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Causes of Vacancies in the Housing Market – A Literature Review[*]

Abstract

We review the existing literature on the causes of vacancies in the housing market. First, we present a detailed overview of theoretical approaches that may explain the mechanisms causing vacancies under the assumptions of a standard market model, the search and matching theory and behavioral economics. Concerning the latter, we propose a new framework to explain vacancies in the housing market in the context of prospect theory which could be extended by future research. Second, we formulate hypotheses based on these theories regarding the causes and the extent of vacancies. Third, we evaluate the validity of the hypotheses by referring to the existing empirical literature while comparing the data, samples and methods employed in the various studies. The main findings of our literature review are (1) that there is considerable room to extend existing theoretical models and (2) that some hypotheses have either been investigated by the empirical literature only to a limited degree or have not been investigated at all. We also suggest that (3) a social welfare analysis that takes the specific type of vacancy into account is highly relevant for housing policy decisions.

JEL-Codes: D83, R21, R31
Keywords: Search frictions, matching, prospect theory, real estates, housing, vacancy

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1. Introduction

Abundant vacancies are perceived as highly problematic by most housing experts: they represent the unused capital of owners, implying a deficient allocation of economic resources. Additionally, vacant dwellings are usually less adequately maintained, leading to external effects such as the stigmatism of whole neighborhoods due to vandalism and crime. Local governments may incur management and demolition costs if a dwelling is abandoned (see Silverman et al. 2013 and Molloy 2016). As a consequence, governmental policies are instituted to pursue a targeted reduction in vacancies. Before such policies are implemented, it is desirable to understand the causal relationships and factors that lead to vacancies as not all types of vacancies are considered as problematic (Guasch and Marshall 1985 and Silverman et al. 2013). For example, consumers looking for an apartment benefit from having a wider choice of apartments so they find one, which matches their needs.[1] Additionally, long-term vacancies can be found in regions with very diverse characteristics. Thus, policies that are effective for reducing vacancies in one area might be less effective in others (Molloy 2016).

Despite being a very relevant topic in political debates, there has been no systematic review of the existing concepts explaining vacancies or the influencing factors. We provide the first overview of the vacancy literature and identify three different approaches that explain the causes of vacancies in the housing market. We start by illustrating the emergence of vacancies based on (1) the standard market model followed by a summary of (2) the search and matching literature, which is the focus of the main body of the literature. Afterwards, we propose a new framework that is based on (3) behavioral assumptions to explain why and under which conditions homeowners are hesitant to sell their dwellings, which may lead to vacancies. This framework could be extended by future research to formulate a complete theoretical model. From these theories, we derive hypotheses regarding the causes and the extent of vacancies. Afterwards, we evaluate these hypotheses by comparing them with the results found in the empirical literature. We note differences in the empirical analyses regarding the data that is used and the methods that are applied. In the last section, we summarize the results and discuss the theoretical approaches and empirical studies. The main finding of our literature review is that there is still considerable room to extend existing theoretical models, especially those based on search and matching theory. Furthermore, some hypotheses have either been investigated by the empirical literature only to a limited degree or have not been investigated at all. We also suggest that a social welfare analysis that takes the specific type of vacancy into account should be considered by future studies.

[1] A vacancy rate of close to zero should therefore not be aimed for, as housing markets need a certain vacancy rate to reduce market friction, which also occurs in the labor market.

2. Theoretical approaches explaining vacancies in the housing market

Three different models are proposed in the literature to explain the mechanisms leading to vacancies in the housing market. In addition to assuming standard perfect market conditions, the search and matching theory provides a theoretical framework for supply and demand balance in the housing market. Lastly, vacancies can be a symptom of market participants acting according to patterns described by behavioral economics. In this section, we will analyze each model and formulate hypotheses explaining the emergence of vacancies.

The standard market model

In his seminal work, Fallis (1984) treats housing as any other good in microeconomics and describes a standard market model of housing. In a standard market model with full competition, rational actors and symmetric information, demand and supply determine the quantity of traded goods and the related price levels. In equilibrium, demand and supply are in balance and the market clears. Basic economic theory assumes an upward-sloping supply curve. However, it seems reasonable to assume that in the short and medium run, the supply in the housing market is fixed: a building would have to be demolished to reduce the supply.[2] A decrease in demand should therefore result in a decrease in the equilibrium price of housing. The number of units on the market remains unchanged (Molloy 2016).

