Real Estate Prices and the Importance of Bequest Taxation

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Abstract

Taxation of bequests and donations is an important determinant of real estate prices. We show that, ceteris paribus, a decrease in taxes on inter vivos donations and bequests brings about an increase in real estate prices. We provide a general equilibrium rationalization in the context of OLG economies featuring intergenerational altruism. This has relevant policy implications. We test the predictions of our theory employing a unique policy shock: the abolition of bequest and donation taxation that took place in Italy in 2001. Considering this policy shift provides the first evidence that a drastic reduction in bequest and donation taxation significantly increased real estate prices. Our estimates suggest that the 2001 abolition of taxation on bequests and donations alone led to an appreciation of residential real estate in excess of 10%.

JEL Code: E62, H30.

Keywords: real estate prices, donations, bequest taxation.

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1 Introduction

This paper investigates the effect of the tax treatment of bequests and *inter vivos* donations on 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. President Obama is considering to reintroduce it, after President Bush opted for its complete abolition starting from 2010.[1] In addition, real estate prices played a central role in the current and past financial crisis and we should carefully consider of their determinants.

This study argues theoretically and shows empirically that the tax treatment of bequest and *inter vivos* donations (for brevity: bequest taxation from now on) is an important determinant of the price dynamics of long-lived assets in general, and real estate in particular.[2] First, we develop a theoretical analysis in the context of economies with overlapping generations to show that changes in bequest taxation have a general equilibrium effect on real estate prices. Our theoretical perspective shows that the intent of policymakers to ease the fiscal burden - by lowering bequest taxation - on a particular set of assets, namely real estate, ends up making them less affordable for the majority of the population. Then, exploiting a unique *policy shock* that took place in Italy during 2001, we provide supporting evidence that the abolition of bequest taxation had a significant and sizeable *positive* effect on real estate prices, beyond what can be explained by macroeconomic and demographic fundamentals. Given the characteristics of such a policy change - a *quasi* natural experiment-, this is the first paper to provide such evidence.

Italy offers an extraordinary opportunity to investigate and test the role of bequest taxation as a determinant of asset pricing, a point already suggested by Constantinides et al [5]: bequest taxation was in place at non negligible rates until the middle of 2001 and

[1] The Italian Law 383/2001 stated that the tax previously imposed on bequests and *inter vivos* donations (among family members) would be abolished for all transfers taking place after October 25th 2001. The bequest tax rate was progressive up to the maximum of 33%. Bequest and donation taxation was reintroduced in 2006, by Decree 262/2006, although at much lower rates and with substantially larger exemption thresholds. For a preview on the American debate see "Obama Plans to Keep Estate Tax", *Wall Street Journal,* January 12th 2009.

[2] Constantinides et al [5] already pointed out the potentially important role of bequest for asset pricing in the context of the equity premium puzzle while Bernheim et al. [2] 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 Farhi et al. [6], [7].

was abolished starting from that year.[3] There are three reasons to believe that taxation on bequests and donations is particularly important in the context of the housing market. First, housing donation is by far the predominant asset through which intergenerational transfers are carried out. Second, differently from other assets, the ratio of real estate donations over market transactions averaged more than 50% across the 13 major Italian cities in 2004. Finally, at the national level, the number of *inter vivos* donations in residential real estate showed a sharp increase after bequest taxation was abolished (Figure 1). The sudden change in economic behavior seems to indicate that the effect of the policy change was far from negligible. Restricting 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.[4]

