RESIDENTIAL LISTING DECISIONS MADE BY HOMEOWNERS: A COLLECTION OF ESSAYS

by

WILLIAM R SWYMER

(Under the Direction of Darren K. Hayunga)

ABSTRACT

The average homeowner stays in their home for 8 to 13 years[1], going through the sales process an estimated 3 to 5 times. The primary residence is often the largest, if not the largest, asset homeowners possess. Comprehensive knowledge of how their decisions in the sales process affect transaction prices, market liquidity, and the probability of a successful sale could be valuable. This dissertation examines two decisions made by sellers during the home-selling process and how those decisions impact transaction price, market liquidity, and the probability of a sale.

The first decision studied is whether to relist a property after an initial listing terminates without a sale. Utilizing a comprehensive dataset of over 670,000 residential properties, this dissertation fills a gap in the existing housing literature, which has largely overlooked the implications of prior listings on sale outcomes. Measuring days on the market by only accounting for the sold listing and failing to include days on market of the initial listing produces biased results regarding the impact of relisting. By accounting for the differences in the distribution of days on the market between single listings and relistings, as well as the method of listing termination, this study provides the most comprehensive analysis relistings.

[1] According to the National Association of Realtors

The second decision in the study is whether to list with an offer deadline. Homeowners are constantly looking for the most efficient method to maximize transaction price, liquidity, and probability of sale when selling their properties. Three marketing mechanisms are available to sellers: For Sale by Owner, broker-represented sales, or auctions. Almost 90% of sellers engage brokers to leverage their expertise and reduce the sellers' workload. Using offer deadlines in listings mimics some fundamental features of auctions without binding sellers. Sellers benefit from increased transaction prices, reduced time on the market, and a higher probability of sale.

These findings contribute to a deeper understanding of the real estate market's complexities, offering insights for homeowners, real estate professionals, and policymakers.

INDEX WORDS: House prices, Market liquidity, House listing contracts, Time on the market, Real estate agents, Probability of sale

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DEDICATION

This dissertation is dedicated to Mom, Dad, Patrick, Rachael, Ginger, all my aunts, uncles, cousins, and friends. All have provided love, support, and encouragement. Ma, Grampy and Brian, I wish you were here to see this accomplishment and share in the celebration.

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CHAPTER 1

House Relistings and Economic Cycles[2]

Introduction

Each year, the National Association of Realtors' Profile of Home Buyers and Sellers survey highlights the strong preference of homeowners for using real estate agents during transactions. In 2023, 89% of buyers and 85% of sellers relied on agents to facilitate their deals. This partnership typically involves sellers signing listing agreements, giving agents the authority to find buyers for their properties. This study focuses on the outcomes experienced by single-family homeowners when their properties fail to sell under the initial listing contracts.

The motivation for this study arises from several factors. First, a considerable number of previous listings do not result in successful sales but are eventually sold after being relisted. In our dataset of over 670,000 sold homes in Massachusetts between 2000 and 2019, nearly 45,000 homes (6.7%) were relisted before eventually selling. These prior listings may offer valuable insights for both sellers and buyers, leading us to explore whether relisted homes exhibit different pricing or marketing outcomes compared to homes sold under a single listing[3].

Second, our study addresses the lack of attention in housing literature to prior listings[4]. Public records datasets commonly used by housing economists often omit relisting information, such as days off market and total marketing periods. By excluding days off market, studies risk

[2] Co-Authur Darren K. Hayunga
[3] Unsold properties are excluded from our study as they lack transaction prices or marketing periods. For reference, our dataset includes 16,228 unsold relisted properties and 63,900 unsold single-listing sales.
[4] Smith, Gibler and Zahirovic-Herbert (2016) is the notable exception.

failing to account for changes in the pool of active buyers (Gilbukh 2023). Some housing research using multiple listing service (MLS) data includes unsold properties (potential relistings) and applies the Heckman correction method to address sample selection bias. However, recent trends favor using propensity score matching (PSM) on sold transactions without relisting information.

Third, excluding prior listing data raises econometric concerns. A censored sample provides incomplete information on certain observations, such as missing days off market, initial listing prices, and full marketing periods in the case of relistings. Censored samples may not accurately represent the population, potentially leading to biased estimates and underestimated variability, which can produce overly confident conclusions and violate statistical assumptions.

Our analysis confirms the presence of censoring bias in the relisting data. Using a system of simultaneous equations, we compare the biased days on market (DOM) from sold relisted homes with the unbiased DOM from single-listing sales. Our findings suggest that relisted properties experience a reduction in the average marketing period by approximately one day.

However, this reduction in marketing time is a biased conclusion. The cumulative days on market (CDOM) for relistings show a significant rightward shift compared to single-listing sales. For instance, the median CDOM for relisted homes in our sample is 155 days, compared to 42 days for single-listing sales, representing a 269% increase[5]. This notable difference in marketing periods motivates further investigation. According to fundamental search theory, prices and marketing times are positively correlated (Krainer 2001), raising the question of whether longer marketing periods lead to price increases. Alternatively, relistings may be viewed

[5] MLS databases have been generally recording both the DOMs and CDOMs for some time so housing economists can use the full CDOMs to control for this bias.

as unsuccessful prior listings with little informational value, or they may be negatively perceived by buyers due to their extended CDOMs (Kaya and Kim 2018).

To model the effects of relistings, we address an econometric issue that allows us to control for causality. Given the differing marketing periods, we employ PSM to match relistings with single-listing sales based on a comprehensive list of housing characteristics. Additionally, we require an exact match between each relisting's CDOM and a single-listing's DOM. We also ensure that both the relisting and single-listing sales begin in the same month and year.

This matched-pair sample addresses the potential argument that longer marketing periods result from sellers with lower discount rates. It is important to note that longer marketing periods do not always lead to a new listing contract, as sellers can extend agreements with their agents without relisting, a customary practice in the U.S. housing market. By matching CDOM to DOM, we create a single-listing sample that mirrors relistings, ensuring that the two groups have equal marketing period distributions. This demonstrates that longer marketing durations alone do not cause relistings, and the discount rates between the groups should be comparable.

Once we control for the extended marketing period, our results reveal two key findings. First, relistings experience unique price outcomes tied to the housing market cycle. Second, these results vary based on the type of relisting, such as expired versus canceled listings.

For expired listings, we observe countercyclical price effects. During the market contraction from 2006 to 2009, we find a positive mean price elasticity of over 4% for expired listings. This suggests that relistings are not always perceived negatively; instead, they reflect sellers' continued efforts to find buyers at acceptable prices in a market with fewer purchasers. Conversely, during the rapid market expansion from 2000 to 2005, expired listings experience a

negative mean price elasticity of 2%, indicating that in a sellers' market, relisting is a negative event.

In contrast, canceled listings show relatively muted price effects across economic cycles. During the 2000 to 2005 expansion, mean transaction prices for canceled listings decreased by about 1% compared to single-listing sales, with no statistically significant price effects during other cycles.

Our results also show minimal impact from changes in agents or brokerage offices on housing market outcomes. While such changes often result in relistings, they do not always lead to representative replacements. Previous studies, such as Daneshvary and Clauretie (2013) and Smith, Gibler and Zahirovic-Herbert (2016), suggest negative price effects when sellers change representatives. However, using a larger dataset spanning a longer period, our analysis shows that switching agents or offices has little to no effect on prices or marketing times.

Our study builds on the work of Smith, Gibler and Zahirovic-Herbert (2016), who examined 6,642 relistings in Atlanta over a two-year period, finding a price increase using unbiased CDOM. Our research differs in several ways. By using a dataset spanning 20 years and nearly 45,000 relistings, we demonstrate the significant role of economic cycles in shaping relisting outcomes and highlight differences between expired and canceled listings. We also emphasize the importance of controlling for the disparity in marketing periods between single-listing sales and relistings.

The paper is organized as follows: section two discusses the theoretical and empirical frameworks of our analysis, section three is data details, section four our empirical findings. We conclude with a discussion of the key findings.

Theoretical and Empirical Frameworks

This section explores the significance of the expected marketing period in understanding the implications of relisting a home, synthesizing search and matching theory with its application to our empirical analysis. A contribution of our study lies in modeling the joint determination of prices and days on market (DOM). While much of the housing literature concentrates on price capitalization, our analysis highlights the integration of prices and DOM[6]. Additionally, this section addresses the empirical challenge posed by the endogeneity of DOM, prices, and their potential determinants, as well as the consideration of time spent off-market between listings.

The housing market, inherently unique and heterogeneous, and fixed in location, operates under distinct dynamics. Buyers invest resources to find properties that align with their preferences, while sellers seek buyers whose reservation prices match their own. This characterizes housing as a search and matching market, where the marketing period is just as crucial as transaction prices.

Wheaton (1990) pioneered the modeling of housing markets within a search-theoretic framework, introducing a model that includes both buyers and sellers, though based on the assumption of time-invariant variables. Williams (1995) expanded Wheaton's model into a dynamic setting, enhancing its relevance to real-world scenarios. At the core of these models is the interrelationship between prices and marketing durations. Krainer (2001) further refined this framework by incorporating state-varying liquidity in the housing market. His model illustrates how rational, forward-looking traders balance decisions on marketing time and prices, both of which are determined endogenously. Collectively, this literature underscores the importance of

[6] Tucker, Zhang and Zhu (2013) and Benefield and Hardin (2015) examine the price impacts of different methods to calculate marketing durations. Their findings also underscore the importance of measuring and including marketing periods.

the expected marketing period and emphasizes that prices do not fully absorb all exogenous economic changes. Further theoretical details on these aspects are presented in the following subsection.

The theoretical framework presented here is a summary of Turnbull and Zahirovic-Herbert (2012) generalization of the standard seller search model. This model demonstrates how expected prices and marketing periods are determined simultaneously, using a common set of factors.

To begin, a seller of a house with attributes represented by the vector x sets a reservation price s. For any buyer's offer b, the seller follows a standard decision rule: sell if $b \geq s$, or wait for another offer if $b < s$. Buyers are ranked by their offers and distributed according to $F(b, x)$ in the market. The probability that an unsold home sells during a time interval dt is the instantaneous arrival rate π, multiplied by the probability that the arriving buyer's offer b meets or exceeds the seller's reservation price s. This is expressed as:

$$prob\{sale; dt\} = \pi[1 - F(s, x)]dt.$$

Let the marketing period required to sell a house be denoted as θ, a stochastic variable. By weighting each feasible θ by the probability of a sale at that value (conditional on the house being for sale), we obtain the expected marketing period:

$$\mathbb{E}[\theta] = \int_1^\infty \theta\pi[1 - F(s, \boldsymbol{x})](1 - \pi)^{\theta-1} F(s, \boldsymbol{x})^{\theta-1} d\theta \quad (1)$$

the expected price for the unsold home:

$$\mathbb{E}[P] = \int_{b \geq s} b\pi dF(b, \boldsymbol{x})/(1 - \pi)F(s, \boldsymbol{x}). \quad (2)$$

The outcome of viewing housing as a search market is that both expected selling prices and marketing periods are determined by the same factors, namely property characteristics x and

the seller's reservation price s. The choice of reservation price s determines both $E[\theta]$ and $E[P]$. By differentiating (1) and (2), we get: obtain $d\mathbb{E}[P]/ds > 0$ and $d\mathbb{E}[\theta]/ds > 0$. Thus, (1) and (2) can be expressed as an upward-sloping price-marketing period surface, implicitly defined by the function: $\Phi(\mathbb{E}[P], \mathbb{E}[\theta], \boldsymbol{x}) = 0$. Figure 1.1 displays this function.

To complete the model, note that sellers' utility functions increase with higher expected selling prices and decrease with longer marketing periods. Let the seller's holding cost per time unit be h. Seller utility is represented by the quasiconcave function $U(E[P], E[h\theta])$, with a first partial derivative $U_1 > 0$ and a second derivative $U_2 < 0$. Applying the implicit function theorem to this utility function at a given utility level, the slope of an indifference curve in the expected price-marketing period space is derived as:

$$\left(\frac{d\mathbb{E}[P]}{d\mathbb{E}[\theta]}\right)_{dU=0} = -h\left(\frac{U_1}{U_2}\right) > 0. \tag{3}$$

The seller's utility function generates the indifference curves shown in Figure 1.1, with curves to the northwest representing higher utility. The upward slope of each curve indicates that sellers prefer either higher expected prices or shorter marketing periods. The shape of the curves reflects the seller's urgency.

The seller's objective is to set a reservation price s that maximizes utility, subject to (1) and (2). Turnbull and Zahirovic-Herbert (2012) reformulate this problem by framing it as the seller choosing the expected price and holding cost to maximize utility, constrained by the market-determined price-liquidity trade-off:

$$\max_{\mathbb{E}([P],\mathbb{E}[\theta])} U(\mathbb{E}[P], h\mathbb{E}[\theta]) s.t. \Phi(\mathbb{E}[\mathrm{P}], \mathbb{E}[\theta], \mathbf{x}) = 0. \tag{4}$$

This reformulation helps draw clearer connections between standard consumer demand theory and search theory, which underpins our use of localized competition and shopping

externality effects in empirical models. The seller selects the reservation price s^* such that the expected price and marketing period create a tangency between the indifference curve U^* and the market constraint. This is represented as points a and b for Seller A and Seller B in Figure 1.1.

The shape of the seller's utility function $U(E[P], E[h\theta])$ reflects their time preference, risk tolerance, and other personal factors. These characteristics differ across sellers, so two sellers of identical houses with equal holding costs, facing the same market conditions, may have distinct utility functions and indifference maps due to differing time preferences and risk attitudes. Figure 1.1 illustrates these differences for two sellers based on their respective time preferences.

Empirical Design

The restatement of the standard seller search model by Turnbull and Zahirovic-Herbert (2012) allows for the determination of prices and marketing durations as a direct application of neoclassical consumer theory. In housing transactions, the expected price $(E[P])$ is considered an economic good, while the expected marketing duration $(E[\theta])$ is seen as an economic bad. As a result, our empirical approach is guided by the structure implied by applied consumer theory. Similar to how the utility maximization model in consumer theory produces a consumer's demand for two goods, A and B, as functions of predetermined variables (e.g., prices, preferences, income), the seller utility maximization model in Turnbull and Zahirovic-Herbert (2012) frames the seller's choices of expected selling price and marketing duration as a function of the same set of predetermined factors. In the context of the housing market, these include

property characteristics, seller preferences, and market conditions, where market conditions reflect buyer preferences and other factors at both micro and macro levels.

More formally, as previously noted, the general search model indicates that expected marketing periods ($E[\theta]$) and prices ($E[P]$) are jointly determined by the two equilibrium conditions for utility maximization: the constraint $\Phi = 0$ and the tangency condition - $h(U_2/U_1) = -\Phi_\theta/\phi_P$. By applying the implicit function ensures, the sufficient conditions for the seller's optimization problem ensure that there is an implicit solution to these conditions. This allows the seller's optimization objectives to be expressed as differentiable functions of exogenous factors such as property characteristics and market conditions. Therefore, functions $E[P] = g_p(x)\ and\ E[\theta] = g_\theta(x)$ exist, paralleling the consumer demand equations derived from neoclassical consumer theory.

Once jointly determined stochastic error terms are added, the realized selling price:

$$\ln P = \sum_i a_i x_i + \epsilon_P, \tag{5}$$

and realized time on the market:

$$\ln \theta = \sum_i \beta_i x_i + \epsilon_\theta. \tag{6}$$

can be modeled accordingly. In practice, two empirical considerations arise. First, given the right-skewed nature of transaction prices and cumulative days on market (CDOM), we employ natural logarithmic transformations, a standard approach in modern housing literature. Second, since equations (5) and (6) are functions of the same variables and jointly determined, the error terms are likely correlated across equations. To address this, we use a system of equations and apply three-stage least squares for estimation.

After establishing the system of equations, we also consider the treatment of "days off market," a factor unique to relisted properties. It remains an empirical question whether the gap between the end of a prior listing and the new listing date influences prices or CDOM[7]. For the main specifications, we test a 30-day gap, as this threshold seems optimal for mitigating issues like DOM gaming, off-market activity, misclassifying new listings as relistings, and property alterations during the days off market. To ensure this boundary does not unduly influence results, we also examine gaps of 7, 90, and 180 days. These added tests provide important validation that a single continuous variable for days off market would not offer.

In place of the 30-day threshold, we first evaluate a 7-day gap. Since all gaps start at zero, this sample includes home sales with days off market ranging from zero to seven. The short gap gives the greatest confidence that an observed prior listing, along with a sold record for the same address in the MLS system, represents a relisting and not a new event. By contrast, a canceled or expired listing from, say, 9 months prior to the new listing would raise doubts about whether these records should be combined or treated as separate events.

The second advantage of a 7-day gap is that it limits the potential for significant structural changes. A brief gap leaves little time for owners to make substantial property alterations. Similarly, it reduces the risk of off-market activities, particularly transactions involving house flippers. After a listing is canceled or expired, an owner might sell the property off-market, and one type of active buyer in this space is the investor who renovates and resells homes quickly. Although certain renovations could occur within 30 days, the 7-day gap reduces this concern, as it is impractical for a flipper to complete major renovations in such an abbreviated time. More generally, the short gap minimizes the possibility of unobservable off-

[7] The CDOM calculation does not include the days off market, which is the standard in MLS systems.

market ownership changes, as it is implausible for a buyer to close a transaction and relist the property within seven days.

If the 7- or 30-day gaps prove too restrictive, we model the system using 90- and 180-day gaps. These thresholds help mitigate DOM gaming and the risk of misclassifying listings with longer gaps as new listings rather than relistings. DOM gaming occurs when owners cancel a listing, remove it from the MLS, and relist it shortly after to reset the DOM count to zero, giving the home the appearance of being a new listing. Listings new to the market may have a higher probability of sale (Gilbukh 2023). The 90- and 180-day gaps help prevent this issue, as being off the market for three or six months is a substantial break for most motivated sellers. For example, the Massachusetts MLS system[8] considers a 90-day gap sufficient to reset the CDOM, treating relistings after 90 days as new listings.

Longer gaps like 90 and 180 days also reduce the chance of misclassifying a new listing as a relisting. With shorter thresholds, like 7 or 30 days, there is more certainty that a prior canceled or expired listing followed by a sold record reflects a relisting. However, longer gaps provide confidence that properties exceeding these thresholds are new listings. For instance, in a 180-day sample, homes with gaps of 181+ days are classified as new listings. The tradeoff with longer gaps is that they increase the likelihood of structural changes to the property and complicate the analysis with changes in sellers' bargaining positions or broader economic conditions. Given these drawbacks, we avoid exploring gaps longer than 180 days, as they introduce too many variables to accurately combine prior listings with subsequent sales.

[8] Tucker, Zhang and Zhu (2013) use the same Massachusetts MLS database to examine a system change implementing a 90-day threshold in April of 2006. We also investigate this system change for DOM gaming in a robustness test.

Data

The section discusses the data and our sample. We employ a comprehensive collection of housing data from the MLS Property Information Network (MLSPIN), which covers the entire state of Massachusetts. Our analysis focuses on single-family properties for the period from January 2000 to December 2019. The sample does not include sales after 2019 due to the unique effects we find in the local housing markets associated with the COVID-19 virus.

Sample

We begin constructing the sample by removing all records containing data errors and then apply the following filters. We require the homes to have 500–9999 square feet, 0–10 acres in lot size, 1–15 bedrooms, and 1–20 bathrooms. Unlike other studies that exclude properties built before 1900, we extend the home age cutoff to 209 years, which acknowledges the significant number of older homes in Massachusetts that are not considered special historical properties but owned by typical homebuyers. To address any leniency in our upper limits, we generate a set of indicator variables to identify properties with potentially atypical characteristics. Binary variables are set to one (and zero otherwise) if the living area exceeds 4915 square feet (*Large Home*), the lot is more than 4.8 acres (*Large Lot*), the home age is more than 166 years (*Older Home*), the number of bedrooms exceeds 6 (*Many Bedrooms*), and the number of bathrooms exceeds 5 (*Many Baths*). These variables generally control for the top one percent of their respective distributions.

To better generalize our results, we trim the transaction prices at the one percent level on both sides of the distribution, yielding a sample with a minimum list price of $82,000 and a maximum of $2.5 million. Lastly, we include sales with marketing durations between 2 and 360 days. This trimming removes 0.5 percent of the data on the left to mitigate pocket sales and 3.1

percent of the sales on the right, where we question sellers' motivations given the extended time to reach an agreement with a buyer.

Our sample excludes new construction, foreclosures, and short sales. New homes generally exhibit different price/marketing period tradeoffs compared to existing houses, and builders can offer seller concessions that may not be well captured by one dummy variable for new construction. Similarly, we remove foreclosures and short sales because quality and price/CDOM tradeoffs can exhibit large variances in the cross-section, which is not well captured using one binary variable.

Apropos to our analysis, we require each property to have a terminal listing status of sold, expired, or canceled. The sold classification signifies the successful transfer of ownership. The expired status indicates the termination of the listing upon reaching the pre-agreed expiration date stipulated in the listing contract. The canceled classification denotes a mutual agreement between the broker and the seller to terminate the listing agreement before its designated expiration date. Some MLS systems allow for a withdrawal status, which is not a terminal condition but a temporary one. Sellers can choose to stop marketing the property through MLS, but the exclusive right-to-sell contract remains in force. Withdrawals will then evolve into one of the three terminal statuses. Since withdrawals are temporary, they are not appropriate for a relistings study.

Because search and matching models of the housing market specify expected prices and marketing durations as jointly determined outcomes, an econometric problem arises. The theory implies that both prices and marketing periods are simultaneously determined by identical factors. Hence, empirical equations modeling the market outcomes will be an under-identified simultaneous system. Turnbull and Dombrow (2006) establish a framework for addressing the co-determination of prices and marketing periods using two unique independent variables.

The number of homes for sale in a small spatial area surrounding the subject home generally influences localized competition and shopping externality effects. The local competition impact arises when a greater number of homes for purchase increases competition among sellers, reducing the probability of a higher-priced match within a given timeframe. The shopping externality develops when a greater number of houses for sale attract more prospective buyers to the neighborhood, potentially increasing the chance of matching a particular house with a buyer. The inclusion of these two independent variables allows us to identify our system.[9]

The variables consider the overlapping days that listings share and the distance between them. Market competition (*MC*) reflects the number of competing properties near the subject property, accounting for the overlap between their DOM. Listing density (*LD*) measures competing overlapping listings per day on the market.

