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Tax Arbitrage and Elderly Housing Retention: Evidence from the United States and Korea

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Research Article

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Posted Date: April 24th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9411294/v1

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Additional Declarations: No competing interests reported.

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Abstract

This study investigates the retirement-saving puzzle–the reluctance of elderly households to downsize housing equity–from an institutional perspective, focusing on the structural incentives created by housing taxation. While the existing literature primarily attributes this phenomenon to intrinsic factors such as bequest motives, transaction costs, or psychological attachment, we argue that the specific combination of property taxes, capital gains taxes, and inheritance/gift taxes systematically shapes the choice between market disposal and intergenerational transfer. Using an optimization model, we show that a tax regime in which capital gains taxes are high relative to property holding and inheritance taxes generates an arbitrage opportunity that strengthens bequest incentives, thereby amplifying housing retention inertia. Empirical analysis of cross-state variation in the United States confirms that elderly housing retention is structurally higher in jurisdictions that penalize transactions while subsidizing holding. Furthermore, evidence from recent policy changes in the Republic of Korea (2018–2021) reveals that punitive capital gains taxes triggered a market freeze–characterized by soaring prices and collapsing transaction volumes–and a strategic surge in inter vivos gifts, particularly among the ultra-elderly (aged 80 and over). Taken together, these findings suggest that the retirement-saving puzzle is partly an institutional outcome of intertemporal tax arbitrage, implying that effective housing supply policy requires a coordinated redesign of the tax mix rather than isolated rate adjustments.

Keywords: Retirement saving puzzle, housing tax structure, housing downsizing, capital gains tax, property tax, inheritance tax

1 Introduction

The standard life-cycle hypothesis posits that households accumulate wealth during their working years and gradually decumulate it after retirement in order to smooth consumption over the life cycle (Ando and Modigliani, 1963). However, contrary to this theoretical prediction, a large body of empirical evidence documents a persistent "retirement-saving puzzle," whereby elderly homeowners exhibit a strong reluctance to downsize or liquidate their housing equity, even at advanced ages (Feinstein and McFadden, 1989; Venti and Wise, 1990, 2004).

The existing literature has primarily attributed this phenomenon to intrinsic economic motives. Prominent explanations include bequest motives (Bernheim, Shleifer, and Summers, 1985), precautionary savings in response to medical expenditure risk (De Nardi, French, and Jones, 2010), and transaction costs associated with lumpy housing adjustments (Yang, 2009). While these factors undoubtedly play an important role, they do not operate in a vacuum. Instead, housing decisions are embedded in an institutional environment that systematically shapes the relative incentives to hold, sell, or transfer housing assets.

This study argues that the "stickiness" of elderly housing assets is not solely a reflection of stable preferences, but is structurally reinforced–and in some cases effectively manufactured–by the design of housing-related taxation. In particular, the decision to retain or dispose of housing is jointly influenced by three distinct taxes. First, property taxes (henceforth, PT) constitute a recurring holding cost incurred annually regardless of transaction status, partially offsetting the utility derived from housing services such as psychological attachment or insurance against rental risk. Second, capital gains taxes (henceforth, CGT) are levied upon sale and directly increase the transaction cost of disposal. Third, inheritance and gift taxes apply to intergenerational transfers and directly interact with bequest motives and inter vivos transfers.

The objective of this study is to examine how elderly households' optimal housing decisions respond to the joint structure of these taxes. Using a simple optimization model, we first show how the relative magnitude of holding, transaction, and transfer taxes alters the choice between market disposal and bequest. Our key theoretical result is that a tax regime characterized by high CGT relative to PT and inheritance taxes (henceforth, IT) generates an intertemporal arbitrage opportunity that strengthens incentives to bequeath, thereby amplifying housing retention inertia. In such an environment, the propensity to retain housing need not decline—and may even increase—as households age.

We then empirically evaluate these theoretical implications using two complementary case studies. First, we examine the United States (henceforth, U.S.) as a setting characterized by substantial cross-state variation in housing tax systems. Exploiting these institutional differences, we show that elderly housing retention is structurally higher in states that penalize transactions while implicitly subsidizing housing holding.

Second, we study the Republic of Korea (henceforth, Korea) as a dynamic natural experiment. Focusing on the period from 2017 to 2021, when punitive transaction taxes, or equivalently CGT, were imposed on multi-homeowners, we document that this exogenous policy shock triggered a pronounced market freeze–characterized by rapidly rising prices and sharply declining transaction volumes–alongside a substantial substitution toward intergenerational gifts. Using a simulation to calculate the tax rates faced by each household, we identify a behavioral reversal among the ultra-elderly (aged 80 and over). Unlike younger cohorts, this group responded to the widened tax wedge by strategically withdrawing housing assets from the market, consistent with a tax-induced amplification of bequest incentives.

The primary contribution of this paper is to provide an institutional explanation for the persistence of housing equity among elderly households. Rather than viewing

downsizing resistance as the outcome of fixed preferences alone, we show that the same behavior can be systematically shaped and intensified by the tax environment. From this perspective, the choice between downsizing and bequeathing emerges as an institutional outcome driven by the combined structure of holding, transaction, and transfer taxes.

This framework yields direct policy implications. First, because elderly housing decisions affect the effective supply elasticity of existing housing stock, the tax mix must be considered as one of the central component of long-run housing market stabilization and intergenerational wealth transfer policy. When the tax structure discourages elderly homeowners from releasing housing assets into the market, the resulting supply rigidity exacerbates price pressures and widens intergenerational wealth gaps–consequences that extend well beyond individual household welfare. Second, and relatedly, policies aimed at facilitating elderly downsizing–such as reverse mortgage programs–may prove insufficient if they focus exclusively on financial product design while ignoring the broader tax environment. Our analysis suggests that even well-designed liquidity instruments may not fully achieve their intended effects if the underlying tax regime systematically favors holding and bequeathing over selling. Finally, our analysis highlights the importance of endogenous feedback between market conditions and tax structures. In countries with progressive tax schedules, such as Korea, rising housing prices mechanically raise effective tax burdens, thereby altering optimal household behavior even in the absence of further policy changes. This interaction suggests that housing market dynamics are shaped not only by exogenous shocks, but also by feedback loops between asset prices and institutional incentives.

The remainder of the paper proceeds as follows. Section 2 reviews the related literature. Section 3 presents a simple theoretical model. Section 4 provides empirical evidence from the U.S. cross-state analysis and the Korean natural experiment. Section 5 concludes with policy implications for housing supply elasticity and intergenerational wealth transfer in aging societies.

2 Literature review

The persistence of housing equity in retirement has been a subject of extensive debate. The literature can be broadly categorized into studies focusing on intrinsic household motives and those examining institutional constraints.

Standard economic models suggest that the elderly should decumulate housing wealth after retirement. To explain the deviation from this prediction, they have emphasized the role of bequest motives. Bernheim, Shleifer, and Summers (1985) introduce the strategic bequest motive, arguing that parents retain assets to influence their children's behavior. De Nardi (2004) and Lockwood (2012) show that bequest motives are essential for explaining wealth concentration and the limited annuitization observed among elderly households.

Another strand of the literature highlights precautionary savings and non-monetary benefits of housing. De Nardi, French, and Jones (2010) and Poterba, Venti, and Wise (2011) argue that exposure to late-life medical expenditure risk induces the elderly to retain assets that can serve as self-insurance. In addition, Nakajima

and Telyukova (2017) develop a structural life-cycle model incorporating housing services, longevity risk, and limited reverse mortgage usage, and show that these factors jointly explain why elderly households decumulate housing equity much more slowly than predicted by standard models. Extending this line of research, Nakajima and Telyukova (2020) emphasize that housing delivers substantial non-monetary utility–such as psychological attachment, customization of living space, and insurance against rental risk–which further discourages downsizing in old age.

Housing also generates frictions due to its dual role as both a consumption good and an investment asset. Henderson and Ioannides (1983) formalize housing tenure choice and emphasize that housing adjustments are inherently lumpy. Using a quantitative life-cycle framework, Yang (2009) demonstrates that transaction costs play a central role in generating a hump-shaped consumption profile, as the financial and psychological costs of moving prevent continuous adjustment of housing consumption.

Taken together, these studies have substantially advanced our understanding of why elderly households retain housing equity, identifying bequest motives, precautionary savings, non-monetary housing utility, and transaction frictions as key explanatory factors. Yet a common feature of this body of work is that the mechanisms examined are largely intrinsic to household preferences or to the physical characteristics of housing as an asset. Comparatively less attention has been paid to the possibility that such motives may themselves be shaped by the institutional environment in which households operate, and specifically by the structure of housing-related taxation. To the extent that the relative burden of holding, transaction, and transfer taxes alters the payoff to selling versus bequeathing, the observed persistence of housing equity may reflect not only stable preferences but also the incentive landscape created by the tax system.

Nonetheless, several studies have examined how individual tax instruments affect housing tenure, mobility, and asset-holding decisions.

First, property taxation, which represents the recurring carrying cost of housing, has been shown to affect residential mobility. Shan (2010) provides causal evidence that higher PT burdens mitigate lock-in effects, finding that a $100 increase in annual PTs raises the two-year mobility rate of elderly homeowners by 0.73 percentage points. Similarly, Zhao and Burge (2017) show that PTs interact with housing wealth to influence labor supply and liquidity constraints, implying that higher PTs can encourage asset reallocation. In contrast, policies that suppress holding costs may reinforce housing inertia; Stohs, Childs, and Stevenson (2001) find that California's Proposition 13–a 1978 constitutional amendment that caps property tax rates at 1% of assessed value and limits annual assessment increases to 2%, with reassessment occurring only upon sale–significantly reduced homeowner mobility by creating strong tax-based disincentives to move. We discuss the institutional details of Proposition 13 further in Section 4.1.

Second, transaction-related taxes and fiscal institutions directly affect the feasibility of downsizing. Ferreira (2004) documents a CGT lock-in effect using evidence from California's Propositions 60 and 90, which allow older homeowners to transfer favorable tax assessments when moving. Removing the tax penalty for relocation increased the mobility of eligible homeowners by approximately 25 percent. In a related vein,

Farnham and Sevak (2006) argue that state fiscal institutions, such as school finance equalization, constrain Tiebout sorting and limit fiscal adjustment by empty-nest households. Cross-country evidence further supports the role of institutional variation: Chiuri and Jappelli (2010) show that elderly homeownership trajectories differ markedly across OECD countries depending on mortgage market regulations and transaction costs, while De Graaf and Rouwendal (2012) document passive saving behavior among elderly households in the Netherlands arising from specific mortgage arrangements.

Finally, broader fiscal policies, including estate and inheritance taxation, also influence elderly location and asset-holding decisions. Conway and Houtenville (2001) find that elderly migration flows are sensitive to state fiscal policies, including death taxes, indicating that taxation of intergenerational transfers shapes where and how wealth is held in old age. Moreover, Suari-Andreu, Alessie, and Angelini (2019) emphasize that bequest motives are closely intertwined with housing wealth, suggesting that preferential tax treatment of bequests can further rigidify housing asset holdings.

While prior research has produced valuable insights into how specific taxes influence elderly housing behavior, these studies typically analyze each tax instrument in isolation. In practice, elderly households face a multidimensional trade-off in which the three taxes operate simultaneously: the relevant decision is not simply whether to sell a home, but whether the liquidity gain from selling (net of CGT) outweighs the utility of continued ownership (net of PT) combined with the value of bequeathing housing wealth (net of inheritance or gift taxes). How the relative configuration of these taxes shapes this trade-off–and, in particular, whether certain tax structures can create systematic incentives that favor intergenerational transfer over market disposal–has received comparatively little attention.

