Housing can be durable "bads": Costly abandonment of homeownership in a shrinking society*

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Abstract

Using Japan's case, this study conceptualizes how owners' difficulty in abandoning property ownership affects the housing-market structure. We first develop a market framework for existing houses facing low demand, revealing that housing can be durable "bads;" that is, owners' burden to keep unnecessary assets can result in negative property valuation. Because market transactions are basically possible only at positive prices, the formal resale market disappears, leaving properties vacant or underutilized, often without changes in ownership. Employing nationwide property-transaction data, we then show that the probability of transactions at very low prices rises in cities facing a higher proportion of underutilized vacant houses. Such market transactions imply that the net value after subtracting demolition or maintenance costs will be negative, supporting our conceptual framework. We argue that institutional settings on owners' difficulty in abandoning property ownership potentially hinder the utilization of vacant properties through formal market transactions.

Keywords: Vacant housing; housing abandonment; housing market; shrinking society; conceptual framework

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1. Introduction

Among the major concerns of a shrinking society is the increase in vacant and abandoned houses (e.g., Accordino and Johnson, 2000; Haase et al., 2016; Kubo and Yui, 2020). To date, the United States (US) context has been widely investigated in terms of properties being foreclosed through tax delinquency or mortgage default and the abandoned properties exhibiting negative externalities for society. That is, an absent owner indicates poor maintenance of the property and neighborhood insecurity, significantly reducing neighboring house prices (Gerardi et al., 2015; Hartley, 2014). In declining US cities, abandoned properties are auctioned even at approximately "one dollar" (a non-negative price just above zero) by local authorities or land banks as property upkeep involves a maintenance cost (The New York Times, 2013).

However, as Morckel (2014) points out, the term "abandonment" in declining US cities has no agreed-upon definition. As the state of houses being vacant and abandoned are interpreted differently (Caramaschi and Chiodelli, 2022), worldwide, a need arises to distinguish between cases involving ownership abandonment as part of foreclosure cases through tax delinquency or mortgage default and those caused by physical neglect and unused vacancy (Suzuki and Asami, 2019; Suzuki et al., 2022).

In this study, we aim to shed light on the more general housing problems in shrinking societies, where vacant-housing problems arise not only in relation to foreclosures. Vacant-housing problems have often been investigated in the context of low demand in housing markets (Bramley and Pawson, 2002; Buitelaar et al., 2021; Keenan et al., 1999; Molloy, 2016; Moroni et al., 2020). While foreclosure-related housing abandonment often involves the transfer of ownership rights, ownership does not change merely by houses becoming vacant (Couch and Cocks, 2013; Keenan et al., 1999). In declining European cities, such as Sicilian villages, there have been housing transactions at approximately zero price (i.e., one euro) (CNN, 2021; The Guardian, 2019). Vacant-property sellers are individual owners (not land banks or other public sector members) wishing to escape the continued maintenance burden, which is possible only through property transactions. However, successful transactions may be limited to "special" properties with hidden potential for buyers (e.g., properties in historical villages).

We argue that, under the institutional settings on owners' difficulty in abandoning property ownership, most vacant properties cannot achieve a positive equilibrium price and are no longer transactable in the formal resale market. An example of a mature but currently shrinking country in which home ownership has been promoted to achieve property-/asset-based welfare is Japan (Doling and Ronald, 2010; Fukuda et al., 2024;

Ronald and Doling, 2012; Searle and McCollum, 2014). The Japanese case demonstrates the negative outcomes of unsuccessful property transactions: owners inescapably having to maintain vacant property.

We first develop a conceptual framework of the housing market that allows negative pricing, where houses can become durable "bads" under excess supply. The term "bads" indicates commodities causing disutility to consumers, as opposed to "goods" (Hara, 2005), and is used mainly in the waste-disposal and environmental-recycling context (Hosoda, 2015). The framework reveals that in a housing market where owners cannot abandon ownership unless they sell the asset, the equilibrium prices can be negative because of the cost of maintaining the asset for potential buyers, causing the formal resale market to disappear and properties to remain vacant or underutilized, often without changes in ownership. Employing nationwide property-transaction data, we then show that the probability of a transaction at very low prices rises in cities facing a higher proportion of underutilized vacant houses. Such a market transaction implies that the net value after subtracting demolition or maintenance cost will be negative, supporting our conceptual framework.

The remainder of this paper is organized as follows: Section 2 describes Japan's vacant-housing problem, especially the owners' upkeep burden. Section 3 develops a conceptual framework for the structure of a housing market facing low demand, discussing the consequences of the costly abandonment of homeownership. Section 4 conducts a housing-market analysis focusing on very low transaction prices, providing supporting evidence of the conceptual framework. Section 5 discusses the short- and long-term consequences of such a housing-market structure in a shrinking society. Section 6 concludes.

2. The Japanese vacant-housing problem

2.1. Emergence of vacant houses in Japan

Table 1 documents the emergence of vacant houses across Japan over time, based on the Housing and Land Survey (Statistics Bureau of Japan). The vacancy rate, which is the ratio of all the vacant houses (i.e., properties currently without any residents) to the total housing stock (i.e., vacant and occupied houses), increased from 7.6% in 1978 to 13.6% in 2018, with an increase in the number of vacant houses by 3.2 times during the same period. The more important statistic is the underutilized vacancy rate, which is the ratio of the number of underutilized vacant houses (officially called "other" vacant houses), neither utilized in any way nor put on the market (i.e., neither used as a second dwelling

nor put up for rent or sale), to the number of total housing stock. The underutilized-vacancy rate also increased from 2.8% in 1978 to 5.6% in 2018, with an increase in the number of underutilized vacant houses by 3.5 times during the same period. These figures suggest the emergence of a significant number of vacant houses, with some remaining underutilized over a long period and not being traded in the market.

