ **1st Stage (a)**	H_{it}^{sale} **1st Stage (b)**	H_{it}^{don} **1st Stage (c)**
r_t $(Instrument)$	-0.797**	-0.053**	0.003
	(0.029)	(0.01)	(0.003)
Tax $(= 1\ if\ year \geq 2001)$ $(Instrument)$	-3.283**	-0.116*	0.29**
	(0.177)	(0.052)	(0.026)
$\Delta\,(Res < 25/Res > 65)$ $(Instrument)$	0.185	0.13**	-0.03**
	(0.096)	(0.028)	(0.007)
$\Delta w_{it}(per\ capita)$ $(Instrument)$	-0.009	0.014*	-0.01**
	(0.03)	(0.01)	(0.003)
$(NetCapInflow/Y)_t$	1.032**	0.026	-0.001
	(0.063)	(0.024)	(0.008)
ΔPop_{it}	0.089*	-0.003	-0.001
	(0.038)	(0.014)	(0.003)
R_t^{equity}	-0.025**	-0.0007	0.0001
	(0.003)	(0.00008)	(0.0002)
Observations	156	156	156
R-squared	0.88	0.93	0.92
F-test: All Inst's $\beta = 0$	765.83	21.84	58.24
SE in parentheses	* significant at 5%	** significant at 1%	$City$ Dummies α omitted

Table 3a

IV-Estimation	Δp_{it} **2nd Stage**
$\Delta i_t^H / Y_t$	1.426**
	(0.441)
H_{it}^{sale}	9.798**
	(3.441)
H_{it}^{don}	21.48**
	(4.986)
$(NetCapInflow/Y)_t$	-0.044
	(0.545)
ΔPop_{it}	-0.794*
	(0.384)
R_t^{equity}	0.033
	(0.02)
Observations	156
R-squared	0.59
SE in parentheses	*City* Dummies α omitted
* significant at 5%	** significant at 1%
Anderson Test (identification / IV relevance test)	24.84**
Hansen J statistics (overidentification all instruments)	1.05

Table 3b

IV-Estimation	$\Delta i_t^H / Y_t$ **1st Stage (a)**	$(\Delta H_{it}^{don} - \Delta H_{it}^{sale})$ **1st Stage (b)**
r_t $(Instrument)$	-0.797**	8.219**
	(0.029)	(2.091)
Tax $(= 1\ if\ year \geq 2001)$ $(Instrument)$	-3.283**	117.517*
	(0.177)	(18.53)
$\Delta\,(Res < 25/Res > 65)$ $(Instrument)$	0.185*	-4.439
	(0.096)	(4.628)
$\Delta w_{it}(per\ capita)$	-0.009	-1.226
	(0.03)	(1.786)
$(NetCapInflow/Y)_t$	1.032**	-30.69**
	(0.063)	(6.252)
ΔPop_{it}	0.089*	-6.688**
	(0.038)	(1.849)
R_t^{equity}	-0.025**	-0.605**
	(0.003)	(0.146)
Observations	156	156
R-squared	0.88	0.48
F-test: All Inst's $\beta = 0$	633.12	13.68
SE in parentheses	* significant at 5%	*City* Dummies
	** significant at 1%	α omitted

Table 4a

IV-Estimation	Δp_{it} **2nd Stage**
$\left(\Delta i_t^H\right)/Y_t$	3.135**
	(0.359)
$\left(\Delta H_{it}^{don} - \Delta H_{it}^{sale}\right)$	0.095**
	(0.02)
$(NetCapInflow/Y)_t$	1.596**
	(0.02)
$\Delta w_{it}(per\ capita)$	-0.19
	(0.284)
ΔPop_{it}	-0.246
	(0.407)
R_t^{equity}	0.133
	(0.029)
Observations	156
R-squared	0.29
SE in parentheses	*City* Dummies β omitted
* significant at 5%	** significant at 1%
Anderson Test (identification / IV relevance test)	44.37**
Hansen J statistics (overidentification all instruments)	2.017

Table 4b

IV-Estimation	Δp_{it}^{NEW} **2nd Stage**
$\Delta i_t^H / Y_t$	1.51**
	(0.451)
H_{it}^{sale}	7.945*
	(3.441)
H_{it}^{don}	26.973**
	(5.021)
$(NetCapInflow/Y)_t$	-0.558
	(0.549)
ΔPop_{it}	-0.553*
	(0.226)
R_t^{equity}	0.036
	(0.021)
Observations	156
R-squared	0.61
SE in parentheses	*City* Dummies α omitted
* significant at 5%	** significant at 1%
Anderson Test (identification / IV relevance test)	24.83**
Hansen J statistics (overidentification all instruments)	0.081

Table 5

IV-estimation	Δp_{it} **R-squared - 2nd stage**
$Pseudo-Tax$ $(= 1\ if\ year \geq 2000)$ $(Instrument)$	0.338
Tax $(= 1\ if\ year \geq 2001)$ $(Instrument)$	**0.598**
$Pseudo-Tax$ $(= 1\ if\ year \geq 2002)$ $(Instrument)$	0.602