This study contributes to the literature by analyzing how the relative configuration of these three taxes jointly coordinates elderly housing decisions. We argue that the retirement-saving puzzle is most pronounced not merely where transaction costs are high, but where the tax system creates an arbitrage opportunity that favors holding housing until death over selling during life–a mechanism we empirically investigate using evidence from both the U.S. and Korea.

3 A simple theoretical model

This section develops a simple theoretical model to clarify the decision-making mechanism of market participants. To keep the analysis tractable, we consider a two-period binomial tree model for housing prices as follows.

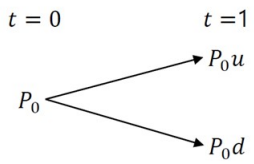


Fig. 1 A simple two-period binomial tree.

Let P_0 denote the housing price per unit of area at time 0. Housing prices at time 1 evolve according to a binomial process: in the up state (u), prices increase by a factor u, while in the down state (d), prices increase by a factor d. The probabilities of the up and down states are denoted by π_u and π_d, respectively. The investor is assumed to die at the end of period 1, at which point all remaining assets are bequeathed to heirs. Bequests are subject to an IT.

The key decision faced by the investor is whether to sell the current house at time 0 and move to a smaller house (downsizing), or to retain the current house until death and leave it as part of the bequest. Downsizing allows the investor to hold more liquid financial assets at time 0. The decision problem is formulated by comparing two value functions: one corresponding to downsizing at time 0, and the other corresponding to retaining the current house and bequeathing it.

When the investor sells the current house and moves to a smaller one, the value function is given by

$$\begin{aligned} V^m(X_0, P_0 q_l) = \; & \max_{c,s} U(c_0) + \beta \mathbb{E}\left[\psi(B_1)\right], \\ \text{s.t.} \quad & X_0 + (1-\eta) P_0 q_l = c_0 + s_0 + P_0 q_s + \tau_c (P_0 - \underline{P}) q_l + \tau_o P_0 q_s, \\ & s_0(1+r) + P_1 q_s = B_1 + \tau_i P_1 q_s. \end{aligned}$$

Here, X_0, c_0, and s_0 denote financial asset holdings, consumption, and savings at time 0, respectively. q_l and q_s represent the sizes of the large (current) and small (downsized) houses. $U(\cdot)$ is the period utility function, and $\psi(\cdot)$ is the bequest utility function.

The parameters τ_c, τ_o, and τ_i denote the CGT rate, the PT rate, and the IT rate, respectively. We are interested in how changes in these tax rates affect the household's optimal decision. The interest rate is denoted by r, η represents proportional housing transaction costs, β is the subjective discount factor, and $\underline{P}$ is the reference housing price used for capital gains taxation (i.e., the purchase price of the current house).

If the investor retains the current house and bequeaths it, the value function is

$$\begin{aligned} V^n(X_0, P_0 q_l) = \; & \max_{c,s} U(c_0) + \beta \mathbb{E}\left[\psi(B_1)\right], \\ \text{s.t.} \quad & X_0 = c_0 + s_0 + \tau_o P_0 q_l, \\ & s_0(1+r) + P_1 q_l = B_1 + \tau_i P_1 q_l. \end{aligned}$$

Assume that both the period utility function and the bequest utility function take a constant absolute risk aversion (CARA) form:

$$U(x) = -\frac{1}{a} e^{-ax}, \qquad \psi(x) = -\frac{1}{a} e^{-a\kappa x}.$$

where a is the coefficient of absolute risk aversion, and κ captures the strength of preferences for bequests.

Then, the optimal choices under downsizing are given by:

$$\begin{aligned} c_0^{m*} &= -\frac{\log\left(\beta\kappa(1+r)\Theta\right)}{a\left(\kappa(1+r)+1\right)}, \\ S_0^{m*} &= X_0 + (1-\eta)P_0 q_l - c_0^{m*} - (1+\tau_o)P_0 q_s - \tau_c\left(P_0 - \underline{P}\right) q_l, \\ V_m &= -\frac{1}{a}e^{-ac_0^{m*}} - \frac{\beta}{a}e^{-a\kappa s_0^{m*}(1+r)}\left(\pi_u e^{-a\kappa(1-\tau_i)P_0 u q_s} + \pi_d e^{-a\kappa(1-\tau_i)P_0 d q_s}\right), \end{aligned}$$

where

$$\begin{aligned} \Theta = e^{-a\kappa\{X_0+(1-\eta)P_0 q_l-(1+\tau_o)P_0 q_s-\tau_c(P_0-\underline{P})q_l\}(1+r)} \\ \times\left(\pi_u e^{-a\kappa(1-\tau_i)P_0 u q_s} + \pi_d e^{-a\kappa(1-\tau_i)P_0 d q_s}\right). \end{aligned}$$

Similarly, the optimal choices without downsizing are:

$$\begin{aligned} c_0^{n*} &= -\frac{\log\left(\beta\kappa(1+r)\Gamma\right)}{a\left(\kappa(1+r)+1\right)}. \\ S_0^{n*} &= X_0 - c_0^{n*} - \tau_o P_0 q_l, \\ V_n &= -\frac{1}{a}e^{-ac_0^{n*}} - \frac{\beta}{a}e^{-a\kappa s_0^{n*}(1+r)}\left(\pi_u e^{-a\kappa(1-\tau_i)P_0 u q_l} + \pi_d e^{-a\kappa(1-\tau_i)P_0 d q_l}\right), \end{aligned}$$

where

$$\Gamma = e^{-a\kappa(X_0-\tau_o P_0 q_l)(1+r)}\left[\pi_u e^{-a\kappa(1-\tau_i)P_0 u q_l} + p_d e^{-a\kappa(1-\tau_i)P_0 d q_l}\right].$$

By comparing the two value functions, V^m and V^n, we can identify the regions of tax rates under which downsizing yields higher utility. Figure 2 illustrates these regions in the space of tax rate combinations, based on the following parameter values:

$$\begin{aligned} &P_0 = 1, \quad \underline{P} = 0.5, \quad q_L = 1, \quad q_S = 0.5, \quad \xi = 0.03, \quad u_{=}1.2, \quad d = 1/u, \quad \pi_u = 0.5, \quad \pi_d = 1-\pi_u, \\ &r = 0.03, \quad a = 2, \quad \kappa = 1.5, \quad \beta = 0.97. \end{aligned}$$

In the figure, combinations of tax rates that lie below the surface favor downsizing, whereas combinations above the surface favor retaining the current house. The figure implies that higher CGT rates discourage downsizing, while higher IT rates and higher PT rates increase the incentive to downsize. These comparative statics result highlights the differential roles of housing-related taxes in shaping late-life housing decisions.

The core trade-off underlying the downsizing decision arises from the interaction between liquidity, risk exposure, and tax distortions.

First, the CGT introduces a lock-in effect. A higher CGT rate increases the effective cost of selling the existing house, thereby reducing the net proceeds from downsizing. This weakens the liquidity benefit of downsizing and shifts the indifference boundary in favor of retaining the current house. Consequently, higher CGT discourage downsizing.

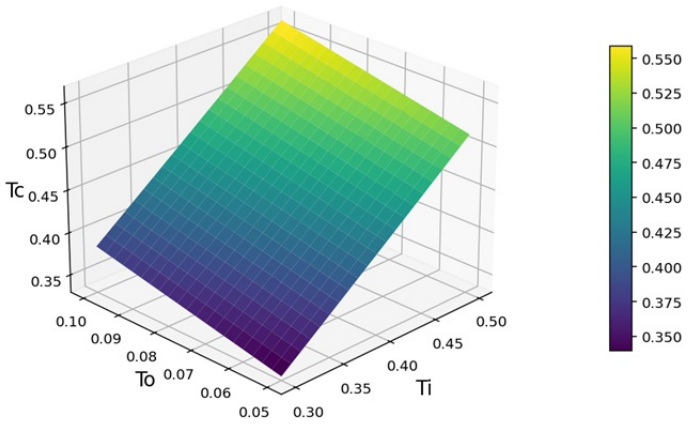


Fig. 2 Tax rates and downsizing decision.

Second, inheritance taxation operates in the opposite direction. When the IT rate is high, retaining the house until death becomes relatively less attractive because a larger fraction of housing wealth is taxed away at the bequest stage. Downsizing mitigates this distortion by shifting wealth from taxable housing assets into financial assets earlier in life, thereby increasing after-tax bequests. As a result, higher ITs strengthen the incentive to downsize.

Finally, PTs amplify the cost of maintaining a large house. Higher holding taxes reduce the net return to keeping housing wealth concentrated in the current residence, making downsizing relatively more attractive. This channel operates even in the absence of uncertainty and reflects a pure flow-cost effect of housing size.

Taken together, the model clarifies why CGTs discourage downsizing, while ITs and PTs promote it. The interaction of these taxes determines a threshold region in which the liquidity and risk-sharing benefits of downsizing dominate the tax-induced costs, leading the household to optimally reduce housing consumption late in life.

4 Empirical Case Studies

4.1 The United States: Comparing Housing Demand Patterns Across States

In this section, we discuss, through empirical observations, whether the tax structures are actually related to housing demand patterns. We first provide a concise overview of the relevant tax system in the U.S., and then analyze whether differences in state-level tax structures lead to meaningful variations in housing demand patterns. The U.S. tax system has a multi-layered structure in which both the federal and state governments levy taxes. While federal tax policies are uniformly applied to all individuals, each state applies various tax rates, which may result in different behavioral responses across states.

Let us start with estate taxes and ITs. Estate tax and IT are imposed on one's estate upon their death, therefore is also called as the death tax. The conceptual

difference is that the estate tax is levied on the total value of the estate and paid by it, while the IT is levied only on the value of the inheritance received by the beneficiary, and each beneficiary pays tax based on their received amount.

The Federal estate tax has a $13.61 million exemption for 2024, and the exemption level is adjusted each year for inflation. The tax rates vary from 18% for taxable amount under $10,000 to 40% for taxable amount over $1,000,000. However, there is unlimited marital deduction so that any amount of assets transferred to their spouses are free from tax. Combined with the base deduction amount of $13.61 million, the federal estate tax applies to only a very small fraction of individuals. 13 states have state-level estate tax, but the tax system differs in both the deduction amount and the tax rates. For example, Connecticut has $13,990,000 exemption while Massachusetts allows exemption for only $2,000,000. Washington and Hawaii maintain some of the highest maximum tax rates (up to about 20%), and meanwhile, some states (such as Illinois, Maryland, Massachusetts, Rhode Island) have endured relatively low minimum tax-rate thresholds (for example, 0.8%). While the federal government does not impose IT, only 6 state governments do, namely Iowa, Nebraska, Maryland, New Jersey, Kentucky, Pennsylvania. New Jersey and Maryland has both estate tax and IT, while Nebraska, Iowa, Kentucky, and Pennsylvania has only IT. Exemption level and tax rate of IT both depends on the heir type. However, in all states, bequest to the spouses has 100% exemption rate. Therefore, it can be broadly concluded that the overall burden of estate and ITs in the U.S. is low, both in terms of their effective tax rates and the proportion of individuals to whom they actually apply.