[Table 1 about here]

Most vacant houses in Japanese society are mortgage free after several decades since their construction (Hirayama, 2010), and their vacancy is not necessarily related to foreclosures. They have been left unoccupied basically because of the market structure of a smaller demand and a large potential supply (Uto et al., 2023). To some extent, this is common in shrinking societies, although the context of shrinking societies varies across countries and regions (Mallach et al., 2017).

The specific explanation for a smaller demand and a large potential supply for existing houses in Japan is threefold. First, Japan is a super-aging society with fewer children, which is a common cause for vacant houses in other East Asian countries (Jeon and Kim, 2020). The share of senior adults (over 65 years old) in Japan's total population was 29.1% in 2023, the highest rank among countries and regions worldwide, and this rate is rapidly increasing. Moreover, the country has a decreasing population and a proportionally smaller younger generation. Typically, after parents, who have lived in their houses for long periods of time, pass away or move to elderly-care facilities, their houses are inherited by their heirs and left vacant because the latter currently live in different cities and therefore cannot use the houses themselves. Indeed, a nationwide survey of vacant-house owners in 2019 by the Ministry of Land, Infrastructure, Transport and Tourism (2020; p.24) reports that approximately 55% of houses left vacant are those acquired through inheritance.[1]

Second, the existing home sales market in Japan has not matured, with the market demand skewed toward new houses. In 2018, the share of resale-housing transactions in the total housing transactions (i.e., the sum of resale and newly built houses) in Japan was only 14.5%, far less than that in the US (76.4% in 2022) (Ministry of Land, Infrastructure, Transport and Tourism, 2023), which stemmed from a lack of reliable evaluation, information asymmetry (Iwata and Yamaga, 2007, 2008), and inadequate evaluation procedures, especially for detached, aged wooden houses (Suzuki and Asami, 2022).

[1] These were sampled from houses first identified as vacant in the 2018 Housing and Land Survey (Statistics Bureau of Japan). The number of owners of vacant houses was 3,912.

Furthermore, selling (or renting out) vacant properties requires cleaning and renovation. Even if they are successfully sold, the net benefit (after broker margins, surveying cost, and sales taxes) tends to be small. Thus, vacant houses are likely to be left unoccupied even if they are usable as residences.

Third, demolitions are infrequent in Japan. As the property tax for a residential lot is discounted to be 1/6 if the lot has a building on it (even if vacant), owners hesitate to demolish vacant houses for fear of the increasing tax burden from turning them into vacant lots. This system was originally created to develop vacant land during times of increasing urbanization and it continues to this day. The demolition of vacant properties is mostly restricted to cases with apparent dangers to neighborhoods, for example, dilapidated buildings.

2.2. Owner's burden on keeping vacant houses

In Japan, ownership abandonment of a property is uncommon, even when owners do not wish to or cannot continue to own and utilize it. If owners wish to abandon a property at the time of inheritance, they must also abandon all other financial assets inherited in addition to the property (i.e., abandonment of a single asset is not allowed). This is the formal legal procedure for inheritance of any asset type. Moreover, national or local governments do not easily accept abandoned properties owing to maintenance costs and legal problems, such as boundary demarcation or attached lines. Thus, owners find the costs of meeting the conditions for donating to the government rather high, making property-ownership abandonment difficult.

Owners cannot simply stop taking responsibility for their property because of personal penalties if they fail to do so. If an accident (e.g., a fire) occurs in a vacant house, the owner must compensate the victims. Not taking responsibility is seen as socially or culturally irresponsible; strong social norms from neighborhood communities exist for owners to maintain their property in good condition, even if not currently occupied. Indeed, a survey on owners of vacant properties in 2019 (Ministry of Land, Infrastructure, Transport and Tourism, 2020: p.89) reports that only 3.2–6.9% of vacant houses (excluding properties whose owners are unknown) are not maintained. The remaining vacant houses are maintained, mostly by their owners or their families/relatives (accounting for 88.1% of the maintained vacant houses).

Some owners use professional maintenance services to reduce negative externalities to the neighborhood. These time and money costs are an ongoing burden for vacant-property owners. Table 2 lists the problems in maintaining vacant properties: Only 30.2%

have no maintenance problems, and the remaining have some or other problems. Specifically, 29.8% stated that "maintenance work is hard to do," and 21.6% reported "heavy financial costs."

[Table 2 about here]

As discussed, donating vacant properties is currently a difficult option. Table 3 documents owners' willingness to pay if the donated property is accepted. The sample comprises owners who have clearly expressed a willingness to donate their vacant properties and are searching for recipients. Note that the sample size is small because these owners account for only 1.3% of all vacant-property owners (potentially, more vacant-property owners may be willing to donate, which is currently an unrealistic option). Table 3 shows that a non-negligible proportion of the owners (44%) indicated their willingness to pay to donate their vacant properties. Specifically, 4% indicated their willingness to pay demolition costs, and 12% indicated their willingness to pay 10 years of property tax and maintenance costs. This implies that for some owners, the vacant properties become durable "bads," yielding negative value. This may be the reason that some transactions occur at approximately zero price in Japan (CNN, 2019).

[Table 3 about here]

3. Conceptual framework of housing market pertaining to costly abandonment of homeownership

3.1. Market for existing houses facing low demand

Glaeser and Gyourko (2005) contrast cities or metropolitan areas, where the price level of properties is above the construction cost, with those where it is below to illustrate the different demand-supply structure in each situation. In the latter case, supply is considered to be fixed (i.e., supply is inelastic to price) for the existing house market.