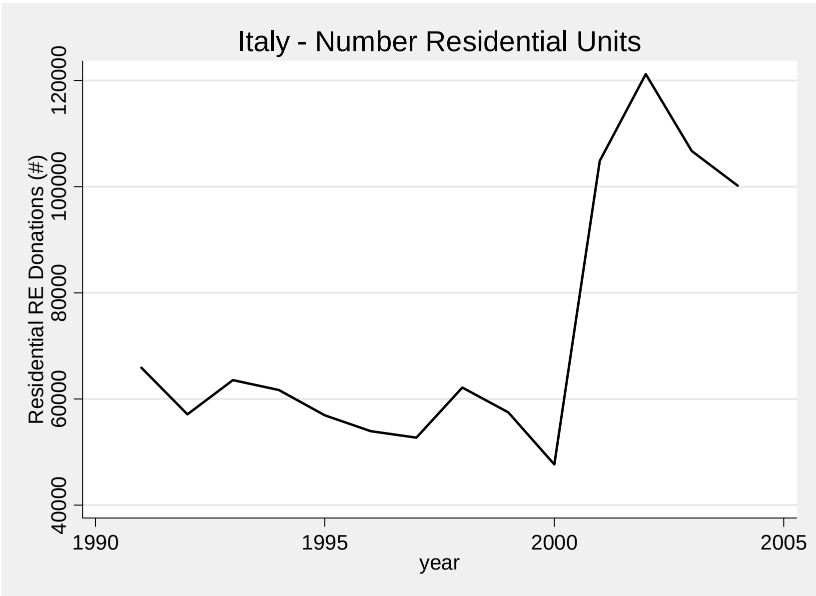

Figure 1 - Italy: Donated Residential Units

The surge in real estate prices has been a global phenomenon up to 2007. Between 1997 and 2003 real estate prices in different economies - Australia, France, Ireland, Netherlands,

[3] Until 2001 the tax rate on bequest and donations ranged from 3% to 33%, depending on the amount of the transfer.

[4] Bequest taxation was already reduced in 2000 by Law 242/2000, but this had little effect on real estate prices as the numbers of donations - which fell - and sales were not affected. A possible explanation of why the reduction of 2000 did not increase the number of donations is that agents were expecting a further reduction in the tax, that in fact took place in 2001.

Spain and the United Kingdom - have risen by more than 70 percent while Italy and the US have witnessed increase in excess of 30%.[5] By and large, it is not difficult to rationalize this empirical evidence if one considers that, during that period, most of these countries experienced sustained economic growth, some population growth and low real interest rates. First, everybody's income - and the income of the young in particular - depends closely on economic growth through salary compensations. Second, demographic growth increases the relative weight of the young generation within a given population and puts upward pressure on the available stock of housing. Third, the ease and accessibility of credit granted by low real interest rate facilitates the purchase of real estate and so it provides an additional push toward its appreciation.