Table 6

IV-Estimation	$\Delta i_t^H/Y_t$ **1st Stage (a)**	H_{it}^{sale} **1st Stage (b)**	H_{it}^{don} **1st Stage (c)**
r_t $(Instrument)$	-1.050**	-0.035	0.006
	(0.002)	(0.021)	(0.007)
Tax $(= 1\ if\ year \geq 2001)$ $(Instrument)$	-2.329**	-0.130*	0.271**
	(0.006)	(0.055)	(0.031)
$\Delta\,(Res < 25/Res > 65)$ $(Instrument)$	0.031**	0.113**	-0.027*
	(0.004)	(0.036)	(0.011)
$\Delta w_{it}(per\ capita)$ $(Instrument)$	0.008**	0.006	-0.003
	(0.001)	(0.014)	(0.005)
$(NetCapInflow/Y)_t$	0.290**	0.029	0.012
	(0.002)	(0.028)	(0.014)
ΔPop_{it}	0.004	-0.022	0.002
	(0.004)	(0.023)	(0.007)
R_t^{equity}	-0.001**	-0.003*	-0.000
	(0.000)	(0.001)	(0.000)
$\Delta p_t - EU15$	0.874**	-0.018	-0.038*
	(0.003)	(0.029)	(0.015)
Observations	104	104	104
R-squared	0.99	0.95	0.97
F-test: All Inst's $\beta = 0$	252.3	875.26	394.95
SE in parentheses	* significant at 5%	** significant at 1%	*City* Dummies α omitted

Table 7a

IV-Estimation	Δp_{it} **2nd Stage**
$\Delta i_t^H / Y_t$	1.753**
	(0.547)
H_{it}^{sale}	16.874**
	(5.936)
H_{it}^{don}	24.288**
	(7.030)
$(NetCapInflow/Y)_t$	-1.550
	(0.801)
ΔPop_{it}	-0.132
	(0.484)
R_t^{equity}	0.046
	(0.028)
$EU15\Delta p_t$	0.351
	(0.761)
Observations	104
R-squared	0.56
SE in parentheses	*City* Dummies α omitted
* significant at 5%	** significant at 1%
Anderson Test (identification / IV relevance test)	20.77**
Hansen J statistics (overidentification all instruments)	1.654

Table 7b

City	$\widehat{\Delta p}_{i2001}\Big\vert_{\text{Tax Change}}$	*City*	$\widehat{\Delta p}_{i2001}\Big\vert_{\text{Tax Change}}$
Bari	16.6	Napoli	14.7
Bologna	14.3	Padova	16.3
Cagliari	16.6	Palermo	14.3
Catania	15.3	Roma	13.9
Firenze	14.4	Torino	14.3
Genova	13.7	Venezia	14.7
Milano	14.8		