Next, CGT is levied if one makes profit from selling a house. The actual amount of tax one has to pay depends on various factors; original purchase price, sales prices, marital status, how long one has owned the house, whether the sold house was an investment property or for primary residence, cost of repair, improvement and upgrades for the house, to name the major factors. If the sold property was held for less than a year, the profit is considered as short-term capital gain and the tax rate is equal to the ordinary income tax rate. If it was held for more than a year, long-term CGT applies.

For the 2024 tax year, the 0% long-term capital gains rate applies to taxable income up to $47,025 for single taxpayers and married filing separately, $63,000 for heads of household, and $94,050 for married couples filing jointly and qualifying surviving spouses. For gains above these thresholds and below $518,900 (single), $583,750 (married filing jointly), $291,850 (married filing separately), or $551,350 (head of household), the tax rate is 15%, while portions above those upper thresholds are taxed at 20%. The income thresholds for these brackets are adjusted annually for inflation. If the sold property was owner-occupied and meets the ownership and use tests, $250,000 of gain (or $500,000 for those married filing jointly) can be excluded from taxable income. Various costs, such as the cost of certain repairs, improvements and upgrades to the house, can also be qualifying adjustments to basis or deductions.

The structure of capital gains taxation varies across states. For example, states such as Arizona, Colorado, Indiana, and Michigan employ a flat tax, whereas California, Iowa, Maine, Massachusetts, and New York apply a graduated-rate structure. In contrast, Alaska, Florida, New Hampshire, Nevada, South Dakota, Tennessee, Texas,

and Wyoming impose no additional tax on capital gains. The additional tax rates also differ significantly across states, ranging from approximately 2.5% to 13.3%. California has the highest top marginal tax rate (13.3%), followed by New York (10.9%) and New Jersey (10.75%). Among states that tax capital gains, some of the lowest top marginal rates are observed in Arizona and North Dakota (approximately 2.5%), Indiana (around 3.05%), and Pennsylvania (3.07%). Therefore, there are considerable differences in the level of capital gains taxation from state to state.

In practice, this asymmetry is reinforced by the stepped-up basis provision in the U.S. federal tax code, which resets the cost basis of inherited assets to their fair market value at the time of death, effectively eliminating accrued capital gains tax liability for the heir. Combined with the generous federal estate tax exemption, this means that for the vast majority of households, transferring housing through bequest incurs substantially less tax than selling during one's lifetime–particularly in states with high capital gains tax rates.

Lastly, PT is a tax imposed by local governments on real estate owners and is typically assessed on a regular basis (usually annually) as long as the property is owned. The tax is calculated based on the assessed value of the property, which can vary according to the local government's PT rate. Some states have equalization requirements that ensure uniformity in PT rates across the state. Local governments can use different methods to tax properties, such as multiplying the market value of the property by an assessment ratio and a tax rate, or by directly applying a tax rate to the fair market value.

As PT systems vary from state to state, it is difficult to provide a perfectly standardized state-level comparison. The methods for calculating assessed values can differ among jurisdictions, and the determination of the tax rate is subject to state laws. For example, in some states, real estate properties are categorized based on their type, such as residential, commercial, industrial, or vacant, and different tax rates may be imposed for various public purposes. In Washington D.C., the PT rate for occupied residential properties is 0.85%, while vacant residential properties are taxed at a rate of 5%.

Nevertheless, it is worth noting that the effective tax rates on owner-occupied housing (which is defined by the average amount of residential PTs actually paid to property value) in the U.S. can significantly vary depending on the state in which the property is located. The differences in effective PT rates among states can also be influenced by relevant state legislation in addition to the explicit tax rates themselves. In particular, some states have limits on the extent to which PTs can be raised within a year, which can significantly lower the effective PT rate. As briefly introduced in Section 2, Proposition 13 in California is a landmark property tax reform measure adopted in 1978 through a voter-approved constitutional amendment. Proposition 13 established a cap on PT rates in the state, limiting them to 1% of the assessed value of the property, and not allowing them to increase more than 2% over the previous year. It also established a system for reassessing the value of properties for tax purposes only when they are sold or change hands, rather than on an annual basis.

Consequently, it can be said that there are significant differences in effective PT rates across states, with some states having relatively high rates and others having relatively low rates. Using data from the 2023 American Community Survey, the Tax Foundation reports that Illinois had the highest effective property tax rate on owner-occupied properties at 1.83%, followed by New Jersey (1.77%), Connecticut (1.48%), and Nebraska (1.43%). Our own calculations based on the same data show that Alabama (0.36%), Utah (0.47%), South Carolina (0.47%), and Hawaii (0.32%) recorded effective rates below 0.5%.

In summary, the U.S. tax system is characterized by low estate and inheritance taxes, together with considerable variation in capital gains and property tax rates across states. The low and relatively uniform burden of estate and inheritance taxes across most U.S. states has an important analytical implication. On the one hand, it simplifies our empirical design by allowing us to focus on the two tax instruments that exhibit the greatest cross-state variation–capital gains taxes and property taxes. On the other hand, it limits our ability to directly test the inheritance tax channel of our theoretical model using U.S. data alone. In effect, the U.S. case provides a setting in which the bequest tax wedge is uniformly small, so that the dominant margin of variation is between transaction costs and holding costs.

As implied by our model, we expect that in states where CGT rates are relatively high and PT rates are comparatively low, elderly homeowners are less inclined to downsize their housing. To begin with, we group the states in the U.S. according to the relative levels of CGT and PT. Using the median as a threshold can be misleading, as it may lie disproportionately close to one side of the distribution and therefore fail to generate a meaningful categorization. Since our aim is to capture substantive differences in tax levels across states, we use the midpoint–defined as the value between the minimum and maximum–instead of the median. We classify states as high CGT states if their tax rates exceed the threshold, $\theta = 0.5(\text{max rate} - \text{min rate})$, and as low CGT states if their rates fall below this threshold, where max rate and min rate denote the highest and lowest CGT rates among all states. Likewise, we apply the same procedure to PT and classify states into high and low PT groups, based on whether their tax rates are above or below the midpoint threshold. Based on criteria, if a state is a low PT state and as well as a high CGT state, we categorize them as group A. If a state is a high PT state and as well as a low CGT state, we categorize them as group B. Group A includes California, Hawaii, Maine, Massachusetts, Minnesota and Oregon. Group B includes Illinois, Iowa, Kansas, Michigan, Nebraska, New Hampshire, Ohio, Pennsylvania and Texas. The remaining states–those in which both PT and CGT are either above the threshold or below the threshold–are excluded from this classification. In such states, the effects of holding and transaction taxes are likely to offset each other, making it difficult to isolate the differential impact of the tax structure that is central to our analysis.

To test our hypothesis, we examine household-level data from the 2023 American Community Survey, a nationally representative annual survey conducted by the U.S. Census Bureau that provides detailed information on demographic, socioeconomic, and housing characteristics of U.S. households. We expect that elderly households in

Group A maintain higher-than-average housing stock, while those in Group B are likely to hold lower-than-average levels.

To show that the differences in the housing stock by states, we compare the price-to-income ratio (henceforth, PIR). A simple comparison of housing prices or dwelling size alone may be misleading, as such measures can be heavily influenced by differences in household economic conditions, as well as variations in state-level characteristics such as land area and population size. By contrast, the PIR controls for household income and therefore provides a more meaningful measure of housing stock relative to economic capacity. Comparing PIR across states thus offers a more appropriate way to capture the substantive differences in housing stock holdings.

Table 1 present the average PIR for two-person households where both members are over 70 years old.[1] Consistent with the model's prediction, the average PIR of elderly households in Group A is higher than that of Group B. In California, Hawaii, Maine, Massachusetts, Minnesota, and Oregon, the average PIRs for elderly households are 12.441, 14.681, 5.604, 8.543, 5.787, and 8.209, respectively. The overall average PIR for Group A is 10.306, which exceeds the national average of 6.473 for elderly households. By contrast, the average PIRs for elderly households in Illinois, Iowa, Kansas, Michigan, Nebraska, New Hampshire, Ohio, Pennsylvania, and Texas are 4.049, 3.832, 3.706, 4.726, 3.905, 6.391, 4.086, 4.610, and 5.436, respectively. The average PIR for Group B is only 4.655, which is lower than the national average.

Table 1 The average housing PIR of two-person households where both members are over 70 years of age.

Group A		**Group B**	
State	**PIR**	**State**	**PIR**
California	12.441	Illinois	4.049
Hawaii	14.681	Iowa	3.832
Maine	5.604	Kansas	3.706
Massachusetts	8.543	Michigan	4.726
Minnesota	5.787	Nebraska	3.905
Oregon	8.209	New Hampshire	6.391
		Ohio	4.086
		Pennsylvania	4.610
		Texas	5.436
Average (Group)	10.306	Average (Group)	4.655
National average (elderly households)			6.473

Source: 2023 American Community Survey.

In next, we compare, at the state level, the difference in housing demand between elderly households and middle-age households (headed by individuals in their thirties to fifties). If households in Group A exhibit a stronger reluctance to downsize as they age, they are likely to maintain their housing stock despite declining income

[1] Due to the nature of the PIR, extreme values in the distribution are prone to outliers. Therefore, for each state, we excluded the top and bottom 1 percent of the PIR distribution before calculating the mean.

in retirement. As a result, the PIR of elderly households–whose income is typically lower than that of middle-aged households–will remain disproportionately high. Consequently, the gap in PIR between elderly and middle-aged households is expected to be substantially larger in Group A than in other states.

Table 2 presents the difference in PIR between two-person elderly households (aged 70 and over) and middle-age households. The overall U.S. average difference is 2.129. Consistent with the model's prediction, Group A exhibits a substantially higher average PIR difference of 3.876. The states with the largest differences are Hawaii (5.157), California (4.779), and Massachusetts (3.469), indicating that elderly households in these states maintain significantly higher housing demand relative to middle-aged households. By contrast, Group B shows a much smaller average difference of 1.385, which is notably below the national average. In this group, New Hampshire (2.459) and Texas (1.645) display modest differences, while other states–including Pennsylvania (1.443), Michigan (1.386), Iowa (1.248), Ohio (1.196), Illinois (1.155), Kansas (1.071), and Nebraska (1.059)–remain slightly above zero, suggesting relatively limited divergence in housing demand between elderly and middle-aged households.

Table 2 Difference in average PIR between two-person elderly households (aged 70 and over) and households headed by individuals in their 30s to 50s.

Group A		**Group B**	
State	**PIR difference**	**State**	**PIR difference**
Hawaii	5.157	New Hampshire	2.459
California	4.779	Texas	1.645
Massachusetts	3.469	Pennsylvania	1.443
Oregon	2.593	Michigan	1.386
Minnesota	2.357	Iowa	1.248
Maine	1.694	Ohio	1.196
		Illinois	1.155
		Kansas	1.071
		Nebraska	1.059
Average (Group)	3.876	Average (Group)	1.385
Total average			2.129

Source: 2023 American Community Survey.