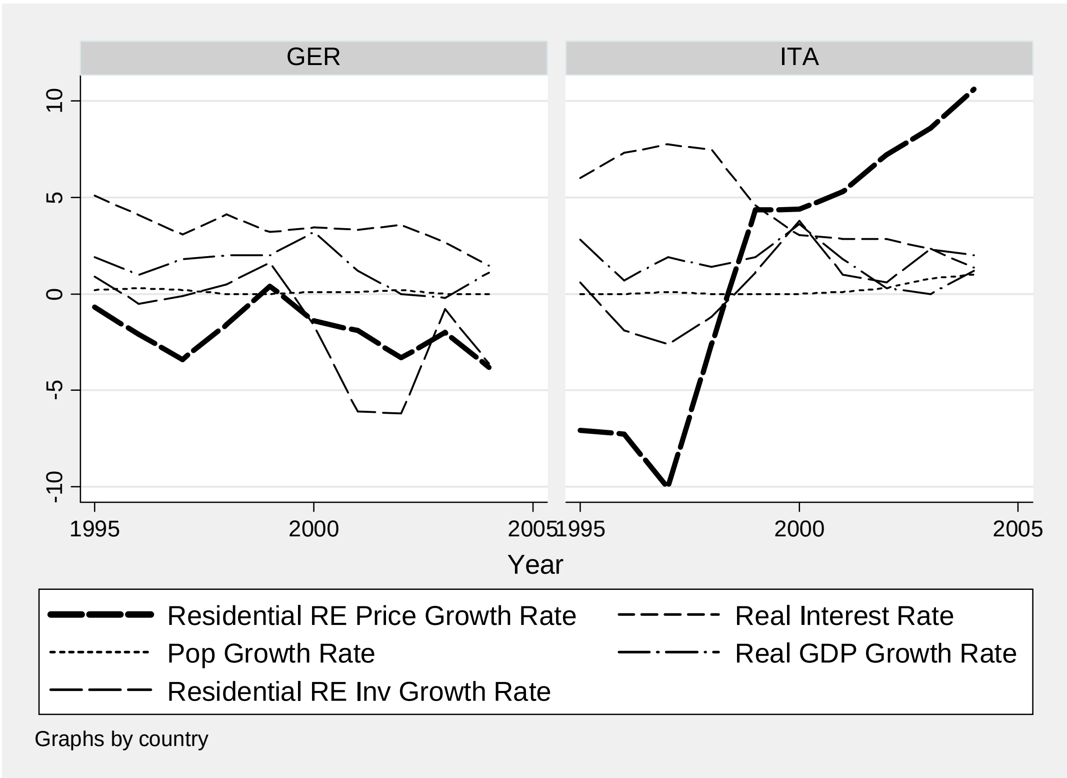

Figure 2 - Germany and Italy: a Comparizon

In the group of economies mentioned above Italy stands as a noticeable exception: during that period it experienced low economic growth, demographic stagnation, while it benefitted from decreasing real interest rates. Nonetheless it displayed substantial real

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

estate appreciation. This was far from obvious: although Germany shared with Italy poor economic, demographic and real interest rates dynamics, its real estate prices have been *falling* over the same decade (Figure 2). We view this stark difference as additional motivation for our enquiry in the specific role of bequest taxation in relation with real estate prices. In fact, residential real estate appreciation coincided in Italy with the abolition of bequest taxation. This paper wants to highlight the importance of this additional factor as a plausible source of the difference between the real estate appreciation that took place in Italy and the German experience.[6]

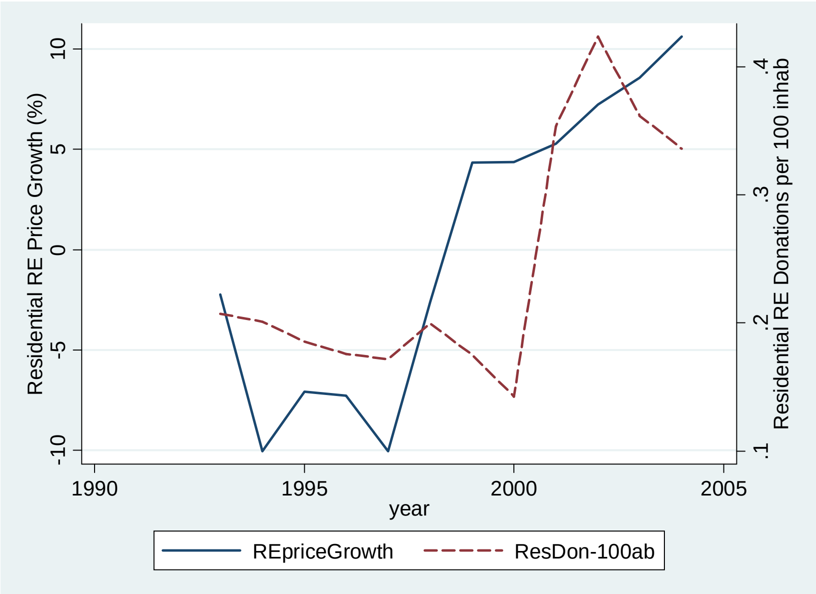

Figure 3. Italy: Residential Real Estate Donations and Prices

The main contribution of this paper is to build a relationship between real estate price appreciation and the sharp increase of donations in the residential market due to the abolition of bequest taxation. Figure 3 offers preliminary evidence in support of our claim. We can provide the intuition for our result relying on a "no arbitrage" argument. An agent owning housing units has to decide, as the end of his life approaches, how to use his housing stock. He can either leave this stock to his offsprings for an "altruistic" motive or he can sell it on the market and receive the market price. In the first case,

[6] Our discussion touches upon the recent debate regarding the development (and the eventual burst) of a bubble in the real estate market. For the sake of this paper we do not take a stance on whether there was a bubble in the real estate market of developed economies.

he will benefit from the indirect utility he enjoys 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 "money" wealth that he can use as he likes, including intergenerational 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 bequests and donations 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 in their "housing portfolio". The second effect is a general equilibrium one related to the no-arbitrage condition: as more and more people donate their housing stock, the market price of residential real estate must increase until a new equilibrium price is reached where the indifference, in utility terms, 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.