Table 8

Figure 1. Italy: Residential Real Estate Donations and Prices

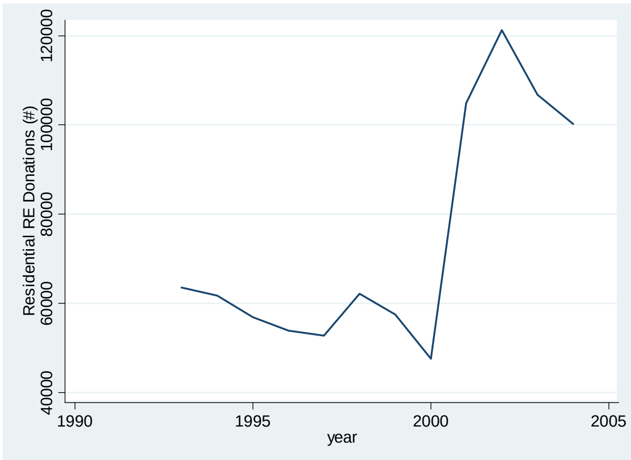

Figure 2. Italy: Total donations, residential units

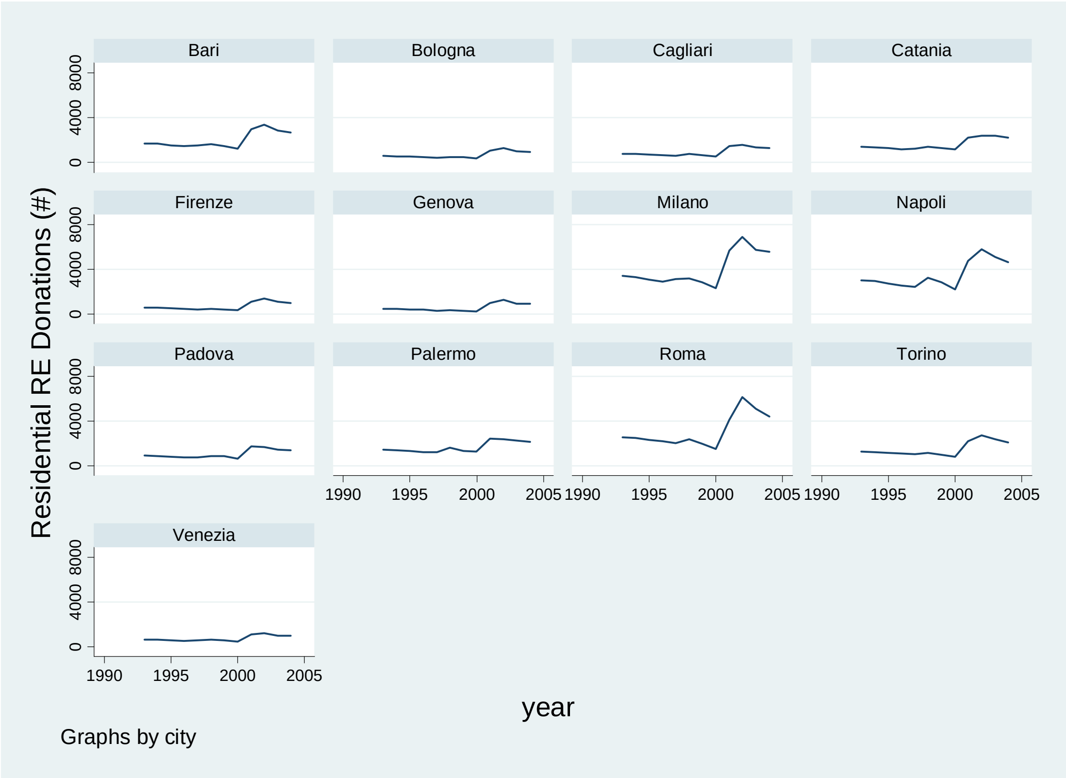

Figure 3. Donations by City

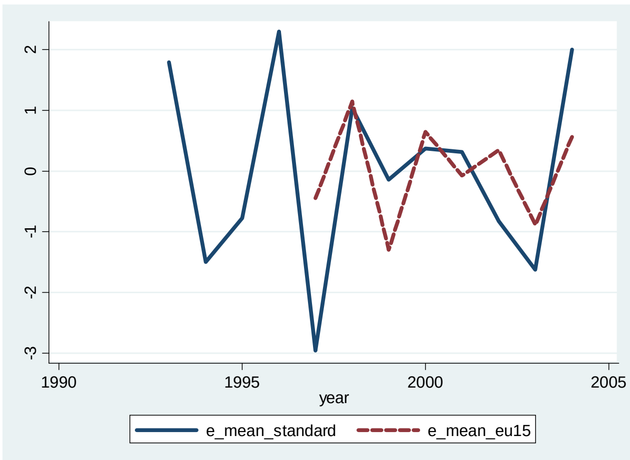

Figure 4. Residuals

6.4 Data Description

Δp_{it} and Δp_{it}^{NEW} are the annual real growth rate in, respectively, not renovated and renovated/new urban residential real estate prices (per squared meter) in the 13 major Italian cities (Source: Nomisma Real Estate, *proprietary data*)

H_{it}^{don} is the number of donations *per 100 inhabitants* taking place in city i and year t in residential real estate units (Source: ISTAT - Italian National Institute of Statistics - and Italian Ministry of Economics)

H_{it}^{sale} is the number of market sales *per 100 inhabitants* taking place in city i and year t and involving residential real estate units (Source: Nomisma Real Estate, proprietary data)

$EU15\Delta p_t$ is the annual real growth rate in real estate prices in the first 15 countries of the European Union (Source: Eurostat)

$\Delta i_t^H/Y_t$ is the national growth rate of physical investment in residential real estate (over GDP) between year t and $t-1$ (Source: ISTAT)

r_t is the (national level) average interest rate on house mortgages in year t (Source: Bank of Italy)

Δw_{it} is the growth rate of per capita employees' compensation in city i between year t and $t-1$ (Source: ISTAT)

$\Delta\left(Res < 25/Res > 65\right)_{it}$ is the change in the ratio of under 25 resident and over 65 resident in city i between year t and $t-1$ (Source: ISTAT)

R_t^{equity} is the stock market (cum dividend) real annual return between year t and year $t-1$ (Source: Research Department, Mediobanca)

$\left(NetCapInflow/Y\right)_t$ is the net capital inflow (net of the change in international reserves) over GDP in year t (Source: National Accounts, Bank of Italy)

ΔPop_{it} is the population growth rate in city i between year t and $t-1$ (Source: ISTAT)

Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
r	4.59	2.488	1.35	8.122	156
Delta(Res<25/Res>65)	-3.619	1.092	-5.571	0.144	156
Delta(w)	0.151	1.599	-4.05	5.520	156
NetCapInflow/Y	-0.189	0.938	-1.632	1.402	156
DeltaPop	-0.724	1.205	-10.895	4.25	156
R(equity)	14.198	24.545	-24.23	54.353	156
mkt100ab	1.299	0.768	0.223	3.395	156
don100ab	0.318	0.217	0.038	1.071	156
Delta(don100ab) - Delta(mkt100ab)	7.168	57.606	-75.589	320.345	156
Delta(i)/Y	0.15	1.961	-2.6	3.8	156
Delta(pNEW)	0.253	6.927	-17.745	15.732	156
Delta(p)	0.271	6.919	-15.072	15.147	156