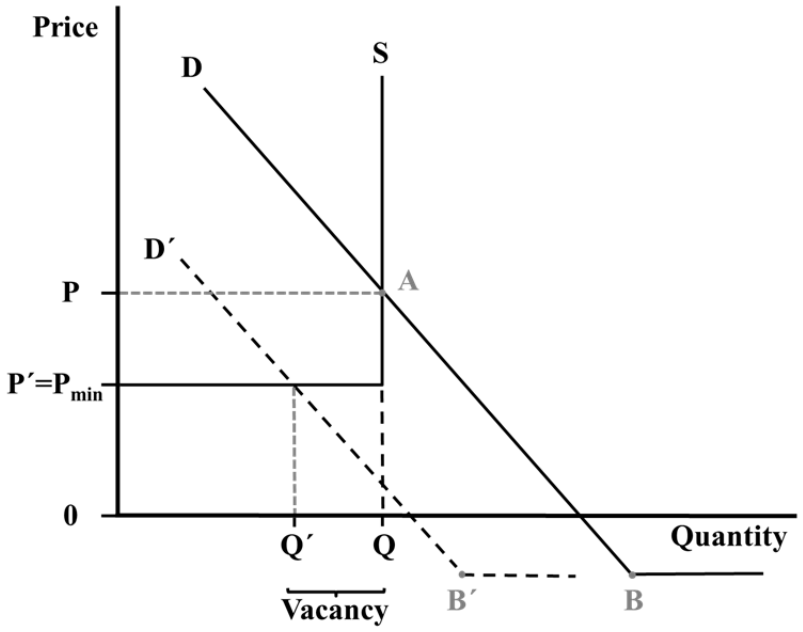
When analyzing vacancies in the context of the standard market model, we are interested in scenarios of extremely low prices. In the following, we describe a scenario in which a supplier (such as an owner who does not use her dwelling for her own residential purposes or a housing company) is trying to sell a dwelling.[3] We assume that the dwelling will only be used if it is sold. Otherwise it remains vacant. Although the number of housing units that are available on the market is fixed, suppliers are not willing to sell if the transaction provides less utility than not transacting at all. When there are no maintenance or transaction costs, the minimum price that they would sell for is zero.[4] At this point, suppliers are indifferent to selling or leaving the dwelling vacant. However, on the one hand, ownership can incur costs such as property taxes and maintenance costs. Therefore, homeowners might be willing to even sell for negative prices, or – in other words – give someone money to take responsibility for the burden. On the other hand, there might be transaction costs linked to selling a dwelling,

[2] Considering the durability of housing, Glaeser and Gyourko (2005) suggest that the supply curve is vertical at all quantities below the equilibrium price. In line with Fallis (1984), we assume that an increase in the quantity supplied takes time because construction processes are rather slow; therefore, the supply curve is strictly vertical.
[3] We base our theoretical framework on the basic model outlined by Molloy (2016), which is one of very few studies analyzing vacancies under standard perfect market conditions.
[4] This scenario could also be applied to the rental market in which suppliers are landlords and the 'minimum price' is the minimum rent.

such as real estate transfer taxes, legal fees, notary fees and brokerage fees. These costs result in higher minimum prices. The resulting minimum price could be either positive or negative depending on which of these costs (costs linked to ownership vs. costs linked to transacting) are higher for the seller.[5] In reality, we commonly observe vacant dwellings with prices above zero.

Figure 1 displays a supply curve S with a positive minimum price (P_{min}). Thus, when demand is very low, prices remain at this positive minimum price, which implies that the number of occupied dwellings might be below the available stock of dwellings Q. For higher prices, the supply curve runs vertically because the housing stock cannot be increased in the short run.

FIGURE 1: ILLUSTRATION OF HOUSING VACANCIES USING THE STANDARD MARKET MODEL



Notes: Own illustration following Molloy (2016).

Similar to the supply curve, the downward sloping demand curve D also has a kink: if there are no potential buyers that would benefit from living in a dwelling that is offered, the demand curve runs horizontally for quantities above the saturation point B. This point lies below zero because a buyer would have to bear both the transaction costs that fall upon her in addition to the costs of owning the dwelling. Therefore, she is indifferent to conducting a transaction if she would only receive sufficient money to cover these expenses (i.e., someone 'sells' the dwelling for a negative price). However, if the negative price for a dwelling overcompensates these costs, a buyer would make a profit by buying dwellings. Thus, for any price below this threshold, there is an infinite demand. For the demand curve

[5] This argument also holds true for a landlord looking for a tenant. It might be plausible to set a negative base rent, e.g., to let the tenant maintain the building or pay the property taxes. However, the act of signing a tenant also results in costs for which the owner wants to be compensated for via a positive rent.

D in Figure 1, there are no vacancies. If demand is very low, as depicted in demand curve D', the market price P' corresponds to the minimum price P_{min}. In this case, the observed number of dwellings on the market is Q'. The difference between Q and Q' is the amount of vacant housing. We therefore state the following hypothesis:

Hypothesis 1.1 Vacancies arise only if the market price equals the suppliers' minimum price.

We can also explain vacancies by relaxing the assumption regarding perfect competition in the housing market: for example in the case of a decrease in demand, a monopolistic landlord could profit from reducing the number of dwellings she offers on the market and thus preventing a decrease in market prices. In the presence of maintenance costs, she would decide to demolish buildings in the long run. However, it seems reasonable to assume that the demolition process might take some time. Hence, the existence of a monopolistic landlord may lead to vacancies, at least in the short run.

Hypothesis 1.2 As market power increases, the number of vacancies will increase.

Search and matching theory

The search and matching theory – which has been very influential to model labor market outcomes such as unemployment – can be applied to housing markets.[6] In this framework, imperfect information is introduced to the market. Guasch and Marshall (1985) were one of the first to analyze vacancies in an application of search and matching theory to the housing market and they were followed by many other scholars. We first describe a simplified application of search theory to housing and discuss various extensions of the theory later on. The majority of studies we present are concerned with the time a house remains on the market before being sold (i.e., not the vacancy rate) and the factors influencing this marketing time. We argue that the time on the market[7] influences the time a dwelling is vacant. A market's vacancy rate can be calculated as the average time a (representative) dwelling remains on the market divided by the sum of the average time on the market and the average time of residence. We use the time on the market in the studies as an approximation for the vacancy rate and assume that the time of residence is unaffected.

In the standard search and matching framework, it takes some time for market participants to conduct a transaction, as they must first find each other (see Stigler 1961). In the housing market context, the

[6] Although Arnott (1987) highlights the fact that the reference to the labor market is unsuitable because in the housing market, vacancies are a sign of the excess supply of a commodity, while in the labor market, unemployment represents the excess supply of an input.