The line of reasoning behind our intuition can be generalized and extended to a variety of assets that can be used to make intergenerational transfers. It is nonetheless important to focus on real estate because, especially in developed economies, this is not only the most commonly used asset when intergenerational transfers are involved, but it also represents a sizeable share of optimal portfolio strategy and a central element of any financial crisis.[7] This justifies even more the special focus of this study and our interest in the relationship between bequest taxation and real estate prices.

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. [9]). 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 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 [14], and Terrones [20] (with aggregate data), and Abraham and Hendershott [1], Case and Shiller [4], Himmelberg et al. [13], and Smith and Smith [19] (with regional

[7]Fugazza et al. [8] document how the optimal investment strategy assigns a share between 10 and 20 percent to real estate investment. Also see Pelizzon and Weber [15].

and city-level data). In a series of recent papers, Glaeser, Gyourko and Saks [10], [11] 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 focus of our analysis, the role of the real estate taxation in affecting house prices, has been analyzed by Bruce and Holtz-Eakin [3], and Hendershott and Price [12] who followed the seminal contributions by Poterba [17], [16]. However, neither this strand of literature nor the former addressed the issue that we raise in this paper, that is, the effect of bequest taxation on real estate prices.

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 and 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 how much (durable) housing services, H_t, to enjoy during lifetime. Generation t utility function Υ_t is defined as follows:

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

where $u(\cdot)$ and $v(\cdot)$ denote the utility derived from consumption of non-durable goods and housing services respectively, and ρ labels intergenerational altruism. 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 intergenerational donation. Therefore, transfer of housing and "money" between generations is charged a proportional cost of $0 \leq \tau \leq 1$.[8]

Although the interpretation may seem completely standard, the reader should notice how equation (2) is set up. H_t^{mkt} represents the actual amount of housing that generation t acquires through intergenerational transfers and private markets in period 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. 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 generation t can allocate its depreciated stock of housing services 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 produces housing services out of non durable goods and satisfies the law of diminishing returns:

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

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

[8] 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.

capital, K_t, and labor, L_t, and satisfies the law of diminishing returns to single factors:

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

Capital is created at no cost from period t consumption good and is employed to produce $t+1$ non durable good. Capital fully depreciates from one period to the next and so capital accumulation follows:

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

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

$$\begin{aligned} y_t &= g(k_t) \\ g' > 0,&\ g'' < 0 \end{aligned}$$

where y_t and k_t are output and capital expressed in per capita terms. Thus (7) can be rewritten in per capita terms as:

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

where i_t represents per capita investment.

2.1 Market Equilibrium: Definition

The market equilibrium is defined by 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 price vector (p_t, R_{t+1}, w_t) such that:

1. agents optimize:

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

2. 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.

3. the housing market clears:

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

Notice that we can exploit the conditions above to find the two dynamic equations that describe the evolution of capital and housing stock in 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.

Moreover, 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 we have that future capital stock is equal to current private savings since there is full depreciation of capital. The assumption that capital fully depreciates has no effect on the qualitative implications of our analysis. If capital was not fully depreciated, the old generations would end up selling and/or donating it to the young generation 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 remain in place nonetheless. This completes the description of the dynamic evolution of the aggregate variables of the economy.

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:

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

This equation has a very simple interpretation: it states that the marginal benefit of consuming an additional unit of housing must be equal to its marginal cost for generation t 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 condition 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 generation will choose consumption when old and the level of donation so that the marginal utility of its consumption equates the marginal utility of consumption of the following generation, discounted by the degree of intergenerational 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 intergenerational 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. Viceversa, 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 1 *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 the stationary environment by assumption, we can safely focus on the stationary steady state of the economy. Therefore, since R_{t+1} is just 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 for real estate prices in steady state 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, it is worthwhile to state the following proposition:

Proposition 1 *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 intergenerational altruism, ρ, increases if the substitution effect (weakly) dominates the income effect.

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

We find it worthwhile to describe the simple proof for (1) here. In the case of a decrease in τ, one needs to consider its effect on the interest rate. Start observing that, 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, 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 (22) 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), 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 raising bequest taxes depresses the price of housing in steady state. 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 return, otherwise only one use - the one delivering more utility - would be observed. As bequest taxation increases, the benefit of intergenerational transfers decreases. Therefore, old agents would be less willing to bequeath and more willing to sell their houses on the market: the increased supply would then lower equilibrium prices. The decrease 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. It is interesting to notice that, if an increase in taxes on monetary bequests affect the price of any financial asset that exceeds the lifespan of a generation, an increase in taxes on housing bequests affects the price of real estate only.