To examine this more formally, we estimate housing demand by age group using a simple regression model. Mankiw and Weil (1989) propose a model to estimate the average housing demand of each age group by counting family members by age group. Originally, the model is intended to predict the impact of predictable demographic changes on long-term housing demand, but in this paper, we modify the model to simply observe housing demand patterns by age and how these patterns differ between Group A and Group B relative to the overall average. The model specification is as follows:

$$\ln V_i = \beta_0 + \sum \beta_s N_{s,i} + \sum \beta_{s,A} N_{s,i} I_{A,i} + \sum \beta_{s,B} N_{s,i} I_{B,i} + \beta_X \ln X_i + \epsilon_i \quad (1)$$

where $\epsilon_i \sim N(0, \delta^2)$. $\ln V_i$ indicates the natural logarithm of housing value of the household i. $N_{s,i}$ is the number of the age group s in the household i. $I_{A,i}$ and $I_{B,i}$ are the indicator variables which count 1 if the household i is in the states belong to Group A (or Group B) otherwise 0. $\ln X_i$ is the natural logarithm of household income as a control factor. Households reporting zero or negative income or asset values are excluded from the sample to ensure meaningful estimation of housing demand.

To assess the impact of taxes on housing demand by age, the interaction terms (the third and fourth terms of the model) are included in the model. As the coefficients β_s is used to measure the average contributions of each age group to the housing demand in a family, the coefficients $\beta_{s,A}$ and $\beta_{s,B}$ the extent to which the housing demands by age diverge in Group A and Group B from the overall average. In other words, the coefficients indicate the adjustment effects from the average housing demands in the U.S. for all age groups when the household is in the states belonging Group A or Group B.

The inertia of housing downsizing would be reflected in the relative difference in the housing demand patterns by age among the states which are grouped by relevant taxes. According to our model, housing demand of households in the states which have relatively higher (lower) CGT and lower (higher) PT tend to be relatively higher with respect to age, compared to the households in the other states. Hence, we can expect that the estimated coefficients of $\beta_{s,A}$ ($\beta_{s,B}$) would tend to increase (decrease) with respect to age.

Unfortunately, our analysis is necessarily subject to measurement limitations, which prevents a fully rigorous test. In particular, the effective CGT rate each individual household faces upon sale depends on a complex set of brackets and state-specific provisions, and our data lack the household-level details required to compute the exact marginal rate. Accordingly, our classification is necessarily coarse. We can identify only whether a household resides in a state that is broadly grouped–based on the top statutory rate–into one of the two tax regimes, rather than compute the precise tax burden it would face upon disposal. Nevertheless, if the tax structure exerts a sufficiently strong influence on life-cycle housing demand, its average effect should still be detectable in the estimated interaction coefficients.

Table 3 presents the regression results, and Figure displays the estimated interaction coefficients for Group A and Group B across age groups. The results show a clear divergence in housing demand patterns across the two groups. For Group A, the estimated adjustment effects in housing demand increase monotonically with age. While the interaction coefficients for younger age groups are close to zero–0.01 for households in their 10s, 0.005 in their 20s, and 0.08 in their 30s–they become substantially larger for older cohorts. In particular, the coefficients rise to 0.167 for households in their 40s and continue to increase steadily, reaching 0.299 for households aged over 80. This pattern indicates that, in states characterized by high CGTs and low PTs, older households maintain disproportionately higher levels of housing stock relative to the national average, consistent with a reluctance to downsize as they age.

By contrast, Group B exhibits an opposite pattern. The interaction coefficients are negative across all age groups and become increasingly negative with age. Starting from -0.007, -0.012, and -0.064 for households in their 10s, 20s, and 30s, respectively,

Table 3 Regression results: age-profile of housing demand and interaction effects.

Age group	Baseline effect	Group A	Group B
0–10 years old	0.033†	0.010*	-0.007*
10–20 years old	0.011†	0.005	-0.012†
20–30 years old	-0.088†	0.080†	-0.064†
30–40 years old	-0.075†	0.167†	-0.104†
40–50 years old	-0.055†	0.200†	-0.106†
50–60 years old	-0.059†	0.231†	-0.109†
60–70 years old	-0.030†	0.248†	-0.133†
70–80 years old	0.011†	0.269†	-0.141†
Over 80 years old	0.035†	0.299†	-0.160†
Constant		6.639†	
Income (log)		0.527†	
Observations		954,114	
R^2		0.285	

Note: The baseline effect corresponds to age-group dummy coefficients. Group A and Group B report interaction effects with group indicators. * and † denote statistical significance at the 5% and 0.1% levels, respectively.

the coefficients decline further for older cohorts, reaching -0.16 for households aged over 80. These results suggest that, in states with low CGTs and high PTs, households tend to reduce their housing consumption more aggressively as they age, relative to the overall average. Taken together, these findings provide empirical support for our model's prediction: tax structures shape the age profile of housing demand by influencing the incentives to downsize. The contrast between Group A and Group B highlights how higher CGTs combined with lower holding costs can generate inertia in housing consumption among elderly households, whereas the opposite tax configuration encourages more active downsizing over the life cycle.

Robustness Checks

A potential concern with the baseline specification is that the estimated interaction effects may partly reflect omitted state-level characteristics rather than tax-induced incentives. In particular, two confounding factors warrant attention. First, states differ substantially in average income levels, and wealthier states may exhibit higher housing demand for reasons unrelated to tax policy. Although our baseline model controls for household-level income, it does not account for the broader economic environment at the state level, which may independently affect housing market equilibria. Second, geographic features–most notably, proximity to the coast–impose physical constraints on land supply, potentially inflating house prices and PIR through a supply-side channel that is orthogonal to taxation (Glaeser, Gyourko, and Saks, 2005; Saiz, 2010).[2] Since several Group A states (e.g., California, Hawaii, Oregon) are coastal, the estimated tax effects could be confounded with geographic supply constraints.

[2] Glaeser, Gyourko, and Saks (2005) demonstrate that land-use regulations and geographic barriers significantly constrain new housing construction, thereby amplifying house price responses to demand shocks. Saiz (2010) further quantifies the role of physical geography–particularly the share of developable land bounded by water–in explaining cross-metropolitan variation in housing supply elasticity.

To address these concerns, we re-estimate the model with additional state-level controls. Specifically, we augment the regression equation (1) with two sets of covariates:

(V1) The natural logarithm of per capita personal income at the state level, which captures cross-state differences in economic conditions and purchasing power.

(V2) In addition to the per capita income control, a set of coastal classification dummy variables (Ocean Coast, Gulf Coast, and Inland, with non-coastal states as the reference category), which proxy for geographic constraints on housing supply.

To construct these controls, we obtain state-level per capita personal income data for 2023 from the U.S. Bureau of Economic Analysis (BEA) Regional Economic Accounts (SAINC1 Personal Income Summary). Coastal classification is based on geographic definitions from the U.S. Census Bureau and the National Oceanic and Atmospheric Administration (NOAA), which categorize states into Ocean Coast, Gulf Coast, Inland, and Great Lakes. In the regression, we include dummy variables for Ocean Coast, Gulf Coast, and Inland, with Great Lakes states as the reference category.

Table 4 reports the results of specification V1. After controlling for state-level per capita income, the qualitative pattern of the interaction coefficients remains unchanged. For Group A, the estimated adjustment effects continue to increase monotonically with age: the coefficients rise from -0.009 for the youngest cohort to 0.041 for those in their 20s, 0.099 for their 30s, and reach 0.178 for households aged over 80. All coefficients for age groups 20 and above are highly significant ($p < 0.001$). For Group B, the interaction terms remain uniformly negative and become increasingly negative with age, declining from -0.010 for the youngest cohort to -0.149 for the 80-and-over group. The monotonic divergence between the two groups is preserved, indicating that the baseline results are not driven by differences in state-level income.

Table 5 reports the results of specification V2, which further includes coastal classification dummies. The coefficients on the coastal indicators are positive and highly significant: Ocean Coast (0.257), Gulf Coast (0.121), and Inland (0.060), relative to states bordering the Great Lakes. These estimates confirm that geographic constraints on land supply are indeed associated with higher housing values, consistent with the findings of Glaeser, Gyourko, and Saks (2005) and Saiz (2010). Importantly, however, the inclusion of these geographic controls does not alter the core pattern. For Group A, the interaction coefficients remain positive and monotonically increasing with age, ranging from 0.041 for the 20s cohort to 0.174 for those aged over 80. For Group B, the coefficients remain uniformly negative and monotonically decreasing, from -0.006 for the youngest cohort to -0.085 for the 80-and-over group. While the magnitudes of the Group B coefficients are somewhat attenuated relative to the baseline–reflecting the partial absorption of geographic effects–the qualitative divergence between the two groups remains pronounced and statistically significant across all older age cohorts.

Taken together, these robustness checks demonstrate that the divergent age profiles of housing demand between Group A and Group B are not artifacts of omitted economic or geographic heterogeneity. These results reinforce the interpretation that the tax structure—specifically, the combination of high CGTs and low PTs—exerts

Table 4 Robustness Check (V1): Controlling for State-Level Per Capita Income.

Age group	Baseline effect	Group A	Group B
0–10 years old	0.041†	-0.009	-0.010*
10–20 years old	0.018†	-0.011*	-0.021†
20–30 years old	-0.079†	0.041†	-0.061†
30–40 years old	-0.051†	0.099†	-0.084†
40–50 years old	-0.021†	0.119†	-0.093†
50–60 years old	-0.025†	0.137†	-0.096†
60–70 years old	-0.006**	0.147†	-0.124†
70–80 years old	0.029†	0.158†	-0.135†
Over 80 years old	0.036†	0.178†	-0.149†
Constant		-8.871†	
Income (log)		0.403†	
Per capita income (log)		1.515†	
Observations		973,598	
R^2		0.222	

Note: The baseline effect corresponds to age-group dummy coefficients. Group A and Group B report interaction effects with group indicators. The specification additionally controls for the natural logarithm of state-level per capita personal income. *, **, and † denote statistical significance at the 5%, 1%, and 0.1% levels, respectively.

Table 5 Robustness Check (V2): Controlling for State-Level Per Capita Income and Coastal Proximity.

Age group	Baseline effect	Group A	Group B
0–10 years old	0.041†	-0.007	-0.006
10–20 years old	0.020†	-0.012*	-0.021†
20–30 years old	-0.086†	0.041†	-0.037†
30–40 years old	-0.064†	0.095†	-0.040†
40–50 years old	-0.036†	0.115†	-0.045†
50–60 years old	-0.042†	0.135†	-0.046†
60–70 years old	-0.022†	0.145†	-0.070†
70–80 years old	0.010†	0.154†	-0.077†
Over 80 years old	0.015†	0.174†	-0.085†
Constant		-5.579†	
Income (log)		0.401†	
Per capita income (log)		1.208†	
Ocean Coast		0.257†	
Gulf Coast		0.121†	
Inland		0.060†	
Observations		973,598	
R^2		0.227	

Note: The baseline effect corresponds to age-group dummy coefficients. Group A and Group B report interaction effects with group indicators. The specification additionally controls for the natural logarithm of state-level per capita personal income and coastal classification dummies (Ocean Coast, Gulf Coast, and Inland; non-coastal states serve as the reference category). * and † denote statistical significance at the 5% and 0.1% levels, respectively.

an independent and substantively important influence on the life-cycle trajectory of housing demand among elderly households.