[7] We assume that all dwellings that are offered for sale are not inhabited.

seller receives various offers for her dwelling and must decide whether she accepts one or not. The seller knows the distribution of the submitted offers for her dwelling type. For each time period, she estimates whether it is more profitable to wait for higher offers (i.e., to reject in this period and the sampling continues) or to accept the current offer. The price at which she is indifferent to wait longer or to sell is called her reservation price. It can be profitable for the seller to postpone a sale in hopes of a higher offer in the future. Buyers randomly search among the pool of dwellings and have a specific offer price for dwellings of a certain type. If a buyer inspecting the unit has an offer price not less than the reservation price of the seller, the dwelling becomes occupied; otherwise it remains vacant.

Buyers face very heterogeneous goods (i.e., types of dwellings with different characteristics) in the housing market. They need to gather information about the properties and quality of available dwellings (Guasch and Marshall 1985). This can be a very time consuming and therefore, costly process. To identify all the relevant characteristics of a dwelling, often, a personal inspection is necessary (Haurin 1988). As a result, a dwelling remains vacant while potential buyers gather the information needed to make a purchase decision. In the case of dwellings with very diverse characteristics (not only regarding the number of bathrooms, balconies, and pools but also with very unique features such as extravagant tiles), there are fewer market participants for every 'dwelling category', leading to a long search and matching process. In the housing literature, the term 'heterogeneity' is used to describe such differences in characteristics among dwellings (see for example Guasch and Marshall 1985, Haurin 1988, Sass 1988 and Forgey et al. 1996).

Hypothesis 1.3 The more heterogeneous the dwellings are, the more vacancies.

The motivation of buyers and sellers to search and wait is influenced by the costs they face during this process. For example, Miceli (1989) describes a framework in which sellers seek to optimize between the sales price (for which they might have to wait longer) and the amount of time the dwelling remains on the market. Buyers have to optimize between a lower price (for which they might have to look longer) and a fast transaction. Depending on the costs to hold a dwelling, these factors (price vs. time) are weighted differently. If the costs to hold a dwelling are very low, the matching process is prolonged and dwellings remain vacant for a longer period of time.

Hypothesis 1.4 The lower the costs to hold a dwelling, the more vacancies.

The basic search and matching framework can be extended by considering different factors that influence the matching process. One such factor is the introduction of uncertainty about the submitted offers and a Bayesian learning process.[8] In this case, the seller sets the initial list price relatively high (Horowitz 1992). If no match occurs, she learns something about the distribution of offers and adjusts the list price downwards (Lazear 1986, Herrin et al. 2004). High list prices above the market value could lead to a much lower demand for a specific dwelling (e.g., if buyers only look at a specific price range). This implies that it would remain vacant for a longer period of time.

Hypothesis 1.5 The higher the list prices are compared to the market value, the more vacancies.

Vacancies are influenced not only by the overall heterogeneity of dwellings but also by the presence of certain dwelling types. Guasch and Marshall (1985) propose a framework in which small units usually attract more transient residents and thus have a higher probability of tenants leaving the unit.[9] Owners (i.e., landlords), however, prefer long-term tenants because frequent changes in tenants are associated with higher (search) costs. As a result, the authors assume that owners set a higher rent per unit space compared to large units.[10] Therefore, not only should the time of residence be lower but also the marketing time for small dwelling should be higher. As a result, market segments with a high share of small units should exhibit higher vacancy rates than comparable markets with bigger units.

Hypothesis 1.6 For the overall rental market, the higher the share of small dwellings, the more vacancies.

There are also factors that can decrease the number of vacancies: intermediaries (such as real estate brokers) can reduce the time a dwelling remains on the market (see Yavaş 1992, Mantrala and Zabel 1995 and Forgey et al. 1996). These intermediaries might reduce the information asymmetries of market participants (e.g., they assist potential buyers during their search), which could accelerate the matching process between agents.[11]

[8] In the standard framework, sellers know about the distribution of offers and there is only uncertainty about which offers are drawn from the distribution.
[9] In their framework, the authors assume that household size is an increasing function of the age of the household head and that older residents move less frequently than younger households with one or two members. This assumption is based on data from the Bureau of the Census of the United States.
[10] This is a strict assumption because it can also be argued that there are more offers in a housing market for transient residents (as transient residents search more frequently) and therefore search costs for owners are lower.
[11] An analysis of Read (1988) follows a similar logic. The author points out that landlords' advertising intensity reduces the vacancy duration. Hiring a real estate broker can be considered a special case of advertising.

Hypothesis 1.7 The more intermediaries there are, the fewer vacancies.

Read (1988) introduces lags between search processes of landlords and tenants as another extension to the standard search model. In the author's model, a tenant starts her search process before informing her current landlord about her intention to move. Subsequently, the landlord can only start her search process at the time at which her dwelling falls vacant. However, tenancy laws differ between regions. This form of vacancy can be avoided if a sufficiently long period of notice is mandatory.

Hypothesis 1.8 The longer the mandatory period of notice, the fewer vacancies.

Behavioral economics

There are very few studies that incorporate patterns described by behavioral economics in the context of housing markets. In contrast to previously discussed approaches, behavioral economics considers psychological factors that might influence the decision-making processes of market participants. These factors may explain some of the behavioral patterns that do not seem to be rational according to the standard incentive paradigm.

For this theoretical approach to housing vacancies, loss aversion and the related prospect theory need to be explained (see Kahnemann and Tversky 1979). Compared to other behavioral economics approaches[12], prospect theory considers the disposition effect[13], which is also observed on the stock market. This effect describes the behavior of keeping assets with a value below the initial purchase price longer than assets for which the price has increased.