In our study, we focus on the latter type of market, particularly the submarket for *existing houses with sufficiently low demand*. As we discussed in Section 2.1, in Japan, the existing house market is separate from that for newly built houses, and the market for existing houses is further segmented by the demand level. We assume that the cost of putting vacant houses on the market is zero; thus, the supply curve represents the physical stock of vacant houses that owners automatically supply to the market. Note that, in reality, many vacant houses are not offered for sale for a non-economic reason that each owner

faces (despite whatever the market price may be) and because of repair costs that exceed the current property value. Our analysis does not focus on properties that are vacant because of the above-mentioned reasons.

3.2. Abandonment of homeownership is costly for owners

Housing is widely accepted as durable "goods" with a positive price. However, the equilibrium price is positive only when the supply in the transaction market is maintained at a certain level. In the event of excess supply, houses can become durable "bads," exhibiting negative valuation. In other words, unused durable houses impose a maintenance burden on owners if ownership abandonment is not allowed. We capture this by incorporating the positive abandonment cost, c (> 0), which is the cumulative burden of the future maintenance of an unused property.

3.3. Demand-supply curve

A specific feature of the housing market is that transactions involving negative prices are not formally permitted because real-estate brokers, who receive a constant rate of the (positive) property price as a margin, are involved. In areas with low property prices, direct sales from seller to buyer without a broker may occur. In some cases, sellers of properties around the zero price may bear renovation costs, in which case the real transaction price can be considered negative to some extent. However, transactions do not occur for properties with substantially negative net values.

Figure 1 illustrates the demand-supply curve for an existing house market facing low demand. The supply is expected to remain constant, independent of the price level of existing houses, because their vacancy occurs owing to the original occupants moving out for exogenous reasons. Following Glaeser and Gyourko (2005), we express this as a vertical supply curve.

[Figure 1 about here]

For the rental-housing market, Goodman (2013) proposes a framework in which properties are withdrawn from the market if the rent falls to the average variable cost level to maintain property operations. At this rent level, "ceasing" or "keeping" the property operations makes no difference to the owners. This is modelled as a vertical supply curve kinked to the horizontal direction at the average variable cost level. Following this framework, we assume that the supply curve kinks when the price level is $-c$ (< 0), which

is the cumulative level of the future maintenance burden. Below this price level, owners choose not to rent out their properties and assume the maintenance burden themselves.

Although the demand curve is downward-sloping (as usual), it expands into a negative price region, reflecting that the price can be negative because of the maintenance burden on the owners. Once the potential supply exceeds the threshold, q_0, the property valuation becomes negative, indicating that the properties are no longer traded in the market (thus, we show this region using a dashed line).

We consider three cases of an existing housing market facing low demand in Figure 1. Figure 1(a) illustrates a moderate supply level. If the supply level is at q_A ($< q_0$), that is, when the supply curve is S_A, the equilibrium price becomes positive at the intersection point A: $p_A > 0$. Because of the positive equilibrium price, properties are traded by those who display a higher willingness to pay. The cost of abandoning property ownership does not exhibit any critical influence. In case sufficient demand exists relative to supply (in a market that deals only with well-selected existing houses), such existing houses do not become "bads;" the supply and demand will balance at a positive price and trade in the market as "goods."

However, these properties will result in "bads" when there is insufficient demand relative to supply. Figure 1(b) illustrates a case of excess supply. If the supply is at $q_B \geq q_0$, that is, when the supply curve is S_B, the equilibrium valuation becomes negative at the intersection point B: $p_B < 0$. If it "dares" to be traded in the market, it is assigned a negative price, representing the costs of disposal (i.e., remove its existence). Economic theory posits that at equilibrium, demand equals supply, and negative pricing occurs when there is excess supply. The supply of vacant properties is exogenous in the short term, and it also holds in the long term assuming that owners always wish to dispose of their vacant properties to avoid maintenance costs, and that sufficient demolition does not occur.

The fact that a negative price is an equilibrium price means that the properties will not be traded explicitly in the formal market because the price for transactions must be non-negative. In the formal market, it is possible that properties are traded at a price approximately close to zero (point B') at first glance. However, even in this case, the real value becomes negative ($p_B < 0$ at point B) when the costs of demolition or maintenance are considered. Thus, in most cases, the properties are demanded only for limited usage, which we call an "informal" transaction. The original owners may have no choice but to continue to own the property as a storage space, and finally, at the time of inheritance, the properties are passed on to their children. The properties may also be purchased by landowners of adjoining lands, although this type of informal transaction does not appear in the formal housing market.

Figure 1(c) illustrates another case of excess supply; specifically, the supply is more than that in the case shown in Figure 1(b). If the supply is at $q_C \geq q_{C'} \geq q_0$, that is, when the supply curve is S_C, the equilibrium valuation again becomes negative at the intersection point C: $p_C = -c < 0$. Thus, in the formal market, it is possible that properties are traded at a price approximately close to zero (point C') at first glance. However, even in this case, the real value becomes negative ($p_C = -c < 0$ at point C) when the costs of demolition or maintenance are considered. In Figure (c), the "informal" transaction occurs only for quantity q'_C, which is informally traded in the market or used by the original owners or the relatives. The remaining supply, $q_C - q'_C$, is not used, even informally, at all. The original owners maintain the properties with burden $-c$; the negative value does not fall lower than this level.

4. Housing-market analysis focusing on very low transaction prices

4.1. Empirical methodology

Because transactions at negative prices are unobservable in the formal resale-housing market, transactions at a very low price (i.e., close to zero) are considered here as a proxy. That is, even if a property is traded at a very low but positive price, the net value (subtracting the maintenance and/or demolition costs of the existing old building) is likely to be negative. The observation that a transaction at a very low price (corresponding to point B' in Figure 1(b) and point C' in Figure 1(c)) is likely to occur in a housing submarket facing low demand supports the conceptual framework developed in Section 3. Therefore, we test the following hypothesis:

Hypothesis: Properties in municipalities facing a higher proportion of underutilized vacant houses are more likely to be traded at prices approximating zero.