The distance between the subject and competing properties is a function in the *LD* and *MC* variables. Consistent with Turnbull and Dombrow (2006), we use all competing homes within one mile of the subject property as well as those within ±20 percent of the subject property's living area measured in square footage. To capture all market activity in proximity, we include newly constructed homes, foreclosures, and short sales when calculating the *MC* and *LD* variables.

Following Turnbull and Dombrow (2006), we set $L(i)$ and $S(i)$ to be the listing date and end-of-listing date for property i. The overlapping number of days with other properties j is defined as:

$$O(i,j) = \min\big(S(i), S(j)\big) - \max\big(L(i), L(j)\big) + 1$$

[9] Prior studies using this method include Zahirovic-Herbert and Turnbull (2008), Turnbull and Zahirovic-Herbert (2011), Zahirovic-Herbert and Chatterjee (2011), Hayunga and Munneke (2021), and Fang and Hayunga (2024).

The variable $D(i,j)$ is the straight-line distance between properties i and j. The two variables are computed as:

$$\text{Market competition}_{\text{i}} = \sum_{j \in I} \left(1 - D(i,j)\right)^2 O(i,j)$$

and

$$\text{Listing Density}_{\text{i}} = \sum_{j \in I} \frac{\left(1 - D(i,j)\right)^2 O(i,j)}{S(i) - L(i) + 1}.$$

For application to relistings, we calculated *LD* and *MC* in two ways. When testing the biased DOM for relistings that only measures the marketing durations of the last sold listing, *LD* and *MC* also use the biased DOM. This is the standard practice in the extant literature that censors the prior listing information. In all our other tests, *LD* and *MC* use the correct CDOM, which combines the prior listing and sold listing periods but excludes the days off market.

The price equation is a function of list price L, housing attributes X and neighborhood market conditions C, $P = f(L, X, C) + \epsilon_p$. A regression of price yields the estimated impact of the neighborhood market conditions on price as the partial derivative $\delta P/\delta C$. A change in LD is a change in neighborhood market conditions while holding liquidity (days on market) consistent. With this we have $\delta P/\delta C \equiv \delta P/\delta LD$. The price equation is rewritten $P = f(L, X, LD) + \epsilon_p$. The system of equations for price and days on market are just identified.[10] LD affects only price and has no impact on liquidity, satisfying the exclusion restriction that requires a specific exogenous variable to influence only one endogenous variable within the system.

[10] The full explanation for using LD in the price equation and MC in the days on market equation is available in Zahirovic-Herbert and Turnbull (2008)

With *LD* and *MC* providing unique independent variables, our system of equations is:

$$\begin{aligned} Ln(P_i) = \alpha_P + \beta_1 Ln(CDOM_i) + \beta_2 RL_i + \beta_3 RL_i \times ML_i + \beta_4 RL_i \times AC_i \\ + \beta_5 RL_i \times BC_i + \beta_6 RL_i \times LPI_i + \beta_7 RL_i \times LPD_i + X'\delta \\ + \beta_8 \mathrm{LD}_i + \omega_i + \delta_i + \epsilon_i \end{aligned} \quad (7)$$

and

$$\begin{aligned} Ln(CDOM_i) = \alpha_{CDOM} + \delta_1 Ln(P_i) + \delta_2 RL_i + \delta_3 RL_i \times ML_i + \delta_4 RL_i \times AC_i \\ + \delta_5 RL_i \times BC_i + \delta_6 RL_i \times LPI_i + \delta_7 RL_i \times LPD_i + X'\delta \\ + \delta_8 \mathrm{MC_i} + \omega_i + \delta_i + \epsilon_i. \end{aligned} \quad (8)$$

LD appears in the price equation because it measures the average intensity of competition as an average of competing houses per day of time on the market. It is proper to exclude *LD* in the CDOM equation because the CDOM of each sold home is in the denominator. Thus, *MC* appears in the CDOM model.

Jointly determined outcomes, when estimated using simultaneous equations, inherently introduce endogeneity (Hansen 2022). To address this issue, we employ marketing competition and listing density as instrumental variables. Ensuring the validity of these instruments is critical. The first step is to test whether the instruments are weak, as weak instruments lead to biased estimates and inflated standard errors (Bound, Jaeger and Baker 1995). In the first stage of the three-stage least squares (3SLS) estimation, we evaluate the significance of each instrument in the regression and examine the reported F-statistic. For the instruments to be considered strong, the coefficients must be statistically significant, and the F-statistic should exceed the conventional threshold of 10.

In the first regression for $Ln(Price)$, the coefficients for both marketing competition and listing density are statistically significant at the 1% level (p-values < 0.000), with an F-statistic of 3548.87. Similarly, in the second regression for $Ln(DOM)$, the coefficients for these variables are also statistically significant at the 1% level (p-values < 0.000), with an F-statistic of 275.41. These results indicate that the instruments successfully pass the weak instrument test. While it would be preferable to perform an overidentification test, such as the Sargan or Hansen J-test (Hansen 1982; Sargan 1958; Stock and Yogo 2002; Wooldridge 2010), this is not feasible in a just-identified model, addressing the presence of weak instruments is the primary concern.

Our system of equations in (7) and (8) considers several variables of interest. Initially, we focus on the base variable RL_i, which is a binary variable equal to one for a relisted property and zero otherwise. In subsequent specifications, RL_i is replaced with binary variables set to one when prior listings are either canceled or expired, and zero otherwise. Although relatively uncommon, approximately 5,500 properties relist multiple times. We account for this aspect with another binary variable, ML_i, which is set to one for multiple relistings and zero otherwise.

Our equation system also includes AC_i and BC_i, binary variables set to one for agent or brokerage office changes, and zero otherwise. Note that $RL_i \neq AC_i$ and $RL_i \neq BC_i$ as not all relistings generate agent or brokerage office changes, but all agent or office changes result in relistings. Table 1.1 illustrates that 3 percent and 6 percent of relistings experience agent or office changes, respectively with a combined occurrence of 51 percent of relistings.

Lastly, we control for list price changes between the prior listings and the listings that results in sales, both increases (LPI_i) and decreases (LPD_i). Table 1.1 reports that increases occur in 8 percent of relistings while decreases happen in 55 percent of these instances. Note that our set

of variables of interest detailed here are conditional on RL_i and thus we create the interaction terms as show in (7) and (8).

Concerning covariates, the variable X_i is a time invariant matrix of myriad house attributes. Table A.1 in the Appendix provides a list and definitions of these characteristics. They include quality variables we create based upon textural analysis (Liu, Nowak and Smith 2020). We find binary variables controlling for home quality and local market competition influence our variables of interest. Our models also include temporal fixed effects, ω, using month×year and spatial fixed effects, δ, at the ZIP code level.

Descriptive Statistics

The final dataset consists of 670,398 property listings, of which 44,817 are relistings. Table 1.1 provides descriptive statistics for the full pooled sample as well as the subsamples of single-listing sales and relistings. While many characteristics are similar, one notable difference is the measurement of the marketing period. Using only sold listings; the mean DOM is 61.8 days for the pooled sample. However, this sample is censored and the average ignores prior listings. For the relisting subsample, the true CDOM has a mean of 170.9 days, indicating a significant shift in the CDOM distribution compared to the DOMs of single-listing sales.

Table 1.2 presents descriptive statistics comparing canceled and expired prior listings. Many characteristics are similar between the two groups. Among the total relistings, 25,794 (57.6 percent) are canceled, while 19,023 (42.4 percent) are expired. The distribution of owners who change or keep their agents, brokers, or both remains consistent across both types of relistings. Additionally, the incidence of list price decreases is similar, with 56 percent for canceled listings

and 54 percent for expired ones, while list price increases occur in 8 percent of cases for both types.

However, a notable disparity arises in the CDOM. Owners who opt to cancel their listings experience a decrease in CDOM compared to those waiting for the listing to expire, with an average CDOM of 196 days for expired listings compared to 152 days for canceled ones.

To further illustrate the differences in DOM and CDOM across the two relisting types as well as single-listing sales, we provide Figure 1.2 through Figure 1.4. Figure 1.2 displays the expired prior listings. Since these are expired first listings, the *x*-axis is the DOM and not the CDOM that includes the second listing. We note the clustering of data at 30-day intervals, which is consistent with the length of typical listing contracts.

Figure 1.3 illustrates DOM for canceled prior listings. Unlike the expired listings, these data exhibit right skewness. Notably, there are periodic increases in activity. Initially, we suspected these increases occurred at 15-day intervals; however, further examination reveals they are more frequent. The distribution of canceled prior listings closely resembles that of single-listing sales shown in Figure 1.4, rather than the expired prior listings in Figure 1.2. Like canceled listings, the single-listing sales data also display right skewness with patterned increases in the number of homes exhibiting specific DOM values.

Since the intervals are more frequent than 15 days, we check for daily activity across the three terminal statuses. Figure 1.5 shows a few patterns in the data. Expired prior listings show a more uniform distribution across all days of the week, consistent with the passive action of sellers allowing their initial listing to expire. Canceled prior listings occur more often during the week, with a slight peak on Mondays, possibly reflecting owners waiting through the weekend for an

offer and then canceling when one does not emerge. Concerning single-listing sales, sellers find buyers throughout the workweek, with a few sales occurring on weekends.

Results

This section details the regression analysis that model transaction prices and marketing periods. We first consider the use of the biased DOM, which measures the marketing period for the single-listing sales but does not reflect the prior listing for relisted homes. We subsequently model the true CDOM for all transactions in the remainder of our tests.

Table 1.3 displays the results using the biased DOM. The binary variable in the price equation suggests relisting a property will reduce transaction prices by 1.8 percent versus a single-listing sale, all else held equal. The other implication is that relisting a property reduces the market time compared to a single-listing property. However, as discussed above, this seems implausible since relistings typically take longer to sell on average, as indicated by their distributions.

The model in Table 1.4 executes the system of equations using the full CDOM for all transactions[11]. The coefficient on the variable of interest, *Relist*, is a negative value of 2.9 percent ($9,900). As expected, when holding transaction prices constant, the parameter estimate of 0.841 in the CDOM equation is an increase of 57 days on average (from 42 to 100).

One possible feature of relistings is an agent and/or broker office change. These are one of the quickest adjustments sellers can make if they are dissatisfied with either representative. If

[11] All variables reported in table 3 and table 4 were tested for statistical difference. Table A.2 and Table A.3. present the z-statistic and p-value for each variable confirming there is no statistically significant difference between control variables. The main variable of interest Relisting is statistically different between the Table 1.3 and Table 1.4 for both price and days on market (cumulative days on market).

owners employ new agents with higher expertise levels, switching representatives has the potential to increase transactions prices and/or reduce the CDOM. Alternatively, findings in Daneshvary and Clauretie (2013) and Smith, Gibler and Zahirovic-Herbert (2016) suggest that replacing agents decreases transaction prices. All our models include the interaction terms for separate agent or broker changes as well as the replacement of both. The results in Table 1.4 indicate that changing agents or brokerage offices does not significantly impact prices or marketing times. We find this conclusion holds across all our models.

While most of the interactions do not materially impact outcomes, the equations demonstrate statistical significance on the interaction term when sellers relist multiple times. However, the economic impact is inconsequential in the price equations across all our tests. For instance, the parameter estimate is negative 0.016 in Table 1.4. The base relist variable is negative 0.029. The marginal effect of $0.016 \times 0.029 = 0.000464$ for an overall impact of 0.029464 when a home is relisted multiple times. Alternatively, and as can be expected, relisting multiple times does increase the marketing period significantly, which we observe throughout our results. In Table 1.4, we observe a slope coefficient of 0.481 on the interaction term *Relist x Multiple Relist*. This equates to an increase from 100 to 152 days for those homes that relist multiple times.

The other variables in Table 1.4 meet with our priors. We observe the expected price increases for larger homes and larger lots. Compared to conventional financing, the results demonstrate the expected decrease in prices when sellers purchase with cash. Consistent with Hayunga and Munneke (2021), estate sellers experience negative price impacts holding CDOM constant. Lastly, we note the importance of including the quality and atypicality controls in the system of equations as almost all have significant impacts on both prices and marketing times.

Days Off Market and Matching CDOMs

Our next analysis examines three aspects. First, we differentiate between expired and canceled relisting types. The equations also explore various gap boundaries. As mentioned, using alternative days-off-market tests provides important confirmation of results that cannot be obtained with a single continuous variable for days off market.

The third aspect we consider is matching single-listing and relisted homes. It can be hypothesized that properties selling within a single listing interval differ from those that are relisted. For instance, relisted homes may possess more atypical characteristics that prolong their time on the market. Additionally, sellers of relisted properties might have lower discount rates, making them more willing to extend their market periods to match with buyers who have sufficient reservation prices.

To address potential differences, we use PSM to generate a balanced sample. For each relisting, we find a matching single-listing sale based on the listing period (month and year), ZIP code, home square footage, lot size, year of construction, number of bedrooms, and number of bathrooms. To control for the significant shift in the marketing period distribution for relistings, we also match on CDOM. Figures 4 and 6 illustrate the importance of this factor. The single-listing sales shown in Figure 1.4 are right skewed, with 50 percent of the observations having a DOM under 43 days. The CDOM distribution of relistings shown in Figure 1.6 exhibits a markedly different form, with a median (mean) CDOM of 155 (161) days. By including CDOMs in our PSM, we create a DOM distribution for single-listing sales, shown in Figure 1.7, which resembles the CDOM distribution in Figure 1.6 and differs significantly from the distribution in Figure 1.4. The median (mean) of the Figure 1.7 data is 163 (162) days.

In case propensity scoring does not sufficiently control for differences in marketing periods, we create another sample where each relisting is paired with a single-listing sale that has the exact number of marketing days (DOM) as the relisting CDOM. We also require the same listing month and year for every relisting and single-listing pair. After meeting these conditions, we form the new sample using standard propensity scoring and confirm that it meets the criteria of balance, common support, and equality of treated versus untreated means.

The matched-pair sample addresses a few sample selection issues. First, it straightforwardly matches treated and untreated structures and neighborhoods. Second, requiring the CDOM of each relisting to be equal to the DOM of a single-listing sale controls for the hypothetical reverse causation that longer marketing periods lead to relistings. As mentioned, longer CDOMs do not necessarily lead to relistings, as owners can extend listing agreements without relisting. Furthermore, matched pairs create a sample with identical marketing period distributions, indicating that longer marketing periods are not solely causing relistings in this test.

The third sample selection issue that the matched-pair sample helps to address is differing sellers' discount rates between relisted and single-listing transactions. Owners with lower discount rates may stay on the market longer to obtain higher prices. Since the matched-pair sample has the same distribution, the owners' discount rates between the treated and untreated groups should be comparable.

The results of our new models are in Table 1.5. The first finding of interest is that the parameter estimates across the days-off-market gaps are not notably different. The price elasticity on expired prior listings is positive, around 2 percent. Consistent with the passive nature of letting a listing expire, the marketing durations are positive and significant. For canceled prior listings,

the price impacts are generally slightly negative. Overall, it appears that DOM gaming, off-market activity, and misclassifying new listings as relistings are not causing our findings.

The second notable finding from Table 1.5 is that price outcomes for expired prior listings are consistently higher than those for canceled prior listings, with a difference of approximately 3 percent. Additionally, canceled listings have shorter CDOMs compared to expired ones. This observation supports search theory: expired prior listings tend to achieve higher prices and experience longer marketing durations, while canceled listings generally sell for slightly lower prices. The negative slope coefficients in the CDOM models for canceled listings indicates shorter marketing periods. These results suggest that sellers allowing their listings to expire are more passive, whereas those who cancel their listings are more proactive.

Real Business Cycles

We now turn to the impact of economic cycles on relisted homes, particularly regarding their prices, given varying market conditions. In a "hot" market, when buyer demand is higher than the supply, relisting a home might be perceived negatively. During such periods of high liquidity, a relisting could be viewed as an unsuccessful initial attempt. However, the increased demand might also suggest that relisting is less detrimental and could signal that owners are holding out for higher reservation prices or have lower discount rates (Krainer 2001). Conversely, during economic contractions, when housing supply exceeds buyer demand, a relisting may simply reflect ongoing efforts by owners to find buyers with acceptable reservation prices.

Our sample period includes three distinct market phases in Massachusetts. Figure 1.8 illustrates these phases using the seasonally adjusted S&P/CoreLogic/Case-Shiller home price

index for Boston. The first period, from January 2000 to April 2005, was marked by rapid expansion with a continuously compounded annual growth rate of 10.9 percent. The second period, from April 2006 to March 2009, saw a contracting market with a negative growth rate of 6.0 percent. The final period, from May 2012 to May 2019, experienced a more moderate expansion with a growth rate of 5.3 percent.

Before detailing the results across the economic cycles, we note that our models introduce agent fixed effects to account for the influence specific agents may have on the likelihood of single-list sales versus relistings. One issue with incorporating agent fixed effects is the significant number of singletons, which are observations of agents selling only one home during our 20-year sample period. Across the three economic cycles detailed in Table 1.6, the number of singletons is 4,417 (17.26 percent) in the rapid expansion period, 4,118 (31.65 percent) in the contraction interval, and 5,570 (20.94 percent) in the third period. These singletons can pose an econometric issue because they are the sole observations for those agents and may distort statistical inferences. Accordingly, we use the singletons as our holdout class.

Table 1.6 reports our key variables across these economic intervals, utilizing the propensity scored sample from Model 2 in Table 1.5. For expired prior listings, the impact of economic cycles varies. During the rapid expansion of the early 2000s, expired listings experienced an average price decrease of 2 percent compared to single-listing sales. In contrast, during the contraction period, sellers who let their listings expire before relisting achieved an average price increase of 4.3 percent. In the moderate growth phase from 2012 to 2019, the price impacts of expired prior listings were like single-listing sales. Throughout all periods, the CDOM for expired listings increased, reflecting a passive approach by sellers before relisting.

Overall, the price impacts of expired prior listings appear countercyclical. In a seller's market, an expired relisting may be viewed negatively. However, in a buyer's market, relisting post-expiration is not seen as detrimental but rather a practical necessity due to the high supply relative to demand. In more typical growth markets, the impact of relisting after expiration is minimal and rational.

Canceled prior listings exhibit different price impacts. During the rapid expansion of the early 2000s, these listings experienced a negative price impact of approximately 1 percent compared to single-listing sales, which is less in absolute value compared to expired prior listings during the same period. In the other two periods, there were no significant price impacts relative to single-listing sales. These results suggest that the market does not perceive canceled prior listings as an unsuccessful event, and owners are not able to leverage additional market information from the initial listing period to secure higher prices.

Robustness – System Gaming

The final aspect we consider concerns the potential manipulation of the system by homeowners who temporarily withdraw their properties from the market and then relist them as new listings. Our analysis includes tests using 90- and 180-day gaps to mitigate this issue. Additionally, the MLSPIN system categorizes the total CDOM separately from the DOM for up to 90 days. Most current MLS systems, including online platforms, provide extensive property histories dating back several years, containing listing dates and prices as well as sales dates and prices. Consequently, buyers and their agents have access to comprehensive information about properties' listing and sales histories, enabling them to make informed decisions based on current and recent data.

However, it is worth noting that the MLSPIN system did not implement the 90-day threshold until April 2006. Before this change, homeowners could remove their properties from the market for as little as a day and then re-list with the DOM reset. To ensure that our findings for the rapid expansionary period from January 2000 to April 2005 are not influenced by such gaming tactics, we conduct a specific robustness test.

The results in Table 1.7 present findings for canceled prior listings from January 2000 to April 2005. Instead of the MLSPIN system date of April 2006, we choose April 2005 as the end date for this test, as it aligns with the conclusion of the rapid expansionary period depicted in Figure 1.8 and Table 1.6. While our system of equations utilizes the complete information set, we specifically focus on and report the canceled prior listings because allowing listings to passively expire is not indicative of gaming behavior.

To investigate potential gaming, we employ a 7-day gap, allowing homeowners to withdraw from the MLSPIN system for zero to seven days and reset their DOM without affecting their CDOM. Notably, the results in Table 1.6 demonstrate that withdrawing for periods ranging from zero to thirty days is inconsistent with gaming, as it either leads to a negative mean price impact or an extended marketing duration. These findings suggest that homeowners lose valuable time off the market during a seller's market.[12]

Utilizing the PSM sample and the 7-day gap, Table 1.7 reveals a negative slope coefficient on *Canceled Prior* of 1.4 percent. This coefficient, slightly more negative than the parameter estimate in Table 1.6 for the first economic interval, indicates no incentive for relisting on average.

[12] Like the result in Table 1.6, the parameter estimate on the base variable of *Expired Prior* is negative 2 percent, which is contrary to a gaming hypothesis.

While homeowners could have potentially manipulated the system during this period, the results demonstrate that it was not a beneficial strategy on average.

Conclusion

This article explores the market outcomes of homes that do not sell under their initial listing agreements and are subsequently relisted. Our analysis, covering the period from 2000 to 2019, examines over 625,000 single-listing sales and nearly 45,000 relistings (6.7 percent) in Massachusetts. The data show that relistings which eventually sell are not uncommon in the housing market.

Our analysis reveals nuanced differences in market perceptions of expired versus canceled relistings, which shift with economic cycles. During the 2006-2009 economic contraction, no price difference was observed between homes sold after a canceled prior listing and those sold after a single listing. However, expired listings during this period saw an average price increase of over 4 percent. In the high market liquidity period from 2000 to 2005, both types of relistings showed slight negative price elasticities, with mean price decreases of 2 percent for expired listings and around 1 percent for canceled listings. From 2012 to 2019, a more typical growth period, neither type of relisting showed significant price differences compared to single-listing sales.

Also, in line with search theory, our findings emphasize the importance of considering the total marketing duration of sold homes when analyzing prices. We identify a censoring bias in both price and Days on Market (DOM) outcomes for relisted homes. To correct this, housing economists should incorporate the full marketing period, including prior listings, when evaluating relisted homes.

In conclusion, our findings suggest that relistings are not a sign of failed listings but rather a common market occurrence influenced by liquidity conditions and possibly sellers' discount rates. During economic contractions, sellers may need more time on the market to find buyers, leading to relistings. It is only during the rapid expansion of the early 2000s that we observe slight price decreases relative to single-listing sales, possibly due to the higher number of buyers in that period.