Based on experimental studies, Kahneman and Tversky (1979) construct a utility function that does not depend on the absolute (e.g., monetary) value of the good but on changes relative to a reference point. The authors find that test subjects become more risk seeking if they must make a decision after suffering a loss. However, they exhibit risk aversion when facing potential gains. The authors derive an S-shaped function for the relative values of utility. Moreover, they observe that losses (relative to the reference point) have a greater impact on utility than gains of an equal size. As a result, the utility function exhibits a kink at the reference point. It is steeper in the range of losses than in the range of

[12] In this context, 'mental accounting' should be mentioned (see Thaler 1985): this behavior describes the aversion of an investor to incur a loss and having to admit she struck a bad deal. Similarly, the sunk-cost effect can explain the risky behavior of a seller if she suffered a loss: costs that were previously incurred are included in the present decision-making process (see Arkes and Blumer 1985).
[13] This term was introduced by Shefrin and Statman (1985).

gains. For an agent to enter a lottery that results in a loss or a gain relative to the reference point, the expected value must be significantly positive.

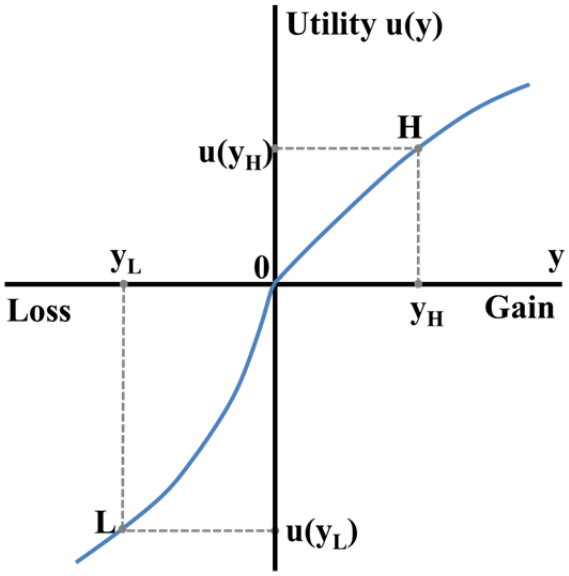
Prospect theory was applied to the housing market by Genesove and Mayer (2001) and later by Anenberg (2011). Bokhari and Geltner (2011) applied prospect theory to the commercial real estate market. Genesove and Mayer (2001) argue that a seller asks for a higher price for the dwelling if the expected sales price is below the initial purchase price. Based on this consideration, they analyze the amount of time that a dwelling stays on the market in a search and matching context. If the seller demands a higher price than the market value, it takes longer until an offer is submitted because the buyer must be willing to pay the higher price. The same argument holds for the broader context of loss aversion, which has gained attention in subsequent studies (Engelhardt 2003 and Einiö et al. 2008).

From our point of view, prospect theory can be used to explain more than the vacancies in a search and matching context. The theoretical model underlying prospect theory can also be used to describe how the price setting mechanism is influenced by a certain reference point and why the owner might be reluctant to sell (which eventually leads to a vacancy). In the context of this model, vacancies can arise even for homogeneous dwellings, agents with homogeneous preferences and symmetric information. In the following, we provide a conceptual framework to explain this mechanism.

An agent A, who is owning and inhabiting a dwelling, leaves and wants to sell her property. She can either sell it in period 1 to agent B or keep the house for another period. Agent A acquired the house in the past for cost c and is offered a purchase price by agent B of either p_L or p_H, with $p_L < c < p_H$. The resulting net gains from a potential sell would be $y_L = p_L - c < 0$ and $y_H = p_H - c > 0$, respectively. If agent A does not sell her property in period 1, she could participate in a lottery for price development in period 2. In this case, the dwelling would be vacant for one period. The same lottery is open to agent B. Agent B can buy the house in period 1 to sell in period 2. Agent B, however, would live in the housing such that it is not vacant. As our simple model is limited to two periods, in period 2, either agent is going to sell her property (if she is an owner). For simplicity, an agent's utility depends only on cash flows associated with purchasing or selling the house.

Agents A and B exhibit a utility function in accordance with the findings of Kahneman and Tversky (1979). The function is S-shaped with a kink. Figure 2 depicts the utility function of agent A and its set of options in period 1. The utility function is formed such that the agent becomes more risk seeking after suffering a loss (point L; convex) compared to facing a gain (point H; concave) and losses are valued higher than gains (the utility function is steeper in the loss area than in the gain area).

FIGURE 2: ILLUSTRATION OF UTILITY FUNCTION OF AGENT A



Notes: Own illustration following Kahneman and Tversky (1979).

It is now possible to assess whether agent A is going to sell to agent B in period 1 or whether she is going to participate in the lottery. We can do so by comparing the value of the lottery for both agents using the certainty equivalent. The certainty equivalent refers to the guaranteed return that yields the same utility for an agent as a risky return from a lottery. Thus, the certainty equivalent measures the subjective value of the lottery depending on the risk attitude of the agent. For a transaction to occur, agent B needs to value the lottery higher than agent A. Agent A's value of the lottery, however, depends on her risk attitude, which, in turn, depends on the past price development, i.e., whether she receives net gain y_H or net loss y_L.

The difference between the two agents is that agent B has no history, thus starts in point 0, while agent A has incurred costs of c before and is now offered a price of p_L or p_H, thus starts in either point L or H. Hence, in period 1, agent B would consider her investment as the reference point. She bases her decision on the possible future price development, whereas the past development is irrelevant to her. Due to the steeper slope in the utility function for potential losses than for gains, she is risk-averse regarding a possible investment. Her certainty equivalent is therefore below the expected price in the next period.