The tendency for a transaction price to be very low is estimated in the following probit model:

$$Y_i = \alpha + \sum_j \beta_j UVR_{ji} + \sum_k \gamma_k X_{ki} + P_j + T_t + u_i, \quad (1)$$

where Y_i captures the transaction at a very low price for property i, taking 1 if the transaction price is less than JPY 1 million and 0 otherwise. The JPY 1 million is equivalent to USD 6,454 (USD 1 = JPY 154 as of July 30, 2024). α is a constant. UVR_{ji} captures a municipality's underutilized vacancy rate, assuming 1 if the underutilized

vacancy rate is in category j and 0 otherwise; β_j is the corresponding coefficient.[2] Specifically, as in Section 2.1, the underutilized vacancy rate is the ratio of the number of underutilized vacant houses (officially called "other" vacant houses), neither utilized in any way nor put on the market (i.e., neither used as a second dwelling nor put up for rent or sale), to the number of all the housing stock. The underutilized vacancy rate is observed in our dataset only for cities (because they have sufficient housing stocks), and thus its categories comprise 0–5%, 5–10%, 10–15%, 15% or more, and towns/villages (i.e., unobserved municipalities). If the coefficient, β_j, is positive with statistical significance and its absolute size rises as the other vacancy rate rises, this implies that low transaction prices are likely to be observed in the housing market facing low demand.

X_{ki} denotes the other control variables. Building characteristics for detached houses include building age, floor space, and a dummy variable for lack of building information (i.e., old property may be sold as land on which the building to be demolished stands). Land characteristics include land area, walking time to nearest train station, a dummy variable for using a bus to the nearest station, floor-area ratio (FAR), zoning category, a dummy variable for unshaped land, and a dummy variable for the inability to (re-)build a house because the lot does not face a street (i.e., taking 1 if the frontage is no less than 2m and front-road width is no less than 4m and 0 otherwise). Additional circumstances include a dummy variable for transactions for a specific reason (e.g., purchase of an adjacent land), as well as purpose of future use (housing as a reference category, office/commercial/factory/warehouse, others, and unknown). P_j is the prefecture-fixed effect, T_t is the time-fixed effect (quarterly frequency), and u_i is the error term.

4.2. Data

We employ transaction data on detached houses and residential land from Real Estate Transaction Price Information (Ministry of Land, Infrastructure, Transport and Tourism) from January 2014 to June 2023. We also employ Housing and Land Survey (Statistics Bureau of Japan) in 2018 to calculate the proportion of the underutilized vacant houses in all the housing stock.

Table 4 shows the summary statistics. While the mean transaction price is JPY 33.2 million for detached houses (JPY 22.1 million for residential land), 1.3% (4.1%) of properties are traded at less than JPY 1 million. While the mean proportion of underutilized vacant houses is 4.9% for detached houses (5.5% for residential land), the

[2] We also conduct an alternative specification employing a continuous variable for the underutilized vacancy rate and a dummy variable for the towns/villages (i.e., a municipality without an observation of the number of underutilized vacant houses).

proportion of underutilized vacant houses is 15% or more for 1.0% (1.6%) of the sample observations. Towns/villages, for which the proportion of underutilized vacant houses is not disclosed, account for 2.0% (3.4%) of the sample of detached houses (residential land).

[Table 4 about here]

Figure 2 shows the proportion of transactions at very low price for detached houses in Panel (a) and for residential land in Panel (b) relative to the proportion of underutilized vacant houses and by years of transactions. Cities with a higher proportion of other vacant houses as well as towns/villages have a higher percentage of property transactions under JPY 1 million. The more recent the year, the higher the percentage of low transaction prices.

[Figure 2 about here]

4.3. Empirical results

Table 5 shows the regression results based on Equation (1). Columns (1) and (2) show the results for detached houses, while Columns (3) and (4) show the results for residential land. For the proportion of underutilized vacant houses, Columns (1) and (3) employ a continuous variable, while Columns (2) and (4) employ categorical variables and calculate their average marginal effects.

For detached houses, in Column (1), the coefficient of the proportion of underutilized vacant houses is positive and statistically significant. This implies that properties in municipalities facing a higher proportion of underutilized vacant houses are more likely to be traded at low prices. In Column (2), the size of the coefficients increases for higher categories of the proportion of underutilized vacant houses. Regarding the average marginal effect, properties in cities with 15% or more proportion of underutilized vacant houses face a 2.5% increase in the probability of a low transaction price. Note that both in Columns (1) and (2), towns/villages, in which the proportion of underutilized vacant houses is not recorded, exhibit a higher probability of low transaction prices compared to cities, in which the proportion of underutilized vacant houses is recorded.

Similarly, for residential land, Column (3) shows that the coefficient of the proportion of underutilized vacant houses is positive and statistically significant; properties in municipalities facing a higher proportion of underutilized vacant houses are more likely to be traded at low prices. In Column (2), the size of the coefficients rises for

higher categories of the proportion of underutilized vacant houses. Regarding the average marginal effect, properties in cities with 15% or more proportion of underutilized vacant houses face a 5.3% increase in the probability of low transaction prices. In both Columns (3) and (4), towns/villages, in which the proportion of underutilized vacant houses is not recorded, exhibit a higher probability of low transaction prices compared to cities, in which the proportion of underutilized vacant houses is recorded.