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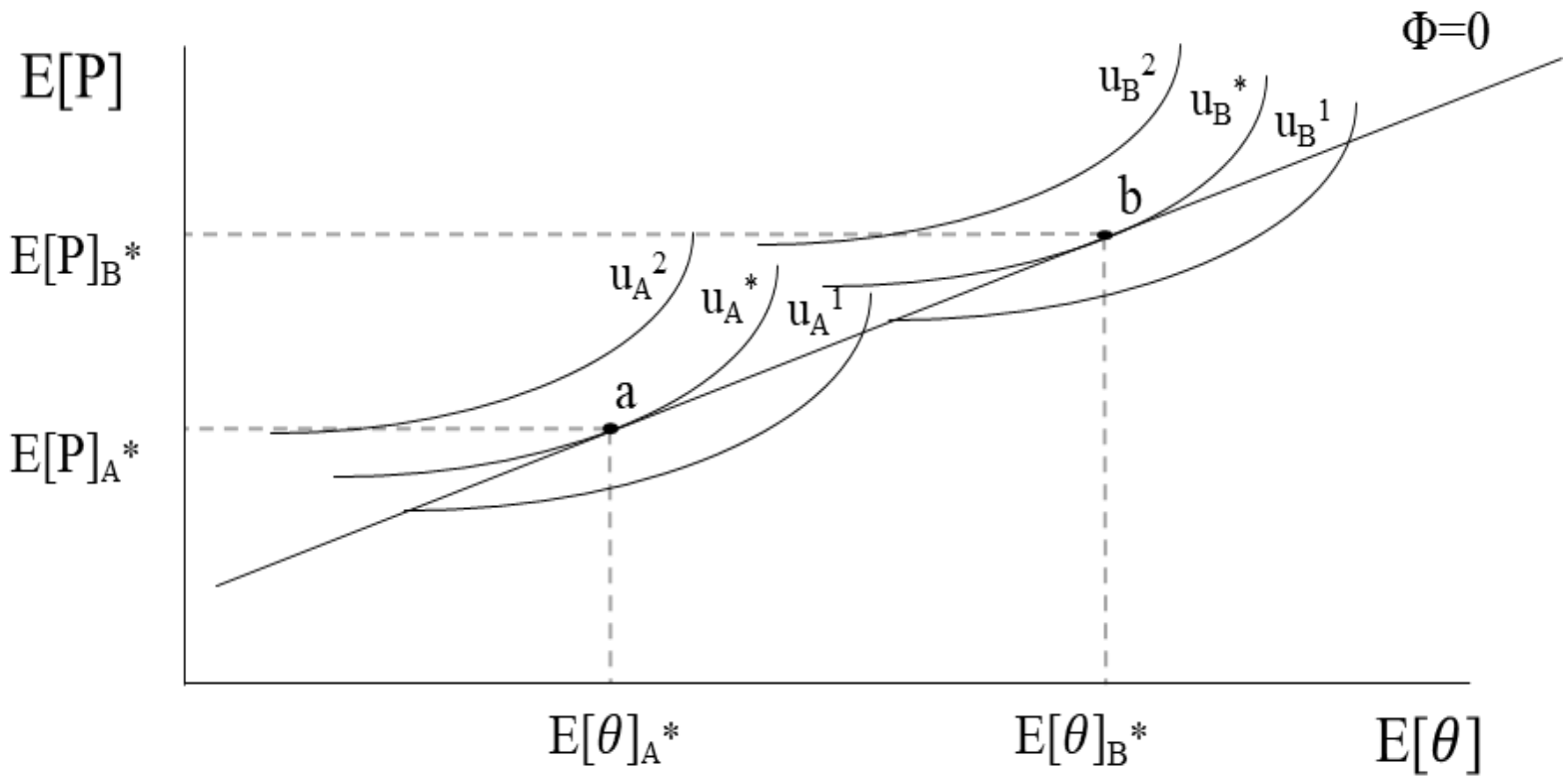

Figure 1.1: Seller Preferences

Expected price and selling time equilibria for two sellers A and B subject to the market-determined liquidity-price constraint $\Phi(\mathbb{E}[P], h\mathbb{E}[\theta]) = 0$ represented in points a and b. Seller A exhibits a higher rate of time preference indicated a low willingness to trade off longer expected marketing durations for higher expected prices. Seller B has a lower rate of time preference indicating their preference for a higher price and willingness to trade off a longer expected selling time.