4.2 The Republic of Korea: A Natural Experiment of Tax-Induced Distortions

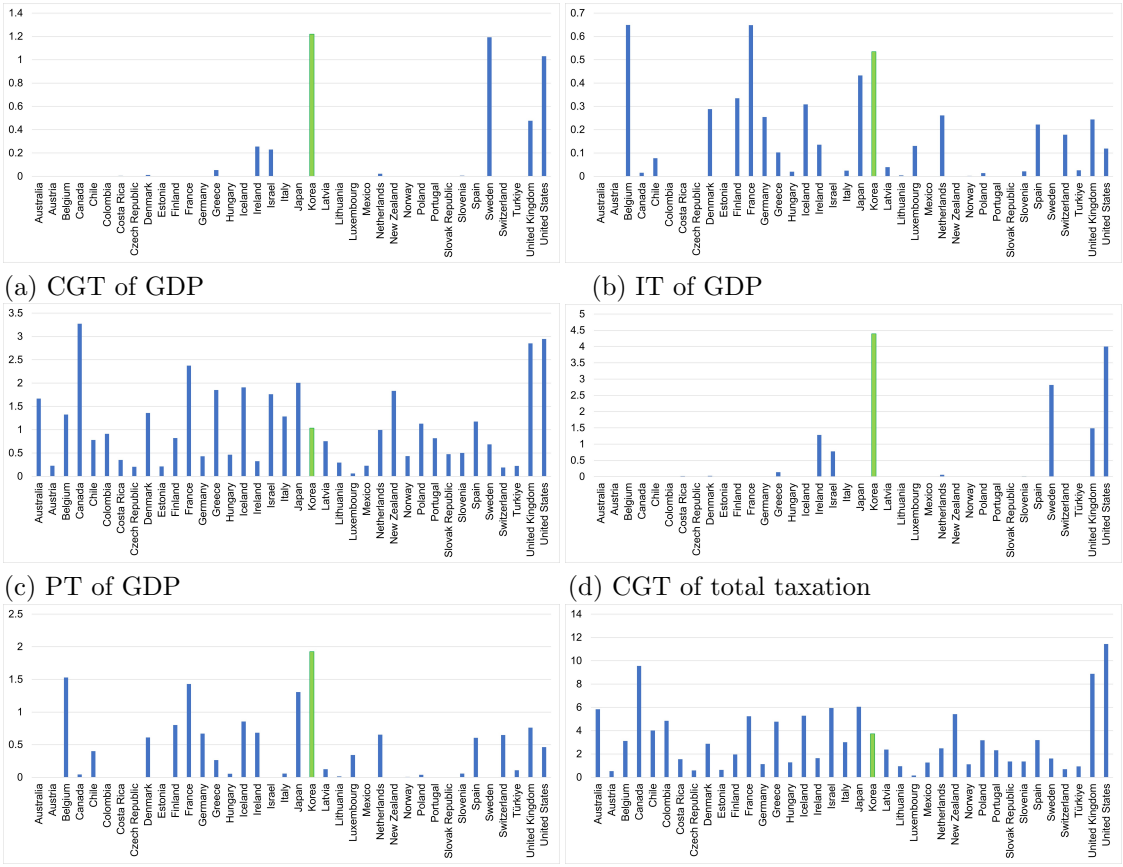
While the U.S. case illustrates how housing demand varies across states under relatively stable tax regimes, Korea offers a unique natural experiment. In this section, we analyze how a specific institutional setting–characterized by a disparity between high statutory and effective tax rates–interacted with exogenous policy shocks to distort market incentives.

A country's tax mix is, of course, shaped by the historical context in which its fiscal institutions evolved. PT is a fundamental local tax that can be justified by the benefit principle, under which residents pay in proportion to the local public services they receive. In countries with mature local autonomy and fiscal decentralization–such as the U.S. and the United Kingdom–PT has traditionally been a major source of local revenue and accounts for a substantial share of the overall tax burden. By contrast, Korea's long history of centralized governance has been associated with a tax system that relies more heavily on transaction-based taxation, particularly capital gains taxation, which is comparatively convenient to administer–especially during the rapid economic development since the 1960s.

As a result, as shown in Figure 3, Korea's tax revenue structure deviates significantly from global norms. The CGT revenue amounts to 1.21% of GDP, which is the highest among OECD countries and starkly contrasts with the OECD average of 0.14%. Similarly, IT revenue accounts for 0.53% of GDP, exceeding the OECD average of 0.13%. By contrast, PT revenue stands at 1.03%, slightly below the OECD average of 1.05%. This pattern suggests a structural asymmetry in the tax mix: realized gains and intergenerational transfers related to real estate investment are taxed more intensively, whereas the recurring cost of holding property remains comparatively modest.

Another important feature of Korea's tax system is the high progressive tax rates. In most countries, real estate tax serves mainly as a source of revenue for local governments. But in Korea, the taxes has been adjusted under the strong policy stance to control the volatility of housing prices. Since the 1960s, Korea has undergone rapid economic growth and urbanization, which has led to a significant and continuous escalation in housing prices and has been recognized as a major social issue. In this context, Korea's real estate tax system reflects policy objectives aimed at preemptively inhibiting speculative behavior such as acquiring multiple properties for the purpose of realizing capital gains. As the Korean government has actively used its taxation system to regulate the housing market, the level of housing tax burden has been adjusted in response to market fluctuations.

The purpose of such a tax structure is to discourage behaviors that may contribute to price bubbles and reduce housing affordability for ordinary households. To achieve these policy objectives, the tax system is designed to impose higher taxes on individuals who have multiple housing units, properties that are relatively expensive, properties that are bought and sold within a short period of time, and properties



(a) CGT of GDP (b) IT of GDP

(c) PT of GDP (d) CGT of total taxation

(e) IT of total taxation (f) PT of total taxation

Fig. 3 Tax revenues of OECD countries.

that are located in areas with faster appreciation rates in housing prices. As a result, Korea's taxation system has not only become highly progressive in terms of tax rates, but it has also acquired a nature as personal tax.[3] For instance, capital gains derived from the sale of a house valued at 900 million won[4] or less that has been occupied by a household for a period of two years or more are exempt from taxation. Meanwhile, if a household with three or more houses sells a property located within a speculative control zone, the tax rate goes up to 70%.

However, such a progressive tax structure has also created regional disparities in the taxation environment. In Korea, there exists a substantial gap between housing prices in the capital city of Seoul and those in other regional cities. Under the progressive tax system, this price disparity resulted in significantly higher average CGT rates being applied to properties located in Seoul, while the designation of speculation

[3]Real estate taxes are generally considered a type of real taxes, which are levied on property rather than on individuals. Personal taxes, on the other hand, are taxes that vary with the state of individuals, such as income tax.

[4]Based on the currency exchange rate as of March 23, 2023, approximately 0.7 million dollars.

control zones–which impose additional CGT burdens–was also concentrated primarily in Seoul. The lock-in effect is visibly reflected in housing consumption patterns. According to our calculations, the average PIR for elderly households (aged 70+) in Seoul reached a staggering 39.84, compared to the national average of 8.60. This disproportionately high housing consumption relative to income implies that elderly homeowners in Seoul are 'house-rich, cash-poor', yet they refuse to downsize due to the tax structure.

The Korean government's responses to the housing market from 2017 is a recent example of how the market movement is affected by the tax structure. Since the Korean government announced a large-scale urban development project in 2017, the housing prices in the metropolitan area began to rapidly increase. However, the government had a negative view on such price increases and diagnosed it as an initiation of housing bubble led by a small number of speculators. Eventually, on August 2nd, 2017, the government announced policies to prevent speculative activities in the housing market. While the policy package consisted of multiple measures, its key feature was a substantial increase in the effective CGT on housing transactions in designated regulated areas, largely concentrated in the Seoul Metropolitan Area. Specifically, the policy involved an increase in punitive CGT rates on multiple-home owners in these areas, combined with the elimination of long-term holding deductions. The Korean government also introduced additional tax surcharges on capital gains for multiple-home owners in these areas, imposing a surcharge of 10 percentage points for owners of two homes and 20 percentage points for owners of three or more homes on top of the standard tax rates ranging from 6 to 45 percent. At the same time, eligibility for long-term holding deductions was completely revoked for these taxpayers, substantially increasing their effective tax burden.

As housing market overheating persisted, the government further intensified the punitive tax scheme on July 10, 2020. Under this revision, the surcharge was raised to 20 percentage points for two-home owners and 30 percentage points for owners of three or more homes in regulated areas. Consequently, for taxpayers owning three or more homes and subject to the top statutory CGT rate of 45 percent, the combined statutory tax rate rose to 75 percent. When the local income tax surcharge of 10 percent is included, the effective top marginal tax rate reached 82.5 percent of capital gains, representing an unprecedented level in Korea. In parallel, to curb short-term speculative transactions, CGT rates on short-term property holdings and pre-sale rights[5] were sharply increased. For properties held for less than one year, the CGT rate was raised from 40 percent to 70 percent, while properties held for at least one year but less than two years became subject to a flat tax rate of 60 percent, replacing the application of the standard progressive tax schedule.

The change in tax regime resulted in sharp increase in effective capital gain tax rates. Table 6 presents the estimated effective tax rates for the general population and for households specifically liable for CGT (i.e., excluding 1-house owners eligible for exemptions). This distinction is crucial because the generous tax exemptions for

[5]Pre-sale rights (bunyang-gwon) refer to contractual rights to purchase a housing unit, typically in a newly constructed apartment complex, prior to its completion. These rights are actively traded in secondary markets in Korea and can generate substantial capital gains, as they are often acquired at below-market prices through lottery-based allocation systems.

single-home owners in Korea can mask the marginal tax burden faced by multi-home owners and owners of high-value properties–the very agents most likely to influence market liquidity. As we can see, the nationwide effective CGT level from 3.56% in 2016 to 12.54% in 2021. In Seoul, the increase rate was much steeper; it raised from 5.60% to 21.35%.

Table 6 Estimated effective tax rates in Korea, 2016–2021.

		2016	2017	2018	2019	2020	2021
Panel A: General population							
Nationwide	CGT (%)	3.56	6.60	6.62	6.19	6.99	12.54
	PT (%)	0.88	0.98	1.22	1.20	1.19	1.11
	IT (%)	0.14	0.20	0.21	0.27	0.33	0.60
Seoul	CGT (%)	5.60	11.93	13.46	13.36	15.35	21.35
	PT (%)	0.86	0.84	1.06	1.03	1.03	1.00
	IT (%)	0.54	0.85	1.04	1.23	1.76	2.94
Panel B: Households liable for CGT							
Nationwide	Proportion (%)	72.62	73.90	72.35	68.38	72.44	78.54
	CGT (%)	4.90	8.94	9.14	9.06	9.65	15.97
	PT (%)	0.84	0.85	1.16	1.12	1.13	1.07
	IT (%)	0.13	0.20	0.23	0.28	0.36	0.63
Seoul	Proportion (%)	76.29	81.60	82.78	81.36	85.55	87.82
	CGT (%)	7.34	14.62	16.26	16.42	17.94	24.31
	PT (%)	0.83	0.82	1.00	0.97	1.00	0.99
	IT (%)	0.52	0.90	1.16	1.25	1.91	2.97

Note: Panel A reports estimated effective tax rates for the overall population of homeowners. Panel B restricts the sample to households facing nonzero CGT liabilities, excluding single-home owners eligible for exemptions.

Source: Authors' calculation based on Korean tax statistics.

Meanwhile, the PT rates in Korea remained relatively low. While the CGT more than tripled during 2016-2021, the nationwide PT increased from 0.88% to 1.11%, which is only about 26%, or 0.23%p increase. This limited increase suggests that statutory rate hikes were dampened by tax assessment caps and a realization ratio (official price vs. market price)[6] that remained around 70%. Consequently, the increase rate in PT, which should theoretically incentivize downsizing, was insufficient to counteract the increase rate in capital gain tax, the retention incentive.