Note that the probability of transactions at a very low price relates, to some extent, to the price level of the property, as captured by the control variables. For detached houses, old, small properties without building information tend to be valued less. Regarding land characteristics, small, poor access to stations, unshaped, and being unable to (re-)build a house tends to be valued less. Correspondingly, the probability of a transaction at a very low price increases for properties with these characteristics. Furthermore, a transaction for a specific reason (e.g., purchase of an adjacent land), as well as the buyer's recognition of being unable to use the property as housing, lead to a higher probability of its occurrence at a very low price.

[Table 5 about here]

Table 6 presents the results of robustness checks for detached houses in Panel (a) and for residential land in Panel (b). In both panels, we restrict the sample to properties at the bottom 10% of the price distribution for each property type (i.e., detached houses or residential land) to focus on the low-price property segment. In Columns (1) and (2), the definition of a low price is modified to JPY 100 thousand or lower (accounting for 12.7% in the reduced detached-house sample and 40.0% in the reduced residential-land sample), while the definition of JPY 50 thousand or lower is employed in Columns (3) and (4) (accounting for 5.4% in the reduced detached-house sample and 18.8% in the reduced residential-land sample). In both panels and for both definitions of a low price, we confirm that a higher proportion of underutilized vacant houses is correlated with a higher probability of a transaction at a low price. This is confirmed by using either a continuous variable or categorical variables for the proportion of other vacant houses.

[Table 6 about here]

5. Discussion on the short- and long-term consequences of the housing-market

structure in a shrinking society

5.1. Housing market with costly abandonment of homeownership

The institutional settings on owners' difficulty in abandoning property ownership potentially hinder the utilization of vacant properties through formal market transactions. The transaction volume in the housing market determines (i) the short-term maintenance burden (i.e., who is responsible for maintenance) and (ii) the long-term possibility of reutilizing the property.

In the short term, absent owners of vacant properties are responsible for their property as they hold the ownership rights. Thus, the public burden of maintaining neighborhood security is at a minimum during population shrinkage.

The long-term consequence is the difficulty of utilizing currently vacant properties. As property transactions do not occur at a negative value, most vacant and unused properties continue to be owned by absent individual owners. As the duration without market transactions increases, the properties are inherited by the descendants while the official registration information is not updated. The registration is not mandatory and is costly for owners, particularly in the Japanese context (Yoshihara, 2021). Thus, based on the official registration information, ownership diverges to multiple descendants, and in the long run, properties face a high risk of acquiring "owner unknown" status. Even some of the descendants may not notice that they have inherited the unnecessary property. As the eminent domain laws are extremely weak in Japan, the potential for the regeneration of vacant properties to farmland, greenery, etc. will be severely restricted. The social cost of assembling land is too high to find the actual owner from the large number of relatives.

5.2. Housing market with an option of free disposal

Internationally comparing the institutional settings on the possibility of property-ownership abandonment can set the stage for future policy debates on vacant and abandoned housing problems. In the US foreclosure context, owners, at least partly, have the option to abandon their property rights through strategic default and/or tax delinquency.[3] That is, if the value of a property is expected to decline, its owner may stop

[3] Even in the case of US foreclosure, owners may not always be allowed to explicitly relinquish the title to the property (Huber, 2020). Tax foreclosure of abandoned and vacant properties does not lead to the transfer of titles. While a lien for unpaid taxes is created, the lien holder's (whether public or private) decision to force the transfer of title through legal proceedings is optional. Because public agencies are concerned about the cost of maintenance, in most jurisdictions, neither public nor private lien holders exercise their rights to foreclose. A similar problem exists with mortgage foreclosures, in which lenders frequently refuse to take the title to properties with potentially negative values (Weber, 2015; Weiss, 2015).

paying property taxes and keeping maintenance, and finally have the property ownership transferred to the public (Goodman, 2013; Hillier et al., 2003; Margulis, 1998; Morckel, 2013; O'Flaherty, 1993; Scafidi et al., 1998; Silverman et al., 2013; White, 1986; Wilson et al., 1994). Thus, one issue is that the market price does not become negative; existing excess housing can be thrown away for free. The argument here is that the massive and well-documented externalities and contagion of unmaintained vacant properties in the US may be a temporal phenomenon that realizes long-term market viability.

In the short term, the owner's absence results in poor property maintenance (Hanlon, 2008; Lambie-Hanson, 2015), leading to a further decline in neighboring property prices through negative externalities (Gerardi et al., 2015; Hartley, 2014). The decline in property values may trigger more abandonment until a tipping point is reached (Bond and Coulson, 1989). The public sector, such as the land bank, needs to (temporarily) maintain the abandoned properties to reduce the negative externality. Because abandoned properties are traded through auctions at very low prices—almost zero (Hodge et al., 2017)—they negatively affect neighboring property prices through oversupply (Campbell et al., 2011).

Once property ownership is abandoned, the ownership rights are transferred to the public sector. In the long term, the positive aspects are that the public sector can transfer ownership to a new owner who will use the properties for socially desirable and profitable land use. Even if an abandoned house is unusable, multiple vacant lots can be combined and put to green and agricultural use (Paredes and Skidmore, 2017; Schilling and Logan, 2008). The aggregation of ownership rights through land banks is key to managing these drastic conversions.

6. Conclusion

Using Japan's case, this study conceptualizes how owners' difficulty in abandoning property ownership affects the housing-market structure. We first develop a market framework for existing houses facing low demand, revealing that housing can be durable "bads;" that is, an owner's burden of keeping unnecessary assets can result in negative property valuation. Because market transactions are basically possible only at positive prices, the formal resale market disappears, leaving properties vacant or underutilized, often without changes in ownership. Employing nationwide property-transaction data, we then show that the probability of a transaction at very low prices rises higher in cities facing a higher proportion of underutilized vacant houses. Such a market transaction implies that the net value (after subtracting demolition or maintenance cost) will be

negative, supporting our conceptual framework.