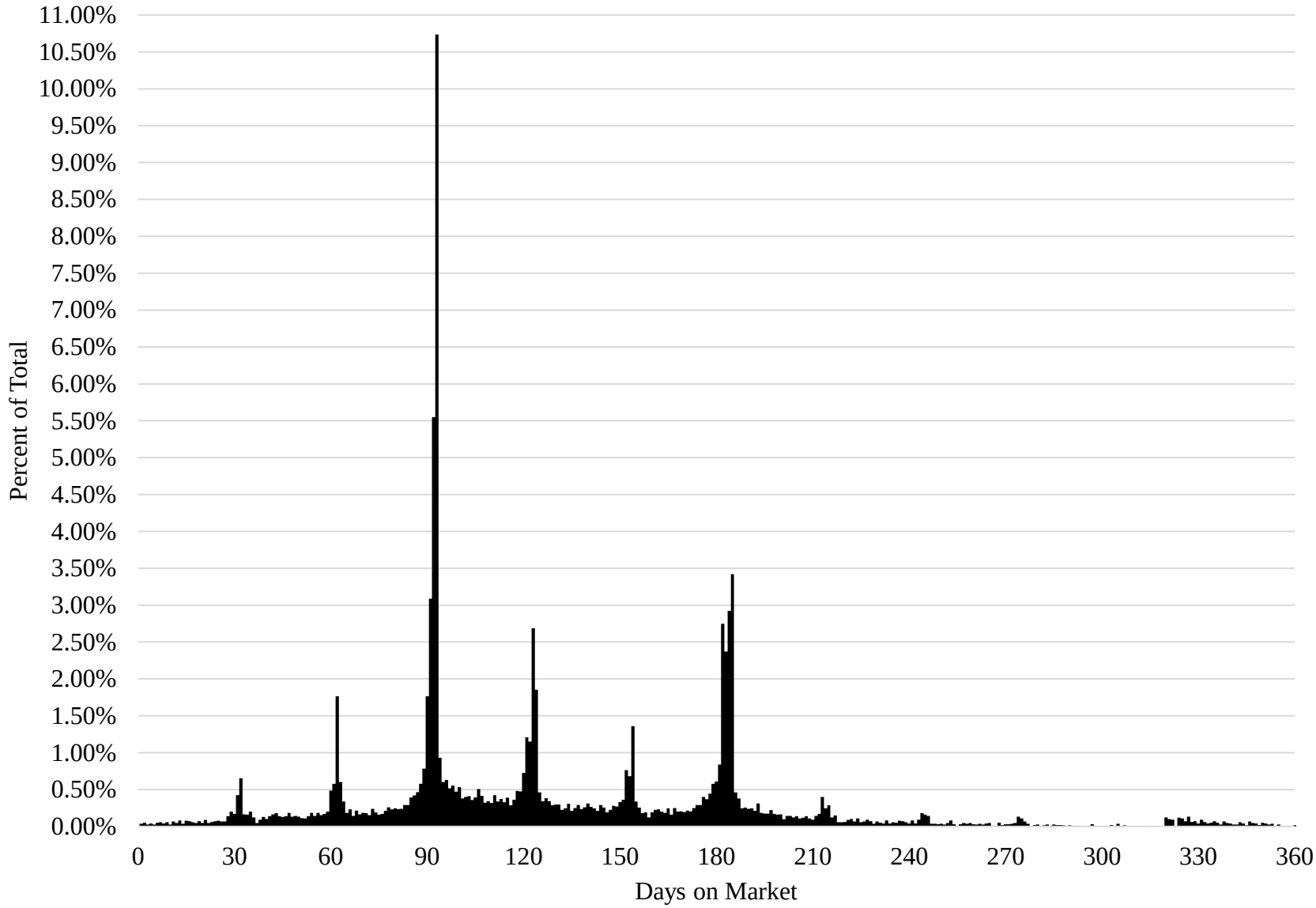

Figure 1.2: Expired Prior Listings

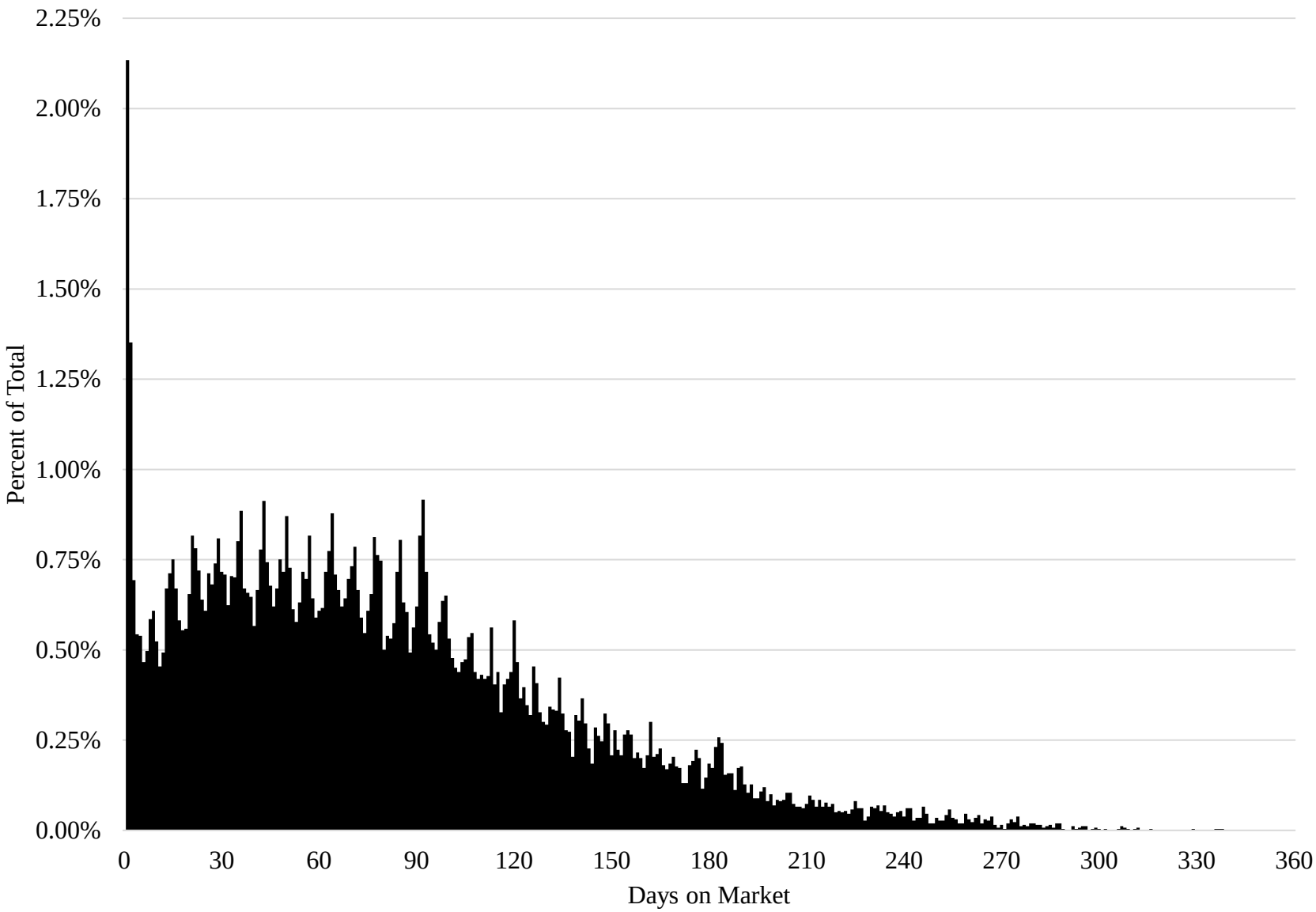

Figure 1.3: Canceled Prior Listings

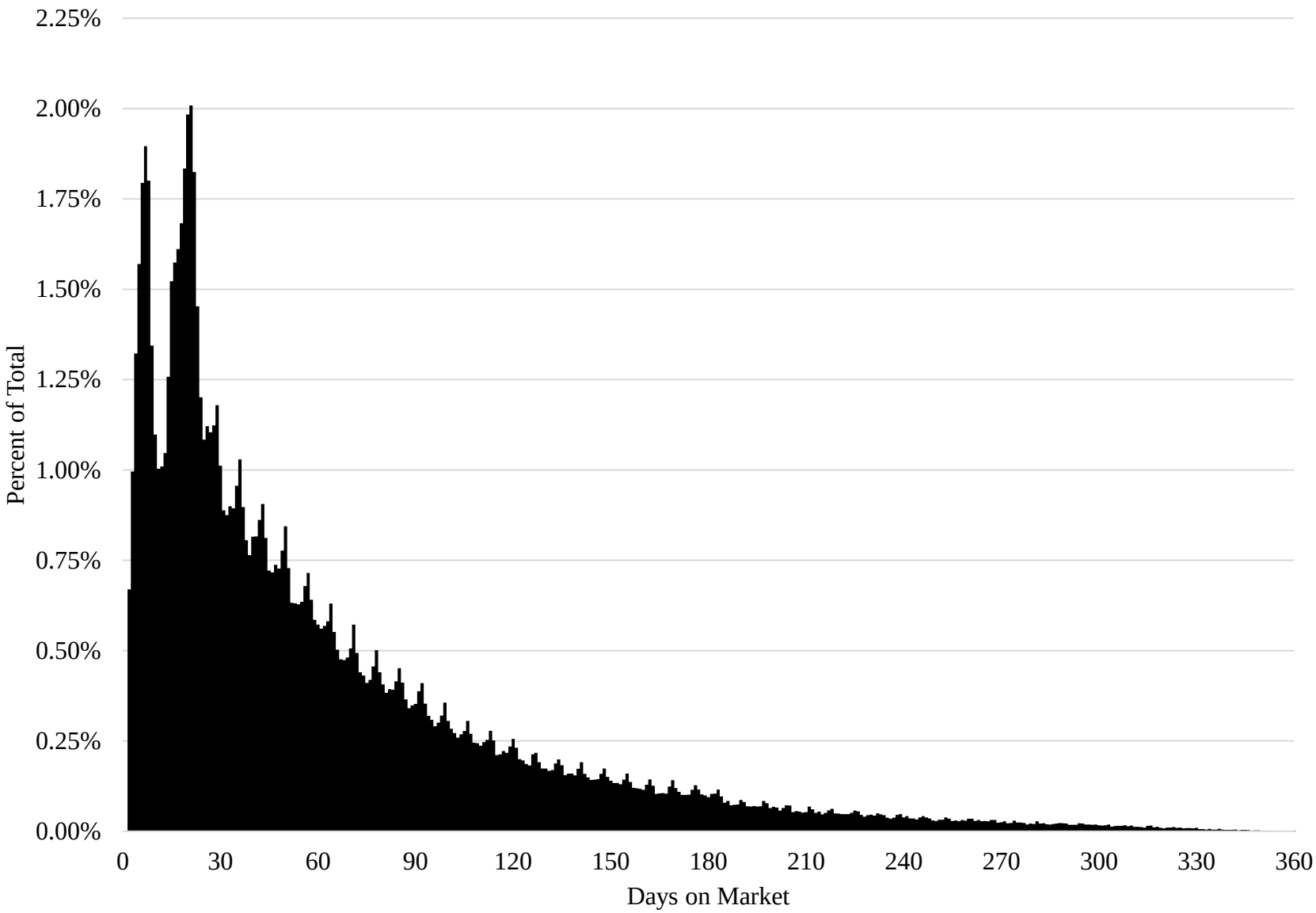

Figure 1.4: Single-listing Sales

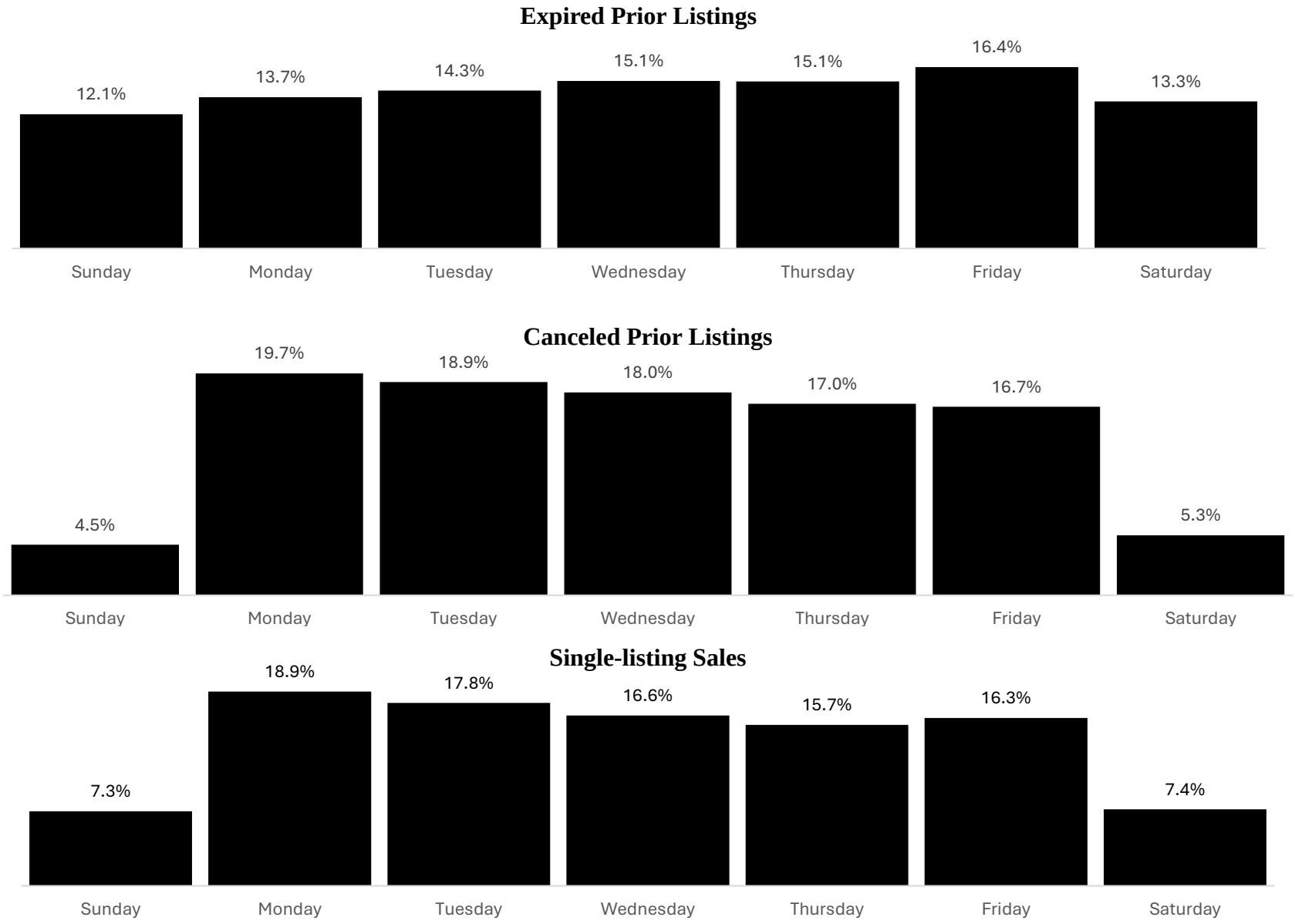

Figure 1.5: Listing Terminations by Day of the Week

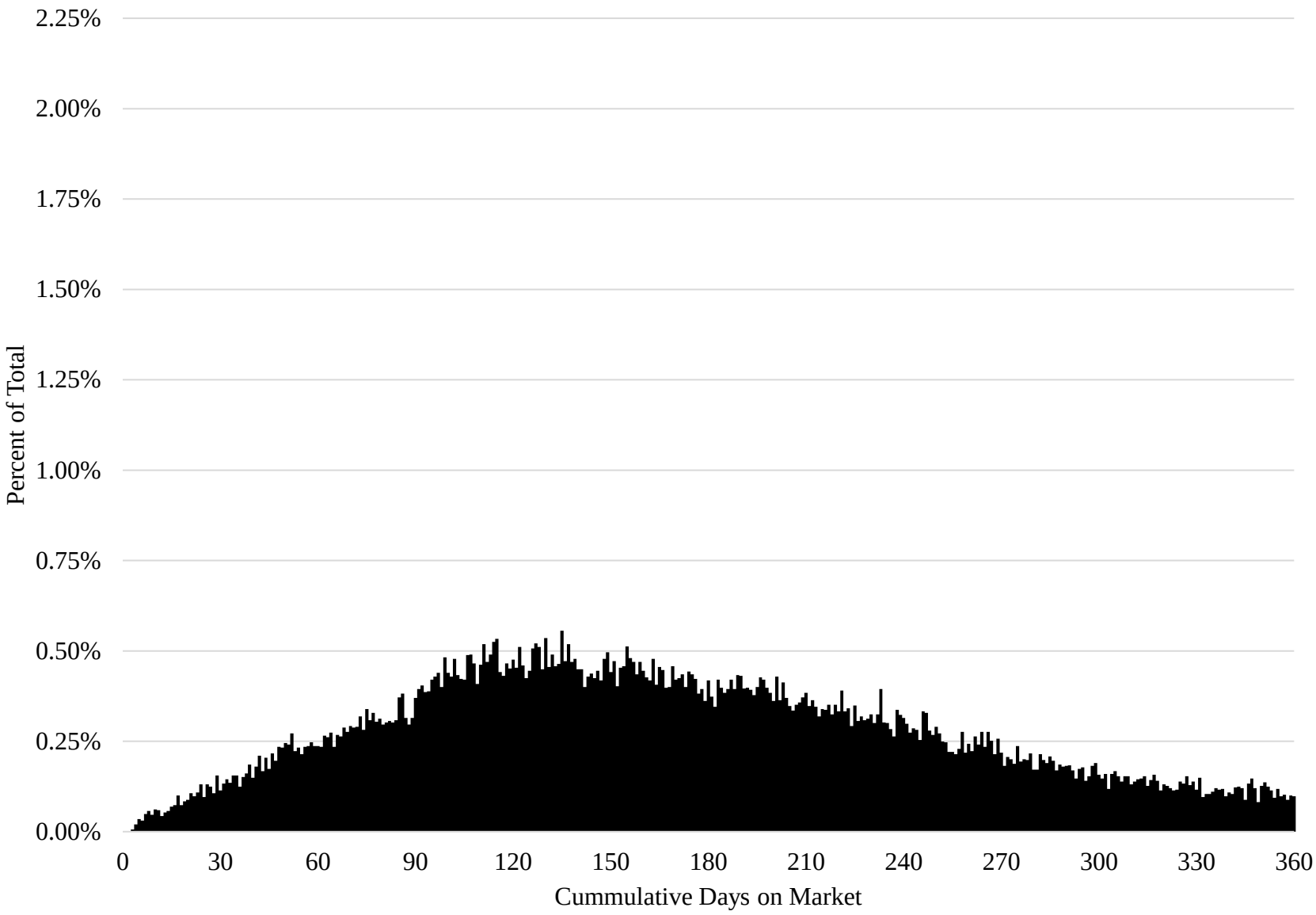

Figure 1.6: Relisted Sales

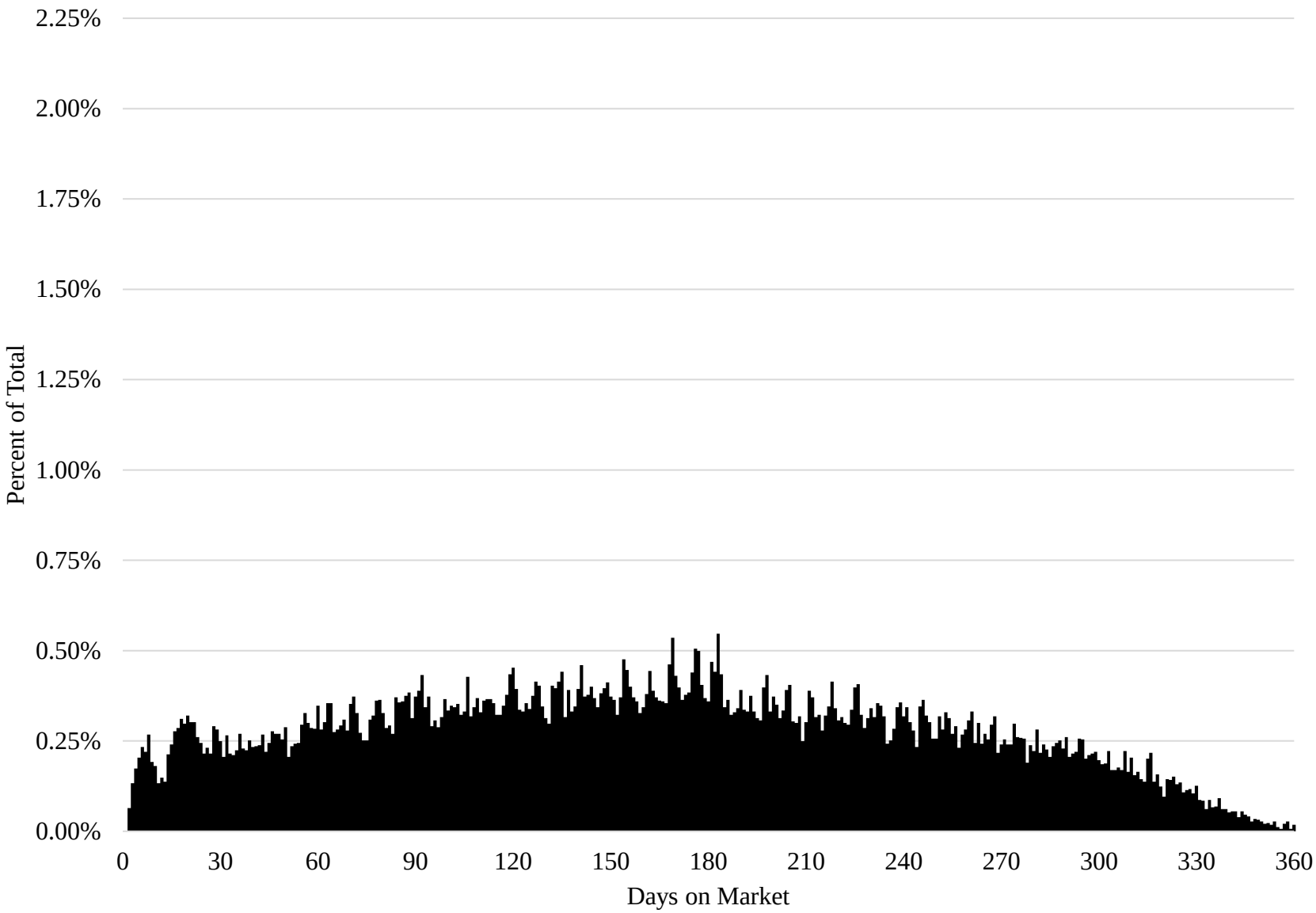

Figure 1.7: Propensity Score Matched Single-listing Sales

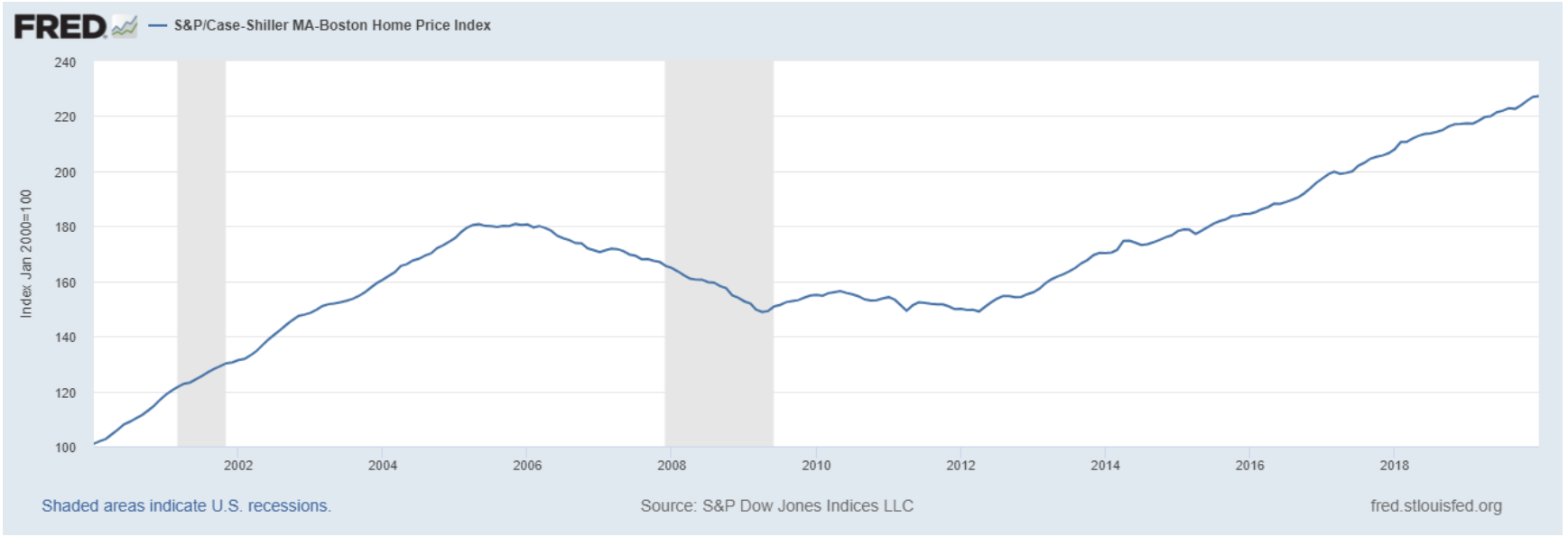

Figure 1.8: Boston House Price Index (Seasonally Adjusted)

Table 1.1: Descriptive Statistics

	Pooled Sample			Single Listing Sales			Relistings Sales		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Original List Price	425,753	82,000	2,500,000	425,641	82,000	2,500,000	427,315	82,000	2,500,000
List Price at Sale	415,115	59,900	2,790,000	414,885	59,900	2,790,000	418,315	74,500	2,524,000
Sale Price	405,316	71,000	2,750,000	405,392	71,000	2,750,000	404,256	71,500	2,460,000
Days on Market	61.8	2	360	61.9	2	360	60.6	2	327
Cumulative Days on Market	69.2	2	377	61.9	2	360	170.9	5	377
Listing Density	1.4	0	25	1.3	0	25	1.5	0	24
Market Competition	96.9	0	5,163	0.0	-	-	240.7	0	5,163
Square Footage	1,898	500	9,998	1,887	500	9,998	2,051	500	9,197
Lot Size (Square Feet)	26,985	500	448,518	26,757	500	448,518	30,175	548	444,909
Age	57.2	2	209	57.5	2	209	53.5	2	209
Bedrooms	3.3	1	15	3.3	1.00	15.00	3.4	1	12
Bathrooms	2.2	1	20	2.2	1.00	20.00	2.3	1	20
No Agent or Broker Change	0.03	0	1	-	-	-	0.40	0	1
Agent Change Only	0.00	0	1	-	-	-	0.03	0	1
Broker Change Only	0.00	0	1	-	-	-	0.06	0	1
Agent & Broker Change	0.03	0	1	-	-	-	0.51	0	1
Multiple Relistings	0.01	0	1	-	-	-	0.09	0	1
Relist with No List Price Change	0.96	0	1	1.00	1.00	1.00	0.37	0	1
Relist with List Price Decrease	0.04	0	1	-	-	-	0.55	0	1
Relist with List Price Increase	0.01	0	1	-	-	-	0.08	0	1
Cash Purchase	0.05	0	1	0.05	-	1.00	0.04	0	1
FHA Financing	0.07	0	1	0.07	-	1.00	0.06	0	1
VA Financing	0.02	0	1	0.02	-	1.00	0.01	0	1
Rental	0.01	0	1	0.01	-	1.00	0.01	0	1
Vacant	0.01	0	1	0.01	-	1.00	0.02	0	1
Estate	0.01	0	1	0.01	-	1.00	0.01	0	1

	Pooled Sample			Single Listing Sales			Relistings Sales		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Flat Fee	0.02	0	1	0.02	-	1.00	0.02	0	1
Waterfront	0.03	0	1	0.03	-	1.00	0.04	0	1
HOA	0.04	0	1	0.04	-	1.00	0.04	0	1
Remodeled	0.08	0	1	0.08	-	1.00	0.08	0	1
Gated Community	0.00	0	1	0.00	-	1.00	0.00	0	1
Country Club	0.01	0	1	0.01	-	1.00	0.01	0	1
Security/Smart Home	0.02	0	1	0.02	-	1.00	0.02	0	1
New Roof	0.07	0	1	0.07	-	1.00	0.07	0	1
In-Law Apartment	0.05	0	1	0.05	-	1.00	0.07	0	1
Stone Counters	0.06	0	1	0.06	-	1.00	0.05	0	1
Observations		670,398			625,581			44,817	

Table 1.2. Descriptive Statistics

	Canceled Relistings			Expired Relistings		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Original List Price	436,955	82,500	2,500,000	414,245	82,000	2,495,000
List Price at Sale	427,134	74,900	2,524,000	406,357	74,500	2,495,000
Sale Price	413,875	72,500	2,460,000	391,212	71,500	2,387,000
Days on Market	60.8	2	317	60.4	2	327
Cumulative Days on Market	152.3	5	362	196.2	7	377
Listing Density	1.5	0	24	1.6	0	20
Market Competition	206.3	0	5,163	287.2	0	5,012
Square Footage	2,081	500	8,756	2,011	503	9,197
Lot Size (Square Feet)	30,314	548	444,909	29,987	600	442,134
Age	52.9	2	209	54.3	2	209
Bedrooms	3.5	1	10	3.4	1	12
Bathrooms	2.4	1	20	2.3	1	9
No Agent or Broker Change	0.38	0	1	0.44	0	1
Agent Change Only	0.03	0	1	0.02	0	1
Broker Change Only	0.07	0	1	0.03	0	1
Agent & Broker Change	0.51	0	1	0.51	0	1
Multiple Relistings	0.10	0	1	0.09	0	1
Relist with No List Price Change	0.36	0	1	0.39	0	1
Relist with List Price Decrease	0.56	0	1	0.54	0	1
Relist with List Price Increase	0.08	0	1	0.08	0	1
Cash Purchase	0.03	0	1	0.04	0	1
FHA Financing	0.06	0	1	0.07	0	1
VA Financing	0.01	0	1	0.01	0	1
Rental	0.01	0	1	0.01	0	1
Vacant	0.01	0	1	0.02	0	1
Estate	0.01	0	1	0.01	0	1
Flat Fee	0.02	0	1	0.02	0	1
Waterfront	0.03	0	1	0.04	0	1
HOA	0.03	0	1	0.05	0	1
Remodeled	0.08	0	1	0.07	0	1
Gated Community	0.00	0	1	0.00	0	1
Country Club	0.01	0	1	0.01	0	1
Security/Smart Home	0.03	0	1	0.02	0	1
New Roof	0.07	0	1	0.06	0	1
In-Law Apartment	0.07	0	1	0.07	0	1
Observations		25,794			19,023	

Table 1.3: Biased DOM

	Ln(Price)	Standard Errors	Biased Ln(DOM)	Standard Errors
Relist	-0.018**	(0.002)	-0.036*	(0.016)
Relist x Agent Change	-0.001	(0.005)	0.069	(0.051)
Relist x Broker Change	0.004	(0.004)	0.131**	(0.038)
Relist x Agent Change x Broker Change	0.000	(0.002)	0.132**	(0.019)
Relist x Multiple Relist	-0.013**	(0.003)	-0.087**	(0.028)
Relist x List Price Decrease	-0.006**	(0.002)	0.054**	(0.019)
Relist x List Price Increase	-0.005	(0.004)	0.089**	(0.033)
Ln(Square Feet)	0.423**	(0.001)	-0.773**	(0.046)
Ln(Lot Size)	0.055**	(0.000)	-0.071**	(0.007)
Ln(Bedrooms)	0.055**	(0.001)	-0.133**	(0.013)
Ln(Bathrooms)	0.132**	(0.001)	-0.291**	(0.016)
Remodeled	0.070**	(0.001)	-0.141**	(0.011)
Cash Purchase	-0.077**	(0.001)	0.037**	(0.013)
FHA Financing	-0.029**	(0.001)	0.133**	(0.009)
VA Financing	-0.012**	(0.002)	0.128**	(0.018)
Rental	-0.026**	(0.002)	0.165**	(0.020)
Vacant	-0.044**	(0.002)	0.178**	(0.022)
Estate	-0.103**	(0.002)	0.190**	(0.023)
Flat Fee	0.024**	(0.002)	-0.051**	(0.017)
Waterfront	0.204**	(0.001)	-0.301**	(0.025)
HOA	0.067**	(0.001)	-0.136**	(0.014)
Gated Community	0.068**	(0.006)	-0.134*	(0.054)
Country Club	0.041**	(0.003)	-0.056	(0.030)
Security/Smart Home	0.035**	(0.002)	-0.068**	(0.016)
New Roof	0.014**	(0.001)	0.004	(0.009)
In-Law Apartment	-0.048**	(0.001)	0.243**	(0.011)
Stone Counters	0.050**	(0.001)	-0.156**	(0.011)
Atypical: Large Home	0.094**	(0.003)	-0.068*	(0.027)
Atypical: Large Lot	-0.002	(0.002)	0.048*	(0.023)
Atypical: Many Baths	0.103**	(0.004)	-0.167**	(0.036)
Atypical: Many Bedrooms	-0.019**	(0.002)	0.171**	(0.021)
Atypical: Older Home	0.034**	(0.002)	0.033	(0.025)
Ln(DOM)	0.008**	(0.000)		
Ln(Age)	-0.064**	(0.000)		
Listing Density	-0.025**	(0.000)		
Ln(Sale Price)			2.213**	(0.105)
Age			0.004**	(0.000)
Age^2			-0.000**	(0.000)
Market Competition			0.003**	(0.000)
ZIP code FE	✓		✓	
Month × year FE	✓		✓	
Observations	670,393		670,393	
R^2	0.88		0.12	

The table presents a system of simultaneous equations modeling the natural log of prices and days on market. For relistings, the DOM is only the market period that resulted in the sale and not the total CDOM that includes the prior listing period. Robust standard errors are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively

Table 1.4: True CDOM

	Ln(Price)	Standard Errors	Ln(CDOM)	Standard Errors
Relist	-0.029**	(0.002)	0.868**	(0.016)
Relist x Agent Change	0.000	(0.005)	-0.048	(0.050)
Relist x Broker Change	0.006	(0.004)	-0.044	(0.037)
Relist x Agent Change x Broker Change	0.001	(0.002)	-0.027	(0.018)
Relist x Multiple Relist	-0.016**	(0.003)	0.481**	(0.028)
Relist x List Price Decrease	-0.007**	(0.002)	0.052**	(0.019)
Relist x List Price Increase	-0.005	(0.004)	0.070*	(0.032)
Ln(Square Feet)	0.422**	(0.001)	-0.782**	(0.045)
Ln(Lot Size)	0.055**	(0.000)	-0.077**	(0.007)
Ln(Bedrooms)	0.055**	(0.001)	-0.130**	(0.012)
Ln(Bathrooms)	0.132**	(0.001)	-0.295**	(0.016)
Remodeled	0.070**	(0.001)	-0.148**	(0.011)
Cash Purchase	-0.077**	(0.001)	0.041**	(0.013)
FHA Financing	-0.029**	(0.001)	0.140**	(0.009)
VA Financing	-0.012**	(0.002)	0.132**	(0.017)
Rental	-0.026**	(0.002)	0.170**	(0.019)
Vacant	-0.044**	(0.002)	0.180**	(0.021)
Estate	-0.103**	(0.002)	0.194**	(0.022)
Flat Fee	0.024**	(0.002)	-0.055**	(0.016)
Waterfront	0.204**	(0.001)	-0.310**	(0.025)
HOA	0.067**	(0.001)	-0.140**	(0.014)
Gated Community	0.068**	(0.006)	-0.134*	(0.053)
Country Club	0.042**	(0.003)	-0.058*	(0.029)
Security/Smart Home	0.035**	(0.002)	-0.073**	(0.016)
New Roof	0.014**	(0.001)	0.004	(0.009)
In-Law Apartment	-0.048**	(0.001)	0.248**	(0.011)
Stone Counters	0.050**	(0.001)	-0.162**	(0.011)
Atypical: Large Home	0.094**	(0.003)	-0.071**	(0.026)
Atypical: Large Lot	-0.002	(0.002)	0.051*	(0.022)
Atypical: Many Baths	0.103**	(0.004)	-0.167**	(0.035)
Atypical: Many Bedrooms	-0.018**	(0.002)	0.161**	(0.020)
Atypical: Older Home	0.034**	(0.002)	0.030	(0.025)
Ln(CDOM)	0.009**	(0.000)		
Ln(Age)	-0.064**	(0.000)		
Listing Density	-0.024**	(0.000)		
Ln(Sale Price)			2.260**	(0.104)
Age			0.004**	(0.000)
Age^2			-0.000**	(0.000)
Market Competition			0.003**	(0.000)
ZIP code FE	✓		✓	
Month × year FE	✓		✓	
Observations	670,393		670,393	
R^2	0.88		0.17	

The table reports a system of simultaneous equations modeling the natural log of transaction prices and cumulative days on market. The marketing duration for relisted homes is the total that includes the prior listing period but not the days off market. Robust standard errors are in parentheses. ** and * denote *p*-values <0.01 and <0.05 respective

Table 1.5: Prior Listing Termination Method & Days Off Market using PSM Sample

	7-day Gap		30-day Gap		90-day Gap		180-day Gap	
	Ln(Price)	Ln(CDOM)	Ln(Price)	Ln(CDOM)	Ln(Price)	Ln(CDOM)	Ln(Price)	Ln(CDOM)
Expired Prior	0.028**	0.302**	0.015**	0.172**	0.014**	0.188**	0.025**	0.212**
	(0.003)	(0.013)	(0.003)	(0.009)	(0.002)	(0.007)	(0.002)	(0.006)
Canceled Prior	-0.003	0.016	-0.021**	-0.151**	-0.010**	-0.162**	-0.007**	-0.138**
	(0.003)	(0.012)	(0.003)	(0.009)	(0.002)	(0.007)	(0.002)	(0.006)
Expired Prior x Agent Change	0.001	0.024	-0.001	0.030	0.000	0.026	0.002	0.025
	(0.012)	(0.050)	(0.009)	(0.033)	(0.007)	(0.022)	(0.006)	(0.018)
Expired Prior x Broker Change	0.006	-0.060	0.008	-0.007	0.009	0.010	0.006	0.007
	(0.010)	(0.040)	(0.008)	(0.028)	(0.007)	(0.020)	(0.006)	(0.017)
Expired Prior x Agent Change x Broker Change	0.010*	0.013	0.011**	0.022	0.005	0.023**	-0.001	0.023**
	(0.004)	(0.017)	(0.003)	(0.011)	(0.003)	(0.008)	(0.002)	(0.006)
Canceled Prior x Agent Change	-0.000	-0.024	-0.000	-0.013	-0.001	-0.006	-0.001	-0.005
	(0.007)	(0.029)	(0.007)	(0.024)	(0.006)	(0.018)	(0.006)	(0.016)
Canceled Prior x Broker Change	-0.001	-0.012	0.002	0.014	-0.002	0.025	-0.005	0.020
	(0.005)	(0.020)	(0.005)	(0.017)	(0.005)	(0.013)	(0.004)	(0.012)
Canceled Prior x Agent Change x Broker Change	0.002	0.025*	0.002	0.049**	-0.006*	0.062**	-0.009**	0.048**
	(0.003)	(0.012)	(0.003)	(0.009)	(0.002)	(0.007)	(0.002)	(0.006)
Expired Prior x List Price Decrease	-0.001	0.004	-0.007*	0.004	-0.006*	0.003	-0.004	0.004
	(0.004)	(0.017)	(0.003)	(0.011)	(0.003)	(0.008)	(0.002)	(0.007)
Expired Prior x List Price Increase	0.007	0.070*	0.011*	0.100**	0.010*	0.112**	0.012**	0.106**
	(0.008)	(0.034)	(0.006)	(0.020)	(0.004)	(0.012)	(0.003)	(0.009)
Canceled Prior x List Price Decrease	0.012**	0.095**	0.011**	0.101**	0.006*	0.098**	0.008**	0.095**
	(0.003)	(0.012)	(0.003)	(0.009)	(0.002)	(0.007)	(0.002)	(0.007)
Canceled Prior x List Price Increase	0.007	0.068**	0.004	0.058**	-0.000	0.044**	-0.000	0.046**
	(0.005)	(0.022)	(0.005)	(0.016)	(0.004)	(0.012)	(0.003)	(0.010)
Expired Prior x Multiple Relist	0.012*	0.256**	0.018**	0.268**	0.009*	0.267**	0.013**	0.260**
	(0.006)	(0.025)	(0.005)	(0.017)	(0.004)	(0.012)	(0.004)	(0.011)
Canceled Prior x Multiple Relist	0.022**	0.370**	0.030**	0.396**	0.019**	0.413**	0.025**	0.412**
	(0.004)	(0.018)	(0.004)	(0.014)	(0.004)	(0.011)	(0.003)	(0.010)
Observations	48,197	48,197	87,412	87,412	117,632	117,632	148,638	148,638
R^2	0.87	0.22	0.86	0.23	0.87	0.27	0.87	0.26