For agent A, however, the value of the certainty equivalent depends on past price developments. If agent A is faced with a loss (point L), she becomes risk seeking. Her certainty equivalent is positive. Thus, in period 1, she will only accept offers that are well above the expected price of the forthcoming period. Otherwise, agent A keeps the house, leaves it vacant and enters the lottery in period 2. Since agent B's offers are below the expected price in period 2 (due to her negative certainty equivalent),

they are also below agent A's certainty equivalent. Agent A considers the lottery more valuable than the offered price and thus, no transaction occurs. The house remains vacant in period 1.

If agent A is faced with a gain (point H), however, the result is less obvious. Agent A is, facing a potential gain, risk-averse as is agent B. Therefore, agent A's certainty equivalent in this scenario is also lower than the expected price in the following period. However, the shape of the utility function suggests that it is not lower than the certainty equivalent of agent B.[14] While in the base model there is still no sale, the certainty equivalents of both parties are a lot closer than in the loss scenario. A transaction therefore becomes more probable when adding other factors to the model, such as operating or maintenance costs. Agent A needs to set these costs off against her certainty equivalent for the lottery. As the costs increase, she becomes more willing to accept an offer. A second expansion would be the potential utility agent B obtains from inhabiting the house. The higher agent B's utility is, the greater her willingness to pay. Therefore, there will be a certain share of sellers and buyers that are able to generate transaction profits. This share will be greater for a positive demand shock with subsequent high prices in period 1 and lower for a negative one with lower prices in period 1.

Hypothesis 1.9 Negative (positive) demand shocks increase (reduce) the number of vacancies.

Clearly, our proposed framework is not a complete theoretical model. This is subject to future research. We highlight the fact that even if buyers and sellers are homogenous individuals, their willingness to pay differs depending on market developments. Given a positive or a negative demand shock on the market, the chance that a transaction will occur either increases or decreases, respectively.

The model can even be extended to include market provision of new houses. If agent A did not buy the dwelling in the past but rather faces the decision to build a new dwelling in period 0, it can be shown that her decision depends on the expectations of pricing in period 1. Agent A needs to assign a sufficiently large probability to receiving y_H over y_L to extend market supply. As a result, houses are constructed only if a sufficiently positive development in the housing market is expected.

3. Empirical findings

In the following, we assess the formulated hypotheses based on the empirical results published in the literature. We also highlight differences in the data, samples and methods employed in the various studies.

[14] Both the kink at the reference point and the concave slope in the gains range of the utility function result in risk aversion. For reasonable parameters for the function, the effect of the kink outweighs the effect of the concave slope (see Hens and Vlcek 2011).

Empirical findings for Hypothesis 1.1: Vacancies arise only if the market price equals the suppliers' minimum price.

As we illustrated in section 2, vacancies could reflect that the demand is saturated. In that case, we expect house prices to reflect suppliers' minimum prices. However, there are no studies quantifying suppliers' minimum prices, let alone linking minimum prices to vacancies.

Empirical findings for Hypothesis 1.2: As market power increases, the number of vacancies will increase.

There is no prior empirical case to review, and to our knowledge, there is no literature regarding the monopolistic power of housing companies. The housing industry is usually quite competitive. Therefore, only very large real estate companies might have some market power and could potentially influence both prices and the number of vacancies.[15]

Empirical findings for Hypothesis 1.3: The more heterogeneous the dwellings are, the more vacancies.

Heterogeneity[16] of dwellings leads to thinner (and therefore less liquid) submarkets and thus to more vacancies, as fewer people demand the different dwellings and it takes longer for buyers to gather all relevant information. The empirical results for this hypothesis are ambiguous. Haurin (1988) uses data on a suburb in Columbus (Ohio) for 1976 and 1977 and finds empirical support for the hypothesis using a survival-failure time model:[17] dwellings with individual characteristics (that form individual submarkets) stay on the market longer.[18] The author concludes that heterogeneity caused by unusual features extends the search process and therefore increases the number of vacancies. Herrin et al. (2004) examine data regarding single-family homes in California and show that sellers in a thin market (e.g., for dwellings with very individual characteristics) take longer to reduce their list prices and therefore face longer marketing periods. Carrillo and Pope (2012) apply a decomposition method to data on transactions in the Washington D.C. metropolitan area between 1997 and 2007. The authors assess how much of the shift of the time distribution for marketing dwellings can be explained by

[15] However, the housing stock of even very large suppliers is relatively small compared to the total market supply.
[16] The term 'heterogeneity' is used in the literature to describe the differences between characteristics of dwellings; see also Section 2.
[17] These models are usually used to analyze factors that influence the time it takes for a specific event to occur. Regarding vacancies, Haurin (1988) measures the time a dwelling remains on the market from its initial listing until it is sold.
[18] This result regarding Columbus has been reconfirmed with updated data (1997-2005) (see Haurin et al. 2010).

changes in the unique attributes of the dwellings.[19] They find that different dwelling types are marketed for different lengths of time: apartments have a longer marketing time than single-family homes.[20] Additionally, the authors find that the market time varies greatly across regions.