We argue that institutional settings on owners' difficulty in abandoning property ownership potentially hinder the utilization of vacant properties through formal market transactions. In a moderate supply-level case, properties are quickly traded for those who are willing to pay; thus, whether property-ownership abandonment is allowed does not make any critical difference. However, in an excess-supply case, only limited demand exists to intensively use or purchase properties in the formal market, and thus most of the vacant properties must be maintained by the original owners. These problems can be placed within the disutility and inequality aspects of homeownership under the property-/asset-based welfare system in a shrinking society. At the individual level, descendants inheriting unnecessary vacant properties in an era of population shrinkage are forced to bear maintenance burdens. This is in contrast to previous generations that financially gained from owning properties, creating inequality across generations. At the national level, the accumulation of vacant and abandoned properties, which are unconvertible into other profitable purposes such as farmland and greenery, creates inequalities across generations.

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Table 1: Increasing vacant-housing problem in Japan

Year	Number of vacant houses [thousand units]	Vacancy rate [%]	Number of underutilized vacant houses [thousand units]	Underutilized vacancy rate [%]
1978	2,679	7.6	977	2.8
1983	3,302	8.6	1,252	3.2
1988	3,940	9.4	1,310	3.1
1993	4,476	9.8	1,488	3.2
1998	5,764	11.5	1,825	3.6
2003	6,593	12.2	2,118	3.9
2008	7,568	13.1	2,681	4.7
2013	8,196	13.5	3,184	5.3
2018	8,489	13.6	3,487	5.6

Source: Housing and Land Survey (Statistics Bureau of Japan)

Table 2: Problems with maintaining vacant property

Problems with maintaining vacant property	Percentage [%]
Difficult to maintain the house because living far away	21.0
Hard to do the maintenance work	29.8
Heavy financial costs	21.6
Not having a reliable contractor/ worker to perform the maintenance work	4.4
Wasteful expenditure because no plan exists to use the house	26.0
No problem	30.2
Number of observations	3912

Notes: Multiple answers allowed. Source: Survey of owners of vacant houses in 2019 (Ministry of Land, Infrastructure, Transport and Tourism).

Table 3: Willingness to pay for donating a vacant property

Willingness to pay for donating a vacant property	Percentage [%]
1 year of property tax and maintenance costs	22.0
5 years of property tax and maintenance costs	6.0
10 years of property tax and maintenance costs	12.0
Building demolition cost	4.0
Unwilling to donate if cost is involved	42.0
Others/Unknown	14.0
Number of observations	50

Source: Survey of owners of vacant houses in 2019 (Ministry of Land, Infrastructure, Transport and Tourism).

Table 4: Summary statistics

Sample:	(1) Detached houses		(2) Residential land	
	Mean	S. D.	Mean	S. D.
Transaction price [million JPY]	33.2	80.9	22.1	70.6
Transaction at less than 1 million JPY	0.013		0.041	
Proportion of underutilized vacant houses [%]	4.9	2.8	5.5	3.2
Proportion of underutilized vacant houses				
0-5%	0.570		0.456	
5-10%	0.357		0.433	
10-15%	0.043		0.061	
15% or more	0.010		0.016	
Town/Village	0.020		0.034	
Building age [years]	17.0	18.5		
Floor space [m^2]	130.9	143.4		
Without building information	0.095			
Land area [m^2]	232.3	252.6	328.4	349.2
Walking time to station [min]	10.3	8.6	9.7	8.9
Bus to station	0.267		0.317	
Floor area ratio (FAR) [%]	173.5	64.9	180.2	63.0
Unshaped land	0.273		0.289	
Not facing a street	0.093		0.102	
Transaction for a specific reason	0.078		0.047	
Purpose of future use				
Housing	0.792		0.513	
Office/Commercial/Factory/Warehouse	0.036		0.027	
Others	0.067		0.146	
Unknown	0.105		0.314	
Number of observations	995252		748865	

Table 5: Probit model for transaction at very low price

Sample:	Detached houses			Residential land		
	(1)	(2)	Average marginal effect in column (2)	(3)	(4)	Average marginal effect in column (4)
Proportion of underutilized vacant houses [%]	0.072**			0.059**		
	(0.001)			(0.001)		
Town/Village	0.859**			0.747**		
	(0.022)			(0.015)		
Proportion of underutilized vacant houses						
0-5%		(reference)			(reference)	
5-10%		0.409**	0.81%		0.351**	2.01%
		(0.012)			(0.009)	
10-15%		0.705**	1.87%		0.560**	3.74%
		(0.017)			(0.013)	
15% or more		0.850**	2.59%		0.717**	5.35%
		(0.027)			(0.021)	
Town/Village		0.702**	1.86%		0.626**	4.39%
		(0.022)			(0.014)	
Building age [years]	0.026**	0.026**				
	(0.000)	(0.000)				
Floor space [m^2]	-0.002**	-0.002**				
	(0.000)	(0.000)				
Without building information	1.052**	1.060**				
	(0.016)	(0.016)				
Land area [m^2]	-0.001**	-0.001**		-0.001**	-0.001**	
	(0.000)	(0.000)		(0.000)	(0.000)	
Walking time to station [min]	0.004**	0.003**		0.005**	0.005**	
	(0.001)	(0.001)		(0.001)	(0.001)	
Bus to station	0.176**	0.172**		0.354**	0.358**	
	(0.016)	(0.016)		(0.012)	(0.012)	
Floor-area ratio (FAR) [%]	-0.000*	-0.000		-0.001**	-0.000**	
	(0.000)	(0.000)		(0.000)	(0.000)	
Unshaped land	0.127**	0.127**		0.251**	0.249**	
	(0.009)	(0.009)		(0.007)	(0.007)	
Unable to (re-)build a house	0.471**	0.471**		0.503**	0.501**	
	(0.011)	(0.011)		(0.009)	(0.009)	
Transaction for a specific reason	0.134**	0.134**		0.259**	0.262**	