The table reports the parameter estimates for our variables of interest across various days-off-market gaps between the prior and sold listings. The models include all covariates listed in Table 1.3 as well as fixed effects for month×year and ZIP codes. Robust standard errors are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively

Table 1.6: Real Business Cycles using PSM Sample

	Rapid Expansion January 2000 – April 2005		Contraction April 2006 – March 2009		Expansion May 2012 – December 2019	
	Ln(Price)	Ln(CDOM)	Ln(Price)	Ln(CDOM)	Ln(Price)	Ln(CDOM)
Expired Prior	-0.020**	0.297**	0.043**	0.117	0.009	0.262**
	(0.004)	(0.015)	(0.007)	(0.062)	(0.005)	(0.017)
Canceled Prior	-0.011**	-0.035**	0.003	-0.166*	-0.010	-0.146**
	(0.003)	(0.013)	(0.008)	(0.078)	(0.005)	(0.016)
Expired Prior x Agent Change	-0.018	-0.002	-0.014	0.028	0.046*	0.067
	(0.014)	(0.049)	(0.023)	(0.212)	(0.018)	(0.060)
Expired Prior x Broker Change	0.005	0.016	-0.000	0.065	0.027	0.038
	(0.015)	(0.054)	(0.017)	(0.160)	(0.015)	(0.048)
Expired Prior x Agent Change x Broker Change	-0.003	-0.024	0.016*	0.014	0.007	-0.027
	(0.005)	(0.018)	(0.008)	(0.071)	(0.006)	(0.020)
Canceled Prior x Agent Change	0.004	-0.099**	0.019	0.056	0.011	0.086*
	(0.009)	(0.033)	(0.020)	(0.183)	(0.013)	(0.042)
Canceled Prior x Broker Change	0.002	-0.019	0.023	0.067	-0.021*	0.009
	(0.009)	(0.031)	(0.012)	(0.112)	(0.009)	(0.029)
Canceled Prior x Agent Change x Broker Change	-0.004	0.030*	0.012	0.059	-0.005	0.067**
	(0.004)	(0.014)	(0.008)	(0.076)	(0.005)	(0.016)
Expired Prior x List Price Decrease	-0.008	0.010	-0.012	0.038	-0.004	0.041*
	(0.005)	(0.018)	(0.008)	(0.072)	(0.006)	(0.020)
Expired Prior x List Price Increase	-0.005	0.082**	-0.019	-0.048	0.019	0.119**
	(0.008)	(0.028)	(0.016)	(0.149)	(0.010)	(0.033)
Canceled Prior x List Price Decrease	-0.004	0.116**	0.014	0.105	0.008	0.125**
	(0.004)	(0.014)	(0.007)	(0.068)	(0.005)	(0.015)
Canceled Prior x List Price Increase	-0.007	0.020	0.018	-0.023	0.001	0.079**
	(0.007)	(0.024)	(0.014)	(0.126)	(0.008)	(0.026)
Expired Prior x Multiple Relist	-0.022**	0.360**	0.022*	0.328**	0.021*	0.270**
	(0.007)	(0.026)	(0.011)	(0.099)	(0.010)	(0.033)
Canceled Prior x Multiple Relist	-0.023**	0.465**	0.021*	0.447**	0.013	0.414**
	(0.005)	(0.020)	(0.010)	(0.093)	(0.008)	(0.026)
Observations	25,940	25,940	13,012	13,012	26,600	26,600
R^2	0.93	0.45	0.90	0.32	0.91	0.47

The continuously compounded annual growth rate in the first period (Rapid Expansion) is 10.9 percent, the second (Contraction) is negative 6.0 percent, and the third (Expansion) is 5.3 percent. Models include the prior covariates along with temporal, spatial, and real estate agent fixed effects. Robust standard errors are in parentheses. ** and * denote *p*-values <0.01 and <0.05 respectively.

Table 1.7: Potential System Gaming

	Ln(Price)	Ln(CDOM)
Canceled Prior	-0.014**	-0.015
	(0.004)	(0.015)
Canceled Prior x Agent Change	-0.009	-0.079*
	(0.010)	(0.038)
Canceled Prior x Broker Change	-0.005	-0.013
	(0.009)	(0.035)
Canceled Prior x Agent Change x Broker Change	-0.004	0.007
	(0.004)	(0.017)
Canceled Prior x List Price Decrease	-0.002	0.112**
	(0.004)	(0.016)
Canceled Prior x List Price Increase	-0.004	0.036
	(0.007)	(0.028)
Canceled Prior x Multiple Relist	-0.012*	0.429**
	(0.006)	(0.023)
Observations	18,906	18,906
R^2	0.93	0.46

This table details the results using a PSM sample that begins January 2000 and ends April 2005. This is the same rapidly expanding economic cycle as reported in Table 1.6. Unlike the 30-day gap used in Table 1.6, this analysis employes a 7-day gap to test for outcome differences due to gaming the MLS system by temporarily removing a home and then relisting shortly after, resetting the DOM to zero within the MLSPIN system before the 2006 policy change. The 7-day gap uses observations that spent from zero to seven days off market. The model includes all covariates including fixed effects for agents, month×year, and ZIP codes. Robust standard errors are in parentheses. ** and * denote *p*-values <0.01 and <0.05 respectively.

Appendix

Table A.1: Variable definitions

Sales Price	Contracted selling price reported in MLS
DOM	Marketing time of sales listing (from List Date to Agreement Date)
CDOM	Marketing time of total listing period (from Initial List Date to Initial Off Market Date) + (from Subsequent List Date to Final Off Market Date)
Square Feet	Property size measured in square feet
Lot Size	Property lot size measured in square feet
Age	Age of the property
Bedrooms	Number of total bedrooms
Bathrooms	Number of total bathrooms
Relisting	Binary variable = 1 if property was relisted for sale
Canceled Prior	Binary variable = 1 if prior listing was canceled by seller
Expired Prior	Binary variable = 1 if prior listing let expire by seller
Agent Change	Binary variable = 1 if agent change by seller
Broker Change	Binary variable = 1 if broker office change by seller
Multiple Relist	Binary variable = 1 if property was relisting multiple consecutive times
Cash Purchase	Binary variable = 1 if purchased with cash
List Price Reduction	Binary variable = 1 if list price was reduced when relisted
List Price Increase	Binary variable = 1 if list price was increased when relisted
FHA Financing	Binary variable = 1 if purchased with Federal Housing Administration financing
VA Financing	Binary variable = 1 if purchased with Veterans Administration financing
Rental	Binary variable = 1 if non-owner occupied
Vacant	Binary variable = 1 if property vacant at time of listing
Estate	Binary variable = 1 if owned by an estate
Flat Fee	Binary variable = 1 if flat fee broker listed
Waterfront	Binary variable = 1 if property is fronted by water
HOA	Binary variable = 1 if property is part of a homeowners association
Atypical: Large Home	Binary variable = 1 if property is greater than 4,915 Square Feet
Atypical: Large Lot	Binary variable = 1 if property lot is greater than 209,088 Square Feet
Atypical: Many Baths	Binary variable = 1 if property has more than 5 bathrooms
Atypical: Many Bedrooms	Binary variable = 1 if property has more than 6 bedrooms
Atypical: Older Home	Binary variable = 1 if property is more than 166 years old
Gated Community	Binary variable = 1 if property located in a gated neighborhood
Country Club	Binary variable = 1 if property is located on or has access to a country club
Security/Smart Home	Binary variable = 1 if property is a smart home or has a security system
Remodeled	Binary variable = 1 if property is remodeled or renovated
New Roof	Binary variable = 1 if property has a new roof
In-Law Apartment	Binary variable = 1 if property has in-law apartment or au-pair suite
Stone Counters	Binary variable = 1 if property has any type of stone countertops
Market Competition	Measure of Market Competition
Listing Density	Measure of Listing Density

Table A.2: Test Statistical Difference of Transaction Price Coefficients

	Ln(Prices) Table 3	Standard Errors	Ln(Prices) Table 4	Standard Errors	*z*-Statistic	p-value
Relist	**-0.01830**	**-0.00173**	**-0.02900**	**-0.00180**	**4.28587**	**0.00002**
Relist x Agent Change	-0.00075	-0.00546	0.00032	-0.00545	0.13818	0.89010
Relist x Brokerage Change	0.00376	-0.00403	0.00603	-0.00403	0.39830	0.69041
Relist x Agent Change x Brokerage Change	0.00039	-0.00199	0.00148	-0.00199	0.38838	0.69774
Relist x Multiple Relist	-0.01250	-0.00303	-0.01630	-0.00304	0.88534	0.37597
Relist x List Price Decrease	-0.00639	-0.00203	-0.00695	-0.00203	0.19506	0.84534
Relist x List Price Increase	-0.00529	-0.00353	-0.00525	-0.00353	0.00801	0.99361
Ln(Sqft)	0.42300	-0.00110	0.42200	-0.00110	0.64282	0.52034
Ln(Lot Size)	0.05460	-0.00037	0.05490	-0.00037	0.57488	0.56537
Ln(Bedrooms)	0.05520	-0.00125	0.05490	-0.00125	0.16971	0.86524
Ln(Bathrooms)	0.13200	-0.00083	0.13200	-0.00083	0.00000	1.00000
Remodeled	0.06960	-0.00087	0.06960	-0.00087	0.00000	1.00000
Cash Purchase	-0.07700	-0.00106	-0.07690	-0.00106	0.06671	0.94681
FHA Financing	-0.02930	-0.00095	-0.02940	-0.00095	0.07483	0.94035
VA Financing	-0.01160	-0.00190	-0.01170	-0.00189	0.03731	0.97023
Rental	-0.02630	-0.00211	-0.02640	-0.00211	0.03351	0.97327
Vacant	-0.04350	-0.00226	-0.04360	-0.00226	0.03129	0.97504
Estate	-0.10300	-0.00214	-0.10300	-0.00214	0.00000	1.00000
Flat Fee	0.02420	-0.00176	0.02410	-0.00176	0.04018	0.96795
Waterfront	0.20400	-0.00131	0.20400	-0.00131	0.00000	1.00000
HOA	0.06740	-0.00132	0.06730	-0.00132	0.05357	0.95728
Gated Community	0.06750	-0.00575	0.06760	-0.00575	0.01230	0.99019
Country Club	0.04150	-0.00313	0.04150	-0.00313	0.00000	1.00000
Security/Smart Home	0.03470	-0.00168	0.03470	-0.00168	0.00000	1.00000
New Roof	0.01430	-0.00093	0.01430	-0.00093	0.00000	1.00000
In-Law Apartment	-0.04830	-0.00107	-0.04820	-0.00107	0.06608	0.94731
Stone Counters	0.05030	-0.00100	0.05040	-0.00100	0.07099	0.94340
Atypical: Large Home	0.09430	-0.00265	0.09430	-0.00265	0.00000	1.00000
Atypical: Large Lot	-0.00152	-0.00245	-0.00191	-0.00245	0.11256	0.91038
Atypical: Many Baths	0.10300	-0.00366	0.10300	-0.00366	0.00000	1.00000
Atypical: Many Bedrooms	-0.01870	-0.00223	-0.01810	-0.00222	0.19068	0.84878
Atypical: Older Home	0.03400	-0.00237	0.03420	-0.00237	0.05967	0.95242
Ln(DOM)/Ln(CDOM)	0.00781	-0.00040	0.00869	-0.00044	1.47669	0.13976
Ln(Age)	-0.06410	-0.00035	-0.06430	-0.00035	0.40063	0.68869
Listing Density	**-0.02530**	**-0.00013**	**-0.02440**	**-0.00014**	**4.71392**	**0.00000**
Observations	670,393		670,393			
R^2	0.877		0.877			

Table A.3: Test Statistical Difference of Days on Market Coefficients

	Ln(DOM) Tabel 3	Standard Errors	Ln(CDOM) Table 4	Standard Errors	*z*-Statistic	p-value
Relist	**-0.03550**	**-0.01630**	**0.86800**	**-0.01590**	**39.67837**	**0.00000**
Relist x Agent Change	0.06950	-0.05090	-0.04780	-0.04980	1.64724	0.09951
Relist x Brokerage Change	0.13100	-0.03760	-0.04450	-0.03680	3.33575	0.00085
Relist x Agent Change x Brokerage Change	**0.13200**	**-0.01860**	**-0.02710**	**-0.01820**	**6.11381**	**0.00000**
Relist x Multiple Relist	**-0.08680**	**-0.02830**	**0.48100**	**-0.02780**	**14.31299**	**0.00000**
Relist x List Price Decrease	0.05440	-0.01890	0.05210	-0.01850	0.08697	0.93070
Relist x List Price Increase	0.08900	-0.03290	0.06980	-0.03220	0.41707	0.67663
Ln(Sqft)	-0.77300	-0.04570	-0.78200	-0.04520	0.14002	0.88864
Ln(Lot Size)	-0.07060	-0.00709	-0.07690	-0.00700	0.63232	0.52718
Ln(Bedrooms)	-0.13300	-0.01260	-0.13000	-0.01240	0.16970	0.86525
Ln(Bathrooms)	-0.29100	-0.01600	-0.29500	-0.01580	0.17788	0.85881
Remodeled	-0.14100	-0.01080	-0.14800	-0.01070	0.46044	0.64520
Cash Purchase	0.03690	-0.01280	0.04080	-0.01260	0.21714	0.82810
FHA Financing	0.13300	-0.00931	0.14000	-0.00914	0.53654	0.59159
VA Financing	0.12800	-0.01770	0.13200	-0.01730	0.16161	0.87161
Rental	0.16500	-0.01980	0.17000	-0.01940	0.18037	0.85686
Vacant	0.17800	-0.02160	0.18000	-0.02110	0.06623	0.94719
Estate	0.19000	-0.02270	0.19400	-0.02230	0.12570	0.89997
Flat Fee	-0.05060	-0.01670	-0.05450	-0.01630	0.16712	0.86727
Waterfront	-0.30100	-0.02510	-0.31000	-0.02480	0.25506	0.79867
HOA	-0.13600	-0.01450	-0.14000	-0.01420	0.19709	0.84376
Gated Community	-0.13400	-0.05410	-0.13400	-0.05300	0.00000	1.00000
Country Club	-0.05630	-0.02950	-0.05810	-0.02890	0.04359	0.96523
Security/Smart Home	-0.06840	-0.01610	-0.07310	-0.01580	0.20835	0.83495
New Roof	0.00447	-0.00879	0.00437	-0.00861	0.00813	0.99352
In-Law Apartment	0.24300	-0.01110	0.24800	-0.01090	0.32140	0.74791
Stone Counters	-0.15600	-0.01070	-0.16200	-0.01050	0.40023	0.68899
Atypical: Large Home	-0.06790	-0.02700	-0.07140	-0.02650	0.09251	0.92629
Atypical: Large Lot	0.04840	-0.02290	0.05140	-0.02240	0.09365	0.92539
Atypical: Many Baths	-0.16700	-0.03590	-0.16700	-0.03520	0.00000	1.00000
Atypical: Many Bedrooms	0.17100	-0.02080	0.16100	-0.02030	0.34407	0.73080
Atypical: Older Home	0.03340	-0.02530	0.03030	-0.02490	0.08733	0.93041
Ln(Sale Price)	2.21300	-0.10500	2.26000	-0.10400	0.31803	0.75047
Age	0.00403	-0.00038	0.00438	-0.00038	0.65646	0.51153
Age^2	-0.00001	0.00000	-0.00001	0.00000	0.48752	0.62589
Market Competition	**0.00310**	**-0.00002**	**0.00261**	**-0.00002**	**21.02772**	**0.00000**
Observations	670,393		670,393			
R^2	0.116		0.168			

CHAPTER 2

Residential Real Estate Listings with Offer Deadlines

Introduction

Searching for a new home and anxiously awaiting the outcome of a submitted offer brings great anticipation and nerves. Sellers of real estate perhaps face greater anticipation and nerves as they wait for interested buyers to arrive and competitive offers to be submitted. Buyers have the ability to browse all properties for sale through multiple listing services or 'For Sale by Owner' websites, giving them a clear view of the market. While buyers can explore a wide array of options to find a home to buy, sellers are left in suspense. Unable to observe the full pool of potential buyers, they wait and see if their listing attracts sufficient interest to receive an offer.

To reach the broadest possible audience, sellers actively promote their property's availability. Over time, the methods for doing so have evolved. While word of mouth—the earliest form of marketing—still plays a role, more formal advertising channels such as direct mail, newspapers, radio, and television have provided new ways to reach buyers. Two of the most impactful tools for the marketing of real estate are the Multiple Listing Service (MLS) and the Internet. MLS systems provide brokers with a centralized hub for property listings that both buyer brokers and seller brokers rely on as a source for current listings. The most transformative shift, however, has been the rise of the Internet. Online platforms like Realtor.com and Zillow have further revolutionized this process by nationalizing MLS data, making it more accessible to buyers across the country.

When sellers engage a broker, they gain access to the MLS and benefit from the combined expertise of the individual agent and the brokerage office. While a percentage-based commission is designed to align the interests of brokers and sellers (Arnold 1992), alignment is not always guaranteed. For instance, a broker may feel they have found a qualified buyer, yet the seller might believe a higher offer is possible. In such cases, the broker's continued efforts could yield a less favorable outcome than if a prior offer had been accepted.

Alternative mechanisms exist that may better align sellers with their representation. One such example is an auction, a method particularly suited to selling heterogeneous, illiquid assets without a market pricing mechanism (McAfee and McMillan 1987; Wang 1993). With proper structure, auctions provide both buyer and seller with a clear understanding of the time frame for sale, the minimum price expected, and the compensation to be paid. However, auctions are not common for non-distressed residential real estate in the United States (Duranton, Henderson and Strange 2015) for several reasons. First, auctioneers must be licensed, and only a small percentage of real estate brokers also hold an auctioneer's license. Additionally, auctions can require a buyer premium calculated as a percentage of sales price. Buyers adjust their bids accordingly, which can reduce the net amount sellers receive compared to a traditional brokered transaction. Moreover, in the U.S., properties sold at auction are often perceived as distressed, signaling urgency on the seller's part. This perception leads buyers to expect a discount, frequently resulting in lower sale prices, irrespective of the property's actual value.

This dissertation chapter studies an alternative way brokers list properties using offer deadlines. A notification is made that property viewings may be limited or unavailable, and that all offers must be submitted by a specific deadline. Offer deadline listings share mechanics of a first-price sealed-bid auction but lack a key feature: neither party is bound to complete the

transaction. A traditional listing requires sellers to observe the arrival of buyers and evaluate each offer without knowing if future offers will come and without knowing if prior offers can be returned to after an initial pass (Cheng, Lin and Liu 2008). If successful an offer deadline listing should provide sellers with a view of the pool of buyers and offers, maximizing the sales price. Agents, in turn, gain confidence in earning their commission, as this approach provides a clearer timeline and a higher probability of sale.

The decision to use an offer deadline listing leads to the first motivation for this paper: testing the statistical significance of these results compared to brokers' marketing statistics. A comparison of offer deadline listings with standard listings in the sample reveals that on average properties using an offer deadline sell 7 percent above the list price, approximately 67 percent faster, and have a 30 percent higher probability of sale. Sellers, often lacking the knowledge to ask detailed questions, tend to accept these figures at face value. Results confirm that offer deadline listings do lead to a 1 percent to 4 percent increase in transaction price, reduction in days on market between 22 percent and 82 percent and increases the probability of sale by 6 percent to 31 percent. The results do not have the same magnitudes as the summary statistics averages, but brokers are not misleading clients when suggesting that sellers could benefit from using this strategy.

The larger proportion of the population in Massachusetts is located closest to the areas in and surrounding Boston. Moving west the population density declines starting past Worchester and moving greater distance away from interstate ninety. The differences in the urban areas with higher population density and rural areas in the western part of the state display differences in the usage and outcomes of offer deadline listings. The number of total offer deadline listings is 22,050. Only 81 are in the rural area and 73 occur in the final twenty-four months of the sample and no property characteristics increase the probability of using an offer deadline listing. The transaction price

results are only significant in the urban areas. Both areas have a statistically significant result in the days on market tests with no difference in the magnitudes. Analyzing the two areas produces support for differences.

The cyclical nature of the real estate market introduces the second motivation for this study: examining how offer deadlines affect transaction outcomes across different real business cycles. The data in this study spans 22 years from January 2000 through December 2021, encompassing six distinct real business cycles - three expansionary, one contracting, and two steady state. The impact of offer deadline listings on the days on market and the probability of sale are consistent across the real business cycles. In each real business cycle there is a statistically significant reduction in the days on market and the probability of sale is higher for offer deadline listings. Transaction price is where there is a lack of consistency. In increasing or rapidly increasing price markets offer deadline listings display a statistically significant increase in transaction price. During the first steady state and decreasing price market there is no significant price difference. The second steady state market demonstrates a positive and significant price result.

The lower number of observed listings during certain cycles leads to the third motivation for this study; to examine how the adoption of offer deadline listings has changed over time and how this impacts outcomes. The number of offer deadlines from 2000 through 2011 ranged from 12 in a year to 81 in a year. The first-year the total number offer deadline listings exceeded one hundred was 2012. Increased use really started to show in 2013 with nearly as many offer deadline listings that year (438) as between 2000 and 2011 combined (495). The average sales price for an offer deadline listing during the first 12 years was $552,800 compared to the standard listing price of $367,400, a difference of $185,400. The difference shrank to $2,100 during the final two years (2020 and 2021) when the average transaction prices were $599,900 and $602,100 for an offer

deadline and standard listing respectively. In the final two years 53.1 percent of all offer deadline listings occurred.

The first contribution of this study is to the literature on offer deadline listings. The popular press has published more on offer deadlines than can be found in the academic literature. Massachusetts is not the only market experiencing the rise of offer deadlines (Gorey 2022); Washington (MacEvilly 2021), California (Meyers 2024) and Michigan (Oboza 2020) are examples of places with increasing awareness of the offer deadlines. Offer deadlines are not exclusive to sellers as buyers can impose a deadline for responding to an offer before it expires. Searching for offer deadline literature in academic journals results in tangential studies in areas like real estate auctions.