Rearranging (15) and including (18), we get the following difference equation describing the dynamic evolution of real estate prices:

$$\frac{1}{p_t}[p_{t+1}(1 - \delta)u'(c_{2t}) + v'(H_t)] = R_{t+1}u'(c_{2t}) \tag{25}$$

It is worthwhile to give an economic interpretation to equation (25), since it will play an important role in the remaining part of our discussion. Equation (25) is the relevant no arbitrage condition of the economy. One unit of consumption buys $1/p_t$ of housing at time t. The overall return of the investment in housing is given by $v'(H_t)$, the increase of utility due to consuming an extra unit of housing plus $p_{t+1}(1-\delta)u'(c_{2t})$, the increase of utility due to additional consumption of the final good in period $t+1$ when housing is resold. The return from housing investment must be equal to the return of buying one unit of capital, given by $R_{t+1}u'(c_{2t})$.

Equivalently, one can rewrite (25) employing (17):

$$\frac{p_{t+1}}{p_t}(1-\delta) = R_{t+1} - \frac{v'(H_t)/p_t}{(1-\tau)\cdot\rho\cdot u'(c_{1t+1})} \tag{26}$$

which states some important facts. We summarize this observation by the following proposition:

Proposition 2 *The rate of real estate appreciation,* $\frac{p_{t+1}}{p_t}$

1. *increases when the rate of return on capital investment increases;*
2. *decreases when the utility of the old generation from a unit spent on housing,* $(v'(H_t)/p_t)$*, increases;*
3. *decreases as the average consumption of the young generation,* c_{1t+1}*, increases;*
4. *decreases when taxation on bequest,* τ*, increases.*

We only provide an intuition for proposition 2 since the proof is standard. Part 1 states that housing must appreciate if its opportunity cost, i.e. the reward of investing in capital markets, increases. Part 2 suggests that housing does not need to appreciate substantially if it already provides valuable services per unit of consumption spent on it. Part 3 shows that the higher is the demand for the non-durable good, the lower is the price of the durable good, given that the two goods are substitutes in the utility function of the agent. Finally part 4 complements proposition 1, by stating that, when bequest taxation increases, the price of real estate not only falls in the new steady state, but does so at a rate that depends positively on the level of τ.

4 Empirical Analysis

In this section we bring our analysis to the data testing the effect on real estate prices of bequest taxation. 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.[9] 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 Economics regarding residential real estate donations. Data have annual frequency and are disaggregated by city to build a panel dataset covering the period 1993-2004. This includes 2001 when bequest and donation taxation was abolished. All variables were netted of CPI inflation[10] and should be considered real.

We test the main empirical prediction of this paper regarding the relationship between bequest and *inter vivos* donation taxation and real estate prices, as stated by propositions 1 and 2. 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. 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 growth rate in the price of residential housing (per squared-meter) in city i between year t and $t-1$, $time$ is the time trend and Tax is the time dummy taking value 1 in all years when bequest and donation taxation was abolished (year $\geq$ 2001).

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 1

[9] In the basic empirical exercise we focus on the price of already established real estate, i.e. we do not consider the price dynamics of newly built residential real estate units. We do so to rule out composition effects in the supply of housing. As we show later this is done without loss of generality.

[10] Source: Bank of Italy.

Table 1 is suggests that there was an additional positive effect on real estate price growth that took place starting with 2001, the year when bequest taxation was abolished. But the proposed general equilibrium analysis provides us with additional guidance about the effect of bequest tax on real estate price growth.[11] When bequest taxation is abolished, agents reallocate a sizeable share of their housing stock toward donation and bequest. The size of this reallocation in turn affects the extent of real estate appreciation. Therefore, it is through the surge in the number of donations that the effect of the abolition of bequest taxation is channeled to real estate prices. This general equilibrium effect provides us with a rationalization of the estimation strategy we adopt. 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 estimate to assess the effect of each of these three factors on real estate prices. Formally, we want to estimate:

$$\Delta p_{it} = \alpha_i + \beta^D \cdot H_{it}^{don} + \beta^S \cdot H_{it}^{sale} + \beta^I \cdot \Delta i_t^H / Y_t + \beta \cdot (Controls)_{it} + u_{it} \qquad (27)$$

where, according to propositions 1 and 2, 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, 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 the main issue 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 issue, 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,[12] 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 - naturally - Tax.[13] There are good reasons to believe these instruments are exogenous and not weak: they either depend (almost directly)

[11] See the discussion after proposition 1.