However, there are findings in the literature that indicate potentially shorter marketing times for very heterogeneous markets: Sass (1988) uses data regarding King County (Washington) from 1977 for a two-stage least squares approach[21] and observes that sellers in a thin market tend to have shorter marketing times than sellers that operate in a more liquid market. The author explains his findings with the information an offer gives about the sample and the respective learning process: thin markets lead to fewer offers (the 'population-size-effect') while at the same time the sellers obtain more information from each offer and therefore adjust their initial list prices faster (the 'price-cutting-effect'). In his sample, the author finds the latter effect on the marketing period to be greater than the former and observes shorter marketing periods for dwellings in thin markets. Anenberg (2016) also studies sellers' learning processes about the distribution of offers for their dwelling but finds quite the opposite effect. The author uses data on single-family home listings in California from 2007 to 2009 and uses a simulated method of moments[22] to show that sellers in thin markets usually face a longer marketing period and thus more vacancies.

Empirical findings for Hypothesis 1.4: The lower the costs to hold a dwelling, the more vacancies.

Low costs for holding a dwelling could decrease the motivation of buyers and sellers to transact quickly and therefore increase the vacancy rate. There are a few studies which investigate the effects of holding costs: Glower et al. (1998) explore differences in seller holding costs using data from Columbus (Ohio) between 1990 and 1991. Using a survival/failure time model and an OLS estimation, they observe differences in the motivation of sellers: if sellers do not want to sell quickly (i.e., if they have low holding costs), they have a higher reservation price and only accept high offers, which results in more vacancies because matching becomes less likely. Holding costs are also studied by Harding et al. (2003) using data obtained from the American Housing Survey (waves from 1985 to 1993). The au-

[19] This method allows to simulate the distribution of time on the market for each year in the study period assuming that the dwellings had the same characteristics as in 2003.
[20] This finding does not necessarily confirm the hypothesis as it could be argued that the market for single-family homes (which might have more individual characteristics) is thinner than the market for apartments (which might be relatively standardized).
[21] In this model, the difference between the list price and the sales price is regressed on a number of factors. In the first step, an instrument needs to be constructed for the variable measuring the days a dwelling spends on the market because differences in prices also influence the number of days a dwelling spends on the market.
[22] This estimation method is an extension of the generalized method of moments in which moments are computed from simulated data that are estimated by the economic model, which are then matched with actual data.

thors apply a censored regression model[23] and identify certain characteristics of the sellers (such as gender, income or the number of children) that significantly influence holding costs. For example, families with school-age children have very high holding costs if they do not sell during the summer break because they might have to wait another (school) year before they can try to sell again. Harding et al. (2003) find that families with school-age children conduct a transaction much faster during summer than families without children. Thus, high costs to hold a dwelling could lead to less vacancies.

Empirical findings for Hypothesis 1.5: The higher the list prices are compared to the market value, the more vacancies.

High list prices above the market value potentially lower demand for a specific dwelling and therefore increase the number of vacancies. There are many studies in the literature that investigate the influence of list prices on the matching process: Yavaş and Yang (1995) construct a regression model using a two-stage least squares approach[24] and show that because of list prices well above the market value of the dwellings, the housing market becomes thinner and matching becomes less likely, which eventually results in an increase in the number of vacant dwellings. Their sample includes data on the State College Area School District in Pennsylvania in 1991. However, the authors only find empirical evidence for dwellings in the medium price range. The authors cannot identify the same relationship for dwellings with relatively high or low market prices. Forgey et al. (1996) apply the same estimation method[25] to data on single-family home transactions in Texas between 1991 and 1993. The authors conclude that higher prices decrease the frequency of submitted offers and higher-priced dwellings remain unoccupied for a longer period of time. Guren (2014) also proposes a framework where list prices above the market value induce a longer marketing time and thus more vacancies. However, he assumes that reducing the list price below the market value only slightly decreases the marketing time. He uses data on listings in Los Angeles and San Diego metropolitan areas from 2008 to 2013 and applies an instrumental variable approach (using the aggregate price appreciation that considers the

[23] Those models are used if the variable of interest is only available under certain circumstances. The American Housing Survey only encodes data starting with the 97th percentile. Thus, the coding point for very expensive properties varies between waves.

[24] Similar to Sass (1988), this method is used to overcome the endogeneity problem between sales prices and the time on the market. Yavaş and Yang (1995) use the time on the market as the dependent variable. Therefore, they develop an instrument for the sales price, in a first step.

[25] Forgey et al. (1996) solve the same endogeneity problem as Sass (1988) and Yavaş and Yang (1995). First, they develop an instrument for the time on the market. For the second step, they regress the sales price and other variables, such as the quality of the dwelling, seasonal effects, the labor market situation, intermediaries and the capital market, on this instrument.

amount the seller originally paid for the dwelling and the relative list price). The author finds a statistically significant concave relationship between marketing time and the list price relative to the (quality-adjusted) average local house price. Khezr (2015) applies the two-stage least squares approach to data on the housing market in Sydney, Australia, in 2011 and finds a positive correlation between the list price and the time a dwelling remains vacant. De Wit and van der Klaauw (2013) conduct an empirical study using data from the Netherlands between 2005 and 2007. By applying survival analysis, they find that there is considerable uncertainty by sellers regarding the market value and that list price reductions increase the chance of selling a dwelling, which reduces the number of vacancies. Han and Strange (2016) provide evidence that higher list prices lead to fewer visits and therefore longer marketing periods. They use data on North American metropolitan areas from 2006 to 2009 and consider the number of bidders on each dwelling. They find that a lower list price encourages more buyers to visit but only up to a certain point. After that point, bidding wars emerge, and no additional buyers can be attracted by an even lower list price.

On the contrary, Sass (1988) finds that higher list prices lead to shorter market periods. The findings are somewhat confirmed by Yavaş and Yang (1995) who cannot find evidence for a positive correlation between list prices and marketing time for dwellings in the very high and very low price ranges. The empirical evidence by Anenberg (2016), however, challenges the results by Sass (1988) (see also empirical findings for Hypothesis 1.3).