A second contribution of this study is to the literature on real estate markets. Studies in this area primarily focus on transaction prices and liquidity, with few examining the probability of sale. The literature studying how market conditions impact real estate typically use the terms “hot” and “cold” markets. There are studies that have looked to help better define these two markets (Carrillo 2013; Novy-Marx 2009) and the performance of real estate during these two markets (Krainer 1999; Li and Yavas 2015; Ngai 2009). Steady state markets are often overlooked, as they are not considered to provide much insight. This study adds to the literature with study of steady state markets (one following an expansion market and one following a contracting market).

The rest of the paper is organized as follows: Section 2 provides the literature review, Section 3 presents the data, Section 4 gives an overview of the methodology, followed by the results in Section 5, and ending with the conclusion in Section 6.

Literature Review

The focus of this study is on offer deadline listings which have received more coverage in the popular press than in academic journals. The most relevant literature to this study encompasses the following areas: broker represented marketing services, auctions, market conditions (Hot and Cold) and estimation of price and liquidity. Broker Represented marketing systems and estimation of price and liquidity have vast literature and as such do not have comprehensive coverage in this literature review but is provided in the other studies highlighted.

Broker Represented, commonly called Real Estate Brokerage is reviewed in great detail beginning with Benjamin, Jud and Sirmans (2000b) in which the research is examined going back to 1981 and organized into six questions about the industry; "*What is the nature of the market for brokerage services and how does it influence the individual firm, What factors determine broker and agent compensation, How does brokerage participation influence time on the market and price, Is the brokerage market efficient and equitable, Must brokerage firms assume greater liability and How do brokerage markets vary internationally".* Zietz and Sirmans (2011) update the study of real estate brokerage beginning in 1999 organizing the papers into four areas; "*efficiencies in brokerage operations, technology, performance, and agency relationships".* One other reference on real estate brokerage is Benjamin, Jud and Sirmans (2000a) which provides a bibliography of the literature.

There is extensive literature studying estimation of price and liquidity, specifically in the residential market, Two papers that provide starting points for this area are Sirmans, Macpherson and Zietz (2005) and Benefield, Cain and Johnson (2014). Benefield, Cain and Johnson (2014) provide a standalone literature review of real estate pricing studies with a specific focus on the evolution of works that adopt the joint determination of transaction price and days on market.

Discussion of the econometric methods used for estimation with joint determination is a major part of the literature review. Each of the studies in the literature review require selection of variables to include in the models. Sirmans, Macpherson and Zietz (2005) test and report the housing characteristics that provide the best model fit. The balance of the literature review is as follows; real estate auctions and market conditions (Hot and Cold Markets).

Real Estate Auctions

The foundational principles of auction theory, as applied to real estate auctions, highlight the complexities introduced by asymmetrical information among bidders and the strategic considerations that influence bidding behavior. Emphasis is placed on understanding bidder dynamics, the role of reserve prices, and the potential benefits of second-price auction methods, all with the aim of enhancing seller revenue and improving resource allocation in competitive bidding environments. The most important and relevant real estate auction literature follows with a more comprehensive literature review of auctions and real estate auctions in provided in the appendix.

Ashenfelter and Genesove (1992) extend the research of real estate auctions using condominium units by investigating the phenomenon of price anomalies in real estate auctions, specifically focusing on condominium units sold in New Jersey. Their study is motivated by previous findings in auction theory, particularly the "price decline anomaly," which suggests that prices for identical items tend to decline rather than increase as the auction progresses, contrary to the predictions of risk-neutral bidders.

An empirical analysis of an auction involving 83 condominium units was done, where it was found that while all units were "hammered down" at auction, approximately 40% of these sales fell through. Subsequent face-to-face negotiations for the same units revealed that they sold

for an average of 13% less than their auction prices, with the largest discounts observed for units auctioned early. This outcome suggests that early bidders may have overpaid due to a "winner's curse," where uninformed bidders pay a premium, leading to significant profits for sellers.

The authors employ a straightforward econometric design to differentiate between price declines attributable to the auction mechanism and those resulting from unobserved quality differences among the units. Findings indicate that the relationship between auction prices and the order of sale is influenced by omitted quality characteristics, as subsequent resale prices showed little correlation with the auction order.

Quan (1994) provides a comprehensive overview of auction theory as it pertains to real estate markets and empirical research. Two primary paradigms of auction theory are distinguished: the independent private value model and the common value model. The independent private value model is a foundational framework for understanding bidder behavior. It highlights that bidders often possess asymmetric information about their own valuations of the auctioned item. This information asymmetry affects their bidding strategies, as bidders generally shade their bids below their true valuations to mitigate the risks associated with competition and uncertainty about their rivals' valuations.

Lusht (1996) studies comparative effectiveness of English auctions versus private negotiations revealing significant insights into pricing mechanisms and buyer behavior. English auctions often lead to higher final prices (8% price premium) due to competitive bidding dynamics, which can stimulate buyer interest and create a sense of urgency. Conversely, private negotiations tend to foster a more personalized approach, allowing for tailored agreements that may benefit both parties, albeit potentially at lower price points. The influence of market conditions, item uniqueness, and seller strategies on the outcomes of both methods is highlighted. Overall, the

choice between these two selling mechanisms is influenced by various factors, including the nature of the goods being sold, the seller's objectives, and the characteristics of the buyer pool, suggesting that a nuanced understanding of each method's advantages and limitations is essential for optimizing sales strategies.

Understanding possible shortcomings of prior studies of the outcomes of real estate auctions Mayer (1998) measure performance with the use of a weighted repeat sales (WRS) methodology to account for unobserved differences in property quality. Revealed is that auctioned properties often sell at significant discounts—ranging from 0% to 21%—depending on market conditions. The study highlights the historical context of real estate auctions in the U.S., noting their emergence in the 1970s and subsequent growth during economic downturns as a strategy to quickly dispose of properties and minimize carrying costs. Findings suggest that while auctions can be advantageous in distressed markets, they are often perceived negatively by practitioners, who typically associate them with lower sale prices.

In Scotland the use of an auction can be selected for the sale of real estate. Buschbom et al. (2018) offer several key findings regarding the impact of these different selling, fixed price and offers over, mechanisms on residential property prices. While there is evidence of sample selection, no significant price effect is found between the two systems. This suggests that the choice of selling mechanism does not inherently lead to higher or lower sale prices.

There is an indication that sellers are rational in their choice of marketing system. They tend to select the system that is predicted to yield the highest sale price for their property. Properties would likely sell for less if the alternative selling mechanism were chosen. The importance of treating the choice of marketing system as endogenous is emphasized, arguing that the simultaneous existence of both selling systems is justified by the differing expected net sale

proceeds under varying conditions, aligning with theoretical models that suggest multiple marketing systems can coexist when there are variations in buyer search costs and seller holding costs.

Sommervoll (2020) investigates the efficacy of jump bids in Norwegian real estate auctions, challenging the prevailing notion that significant bid increases can secure properties at lower prices. Analyzing a comprehensive dataset, the research reveals that while jump bidders do pay a premium—approximately 1-2% when the jump does not conclude the auction and 9-10% for final jumps—they are more likely to win bidding wars, even when their jump bids are matched. This suggests that jump bids serve as credible signals of serious intent, influencing the dynamics of competition among bidders. Ultimately, the findings indicate that jump bids may not deter competition as previously thought, but rather enhance the bidder's chances of success in a highly competitive auction environment.

Sønstebø, Olaussen and Oust (2021) investigates the impact of opening bid strategies on auction outcomes in the context of residential property sales in Norway. Utilizing a dataset of 2,551 auction journals and survey data, the authors analyze bidder behavior and the correlation between opening bid levels and final sale prices. Their findings indicate that higher opening bids can signal a strong valuation of the property, potentially intimidating some bidders while simultaneously reinforcing the beliefs of others regarding the property's value, leading to higher final sale prices. The strategic importance of opening bids in English auctions and provides valuable insights for both buyers and sellers, as well as implications for auction design and market regulations.

Aggressive bidding strategies in real estate auctions, focusing on their impact on sales prices in the Norwegian market is investigated by Dalland et al. (2021). Utilizing two independent datasets four key strategies: high opening bids, jump bids, short acceptance deadlines, and short

response times are identified. Employing structural equation modeling, findings reveal that these aggressive tactics significantly contribute to higher sales prices, challenging the common belief that such strategies might lower final prices. The results underscore the importance of understanding bidder behavior and strategic timing in auction settings, providing valuable insights for both practitioners and researchers in the field of real estate economics.

Hot and Cold Markets

Oen of the early studies on marketing conditions impact focuses on the rental real estate market. Arnott (1989) contributes to this body of research by proposing a model that emphasizes the role of idiosyncratic tastes and the thinness of housing markets in shaping vacancy rates and rental prices. Housing markets are characterized by a high degree of heterogeneity, where individual preferences lead to a sparse distribution of housing units with distinct characteristics. This idiosyncratic nature of demand results in thin markets, granting landlords monopoly power, which they exploit by setting rents above marginal costs. The model suggests that vacancies serve as a crucial equilibrating mechanism, allowing for adjustments in response to market conditions, while also reflecting the costs associated with maintaining unoccupied units. Arnott highlights the distinction between anticipated and unanticipated market changes, with vacancy rates typically higher in depressed economic conditions and lower in booming markets. This relationship underscores the importance of understanding the cyclical nature of housing markets and the factors influencing tenant behavior, such as search costs and information asymmetries.

Building on this understanding of market influences on pricing, subsequent research has explored how various market conditions affect seller behavior, real estate liquidity, search behavior, and the role of intermediaries such as brokers. Dale-Johnson and Hamilton (1998) further

explore housing market conditions by focusing on the complex interplay between listing choices made by sellers and the market share of Multiple Listing Services (MLS). This study indicates that market conditions significantly affect seller behavior. In a seller's market, where demand exceeds supply, homeowners are more likely to list their properties with brokers on the MLS to maximize exposure and potential sale prices. Conversely, in a buyer's market, sellers may opt for alternative listing methods to reduce costs or retain more control over the sale process. Sellers using brokers and the MLS listings benefit from professional marketing strategies and a structured sales process, which often leads to better financial outcomes. This study highlights the importance of market conditions in shaping the decision-making processes of sellers.

Krainer (1999) adds to the discussion of housing market dynamics by examining real estate liquidity and the time it takes to sell residential properties. In hot markets, characterized by rising prices and high liquidity, sellers are quick to capitalize on favorable conditions. In contrast, in cold markets, where prices decline and liquidity is low, sellers exhibit price stickiness, often delaying price reductions in hopes of finding buyers willing to pay more. Fluctuations in economic fundamentals, such as interest rates and job growth, impact housing service flows and market liquidity. Theoretical models suggest that sellers' decision-making processes are influenced by their expectations of future market conditions, leading to strategic behaviors that affect time on the market. Empirics of this study using data from the San Francisco Bay Area, reveal statistical relationships between time on the market and economic indicators, reinforcing the notion that liquidity is influenced by both market conditions and seller behavior.

Ngai (2009) examines the seasonality of housing markets, highlighting the significance of understanding seasonal fluctuations in prices and transactions. The study focuses on housing markets in the UK and the US, where data on constant-quality house prices are readily available.

Existing models, while valuable, often fail to account for the observed seasonality in housing data. Ngai (2009) proposes a new mechanism that incorporates the concept of "thick" and "thin" market effects, suggesting that seasonal patterns in vacancies and transactions are influenced by the timing of buyers' and sellers' decisions, which tend to be cyclical and predictable. Empirical evidence suggests that traditional models alone cannot fully explain the seasonality observed in housing markets, calling for a more nuanced understanding of the factors driving these seasonal trends, including socio-economic variables and the timing of life events.

Similarly, Novy-Marx (2009) explores the dynamics of housing markets by examining the interplay between search behavior, transaction costs, and market conditions. Drawing parallels between housing markets and other markets characterized by costly searches, such as labor and marriage markets, emphasizing that price is not the only variable that adjusts to market imbalances. Other factors, such as the number of participants and their behaviors, also play crucial roles in the adjustment process. The study offers insights into the cyclical nature of housing markets and the complex interactions between market participants, suggesting that understanding these dynamics is essential for comprehending real estate economics.

Carrillo and Pope (2012) investigates the shifts in marketing time for residential properties between 2003 and 2007, highlighting the importance of analyzing the entire distribution of marketing time rather than relying solely on mean or median values. Carrillo and Pope (2012) find that while the average time on the market increased during this period, the changes were not uniform across the distribution, with negligible shifts at lower percentiles and significant variations at higher percentiles. They employ a decomposition method that combines the Kaplan-Meier (Kaplan and Meier 1958) estimator with the DiNardo, Fortin, and Lemieux (DiNardo, Fortin and Lemieux 1995) approach to account for differences in housing characteristics, revealing that the

characteristics of homes sold in 2003 and 2007 were statistically different, which partially explains the observed shifts. This study contributes to the understanding of housing market liquidity and emphasizes the need for comprehensive measures to assess the desirability of residential properties in varying market conditions.

Chernobai and Hossain (2012) investigate the determinants of house search duration in contrasting market conditions, focusing on rising ("hot") and declining ("cold") housing markets. Utilizing search-and-match models, which emphasize the role of individual buyer preferences and planned holding periods in determining housing choices, the authors conduct surveys in Southern California during distinct market phases. Their findings suggest that search durations are influenced by various factors, including the intended length of ownership, reasons for purchase (consumption versus investment), and geographical preferences. Notably, consumption-driven buyers exhibit longer search durations when anticipating longer occupancy, reflecting a greater need for a suitable match. This shift in buyer preferences, especially from coastal to inland areas during colder markets, demonstrates how market dynamics significantly shape buyer behavior.

Carrillo (2013) develops a structural model to analyze the interplay between list prices, sale prices, and marketing time in the housing market, emphasizing the measurement of seller's bargaining power as a key indicator of market conditions. Utilizing Ordinary Least Squares estimation, the study demonstrates that the model can effectively recover structural parameters even from aggregate data, thereby providing insights into seller behavior and market dynamics. The findings indicate that a seller's bargaining power can fluctuate between a seller's market and a buyer's market.

Li and Yavas (2015) contribute to the literature by examining the role of residential brokers in relation to market conditions. In hot markets, where demand is high and properties sell quickly,

the necessity for a broker diminishes as sellers face lower search costs and can achieve favorable transaction prices independently. However, in cold markets, where demand is weaker, brokers provide substantial value by reducing search costs and increasing the likelihood of successful transactions. The study underscores the importance of market conditions when evaluating the role of brokers in residential real estate transactions, suggesting that brokers offer more value in colder markets where search costs are higher and transaction times are longer.

Finally, Smith (2020) investigates housing market fluctuations through the lens of stock-flow matching and endogenous seller entry. The study finds that the behavior of potential sellers is significantly influenced by the number of bidders remaining from previous sales. When multiple bidders are present, competitive bidding ensues, resulting in high sales activity. Conversely, when only one bidder remains, sellers are less inclined to enter the market, leading to periods of minimal or no sales activity. Smith's model incorporates modest extensions that allow for more accurate comparisons with real-world housing statistics, from Dane County, Wisconsin. This study highlights the importance of seller entry decisions in understanding market volatility and links housing market dynamics to broader economic conditions, emphasizing the interplay between buyer competition, seller behavior, and market liquidity.

Data

This study uses a comprehensive collection of property data from the MLS Property Information Network (MLSPIN) covering the entire state of Massachusetts. The analysis focuses on single-family properties listed and sold during the period from January 2000 to December 2021.

Offer Deadline

The focus of this study is on listings using offer deadlines. Offer deadlines are identified by the following characteristics: Brokers list a property in the MLSPIN, provide a limited viewing period for buyers (i.e. open house) and inform buyers of a date and time when all buyers must have an offer submitted in order to be viewed by the seller (deadline for offer submission). This signal is distributed from the sellers' brokers to buyers and buyers' brokers through public and non-public comments of the MLSPIN property listing (Table B.6). Key phrases are identified that indicate a broker is using this strategy. Listings with any of the identified phrases are label as offer deadline listings. One example of the phrases searched for is "final and best offers due". The complete list of phrases is provided in Table B.5, with examples of listings displaying this verbiage in Table B.7.

Sample

The goal is to keep as many of the offer deadline listed properties in constructing the sample. After accounting for data errors, the following filters are applied: square footage (ranging from 500 to 9999 square feet), lot size (ranging from 0.02 to 10.0 acres), bedrooms (at least 1 and not exceeding 9), and bathrooms (at least 1 and not exceeding 8). Due to the significant number of older homes in Massachusetts that are not historical properties and typical homes to be occupied the age cutoff is extended out to 211 years. Transaction prices are trimmed with a minimum sale price of $65,000 and a maximum of $5.0M. Lastly, days on market is kept between one and two hundred and seventy days.

The sample omits new construction, foreclosures, and short sales from consideration. Freshly constructed homes typically involve distinct tradeoffs between price and days on market compared to the entire housing inventory. Additionally, when it comes to new construction,

builders may present seller concessions that might not be adequately represented by a single binary variable, as commonly seen in housing literature. Similarly, we exclude foreclosures and short sales for a parallel rationale: the cross-sectional variations in quality and price/marketing period tradeoffs can be substantial and are not effectively encapsulated by a singular binary variable.[13]

Measurement of property quality is important in a hedonic model. Proper measurement is not easily achieved with standard housing characteristics. Two homes could be nearly identical in location, living area, lots size, age, number of bedrooms and number of bathrooms and still vary greatly in quality. To better control for the unobserved measure of quality, public and non-public comments are analyzed for phrases that indicate quality. Binary variables are created to indicate a home with the following features: country club (located on or with access to a country club), security/smart home (installed security systems or devices to make the home connected over the internet), new roof (age of the roof indicated it was recently replaced), in-law apartment (presence of an in-law apartment or au-pair suite) and stone counter (kitchen counter are granite, marble or some kind of stone).

Identification of properties exhibiting atypical features is completed following Harding, Knight and Sirmans (2003). A property is identified as atypical if any of the following conditions apply: large home (with a living area exceeding 4173 square feet), large lot (over 221,898 square feet), old home (over 166 years old), home with many bedrooms (exceeding 6), or home with many bathrooms (exceeding 5). These atypicality variables largely control for the top 1 percent of their respective distributions where unique price/market period tradeoffs can occur.

[13] New construction, foreclosures and short sales remain in the dataset when calculating the measures of marketing competition and listing density.

Listing Density and Market Competition

Buyers conduct property searches based on individual preferences that influence the specific neighborhoods they focus on. The frequency of buyer visits depends on property attributes and the overall number of properties available in proximity. Spatial competition reduces the probability of buyer visits to alternative properties, while shopping externalities increases probability of buyer visits to adjacent ones. The probability of a property sale is influenced by the likelihood of a buyer visit and the density of the distribution of buyers' willingness to pay. Changes in a buyer's willingness to pay, influenced by the number of properties for sale, lead sellers to adjust their reservation prices. Although the reservation price is not directly observable, changes in the expected transaction price can be.

The alteration in a buyer's willingness to pay is contingent upon the strength of spatial competition or shopping externalities. Spatial competition reduces a buyer's willingness to pay, resulting in a lower expected transaction price. Conversely, shopping externalities increase the willingness to pay and the expected transaction price. The concurrent determination of price and days on market indicates that spatial competition and shopping externalities drive marketing duration, albeit in opposite directions to their effects on price. The existence of shopping externalities increases the likelihood of buyer visits and buyers exhibit a higher willingness to pay. This, in turn, leads to a reduction in marketing duration.

Turnbull and Dombrow (2006) introduce two measures to account for spatial competition and shopping externalities. The variables are measures of market competition and listing density. The variables consider the overlapping days that listings share and the distance between them. Listing density indicates the average competition intensity per day on market, where a negative effect on selling price reflects increased competition that depresses prices. A positive listing

density suggests a shopping externality drawing potential buyers, offsetting the competition effect. Market competition reflects the number of competing properties near the subject property, accounting for the overlap between their days on market. The distance between the subject and competing properties is a factor in the market competition measure. Consistent with Turnbull and Dombrow (2006) all competing homes within 1 mile of the subject property as well as those within ±20 percent of the subject property's living area measured in square footage are used.

Following their method, we set $L(i)$ and $S(i)$ to be the listing date and end-of-listing date for property i. The overlapping number of days with other properties j is defined as:

$$O(i,j) = \min\big(S(i), S(j)\big) - \max\big(L(i), L(j)\big) + 1$$

The variable $D(i,j)$ is the straight-line distance between properties i and j. The two variables are computed as:

$$\text{Market competition}_{\text{i}} = \sum_{j \in I} \big(1 - D(i,j)\big)^2 O(i,j)$$

$$\text{Listing Density}_{\text{i}} = \sum_{j \in I} \frac{\big(1 - D(i,j)\big)^2 O(i,j)}{S(i) - L(i) + 1}$$

Descriptive Statistics

The final dataset consists of 747,989 property listings containing 725,939 standard listings and 22,050 offer deadline listings. Table 2.1 provides descriptives statistics for the full sample as well as for standard property listings and offer deadline property listings. Offer deadline properties list at a mean price almost $99,000 higher ($534K vs $435K) and sell for almost $139,000 higher ($566K vs. $427K). Transaction prices for standard listings range from $65,000 to $5,000,000 as compared to a narrower range for offer deadline listings from $65,000 to $3,958,000. Based on the reported averages for sales price and list price offer deadline listings have a sale price to list price

ratio greater than 1.0 at 1.06 while standard listings have sale price to list price ratio less than 1.0 at 0.98[14]. The days on market for offer deadline listings is 18.5 days compared to 56.0 for standard listings a difference of 38.5 days. The average time from list date to offer deadline date is 7.8 days and offers are agreed to on average 1.7 days after the deadline with 53.0 percent of agreements happen on or before the deadline. One other difference between offer deadline listings and standard listings is the percentage of that terminate in a sale, 95.7% and 66.5%, respectively. These differences are central to one of the motivations of the study, determining if these are statistically significant.

Offer deadline properties have a smaller living area (1,886 sqft vs. 1,910 sqft), smaller lots (20,613 sqft vs. 27,055 sqft), 10.3 years older (68.2 years vs. 57.9 years), fewer bedrooms (3.30 vs. 3.32) and equal bathrooms (2.18). The differences for all these property characteristics are significant at the 1% level (Table 2.2 displays the difference in means test results). Cash buyers are more active in offer deadline listings. There is a 50% increase in the percentage of cash buyers from 6.05% to 9.10%. Observing the larger differences in sales price, the distribution of offer deadline listings across the sample years were investigated. This revealed that there is not a uniform distribution of offer deadline listings across the sample years. Figure 2.1 displays a left skewed distribution with 95% of the offer deadline listings occurring in the last two years of the sample.

[14] A simple regression of $Sales\ Price_i = List\ Price_i + \epsilon_i$ for each subsample results in coefficients for standard listings and offer deadline listings of 0.99 and 1.07 respectively.