	(0.015)	(0.015)	(0.014)	(0.014)
Purpose of future use				
Housing	(reference)	(reference)	(reference)	(reference)
Office/Commercial/Factory/Warehouse	0.356**	0.355**	0.708**	0.708**
	(0.016)	(0.016)	(0.018)	(0.018)
Others	0.425**	0.424**	0.948**	0.949**
	(0.012)	(0.012)	(0.009)	(0.009)
Unknown	0.290**	0.291**	0.766**	0.770**
	(0.013)	(0.013)	(0.009)	(0.009)
Zoning FE, prefecture FE, time FE (quarterly), and a constant	Yes	Yes	Yes	Yes
Number of observations	994722	994722	748865	748865
McFadden's Pseudo R^2	0.308	0.307	0.285	0.285

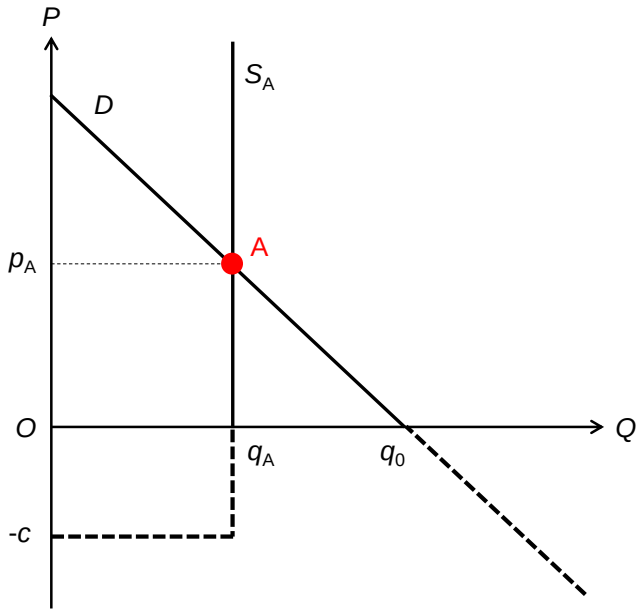
Notes: This table shows the estimated coefficients of the probit model based on Equation (1). The dependent variable takes 1 if transaction price is less than 1 million JPY and 0 otherwise. Standard errors are in parentheses. Significance level: ** $p < 0.01$, * $p < 0.05$.

Table 6: Robustness checks

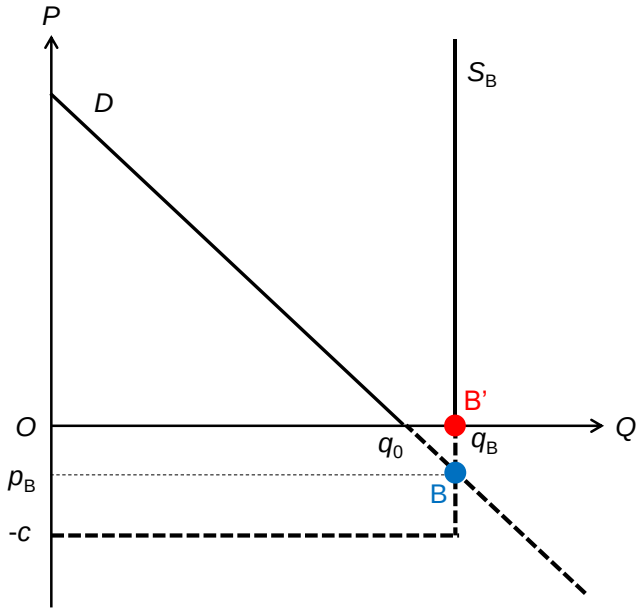
Definition of low price:	JPY 100 thousand or lower		JPY 50 thousand or lower	
	(1)	(2)	(3)	(4)
(a) Detached houses				
Proportion of underutilized vacant houses [%]	0.034**		0.032**	
	(0.002)		(0.002)	
Town/Village	0.432**		0.381**	
	(0.027)		(0.034)	
Proportion of underutilized vacant houses				
0-5%		(reference)		(reference)
5-10%		0.201**		0.195**
		(0.015)		(0.020)
10-15%		0.347**		0.336**
		(0.020)		(0.026)
15% or more		0.419**		0.403**
		(0.031)		(0.040)
Town/Village		0.362**		0.320**
		(0.026)		(0.033)
Number of observations	101843	101843	101843	101843
McFadden's Pseudo R^2	0.075	0.075	0.080	0.080
Proportion of transactions with low price:		12.7%		5.4%
(b) Residential land				
Proportion of underutilized vacant houses [%]	0.013**		0.016**	
	(0.002)		(0.002)	
Town/Village	0.208**		0.197**	
	(0.021)		(0.024)	
Proportion of underutilized vacant houses				
0-5%		(reference)		(reference)
5-10%		0.114**		0.122**
		(0.013)		(0.015)
10-15%		0.121**		0.143**
		(0.018)		(0.021)
15% or more		0.215**		0.221**
		(0.029)		(0.034)
Town/Village		0.202**		0.183**
		(0.020)		(0.023)
Number of observations	77088	77088	77081	77081
McFadden's Pseudo R^2	0.045	0.045	0.047	0.048
Proportion of transactions with low price:		40.0%		18.8%

Notes: This table shows the estimated coefficients of the probit model based on Equation (1). The dependent variable takes