[12] Notice that the rate r_t - a borrowing rate - is not the same as R_t in proposition 2. R_t represents the rate of return one would receive by 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, $Stock - R_t$.

[13] This abolition was one of the very first acts of the newly established government cabinet in 2001. Law 383/2001 stated that the tax previously imposed on bequest and donation among family members would cease starting with transfers taking place after October 25th 2001.

on monetary policy,[14] as in the case of $r_{t,}$ on productivity and bargaining dynamics, as in the case of Δw_{it}, on demographic dynamics, as for $\Delta\left(Res < 25/Res > 65\right)_{it}$ or, finally, on exogenous tax decisions, as for Tax. We will focus on this last instrument, which is central to test the implication of this study.

We also introduce some standard additional controls: $Stock - R_t$, the stock market (cum dividend) real annual return between year t and year $t-1$, $(NetCapInflow/Y)_t$, the net capital inflow (net of the change in international reserves) over GDP in year t,[15] ΔPop_{it}, the population growth rate in city i between year t and $t-1$. City dummies are also included in the estimation and their coefficients are omitted in the tables.

[14] Rudebusch [18] provides a good summary of why central banks should not target their monetary policy to asset prices. Until recently, this was the vastly predominant view in central banking.

[15] This is measured by the financial account balance. In 2001, while bequest taxation was abolished, the government also provided a fiscal safeguard (Decree 350/2001) for all those funds that italian residents held abroad and reentered national borders between November 1st 2001 and February 28th 2002. Since this may have had an effect on real estate appreciation we include net capital inflows among control variables.

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)
$Stock - R_t$	-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 2.a

Tables 2.a and 2.b show the results of our empirical analysis. Consistently with the economic intuition behind the theory set forward, the first stage of the regression displayed in Table 2.a 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 in the economy reallocate their housing stock away from the market and toward donation. 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 donation as would be expected in the case of rationally altruistic agents, capital inflows and population growth are likely to have had a positive effect on the level of real estate investment, while they had no statistically significant effect of market transactions and donations. The *F-tests* on the first stage lean toward the view the chosen instruments are not weak.

Tables 2.b 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 considerations are worthwhile making. 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, its price increases by slightly more than 20%.

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)
$Stock - R_t$	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 2.b

Although we consider a closer test of our model to regress the change in real estate prices on the yearly flows of donations and market transactions regarding residential real estate during a given year, our empirical results are also 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. To make this point clear, we regress a slightly modified version of (27):

$$\Delta p_{it} = \alpha_i + \beta \cdot (\Delta H_{it}^{don} - \Delta H_{it}^{sale}) + \beta^I \cdot \Delta i_t^H / Y_t + \beta \cdot (Controls)_{it} + u_{it} \qquad (28)$$

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 the proposed 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 (27), 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 these are in our opinion appropriate instruments. Detailed first and second stages are reported in Table 4.a and 4.b in the appendix.

One could ponder the possibility 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. We replicate the empirical exercise considered in (27) using as dependent variable only the real growth in the price of "newly built" residential real estate in the different cities of the sample, Δp_{it}^{NEW}. The results are in line with Table 2.b and are reported for brevity in Table 5 in the appendix. 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 (27) 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 "placebo" alternatives.

Second, we address the concern that our regression is overlooking some general, europe-wide trend toward real estate appreciation. If this were the case, the significance of our Tax dummy variable could be a result of this sector specific effect only. We thus perform the same empirical exercise regarding the estimation of (27) but we add the real growth rate in real estate prices in EU15[16], $\Delta p_t - EU15$, as control variable. The two stages of this enriched regression are displayed in Tables 7.a and 7.b. They are vastly consistent with what we found in the original regression (Tables 2.a and 2.b). In particular, Tax remains a statistically significant instrument, even after the introduction of the additional control $\Delta p_t - EU15$. Moreover, we report in Figure 4 the average (cross-city) residuals

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

of regression (27) 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 retains its explanatory power even after the introduction of $\Delta p_t - EU15$.