It is noteworthy that IT level was significantly lower than that of CGT, and the gap increased rapidly through 2016-2021. In 2016, the gap was 3.42%(3.56-0.14), but in 2021, the gap increased to 11.94%(12.54-0.60). In Seoul, the gap was 18.41% in 2021, which is over 50% larger than the gap of overall nation. Furthermore, if we focus

[6]The realization ratio (hyeonsilhwa-yul) refers to the ratio of the government-assessed official price (gongsi-ga) to the actual market transaction price. In Korea, property taxes and the comprehensive real estate tax are levied not on market values but on official prices, which have historically been set at approximately 60-70% of market values. The gap between the two effectively reduces the real tax burden below what statutory rates would imply.

on the households who face nonzero CGT, the gap is even larger; 15.34% nationwide and 21.34% in Seoul. In such tax environment, the optimal strategy for an elderly household shifts from selling to bequeathing, as the tax savings due to low inheritance rates outweigh the liquidity benefits of downsizing.

How did the market respond to this widened gap between transaction and transfer costs? Instead of stabilizing the market as policymakers intended, the prohibitive transaction costs triggered a structural distortion. Macro-level data reveals two striking stylized facts that align with the tax lock-in hypothesis.

First, the market exhibited a stark divergence between prices and transaction volumes. Between 2015 and 2021 in Seoul, a strong negative correlation (-0.856) was observed between housing price changes and the turnover ratio. As illustrated in Figure 4, the policy could have created a vicious cycle. The tax-induced lock-in effect restricted housing supply, which in turn fueled further price appreciation. In Seoul, the cumulative housing price index rose by approximately 88% from 2015 to 2021, far outpacing the national average of 34%. This price surge, interacting with the progressive tax schedule, further elevated the effective tax burden, reinforcing the incentive to hold rather than sell.

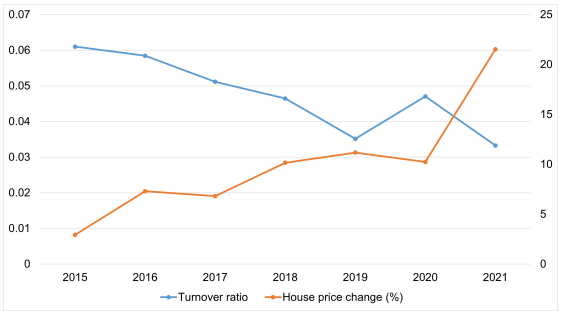


Fig. 4 The relationship between the change in housing prices and the turnover in Seoul from 2015 to 2021.

Second, households engaged in massive substitution from market sales to non-market transfers as in Table 7. As market transactions plummeted from 221,683 in 2015 to 126,834 in 2021, the number of housing transfers via 'gift' (inter vivos transfers) surged from 10,221 to a peak of 35,353 in 2020. This surge coincided precisely with the policy shocks. This suggests that homeowners, facing prohibitive CGT, rationally chose to transfer wealth to their children (effectively a pre-mortem bequest) rather than liquidate assets.

We acknowledge that the surge in gift transactions could partly reflect other concurrent factors, such as rising housing prices increasing the perceived urgency of intergenerational wealth transfer, or tightened mortgage regulations (e.g., loan-to-value ratio restrictions) prompting parents to assist children through direct asset transfers rather than financial support. However, the timing of the gift surge–which closely tracks the specific policy dates of CGT increases (August 2017 and July 2020) rather than the broader trend of price appreciation–suggests that the tax channel

Table 7 Trends in house prices, market transactions, and housing transfers by gift in Seoul.

	2015	2016	2017	2018	2019	2020	2021
House price index change (%)	2.9	7.3	6.8	10.2	11.2	10.2	21.5
Number of transactions	221,683	212,978	187,797	171,050	131,379	177,757	126,834
Number of housing transfers by gift	10,221	13,489	14,860	24,765	20,637	35,353	23,590

Note: "Gift" refers to inter vivos housing transfers (non-market transactions). The number of housing transfers by gift are obtained from the Korea Real Estate Board (KREB).

Source: Authors' calculation based on Korean housing transaction statistics.

played a primary role. Moreover, the micro-level regression results presented below confirm that the gift substitution pattern is strongest among households facing the widest tax bequest gap, further supporting the tax arbitrage interpretation over alternative explanations.

While these aggregate patterns are suggestive, they do not definitively prove that tax incentives drove individual decisions. To rule out confounding factors and rigorously test whether this phenomenon was driven by the mechanism proposed in our model, we conducted a micro-level analysis using household level data. We constructed a comprehensive dataset by pooling microdata from the Population and Housing Census (henceforth, PHC) spanning from 2016 to 2023, resulting in a total sample size of 236,829 households after excluding observations with missing or inconsistent values. To ensure comparability across different years, we first adjusted housing asset values and household income for inflation using the Consumer Price Index (CPI, 2020 base year) to represent real values. Furthermore, since the sum of sample weights varies by survey year, simply pooling the data could lead to biased estimates dominated by years with larger population projections. We normalized the sample weights so that the sum of weights for each year is equalized, ensuring that each year contributes equally to the regression analysis.

A distinct advantage of our analysis on Korea, compared to the U.S. case study, lies in the precision of tax measurements. While the U.S. analysis relied on state-level statutory tax groups due to data limitations, the detailed household-level information in the PHC allows us to construct a microsimulation model that calculates the specific effective tax rates each household would face. Specifically, we computed the hypothetical CGT, PT (including comprehensive real estate tax), and IT for every household in each year. This calculation incorporates complex policy variables such as the number of owned homes, location in regulated areas (e.g., Seoul), holding periods, and year-specific surcharges. This approach enables us to capture the precise incentives faced by heterogeneous households–for instance, distinguishing between a single-home owner with long-term holding deductions and a multi-home owner subject to punitive surcharges–thereby allowing for a more rigorous identification of the tax lock-in effect. The details of tax calculation process are provided in the appendix.

To test out theory, we constructed two key variables, the tax lock-in score and the tax bequest gap. Tax lock-in score measures the relative burden of transaction costs versus holding costs. Since the raw ratio of tax amounts can be highly skewed and prone to outliers, or undefined if the PT is zero, we applied a log-transformation after

adding 1 to both the numerator and the denominator. A higher score implies that the exit cost is significantly larger than the cost of holding, strengthening the incentive to delay disposal.

$$T_{lockin,i,t} = \ln\left(\frac{\text{Estimated CGT}_{i,t} + 1}{\text{Total PT}_{i,t} + 1}\right). \tag{2}$$

Tax bequest gap captures the tax arbitrage incentive between selling and bequeathing. It is defined as the difference between the effective CGT rate and the effective IT rate. A positive gap indicates that the tax burden of selling the property during one's lifetime exceeds the tax burden of transferring it upon death, thereby encouraging strategic retention for bequest purposes.

$$T_{gap,i,t} = \text{Eff. CGT Rate}_{i,t} - \text{Eff. IT Rate}_{i,t}. \tag{3}$$

Again, we extend the Mankiw and Weil (1989) framework to estimate housing demand, incorporating the tax incentive variables and their interactions with age groups. The baseline regression model is specified as follows:

$$\ln V_{i,t} = \alpha + \beta_{tax} Tax_{i,t} \sum \beta_s N_{s,i,t} + \sum \beta_{inter,s} N_{s,i,t} Tax_{i,t} + \beta_X \ln X_i + \Theta_t + \epsilon_i \tag{4}$$

where $\epsilon_i \sim N\left(0, \delta^2\right)$. $\ln V_i$ indicates the natural logarithm value of household i's housing value in year t. $N_{s,i,t}$ is the number of the age group s in the household i in year t. Θ denotes year fixed effects to control for macroeconomic shocks. $\ln X_i$ is the natural logarithm of household income as in the U.S. case.

Since both the T_{lockin} and the T_{gap} are structurally derived from the same underlying asset values, including both variables and their respective interaction terms in a single model raises concerns about severe multicollinearity ($VIF > 10$). To mitigate this issue and isolate the distinct effect of each mechanism, we estimated two separate models and only include one type of interaction term at a time. This stepwise approach ensures the stability of the coefficient estimates and allows for a clearer interpretation of how different tax incentives affect different age cohorts.

Table 8 presents the regression results including only the T_{gap} interaction terms, using weighted least squares (WLS) to correct for sampling bias. The sample weights provided in the raw data are utilized as the weights in the regression analysis. The analysis yields three critical findings that strongly corroborate our hypotheses regarding tax-induced market distortions.

First, we observe a universal lock-in effect across the housing market. The coefficient for the tax lock-in score is positive and statistically significant. This indicates that, on average, a higher relative burden of CGT versus PT leads to increased housing asset retention. This suggests that the punitive CGT structure in Korea acts as a formidable barrier to exit for homeowners, regardless of their age.

Second, the bequest motive plays a significant role in asset retention. The coefficient for the tax bequest gap is also positive and significant. This implies that as the CGT burden exceeds the IT burden, households are more likely to hold onto their assets. This empirical evidence supports the observation mentioned earlier: the surge

Table 8 Regression analysis results: income, tax incentives, and age-interaction effects.

Variable	**Coefficient**	
Key independent variables		
Ln(Real Income)	0.2943***	
Tax Lock-in Score	0.1903***	
Tax Bequest Gap	0.0237***	
Age group effects and interaction terms		
Age group	**Baseline effect**	**Bequest × Age interaction**
0–10 years old	0.0798***	0.0011**
10–20 years old	0.0681***	-0.0013***
20–30 years old	0.1043***	-0.0043***
30–40 years old	0.1812***	-0.0080***
40–50 years old	0.1590***	-0.0077***
50–60 years old	0.1087***	-0.0078***
60–70 years old	0.1071***	-0.0072***
70–80 years old	0.0601***	-0.0040***
Over 80 years old	-0.1309***	0.0023***
Other controls		
Year fixed effects	-0.0882***	
Constant	7.8602***	
Summary statistics		
Observations	236,829	
R^2	0.322	
F-statistic	1,854.2	

Note: $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$.

in gift and inheritance transactions in Korea is a rational response to tax arbitrage opportunities.

Third, and most strikingly, we identify a distinct behavioral reversal among the aged 80 and above cohort. For cohorts aged 10 to 70, the interaction coefficients for the tax bequest gap are negative. This suggests that for the general population, practical life-cycle needs (such as family expansion or retirement consumption) tend to dilute the pure tax sensitivity. However, for the 80+ cohort, the interaction term turns significantly positive, which indicates that bequest motive affects the elders the most.

In Table 9, the regression results with the tax lock-in score interaction terms are shown. As in Table 8, the tax lock in score interaction term turns significantly positive for cohort aged 80+. This result suggests that again, the behavior of the elders is most affected by the tax incentives. The other results are consistent with the results of Table 8.

These findings support our theory and illuminate why elderly homeowners in Korea do not downsize their housing assets. To interpret the results, it is useful to consider the contrasting behavior across age groups.

For households in their 30s through 60s, the interaction coefficients are consistently negative. This implies that, even in a tax environment that favors bequeathing

Table 9 Regression analysis results: tax lock-in incentives and age-interaction effects.