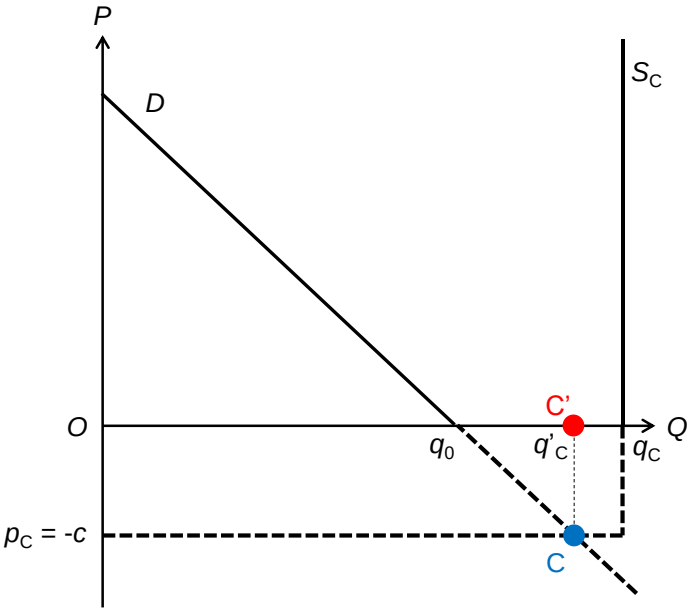
1 if transaction price is less than JPY 100 thousand and 0 otherwise in Columns (1) and (2), while the dependent variable assumes 1 if transaction price is less than JPY 50 thousand and 0 otherwise in Columns (3) and (4). The control variables used in Table 5 are included in the regression but not shown in this table. Standard errors are in parentheses. Significance level: ** $p < 0.01$, * $p < 0.05$.



(a) Moderate supply case



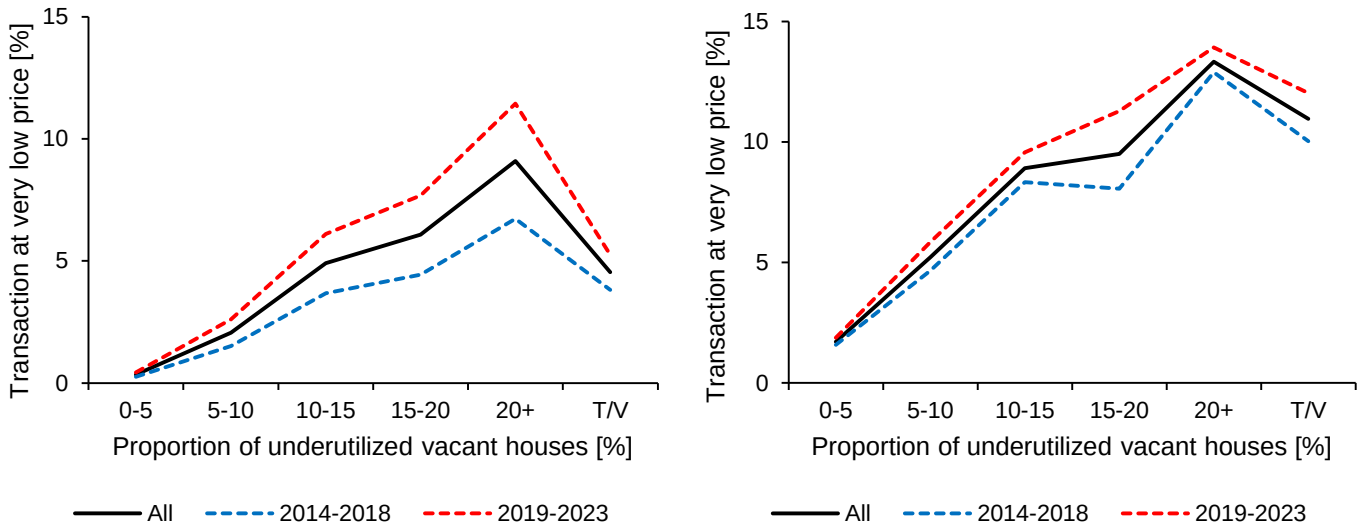
(b) Excess supply case I



(c) Excess supply case II

Figure 1: Demand-supply curve in a housing market with costly abandonment of homeownership

Notes: The horizontal and vertical axes represent the quantity (i.e., number of houses) and price level, respectively. The intersection of the demand curve, D, and either the vertical or kinked supply curve, S_A, S_B, and S_C, indicates an equilibrium. In Panel (a), all properties are traded in the formal market at Point A (quantity q_A at price $p_A > 0$). In Panel (b), properties are valued negatively at Point B (quantity q_B at price $p_B < 0$) and the properties are basically underutilized by original owners. In Panel (c), properties are valued negatively at Point C (quantity q_C at price $p_C = -c < 0$); thus, while most of the properties (i.e., quantity q_C) are basically underutilized by original owners, $q_C - q'_C$ of the properties are completely left vacant. Note that the fact that a negative price is an equilibrium price (point B in Figure 1(b) and point C in Figure 1(c), which are shown in blue) means that the properties will not be traded explicitly in the formal market. In the formal market, it is possible that properties are traded at a price approximately close to zero (point B' in Figure 1(b) and point C' in Figure 1(c), which are shown in red) at first glance. However, even in this case, the real value becomes negative when the costs of demolition or maintenance are considered.



(a) Detached houses

(b) Residential land

Figure 2: Proportion of transaction at very low price (less than JPY 1 million)

Notes: The horizontal and vertical axes represent the proportions of underutilized vacant houses and transactions at a very low price (less than JPY 1 million), respectively, for detached houses in Panel (a) and for residential land in Panel (b). The "T/V" represents towns/villages (i.e., not cities), in which the proportion of underutilized vacant houses is not observed. The black solid line employs the entire sample, while the blue/red dashed lines employ subsamples regarding years of transaction.