Empirical findings for Hypothesis 1.6: For the overall rental market, the higher the share of small dwellings, the more vacancies.

Under the assumption that landlords of small dwellings ask for higher rents per unit space, those dwellings should remain vacant for a longer period of time. The study by Guasch and Marshall (1985) is the only one in the literature that empirically investigates this hypothesis. They use data on rental units in Philadelphia from 1974 to 1977 and confirm the hypothesis. The authors perform an OLS regression of various characteristics on the duration of vacancy in months. They find a positive and significant correlation between the number of units in a structure (where primarily small dwellings can be found in Philadelphia) and the duration of vacancy. In addition, they find a negative and insignificant correlation between the number of rooms in a dwelling and the duration of vacancy. However, Guasch and Marshall (1985) note that their results are not conclusive because the sample includes a very small number of observations. Additionally, the authors are not able to control for regional characteristics (such as differences in the neighborhoods) due to data limitations.

Empirical findings for Hypothesis 1.7: The more intermediaries there are, the fewer vacancies.

Intermediaries could decrease information asymmetries of market participants and therefore fewer vacancies should be observed. Forgey et al. (1996) analyze the influence of real estate brokers: they observe a decrease in the marketing time, implying that housing markets where fewer intermediaries are involved are more likely to be affected by vacancies. By contrast, Rutherford and Yavaş (2012) show that dwellings listed by a discount brokerage firm take longer to sell. The authors use data on metropolitan areas in Texas for dwellings that were sold between 2002 and 2004.[26]

Empirical findings for Hypothesis 1.8: The longer the mandatory period of notice, the fewer vacancies.

Because a landlord can only start her search process when informed about her former tenant's intentions to move, vacancies arise. To the best of our knowledge, there is no empirical study that connects the vacancy rate to the length of the period of notice for terminating a rental contract. Suitable empirical settings could be found, for example, in Germany where, one the one hand, tenancy laws differ significantly across regions and, on the other hand, there have been some rental reforms in the past which affected the mandatory period of notice (e.g., *Gesetz zur Änderung des Einführungsgesetzes zum Bürgerlichen Gesetzbuche, 17/03/2005*).

Empirical findings for Hypothesis 1.9: Negative (positive) demand shocks increase (reduce) the number of vacancies.

There is no empirical work that examines the direct link between demand shocks and vacancies. However, a strand of literature finds that falling (rising) prices in the housing market induce market activity to decrease (increase) and thus the marketing time increases (decreases), which is an implication of our hypotheses. The results in the literature therefore do not reject the hypothesis. Genesove and Mayer (2001) conduct an OLS estimation using data on transactions in the 1990s in Boston. They find that the transaction volume is positively correlated with market prices because sellers who face a loss set higher list prices compared to those facing a gain. Therefore, a negative demand shock reducing market prices would lead to fewer transactions. Furthermore, the authors apply a Cox regression[27] to estimate the influence of impending losses on the time a dwelling remains on the market. Genesove and

[26] Rutherford and Yavaş (2012) use a hazard model to avoid the problem of wasting valuable information that occurs when using ordinary least squares for non-linear relationships. The authors also control for self-selection of a discount listing and find that discount agents obtain prices similar to other agents in comparable residential markets.

[27] Cox regressions (see Cox 1972) are one type of survival/failure time models (see above).

Mayer (2001) find that sellers facing a prospective loss also face an increase in marketing time. The hypothesis is also supported by subsequent studies that observe similar results: Engelhardt (2003) studies US metropolitan areas; Einiö et al. (2008) studies Helsinki; Anenberg (2011) [28] studies the San Francisco Bay Area; and Bokhari and Geltner (2011) studies commercial real estate in the US.

4. Discussion and conclusion

In this section, we summarize the theoretical and empirical results and discuss further extensions and unsolved issues (see Table 1).

TABLE 1. SUMMARY OF THE EMPIRICAL FINDINGS

Hypothesis	*Empirical Findings*	*Comments*
The standard market model		
1.1	No empirical studies quantifying suppliers' minimum prices	Assumptions of the model may create unverifiable relations
1.2	No empirical studies on the monopolistic power of housing companies	Monopolistic power difficult to observe or non-existent; potential for future empirical analysis
Search and matching theory		
1.3	Confirmed by Haurin (1988), Herrin et al. (2004), Haurin et al. (2010) and Anenberg (2016); countervailing effects observed by Sass (1988)	Detailed examination of empirical differences between housing markets is needed
1.4	Confirmed by Glower et al. (1998) and Harding et al. (2003)	Hypothesis confirmed
1.5	Confirmed by Forgey et al. (1996), Guren (2014), Khezr (2015), de Wit and van der Klaauw (2013), Han and Strange (2016); countervailing effects for thin markets observed by Sass (1988) and Yavaş and Yang (1995)	Detailed examination of empirical differences between housing markets is needed
1.6	Confirmed by Guasch and Marshall (1985)	Results limited due to the small number of observations; potential for future empirical analysis
1.7	Confirmed by Forgey et al. (1996)); countervailing effects for discount brokerage firms observed by Rutherford and Yavaş (2012)	Countervailing effects not theoretically studied
1.8	No empirical studies on the mandatory period of notice	Potential for future empirical analysis
Behavioral economics		
1.9	Indirectly confirmed by Genesove and Mayer (2001), Engelhardt (2003), Einiö et al. (2008), Anenberg (2011) and Bokhari and Geltner (2011)	No direct effect on vacancies is measured

Notes: The table summarizes the empirical findings discussed above and includes our own remarks and comments published in the literature regarding possible extensions and unsolved issues.