Variable	**Coefficient**	
Key independent variables		
Ln(Real Income)	0.2948***	
Tax Lock-in Score	0.3042***	
Tax Bequest Gap	0.0093***	
Age group effects and interaction terms		
Age group	**Baseline effect**	**Lock-in × Age interaction**
0–10 years old	0.0803***	0.0061*
10–20 years old	0.0630***	-0.0035
20–30 years old	0.0979***	-0.0286***
30–40 years old	0.1781***	-0.0670***
40–50 years old	0.1576***	-0.0663***
50–60 years old	0.1022***	-0.0602***
60–70 years old	0.1025***	-0.0570***
70–80 years old	0.0599***	-0.0341***
Over 80 years old	-0.1377***	0.0235***
Other controls		
Year fixed effects	Yes	
Constant	7.8682***	
Summary statistics		
Observations	236,829	
R^2	0.321	
F-statistic	2,020.7	

Note: $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$.

over selling, these households do not respond by increasing housing retention. The reason is intuitive: working-age and early-retirement households face binding life-cycle constraints–such as job relocation, family expansion or contraction, and the need to finance consumption out of housing equity–that dominate the tax arbitrage motive. For these cohorts, the practical necessity of adjusting housing consumption outweighs the potential tax savings from holding until death, which in any case lies decades in the future and is therefore heavily discounted.

The pattern reverses sharply for the 80-and-over cohort. According to the standard life-cycle hypothesis, this group should be decumulating most aggressively: their income is minimal, their housing consumption needs are declining, and they face elevated health-related expenditure risks that would ordinarily favor liquidity. Indeed, the baseline age effect for this cohort is strongly negative (-0.1309), confirming that, absent tax considerations, the ultra-elderly do hold less housing wealth. However, the positive interaction coefficients–+0.0023 for the tax bequest gap (Table 8) and +0.0235 for the tax lock-in score (Table 9)–indicate that tax incentives reverse this natural decumulation pattern. This is not merely a weaker version of the negative response observed in younger cohorts; it is a qualitative shift in behavior. The monotonically negative age-interaction pattern that holds from the 10s through the 70s

breaks precisely at the point where mortality becomes imminent and the bequest channel becomes operationally relevant.

The underlying mechanism is straightforward. For an 80-year-old homeowner, the expected time horizon until death is short–typically less than a decade. The tax savings from holding until death (avoiding a CGT rate that can exceed 60% for multi-homeowners in Seoul) and transferring through bequest (at an effective inheritance tax rate far below the CGT rate) are therefore realized in the near future, making their present value substantial. By contrast, for a 40-year-old facing the same tax wedge, the bequest event lies several decades away; the present value of the tax saving is correspondingly small, and the opportunity cost of forgoing liquidity over such a long horizon is high. This asymmetry in time horizons explains why the same tax structure produces opposite behavioral responses across age groups.

Finally, it is worth noting that the lock-in interaction coefficient for the 80+ cohort (+0.0235) is roughly ten times larger than the bequest gap interaction coefficient (+0.0023). This suggests that, for the ultra-elderly, the dominant channel is not the attractiveness of bequeathing per se, but rather the prohibitive cost of selling: the tax lock-in effect–whereby the sheer magnitude of CGT relative to PT makes disposal economically punitive–appears to be the more powerful force keeping housing assets off the market.

Overall, the empirical evidence confirms that Korea's specific tax structure–characterized by high transaction costs relative to holding costs and a favorable bequest tax gap–structurally creates incentives for the elderly to delay housing disposal. This mechanism significantly reduces the supply elasticity of the existing housing stock, exacerbating market imbalances despite government interventions.

Comparing the U.S. and Korean results

Before wrapping up the two empirical cases, it is important to address a notable difference between the two sets of results. In the U.S. analysis, the interaction coefficients for Group A are positive across all age groups and increase monotonically with age, indicating that households in high-CGT/low-PT states maintain higher housing stock than the national average at every stage of the life cycle. In the Korean analysis, by contrast, the interaction coefficients for the tax bequest gap are negative for cohorts aged 10 through 70 and turn positive only for the 80-and-over group. While both sets of results converge on the key finding–that the tax-induced retention effect is strongest among the elderly–the differing patterns for younger cohorts warrant discussion.

We attribute this discrepancy primarily to differences in the nature of the tax variables employed in each analysis. In the U.S. specification, the key variable is a group indicator that captures a fixed institutional environment: whether a household resides in a state characterized by high capital gains taxes and low property taxes. Because this classification reflects the long-run tax regime in which households have accumulated housing wealth over their entire life cycle, the positive interaction coefficients for younger age groups likely capture the cumulative effect of living in a high-CGT/low-PT state–including reduced incentives to trade up or relocate, which lead to a persistently higher housing stock relative to households in other states. In the Korean specification, by contrast, the tax variables are continuous measures

computed at the household-year level, capturing the contemporaneous marginal tax incentive each household faces in each survey year. For working-age households, a high bequest gap at a given point in time primarily signals that capital gains taxes on potential transactions are currently elevated, which discourages housing purchases and upgrades, thereby reducing contemporaneous housing values. Only for the ultra-elderly–for whom the relevant margin is not acquisition or upgrading but rather retention versus disposal–does the bequest gap translate into the retention incentive predicted by our model.

Despite these differences, the two case studies are fundamentally complementary. The U.S. analysis demonstrates that long-run exposure to a tax structure favoring retention produces higher equilibrium levels of elderly housing stock, while the Korean analysis reveals how an exogenous shift in the tax structure triggers behavioral responses–most dramatically among the ultra-elderly–that amplify retention at the margin. Together, they provide converging evidence that the retirement-saving puzzle is, in significant part, an institutional outcome of the housing tax mix.

5 Concluding Remarks

This study revisits the retirement-saving puzzle through an institutional lens, challenging the view that elderly housing retention is driven solely by intrinsic preferences. We argue that the decision to downsize is fundamentally an economic calculation shaped by the relative structure of housing taxation–specifically, the trade-off between the costs of holding (PT), trading (CGT), and transferring (IT).

Our theoretical model serves as the unifying backbone of this analysis. By formalizing the household's optimization problem, we derived a specific condition: the incentive to downsize diminishes as the effective transaction cost rises relative to the holding and transfer costs. The model predicts that once the tax structure crosses a certain threshold, the utility of *holding until death* (bequest) mathematically dominates the utility of *selling for liquidity* (downsizing), regardless of the household's original consumption needs.

Guided by this theoretical framework, we validated the mechanism through two complementary empirical dimensions:

First, facilitating the efficient allocation of housing assets requires a rebalancing of the tax mix. As evidenced by the Group A states in the U.S. and post-2017 Korea, a tax regime that penalizes transactions while subsidizing holding creates a lock-in effect that rigidifies the market. In the U.S., for example, the stepped-up basis provision represents a particularly powerful institutional mechanism that reinforces the incentive to hold until death. Curtailing or eliminating this provision would narrow the tax wedge between lifetime disposal and bequest, thereby reducing the arbitrage incentive identified in our model. In Korea, a phased rebalancing that gradually lowers the punitive capital gains surcharges on multi-homeowners while simultaneously raising recurrent property taxes (e.g., increasing the comprehensive real estate tax base through higher fair market value ratios) would reduce exit barriers without sacrificing the policy objective of discouraging speculative accumulation. The key principle

is that policy should aim to lower transaction barriers relative to holding costs, rather than adjusting either instrument in isolation.

Second, the Korean case verifies the model's dynamic implications through a natural experiment. Unlike the stable U.S. system, Korea experienced exogenous policy shocks that drastically widened the "tax bequest gap." Consistent with our model's comparative statics, this shock triggered striking macroscopic anomalies: a 'market freeze' where housing prices soared by 88% while transaction turnover plummeted (-0.856 correlation), accompanied by a tripling of intergenerational gifts.

Our micro-level regression confirms that this was driven by the ultra-elderly (aged 80+), whose behavior flipped exactly as the model predicted: as mortality risk makes the bequest channel more relevant, a wider tax gap drove them to withdraw assets from the market. In short, the macro-level chaos was the aggregate result of households behaving precisely according to the intertemporal arbitrage logic defined in our model.

Taken together, the theoretical model and empirical evidence provide a coherent explanation: The U.S. evidence shows how tax structures determine the level of retention, while the Korean evidence illustrates how faulty tax design distorts the mode of transfer.

These findings offer critical policy implications for aging economies.

First, facilitating the efficient allocation of housing assets requires a rebalancing of the tax mix. As evidenced by the Group A states in the U.S. and post-2017 Korea, a tax regime that penalizes transactions while subsidizing holding creates a lock-in effect that rigidifies the market. Therefore, policy should aim to lower transaction barriers relative to holding costs to align incentives with liquidity needs of the elderly.

Second, policymakers must account for the endogenous volatility inherent in progressive tax schedules. As demonstrated in our model and vividly illustrated by the Korean experience, rising housing prices mechanically inflate effective tax burdens under a progressive rate structure, creating a feedback loop that further restricts supply and fuels appreciation. To break this vicious cycle, specific stabilization mechanisms should be considered. For instance, in the Korean context, the realization ratio (locally known as Gongsi-ga hyeonsilhwa-yul)–which determines the fraction of market value used for tax assessment–could serve as an automatic stabilizer: indexing the ratio inversely to the rate of regional price appreciation would dampen the pro-cyclical amplification of tax burdens. Alternatively, capital gains tax brackets and long-term holding deduction thresholds could be indexed to a composite housing price index, ensuring that nominal price increases do not erode real deduction values.

Finally, housing tax reform necessitates a holistic approach that integrates IT policy. Our results show that the housing market cannot be stabilized in the tax code makes 'dying with the house' significantly cheaper than 'selling the house'. Closing the arbitrage gap between immediate disposal and future bequest is essential not only for resolving the retirement-saving puzzle but also for mitigating intergenerational wealth concentration.

In conclusion, facilitating the optimal allocation of housing assets requires a structural redesign of the tax system–one that aligns the incentives for holding, trading, and bequeathing to clear the path for downsizing.

Funding

This work was supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government(MSIT) (RS-2023-00242528).

Conflict of interest

The authors declare no potential conflict of interests.

Ethical Approval

This study uses only secondary, de-identified data from publicly available or licensed survey sources and does not involve direct interaction with human participants. Ethical approval was therefore not required under institutional and national guidelines.

References

Akkoyun, H. C., Arslan, Y., & Kanik, B. (2013). Housing prices and transaction volume. *Journal of Housing Economics, 22*(2), 119–134.

Ameriks, J., Caplin, A., Laufer, S., & Van Nieuwerburgh, S. (2011). The joy of giving or assisted living? Using strategic surveys to separate public care aversion from bequest motives. *The Journal of Finance, 66*(2), 519–561.

Ando, A., & Modigliani, F. (1963). The life-cycle hypothesis of saving: Aggregate implications and tests. *The American Economic Review, 53*(1), 55–84.

Bernheim, B. D., Shleifer, A., & Summers, L. H. (1985). The strategic bequest motive. *Journal of Political Economy, 93*(6), 1045–1076.

Blundell, R., Crawford, R., French, E., & Tetlow, G. (2016). Comparing retirement wealth trajectories on both sides of the pond. *Fiscal Studies, 37*(1), 105–130.

Chiuri, M. C., & Jappelli, T. (2010). Do the elderly reduce housing equity? An international comparison. *Journal of Population Economics, 23*(2), 643–663.