We finally employ the constructed dataset and the estimates of (27) to provide a preliminary evaluation of the city-level effect of the abolition of bequest and donation taxation. This can be done 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 how much change in real estate prices would be predicted by the change in the three instrumented variables that is determined by the policy shock represented by the time dummy Tax. Formally, this is equivalent to:

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

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 (27) 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 sizeable and support the claim that change in bequest and donation taxation have important effects on the prices of assets used to make intergenerational transfers. The results are reported in Table 3:

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 3

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 an 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 a novel rich and detailed dataset on real estate sales, donations and prices at city level. By focusing on such unusual policy change (almost a *quasi* natural experiment), this is 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 has a central role in the current global financial crisis. Therefore, we should be particularly interested in 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 the Italian evidence suggests. After all, real estate may still be "the root of all evil" in future financial and economic crises.

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6 Appendix

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

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

add constraint for H_t^{mkt} represents the actual amount of housing that generation t acquires through intergenerational transfers and private markets in period t....

$$c_{1t} = w_t - s_t + p_t \left[(1-\tau)H_{t-1}^{don} - H_t^{mkt}\right] + (1-\tau)D_{t-1} - i_t^H \tag{29}$$

$$c_{2t} = s_t R_{t+1} + p_{t+1} H_t^{sale} - D_t \tag{30}$$

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:

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

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

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

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

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

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

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

Proof Proposition 2.

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. ■

6.1 Tables

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)
$Stock - R_t$	-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% ** significant at 1%	*City* Dummies α omitted

Table 4.a

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)
$Stock - R_t$	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 4.b

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)
$Stock - R_t$	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)
$Stock - R_t$	-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 7.a

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)
$Stock - R_t$	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 7.b

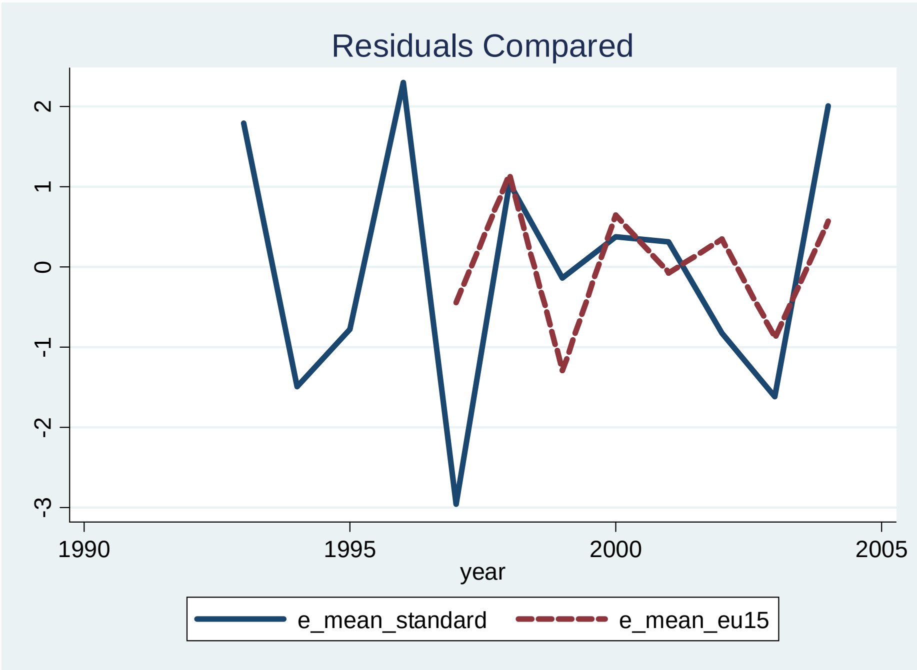
Residuals Compared
2
1
0
-1
-2
-3
1990
1995
2000
2005
year
e_mean_standard
e_mean_eu15

Figure 4

6.2 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 Italian national institute (Source: ISTAT 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)

$Stock - R_t$ 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)

Table 1: 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
Stock-R	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

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