[28] Anenberg (2011) also finds evidence that owners tend to set higher prices after a market downturn due to equity constraints. However, if an owner is faced with equity constraints, she will not leave her current dwelling. Thus, this strand of literature is not related to vacancies and therefore is not included in our study.

Discussion of the theoretical approaches

There is considerable room to extend existing theoretical models. On the one hand, there are aspects of the housing market which could influence the vacancy rate that have not been incorporated in existing models. For example, the search and matching literature regarding real estate markets neglects the possibility of new arrivals on the local housing market, e.g., via immigration (which has already been applied for the labor market; see Rogerson et al. 2005). These agents usually possess less information than local residents (for example, regarding prices or the average time on the market) and therefore face higher search costs.[29] Additional frictions in the housing market could also be introduced due to taxes (such as the real estate transfer tax and property taxes), which, in turn, can influence vacancy rates as shown in Section 2. The effects of taxes in the housing market context have not been studied in the theoretical literature. This type of study could provide valuable information regarding policy strategies intending to reduce vacancies. We also proposed a new framework based on behavioral assumptions to explain vacancies due to speculation in the housing market. However, speculation might be driven by other mechanism that can be addressed with behavioral economics. For example, rapid price increases as we observe in many big cities might be both the cause for and (partly) the result of herd behavior. In both cases of loss aversion and herd behavior, however, speculation is stronger when the costs to hold a property are low (e.g., for building land). Then investors might leave their property vacant in expectations of an increase in prices in the future. Formulating a complete theoretical model of these aspects for the housing market is subject to future research.

On the other hand, some of the empirical studies falsify the existing theories. Thus, there is a need for new theoretical frameworks that could explain the contradicting findings. A detailed theoretical investigation of certain characteristics of market participants (including differences between intermediaries, such as discount vs. traditional brokerage firms), would enhance the current literature. Next to that, some studies find a positive correlation between high list prices compared to the market value and the time on the market, especially in thin markets (e.g., Forgey et al. 1996, Guren 2014 and Khezr 2015), whereas others find the opposite relationship (Sass 1988 and Yavaş and Yang 1995). A theoretical exploration of the contradicting findings could be a valuable addition to the literature.

[29] Higher search costs could imply more vacancies (as a dwelling remains vacant while potential buyers gather the information needed to make a purchase decision). However, it is also possible that new arrivals have higher holding costs than local residents (e.g., due to longer commutes as long as they cannot find a dwelling) which could result in fewer vacancies.

Discussion of the empirical findings

Some hypotheses have either been investigated by the empirical literature only to a limited degree or have not been investigated at all. The influence of monopolistic power on the vacancy rate has not been studied until now, which is either because monopolistic power in housing markets is difficult to observe or does not exist. A suitable setting could potentially be found in thin submarkets that target specific groups of buyers. Monopolistic power could also exist in cities with a large housing association that owns the majority of prefabricated high-rise buildings in specific districts (where they form a large share of the housing supply). Concerning search and matching theory, the empirical investigations of the influence of a certain dwelling type (such as small dwellings) are quite limited.

As already mentioned, the results of some empirical studies are not consistent with those of others (e.g., regarding the influence of high list prices and intermediaries). These countervailing results may be due to differences in environmental conditions of the respective housing markets as different data sets are compared. There might be omitted variables, whose impact on the housing market still needs to be identified in future empirical research.

Conclusion

In this literature review, we summarize existing theoretical and empirical studies regarding the causes of vacancies in the housing market. The main findings of our literature review are (1) that there is considerable room to extend existing theoretical models and (2) that some hypotheses have either been investigated by the empirical literature only to a limited degree or have not been investigated at all. We also suggest that (3) a social welfare analysis that takes the specific type of vacancy into account is highly relevant for housing policy decisions. Therefore, next to the positive analysis of the mechanisms that cause vacancies, we need to pose the normative question, if and under which circumstances vacancies should be considered problematic.

Vacancies in the short run may be a necessity in a search and matching context to offer potential buyers a heterogeneous pool of options to choose from and to fit their individual needs. An artificial reduction in those prices (e.g., due to binding price ceilings) may be effective at reducing vacancies. However, it would also increase the probability that a dwelling is purchased by a buyer with a lower willingness to pay compared to a potential buyer in a future period. Additionally, with the assumptions of behavioral economics, an owner of a vacant dwelling might find greater pleasure in speculating with the object than a buyer would enjoy living in it. Hence, vacancies do not necessarily reflect a welfare loss. However, vacancies could indicate a welfare loss if caused by a monopolist that artificially reduces (and yet does not demolishes) the housing supply on a market. In the context of search

and matching, a reduction in information asymmetry could reduce vacancies and increase welfare. For example, obligating landlords to disclose an energy performance certificate might reduce buyers' search costs and duration and therefore vacancies. Equivalently, a mandatory period of notice for terminating a rental contract might enable landlords to start the search process sooner and thus reduce the vacancy duration. Another important factor influencing vacancies is costs to hold a dwelling. However, an increase in these costs, which raises the motivation for buyers and sellers to transact quickly, e.g., via higher property taxes, could be problematic. As with any market regulation, they must be placed in the context of potential economic distortions regarding the efficient market outcome. It always takes some time for market participants to find each other so the burden of such unavoidable short-term vacancies should not be too high. Furthermore, to leave a dwelling vacant might be efficient for the owners depending on their individual utility function (e.g., if they intend to hold the dwelling for future usage). As long as taxes such as the property tax cover all external costs associated with the vacancy, leaving the dwelling vacant might be an efficient market outcome.

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