Empirical Methods

The primary outcomes of real estate transactions are price, marketing duration and probability of sale. In a standard search and matching market price and marketing duration are jointly determined, as each is a fundamental input to the other (Krainer 2001; Wheaton 1990), and have a positive relationship. Price and marketing duration should be estimated using a system of simultaneous equations. However due to the separation of the joint determination of price and marketing duration from the use of an offer deadline listing the estimation of price and marketing duration will be separately estimated with traditional hedonic functions (Rosen 1974).

The hedonic price function is:

$$Ln(P_i) = \alpha + \gamma OD_i + \tau X_i + \lambda \mathrm{LD}_i + \psi A + \omega + \delta + \epsilon_i$$

where $Ln(P_i)$ represents the natural logarithm of the sales price of house i. The variable, X_i, is a time invariant matrix of house attributes, Table B.1 in the Appendix provides a list of variables and definitions of these characteristics. LD_i denote listing density, A denotes selling agent fixed effects[15]. Temporal fixed effects, ω, are interacted month and year while spatial fixed effects, δ, are controlled for at the ZIP code level. ϵ_i is the error term. Our variable of interest is OD_i, which is a binary variable equal to one for an offer deadline listing and zero otherwise.

The hedonic marketing duration function is:

$$Ln(DOM_i) = \alpha + \gamma OD_i + \tau X_i + \varphi \mathrm{MC_i} + \psi A + \omega + \delta + \epsilon_i$$

where $Ln(DOM_i)$ represents the natural logarithm of the days on market (measure from list date to off market date) of house i. All other variables are as described above for the hedonic price function expect listing density is replaced with marketing competition MC_i.

[15] A test was done to see the difference in results between broker office fixed effects and individual agent fixed effects. The results were consistent to be more granular agent fixed effects are used. Table B.2 and Table B.3 display the results comparing the results.

The third outcome in real estate transactions is probability of sale. The final test will use a probit model to estimate the impact an offer deadline has on the probability of a sale. The probit model to be estimated:

$$P(Sold_i = 1|X_i) = \Phi(\gamma OD_i + \tau X_i + \omega + \delta)$$

The same time invariant of house attributes X_i, month and year interacted temporal fixed effects, ω, and ZIP-code level spatial fixed effects, δ, are used in the probability of sale probit model based on the type of property listings, standard vs. offer deadline.

Results

The results in Table 2.3 display the impact of using an offer deadline listing on transaction prices. Overall, the model fits well, with an adjusted R^2 of 0.90 and the control covariates are as expected. The coefficients on the offer deadline variable indicate that properties sold using an offer deadline listing transact at prices 3.2 percent higher compared to traditional listings, all else being equal. Based on the mean value an offer deadline estimates to have a transaction price of approximately $370,600, which is an increase of roughly $11,700.

Results for the model of days on market are reported in Table 2.4. Indicated by the offer deadline coefficients a reduction in days on market of 33.3 percent is observed compared to traditional listings, all else being equal. The log average days on market for the overall sample is 33.8 days; the log percentage reduction equates to roughly 9.57 days. The results reported in Table 2.3 and Table 2.4 surprisingly provide initial support for the effectiveness of offer deadline listings, as shown in the summary statistics. Offer deadline listings hold up to proper economic controls that result in an increase in transaction price and a decrease in days on market.

The third observable outcome in a housing transaction is the probability of sale. Results for the two probit models (one without agent fixed effects and one with agent fixed effects) estimating this probability are reported in Table 2.5. The probit models were estimated using the same covariates as in Table 2.3 and Table 2.4, except for the type of buyer financing, as this is only observable in the event of a sale. There are a total of 1,075,483 observations in the probit model without agent fixed effects and 406,450 in the model with agent fixed effects. The binary variable for an offer deadline listing, shown in Table 2.5, has the largest coefficient in both models. The large and positive coefficient of 0.654 without agent fixed effects and 0.683 with agent fixed effects indicates that using an offer deadline listing increases the probability of sale more than any other included observable characteristic of the property.

Proper interpretation of the coefficients in a probit model, beyond assessing their direction and relative magnitude, can be complex. However, calculating the marginal effects provides more intuitive insights by showing how changes in the independent variables affect the probability of the outcome. The marginal effects reported in Table 2.6 column (1) indicate that listings with an offer deadline have an 84.4% probability of sale, compared to 66.7% for standard listings without agent fixed effects. Table 2.6 column (3) reports an increase in the probability of sale for both listing types when agent fixed effects are included. The probability of sale is 88.0 percent and 72.8 percent for offer deadline listings and standard listings respectively. Figure 2.2 presents a year-by-year comparison of the probability of sale for these two listing types, demonstrating that the higher probability of sale for offer deadline listings is consistent across all years.

Adoption of Use

An analysis of the sample periods from 2000 to 2021 suggests that the adoption of offer deadline listings may have been inconsequential before 2012. Figure 2.1 displays the total number of offer deadline listings and the proportion of these listings relative to the total listings for each year from 2000 through 2021. Prior to 2012, offer deadlines constituted less than 0.3 percent of total listings and numbered fewer than 100 annually. The total number of offer deadline listings per year exceeded 100 for the first time in 2012.

The limited presence of offer deadline listings in the sample from 2000 to 2011 could introduce bias into the results due to data sparsity or outliers. To assess the impact of these potential biases on the findings reported in Table 2.3 and Table 2.4, the models for transaction price and days on market were re-estimated, restricting the sample to the period from 2012 through 2021. The new summary statistics for the 2012 to 2021 sample and difference in means tests are presented in Table B.9 and Table B.10 respectively. The new sample size is 403,310, a decrease from 747,989. The change in the offer deadline listings for the new sample is minimal, only decreasing from 22,050 to 21,555.

Results from the estimation of the transaction price model using the new sample in Table 2.7 suggest that the original results were biased when using the full sample. The model estimated with the new sample indicates that properties listed with offer deadlines transact at a price that is 2.1 percent higher. This 2.1 percent increase translates to an approximate transaction price increase of $8,500, an increase in the average transaction price from $405,000 to $413,500. Although the average transaction price is larger as compared to the full sample, the percentage increase is reduced by 34.4 percent (3.2% to 2.1%). The reduction in the transaction price increase as a result

of the removal of 495 observations implies the bias was likely the result of outliers and not data sparsity.

The results of the model estimating days on market using the new sample suggest minimal bias due to potential outlier effects. Table 2.8 presents the new estimation results showing a reduction in days on market. Listings with an offer deadline experience a 30.9 percent reduction in days on market compared to standard listings, all else being equal. This translates to a decrease of 8.1 days, from 30.4 days to 22.3 days. The initial results for the entire sample, as shown in Table 2.4, indicated a reduction of 33.3 percent. A test of the difference in coefficients was conducted to ensure no statistically significant difference exists. The test confirmed that the two coefficients are not statistically different at the 1% level. Additionally, the reduced sample resulted in a better model fit, with the adjusted R^2 increasing to 0.39 compared to 0.31 for the full sample. The 495 offer deadline listings were not biasing the results in the days on market model.

Robustness Testing

Due to the lack of randomness of the variables in observational studies, there is a potential for bias. Using the sample from 2012 through 2021 two additional tests are conducted to confirm the results hold. The first is estimation of the price and days on market model with a balanced sample created using propensity score matching (PSM). The second method used is a weighted repeat sales (WRS) model. The construction of the sample in both methods precludes probability of sale testing.

Propensity Score Matching

Cochran and Rubin (1973) review the biases that can result from a lack of random assignment in observational studies and the effectiveness of different correction methods, including matched samples. PSM is employed to create a balanced sample and control for potential bias (Rosenbaum and Rubin 1983; Tucker 2010). The balanced sample is matched without replacement using the following variables: living area, lot size, number of bedrooms, number of bathrooms, property age, property zip code, and the interaction of listing month and year. PSM successfully creates a balanced sample of 41,734. Of the 21,555 offer deadline listings, 20,867 were matched (the Difference in Means Table is reported in Table B.4).

The results for the model estimating $Ln(Price)$ using the PSM sample are reported in Table 2.9. This model shows a 1.8 percent increase in transaction price for properties sold with an offer deadline compared to standard listings, holding all else equal. With an average transaction price of $438,500 in the overall PSM sample, this corresponds to an approximate increase of $8,000 for offer deadline listings to $446,500.

Table 2.10 presents the results of the estimation of $Ln(DOM)$ using the PSM sample. Properties sold with an offer deadline have a 27.1 percent reduction in days on market compared to standard listings, all else being equal. The average days on market for the PSM sample is 27.1 days, so the 27.1 percent reduction translates to approximately 6.4 days. The $Ln(DOM)$ model using the PSM sample demonstrates the best fit among the three models, with a reported adjusted R^2 of 0.42.

These results provide confidence that the observed increase in transaction price and reduction in days on market reported in Table 2.7 and Table 2.8, respectively, are consistent.

Weighted Repeat Sales

PSM is a widely used technique to address potential bias. The availability of computing power has made it much easier to generate a balanced sample using PSM. However, before the advent of powerful computers, testing bias due to using PSM was inconvenient. Mayer (1998) acknowledge the potential for bias and used a WRS methodology (Bailey, Muth and Nourse 1963; Case and Shiller 1988) in his testing the results of real estate auctions. This methodology can also be applied to testing offer deadline listings.

First, all properties that were sold only once between 2012 and 2021 are removed from the sample. Second, properties with a change in listed living area square footage of ±10 percent are excluded. A change of this magnitude could indicate material alterations to the property, meaning that a change in price might not be solely due to the selection of an offer deadline listing. The same filter is applied for changes in lot size; a ±10 percent change in lot size also results in the property being removed from the sample. While WRS models commonly remove or identify new construction, this step is unnecessary here as newly constructed homes have already been filtered from the sample. The final number of observations is 54,251.

Following Mayer (1998) a WRS model is estimated with the following equation:

$$\left(P_{i,t+\tau} - P_{i,t}\right) = A_i'\alpha + \sum_{s=1}^{S} T_i^S \theta^s + \epsilon_i'$$

Where:

$P_{i,t}$ = Log sales price of property i at time t.

$A_i' \left(\equiv A_{i,t+\tau} - A_{i,t}\right)$ = offer deadline dummy variable. $A_t' = 1$ if property i is listed with offer deadline in period $t + \tau$, $A_i' = -1$ if the property is listed with an offer deadline in period

t and $A_i' = 0$ if listed with an offer deadline at both dates or not listed with an offer deadline at all.

$T_i' \left(\equiv T_{i,t+\tau} - T_{i,t}\right) =$ and $Sx1$ vector of time dummy variables, where S equals the number of periods in the sample. $T_i'^s = -1$ when the first sales occurs at time $s = t, T_i'^s = 1$ when the second sale occurs at time $s = t + \tau$ and $T_i'^s = 0$ otherwise.

The results of the WRS model are reported in Table 2.11 and indicate a 1.0 percent increase in transaction price for properties that use an offer deadline listing. The average transaction price is $436,000 with offer deadline listings having a price of $440,400 an increase of $4,400. The is a consistent positive and statistically significant increase in transaction price for offer deadline listings between 1% to 2.1% across the sample period 2012 through 2021.

Spatial Analysis

This next test divides the sample into urban and rural areas due to expected differences in the size of buyer pools in these regions. This distinction can be important, as a larger pool of buyers may increase the arrival rate of buyers and the probability of the seller receiving an offer. The Metropolitan Area Planning Council (MAPC) created a classification system, The Massachusetts Community Types (MCT), to support planning, analysis, and policy development. MCT are based on land use, housing patterns, growth trends, and projected development. There are five MCTs, four of which have two subtypes[16]. Figure B.4 shows the location of each MCT by subtype. For

[16] Summary descriptions are provided in Table B.8.

this analysis, areas were classified as rural (matching the MCT rural type) or urban (all other MCT types)[17].

The geographic distribution of offer deadlines is concentrated in parts of Massachusetts that are closer to the population centers of Greater Boston. The difference in this is evident when comparing the locations of offer deadline listings (Figure 2.4) to standard listings (Figure 2.5). Standard listings extend farther into rural areas in the western part of the state, whereas offer-deadline listings are more common near urban centers. Comparing averages for the urban sample and the 2012-2021 sample, there is no statistically significant difference. Consistent with the 2012-2021 sample, the differences between standard and offer-deadline listings in urban areas are statistically significant (Table B.12). In the rural areas home characteristics such as lot size, age, number of bedrooms and number of bathrooms are not statistically different (Table B.13). Listing prices are not statistically different in rural areas, though sales prices are. Testing the difference in means between the urban area and rural area confirms the differences are statistically significant. One noticeable standout is the difference in average days on market for the two areas (18.33 and 19.16) is not statistically different.

The results demonstrate the impact of an offer deadline listing is the result of properties in the urban area. Table 2.12 displays the results of the models of the two subsamples. Column (1) reports a positive coefficient of 2.1% for offer deadline listings in an urban area. This is the same coefficient from Table 2.7. Offer deadline listings in rural areas have no statistically significant difference in transaction price as displayed in column (3) of Table 2.12. The reported transaction price differences from Table B.13 cannot be attributed to the use of an offer deadline listing.

[17] The OLS models were estimate for each of the 5 MCT and all non-rural displayed consistent results.

The average days on market across the entire state is 30.4 days, with urban areas showing a similar average of 30.3 days. In rural areas, this figure increases to 44.0 days. The results of the two models for the urban and rural area subsamples for days on market are reported in Table 2.13. The coefficient for offer-deadline listings is statistically significant in both models. In urban areas, offer-deadline listings show a reduction in days on market of 31.0% (column (1)). Rural areas display a similar reduction of 28.2% (column (3)). A difference test confirms these two results are not statistically different. Although there is no statistical difference in the percentage change in days on market, the reduction is 8.1 days in urban areas compared to 10.8 days in rural areas. One additional observable difference between the models is that the urban area model in column (1) includes more control variables with significant covariates and has a better fit, as indicated by a higher adjusted R^2 (0.39 vs. 0.27).

One outcome where rural areas show a more significant impact from offer deadlines is the probability of sale. In both areas, the use of an offer deadline listing has the largest impact on the probability of sale. The probability of sale increases the most in rural areas as compared to urban areas. Marginal effects allow for a better interpretation of the results of how the probability of sale compares between offer-deadline and standard listings in the two areas and are reported in Table 2.15. Offer-deadline listings have the highest probability of sale in urban areas, at 89.7%, which is higher than the 81.6% in rural areas. The difference in urban areas is 13.9% higher for offer-deadline listings (89.7 percent vs. 75.8 percent) , while rural areas show a 22.2% difference (81.6 percent vs 59.4 percent) in probability of sale—59.7% higher than the difference in urban areas (Table 2.15).

Real Business Cycles

The final analysis tests how offer deadline listings perform across real business cycles (RBC) in which seasonally adjusted S&P/CoreLogic/Case-Shiller home price index for Boston is changing. Across the entire sample period from 2000 to 2021, six identifiable RBC were observed. The analysis primarily focuses on the two RBC that overlap with the restricted sample period from 2012 to 2021, due to the higher usage of offer deadline listings during this time.

The RBC tests reveal that offer deadline listings have a statistically significant price impact in all periods the change in the market is positive. They reduce days on market across all RBC, with the largest magnitude observed during flat and contracting RBC. Additionally, they consistently result in a higher probability of sale, although this difference diminishes in expanding RBC with increased adoption.

Across the full sample, the Massachusetts market experienced six distinct RBC (difference in means tables are provided in Table B.14 through Table B.19). Figure 2.3 illustrates these RBC using the seasonally adjusted S&P/CoreLogic/Case-Shiller home price index for Boston. The first RBC spans from January 2000 to April 2005, a period of rapid expansion in the housing market, with a continuously compounded annual growth rate of 10.9 percent. Following this, an eleven-month RBC from May 2005 to March 2006 showed minimal change, with a continuously compounded annual growth rate of -0.4 percent. The subsequent interval is a contracting RBC from April 2006 to March 2009 with a continuously compounded annual growth rate of -6.0 percent. This was followed by a three-year RBC from April 2009 to April 2012, with a continuously compounded annual growth rate of 0.04 percent. The next RBC, covering May 2012 to May 2019, is characterized by gradual price appreciation, with a continuously compounded

growth rate of 5.4 percent. The final RBC, from January 2020 to December 2021, displayed rapid expansion, with a continuously compounded growth rate of 11.7 percent.

Period of Rapid Price Increase

In the first market, there were 192 offer deadline listings[18]. Results reported in Table 2.16 show that, all else being equal, offer deadline listings have a transaction price that is 4.6 percent, or $13,800, greater than standard listings, with a reduction in days on market of 44.4 percent, or 11.1 days. This large coefficient in the estimation of $Ln(Price)$ and small amount of offer deadline listings is believed to be influencing the results from Table 2.3.

Period of Steady State

The eleven-month static market that follows had only 32 offer deadline listings[19]. No significant transaction price difference between offer deadline listings and standard listings is observed as displayed in Table 2.17. The impact on days on market is statistically significant, with a reduction of 58.2 percent, equivalent to 19.6 days. During this period having marginal change in the index and lower overall offer deadline listings only a small number of the control covariates have statistically significant coefficients.

Period of Price Decrease

The contractionary market brings an increase in the total number of offer deadline listings compared to the prior cycle with 69 offer deadline listings[20]. Shown in Table 2.18 the difference

[18] Table B.14: Difference in Means Period of Rapid Price Increase January 2000 – April 2005
[19] Table B.15: Difference in Means Period of Steady State May 2005 – March 2006
[20] Table B.16: Difference in Means Period of Price Decrease April 2006 – March 2009

in average transaction price is not statistically significant once all property characteristics are controlled for. However, the difference in days on market is statistically significant, with a reduction of 82.2 percent (28.48 days) compared to standard listings.

Period of Steady State

The subsequent market, with no change in the index, had 258 offer deadline listings, the most of any cycle so far[21]. Differing from the results shown in Table 2.17, the results from this cycle in Table 2.19 show a statistically significant impact on transaction price due to the use of an offer deadline listing of 3.7 percent, equating to a $12,500 price increase. The reduction in days on market for offer deadline listings remains statistically significant at 56.6 percent (21.19 days).

Period of Price Expansion and Period of Rapid Price Expansion

The final two markets almost perfectly align with the increased adoption of offer deadline listings. The 5th and 6th markets deconstruct the results from Table 2.7 and Table 2.8. The 5th index market contains 9,787 offer deadline listings. The average transaction price for an offer deadline listing and standard listing was $525,200 and $449,000 respectively, a difference of $76,200 (first market with a difference under $100,000). This represents a 16.9 percent premium for the use of an offer deadline. Table 2.20 presents the results of the impact due to the use of offer deadline listings, revealing a statistically significant increase in transaction price of 2.3 percent or $8,800. Table B.18 shows the average days on market as 20.53 and 54.73 for offer deadline and standard listings respectively. This difference in average days on market implies offer deadline

[21] Table B.17: Difference in Means Period of Steady State Market April 2009 – April 2012

listings are on the market for 62.5 percent fewer days . The results of the model displayed in Table 2.20 suggests that the days on market are reduced by 38.0 percent or 10.85 days.

The final market is 24 months long, during which time the overall change in the seasonally adjusted S&P/CoreLogic/Case-Shiller home price index for Boston is an increase of 26.5 percent[22]. The average transaction price over this period between offer deadline listings and standard listings was $559,200 and $593,000 respectively, a difference of $33,800 (Table B.19). The first instance of the average price being lower for an offer deadline listing. The difference in average days on market is down to 13.3 days (29.7 vs. 16.4). In this short two-year period, there were 11,712 offer deadline listings, about one for every five standard listings. Offer deadline listings, all else being equal, show an increase in transaction price of 1.7 percent or $8,800. Consistent with prior reported results, the use of an offer deadline is estimated to reduce the days on market. The reduction in this most recent economic cycle is 22.0 percent or about 3.81 days. This result is the smallest observed reduction in days on market, both in percent and days, across all tests.

Results Summary

The analysis of offer deadline listings in the Massachusetts real estate market from 2000 to 2021 reveals significant advantages for properties utilizing this strategy. No matter how the sample is constructed, full sample (2000-2021), reduced sample (2012-2021), by real business cycle, or year by year, there is a constant; the probability of sale for offer deadline listings is higher than for standard listings. The change is the difference between the probability of sale between the two listing types. A greater use of offer deadline listings leads to a smaller difference in the

[22] Index level was 227.50 in January 2021 and 287.71 in December 2021. Base of 100 in January 2000.

probability of sale between an offer deadline listing and a standard listing. Figure 2.2 shows the difference in the probability of sale by year and Figure B.1 shows it by real business cycle. The smallest difference is in the last year of the sample, which has the highest percentage of listings using offer deadlines.

The study also highlights that prior to 2011, the presence of offer deadline listings was minimal, constituting less than 0.5% of total listings. The increased usage of this strategy correlates with a period of gradual price appreciation in the housing market, suggesting that offer deadline listings may be a strategic tool for sellers aiming to maximize sale prices and minimize time on the market. Overall, the results underscore the effectiveness of offer deadline listings in enhancing transaction outcomes.

Conclusion

Sellers aim to maximize transaction price and minimize days on market with the highest probability of sale. Over a 22-year sample period, properties listed using an offer deadline listing outperformed standard listings in transaction price, days on market, and probability of sale. Brokers can advertise that, on average, offer deadline listings sell 6 percent over list price, have a reduction in days on market of 31.7 days, and a 95.6 percent probability of sale. This study analyzed the statistical significance of an offer deadline listing, the outcome with increased adoption, locational concentration effects and the impact across real business cycles on transaction price, days on market and probability of sale.

There is no evidence to suggest that using an offer deadline listing negatively impacts a seller. Transaction prices for offer deadline listings are higher by 1.0 percent to 4.6 percent, days on market are reduced by 22.0 percent to 82.2 percent as compared to standard listings. The difference in probability of sale between offer deadline listings and standard listings ranges from

6 percent to 31 percent. All else being equal, if the worst result is a higher probability of sale, a reduction in days on market, and obtaining the same transaction price for a certain seller with particular characteristics, using an offer deadline should be given serious consideration.

The useage of offer deadline listings during the first 12 years of the sample is less than 100 per year and under 1 percent of total listings. During those 12 years the average offer deadline listing sold for $541,600 and a standard listing sold for $379,900, a difference of $161,700. Over the years 2012 through 2021 the average sales price is $534,000 and $484,700 for offer deadline and standard listings respectively, a difference of only $49,300. A comparrison between the results over the entire sample period and a period from 2012 through 2021 show the possibility of bias. The coefficients on the offer deadline variable indicate an increase in transaction price of 3.2 percent that drops to 2.1 percent over the period 2012 though 2021. There does appear to be differences as more proeprties are sold using offer deadline listings.