Clayton, J., Miller, N., & Peng, L. (2010). Price-volume correlation in the housing market: Causality and co-movements. *The Journal of Real Estate Finance and Economics, 40*(1), 14–40.

Conway, K. S., & Houtenville, A. J. (2001). Elderly migration and state fiscal policy: Evidence from the 1990 census migration flows. *National Tax Journal, 54*(1), 103–123.

De Graaf, M., & Rouwendal, J. (2012). The demand for mortgage debt, increases in house prices and the elderly home equity puzzle. *European Regional Science Association Conference Papers*.

De Nardi, M. (2004). Wealth inequality and intergenerational links. *The Review of Economic Studies, 71*(3), 743–768.

De Nardi, M., French, E., & Jones, J. B. (2010). Why do the elderly save? The role of medical expenses. *Journal of Political Economy, 118*(1), 39–75.

Farnham, M., & Sevak, P. (2006). State fiscal institutions and empty-nest migration: Are Tiebout voters hobbled? *Journal of Public Economics, 90*(3), 407–427.

Feinstein, J., & McFadden, D. (1989). The dynamics of housing demand by the elderly: Wealth, cash flow, and demographic effects. In *The economics of aging* (pp. 55–92). University of Chicago Press.

Ferreira, F. V. (2004). You can take it with you: Transferability of Proposition 13 tax benefits, residential mobility, and willingness to pay for housing amenities. *UC Berkeley Center for Labor Economics Working Paper* No. 72.

Glaeser, E. L., Gyourko, J., & Saks, R. E. (2005). Why is Manhattan so expensive? Regulation and the rise in housing prices. *The Journal of Law and Economics*, 48(2), 331–369.

Henderson, J., & Ioannides, Y. (1983). A model of housing tenure choice. *The American Economic Review, 73*(1), 98–113.

Hurd, M. D. (1989). Mortality risk and bequests. *Econometrica, 57*(4), 779–813.

Lockwood, L. M. (2012). Bequest motives and the annuity puzzle. *Review of Economic Dynamics, 15*(2), 226–243.

Mankiw, N. G., & Weil, D. N. (1989). The baby boom, the baby bust, and the housing market. *Regional Science and Urban Economics, 19*(2), 235–258.

Megbolugbe, I. F., Sa-Aadu, J., & Shilling, J. D. (1997). Oh, yes, the elderly will reduce housing equity under the right circumstances. *Journal of Housing Research*, 53–74.

Nakajima, M., & Telyukova, I. A. (2017). Reverse mortgage loans: A quantitative analysis. *Journal of Finance, 72*(2), 911–950.

Nakajima, M., & Telyukova, I. A. (2020). Home equity in retirement. *International Economic Review*.

Poterba, J., Venti, S., & Wise, D. (2011). The composition and drawdown of wealth in retirement. *Journal of Economic Perspectives, 25*(4), 95–118.

Saiz, A. (2010). The geographic determinants of housing supply. *The Quarterly Journal of Economics*, 125(3), 1253–1296.

Shan, H. (2010). PTes and elderly mobility. *Journal of Urban Economics, 67*(2), 194–205.

Stein, J. C. (1995). Prices and trading volume in the housing market: A model with down-payment effects. *The Quarterly Journal of Economics, 110*(2), 379–406.

Stohs, M. H., Childs, P., & Stevenson, S. (2001). Tax policies and residential mobility. *International Real Estate Review, 4*(1), 95–117.

Suari-Andreu, E., Alessie, R., & Angelini, V. (2019). The retirement-savings puzzle reviewed: The role of housing and bequests. *Journal of Economic Surveys, 33*(1), 195–225.

Venti, S. F., & Wise, D. A. (1990). But they don't want to reduce housing equity. In *Issues in the economics of aging* (pp. 13–32). University of Chicago Press.

Venti, S. F., & Wise, D. A. (2004). Aging and housing equity: Another look. In *Perspectives on the economics of aging* (pp. 127–180). University of Chicago Press.

Yang, F. (2009). Consumption over the life cycle: How different is housing? *Review of Economic Dynamics, 12*(3), 423–443.

Zhao, L., & Burge, G. (2017). Housing wealth, PTes, and labor supply among the elderly. *Journal of Labor Economics, 35*(1), 227–263.

Appendix A Construction of tax variables

Since the PHC does not report the actual tax payments of households, we constructed a household-level microsimulation model to estimate the effective tax burdens for PT (holding tax), CGT, and IT. The tax parameters–including tax brackets, deduction limits, and fair market value ratios–were adjusted annually to reflect the frequent policy changes in Korea from 2016 to 2023. Table A1 and A2 show the marginal tax rate schedules as of year 2021, and Table A3 shows the evolution of key tax parameters over time.

A.1 CGT estimation

We estimated the hypothetical tax liability assuming the household sells their current residence in the survey year.

Cost Deduction: Due to the absence of data on actual transaction costs (e.g., renovation costs, brokerage fees), we applied a uniform deduction rate of 3% of the purchase price. This provides a conservative estimate of the tax base, an upper bound on taxable income.

Exemptions & High-Value Homes: We identified single-home owners and applied the non-taxable exemption rules. For high-value homes (defined as exceeding 900

million KRW until 2020, and 1.2 billion KRW thereafter), we applied the pro-rata calculation method to tax only the portion of gains exceeding the threshold.

Multi-Homeowner Surcharges: Households owning multiple properties in "Regulated Areas" (conservatively defined as Seoul, Incheon, Gyeonggi, Sejong, and the 5 Metropolitan Cities) were subject to surcharge rates (+10%p to +30%p) on top of the standard progressive rates, reflecting the actual policy timeline (e.g., the August 2, 2017 measures and July 10, 2020 measures).

A.2 PT (Holding Tax) estimation

The holding tax includes the local PT and the national comprehensive real estate tax (henceforth, CRET). The local PT is calculated as the sum of basic PT, urban planning tax, and local education tax. Basic PT is calculated using the progressive marginal rates applied on the official prices. Urban planning tax has a flat rate of 0.14% applied to the tax base, and the local education tax is a 20% surtax applied to the basic PT amount.

Tax Base: We calculated the official price by applying the annual realization ratio (approx. 68–71%) to the market value reported in the survey. The tax base for CRET was further adjusted by the Fair Market Value Ratio (rising from 80% to 95% over the sample period).

CRET: We apply the progressive tax brackets (ranging from 0.5% to 6.0% depending on the year and ownership status) and deducted the overlapping portion of local PTes to prevent double taxation, consistent with Korean tax law.

A.3 IT Estimation

We estimated the potential tax burden if the household's net assets were bequeathed immediately.

Net Asset Value: The tax base was defined as Total Assets minus Total Liabilities.

Deductions: We applied a lump-sum deduction of 1 billion KRW (approx. $800,000) for all households. This assumption reflects the standard deduction available for a deceased person with a surviving spouse and children, serving as a baseline for the middle-class tax burden.

Effective Rate: The final tax amount was calculated using the progressive IT schedule (10%–50%) and divided by net assets to derive the effective rate.

This rigorous reconstruction allows us to observe the marginal incentives facing households more accurately than using statutory rates alone.

Based on these estimates, we constructed the tax lock-in score (ratio of CGT to holding tax) and tax bequest gap (difference between effective CGT and IT rates) to measure the distinct incentives for delaying disposal.

A limitation of the PHC is that respondents report the purchase year and price only for their currently occupied residence, omitting details for additional properties. Consequently, our calculation of the effective CGT rate is restricted to the current residence. Given that multi-homeowners are subject to punitive surcharge rates on secondary properties, the actual effective tax burden level at the aggregate level is likely higher than our estimates. Similarly, for PTs and ITs, considering the progressive

Table A1 Marginal tax rate schedules (reference year: 2021).

Tax category	Tax base bracket (million KRW)	Marginal rate	Notes / surcharges
PT (Holding)	≤ 60	0.10%	Local tax applied to all.
	60 – 150	0.15%	
	150 – 300	0.25%	
	> 300	0.40%	
CRET (Holding)	≤ 300	0.6% – 1.2%	Heavy surcharge for multi-homeowners in regulated areas: 1.2% – 6.0% (vs. general 0.6% – 3.0%).
	300 – 600	0.8% – 1.6%	
	600 – 1,200	1.2% – 2.2%	
	$> 9{,}400$	3.0% – 6.0%	
Capital gains (Transaction)	≤ 12	6%	Surcharge for multi-homeowners in regulated areas: +20%p (2 homes), +30%p (3 homes).
	12 – 46	15%	
	46 – 88	24%	
	88 – 150	35%	
	$> 1{,}000$	45%	
Inheritance (Transfer)	≤ 100	10%	Applied to net asset value. Lump-sum deduction: 1 billion KRW.
	100 – 500	20%	
	$> 3{,}000$	50%	

Note: Tax base brackets are expressed in million KRW. Rates reflect statutory marginal tax rates applicable in 2021.

Table A2 Statutory tax rate schedules for holding and transaction taxes (reference year: 2021).

Tax category	Tax base (million KRW)	General rate (single-home)	Heavy rate (multi-home in regulated areas)
CRET (Holding tax)	≤ 300	0.6%	1.2%
	300 – 600	0.8%	1.6%
	600 – 1,200	1.2%	2.2%
	1,200 – 5,000	1.6%	3.6%
	5,000 – 9,400	2.2%	5.0%
	$> 9{,}400$	3.0%	6.0%
CGT (Transaction tax)	≤ 12	6%	26% (+20%p)
	12 – 46	15%	35% (+20%p)
	46 – 88	24%	44% (+20%p)
	88 – 150	35%	55% (+20%p)
	150 – 300	38%	58% (+20%p)
	300 – 500	40%	60% (+20%p)
	500 – 1,000	42%	62% (+20%p)
	$> 1{,}000$	45%	65% (+20%p)

Note: CRET refers to the comprehensive real estate holding tax. CGT denotes CGT applied upon housing transactions. Heavy rates apply to multi-homeowners in regulated areas.

rate structure and the larger asset base of multi-homeowners, property-level effective rates would likely exceed our household-level calculations. Although data constraints

Table A3 Evolution of key tax policy parameters (2016–2023).

Year	Realization ratio[1]	PT & CRET (holding) policies	CGT (transaction) policies
2016	∼65% (Est.)	FMV ratio: 80% No CRET surcharge	No surcharge General rates (6–38%)
2017	∼65% (Est.)	– –	"Regulated areas" designated Surcharge (+10%p) introduced (effective Aug.)
2018	68%	FMV ratio: 80% Roadmap for realization initiated	Surcharge: +10%p (regulated multi-homeowners) Top rate: 42%
2019	69%	FMV ratio: 85% CRET surcharge: +10%p continued	– –
2020	70%	FMV ratio: 90% –	Surcharge: +10%p continued Short-term trading tax increased
2021	70%	FMV ratio: 95% (peak burden) CRET deduction increased (1.1 billion KRW)	Surcharge increased to +20%p (regulated areas) Top rate: 45%
2022	71%	FMV ratio lowered to 60% (relief) Temporary tax cut	Surcharge suspended (from May) Standard rates applied
2023	69%	FMV ratio: 60% Deduction: 1,200 million KRW	Surcharge suspended Market normalization

[1]Realization ratio refers to the ratio of assessed property value to market value.

Note: FMV denotes the fair market value ratio used for PT assessment.

prevent a full-property portfolio analysis, we posit that our estimates serve as a conservative proxy sufficient for identifying the overall behavioral trends and directional effects of tax incentives.