The difference in results between the urban area and the rural area is varied. Transaction price is only significant in urban areas. Days on market is significant in both areas but there is no statistical difference in the impact across the two areas. Rural areas have a larger increase in probability of sale but urban areas have the largest overall profitability of sale for an offer deadline listing.

Results across RBC produced some consistent results. Across the six cycles, offer deadline listings had a reduction in days on market between 3.81 days in a period rapid price increase to 28.48 days in a steady state market. The difference in probability of sale displays a similar pattern, it is always greater for an offer deadline listing (differnce ranged from 8 to 30 percent). The final outcome, sales price, is not as consistently statisitcally significant. During one steady state market sales price for an offer deadline listings is not significantly different from a standard listing but is

in the other. In each of the period of price increase offer deadline listings display an increase in sales price, 4.6 percent during the earliest and 1.7 percent in the final market.

This study seeks to add to the literature in two ways. First to the literature on offer deadlines. The literature on deadline in residential listings is thin. The few studies on deadline reference other types of deadlines in the sales process. The popular press has provided more coverage of offer deadlines in recent years. This alternative listing method shows the potential to impact all three of the outcomes in a real estate transaction; transaction price, days on market and probabiltiy of sale. The significance and magnitude are dependent on usage and market conditions.

The second contribution is to studies about real estate markets specificically those on “hot” and “cold” markets. The result support differences in performance in “hot” and “cold” markets. Looking to expand the study of real estate markets the performance of offer deadline listings in steady state markets is analyzed. Two of the three outcomes, days on market and probability of sale, are still significant in both of the steady state markets in the study.

The presence of an offer deadline listing and the observed results of higher transaction price, reduction in days on market, and increased probability of sale could be due to potential signaling. Sellers potentially let buyers know the posted list price is their true reservation price, and as long as there is at least one offer at or above the posted list price, the seller will accept that offer. Sellers who are price phishing or using the posted list price as part of their selling strategy could reject an offer at the posted list price. During the recent rapidly expanding economic cycle, if a seller observes a large majority of properties selling over the list price, they could set the list price artificially low, lower than their reservation price, in an attempt to create a bidding war. With an offer deadline, sellers could be setting the list price at their true reservation price, and buyers

believe this to be the case. In turn, these properties become their first-choice properties to view and make offers on.

The mechanics and expected outcomes observed in offer deadline listings share similarities with a first-price sealed bid auction. The difference between an offer deadline listing and a first-price sealed bid auction is that sellers are not bound to any stated or unstated reservation price[23], and buyers have no formal commitment to pay their offer price[24] before signing a purchase and sale agreement. The lack of binding can lead to an informal auction or a bidding war (Duranton, Henderson and Strange 2015; Han and Strange 2014). Subsequent negotiations post-deadline expiration between the sellers and multiple buyers could explain the positive price result observed. First price sealed bid auctions for items such as real estate where each bidder is required to form an indvidual estimate of value can exhibit higher winning bids in the form of a winner's curse.

In conclusion this study demonstrates the statistical differences between an offer deadline listing and a standard listing. Recent markets have seen an increase in the use of offer deadline listings. Despite this increase, the results show that offer deadline listings lead to higher transaction prices, shorter days on market, and a higher probability of sale. Across all tests and markets, no results suggested that the outcome of an offer deadline listing was less favorable than that of a standard listing for the seller.

[23] Example: eBay listings require a sale if there is a bid or a stated reserve price is met
[24] Example: eBay buyers must purchase if a bid is made or bid meets stated reserve price

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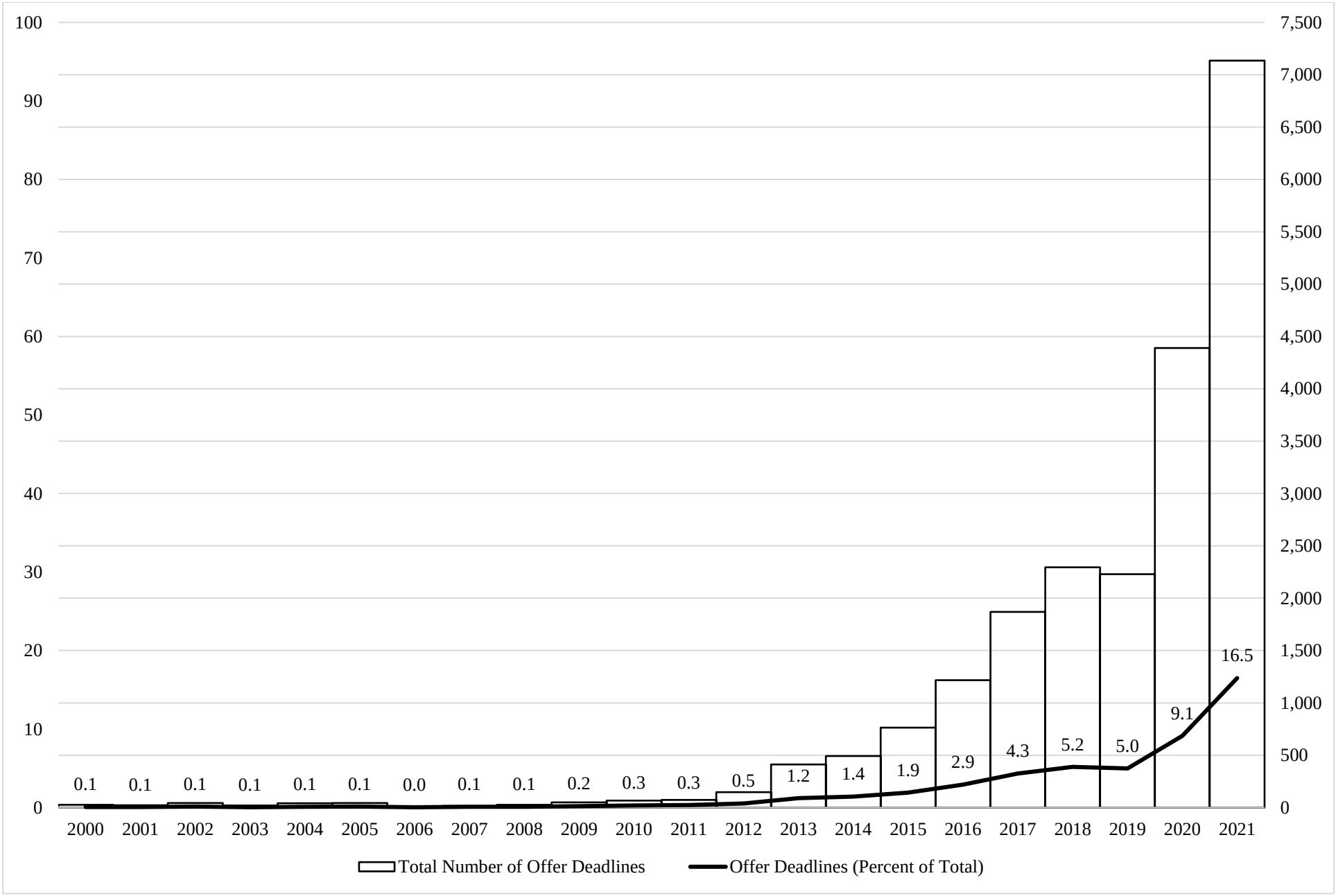

Figure 2.1: Usage of Offer Deadline Listings by Year

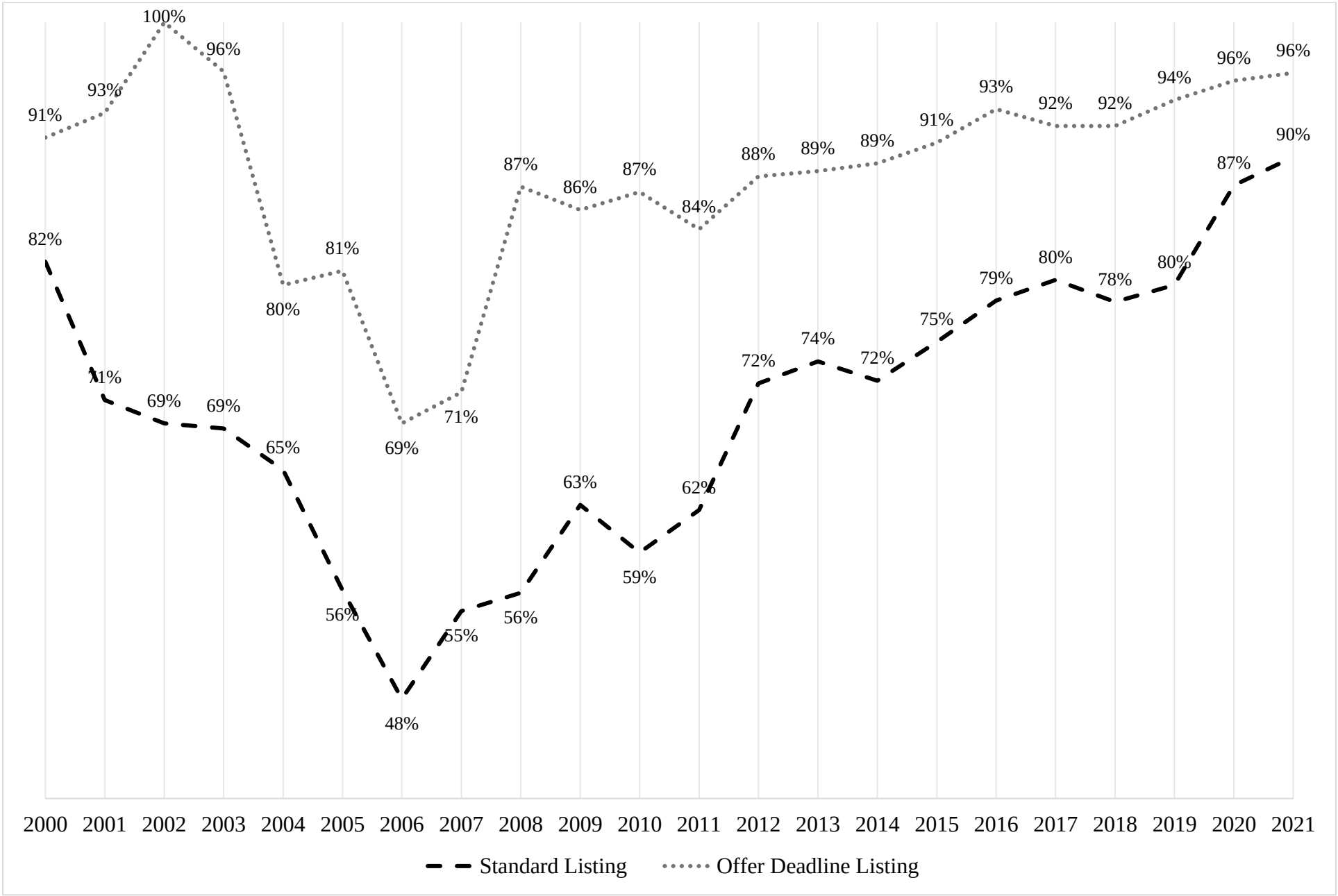

Figure 2.2: Probability of Sale by Year

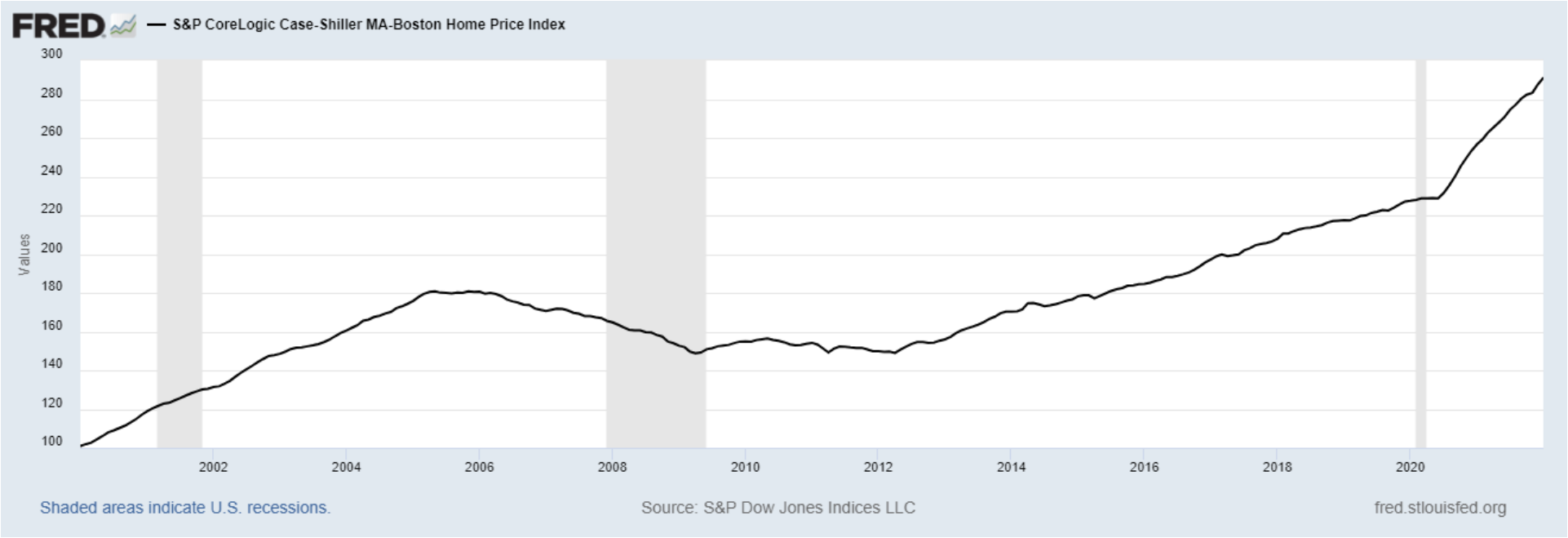

Figure 2.3: Boston Home Price Index (Seasonally Adjusted)

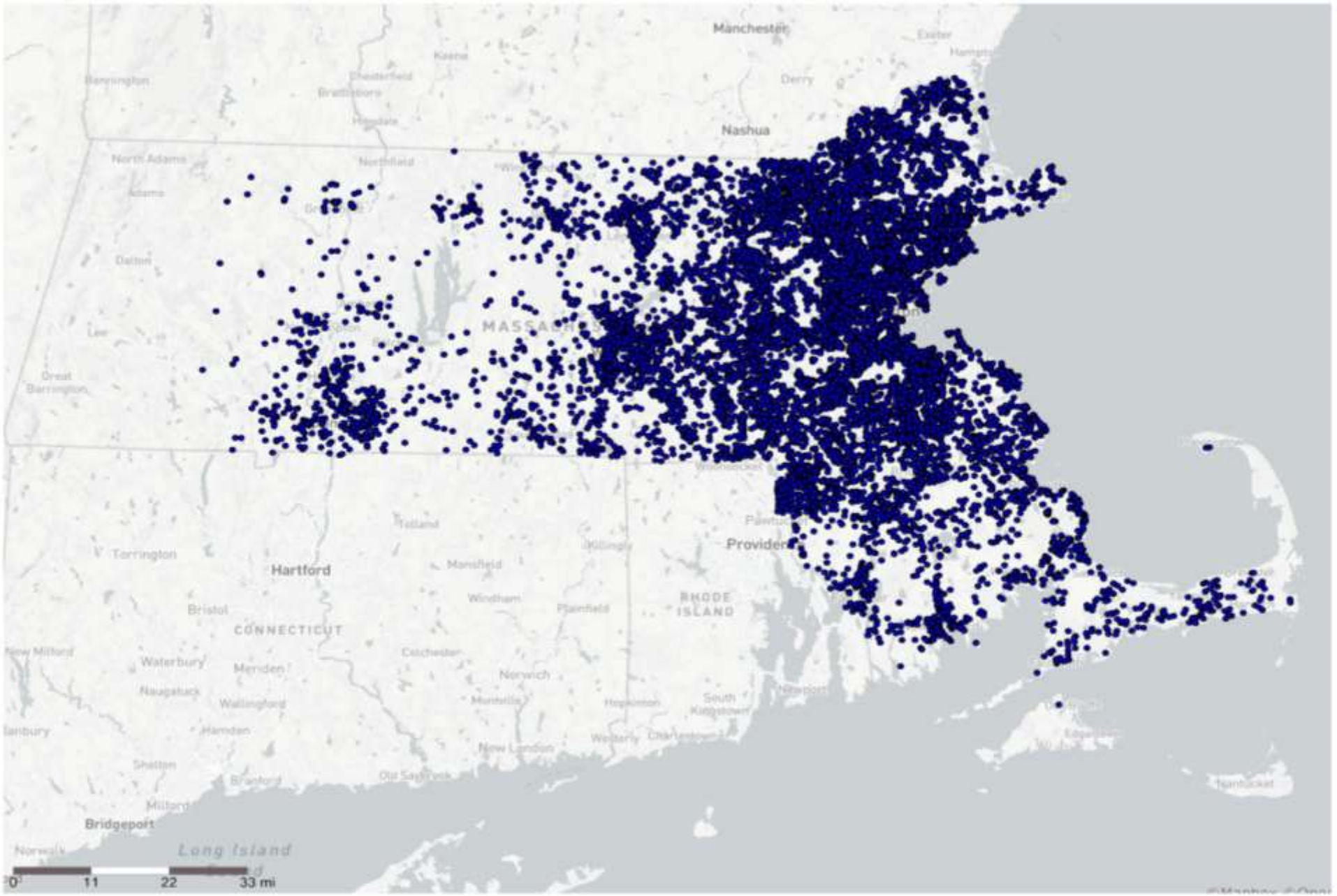

Figure 2.4: Location of Offer Deadline Listings

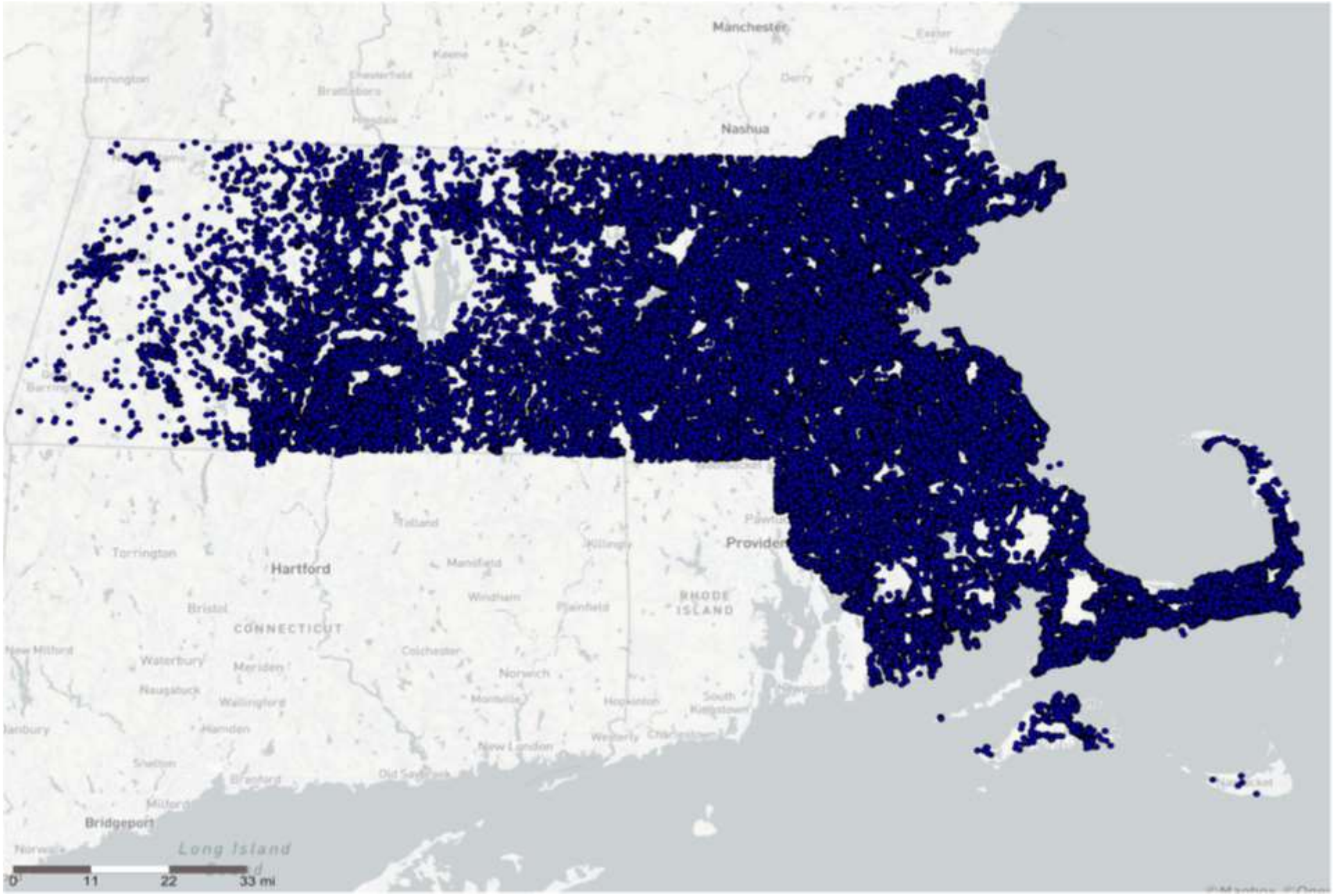

Figure 2.5: Location of Standard Listings

Table 2.1: Descriptive Statistics

	Pooled Sample				Standard-Listing Sample				Offer Deadline Sample			
	Mean	Std. Dev.	Minimum	Maximum	Mean	Std. Dev.	Minimum	Maximum	Mean	Std. Dev.	Minimum	Maximum
List Price at Sale	437,934	338,515	65,000	5,995,000	435,011	339,777	65,000	5,995,000	534,186	277,262	66,000	3,650,000
Sales Price	430,886	328,317	65,000	5,000,000	426,790	328,311	65,000	5,000,000	565,732	298,635	65,000	3,958,000
Sale Price to List Price Ratio	0.98	0.05	0.61	1.51	0.98	0.05	0.61	1.51	1.06	0.06	0.68	1.50
Offer Deadline	0.03	0.17	-	1	-	-	-	-	1	-	1	1
Days on Market	54.9	53.1	1	270	56.0	53.4	1	270	18.5	16.1	1	243
Living Area (Sqft)	1,909	896	500	9,998	1,910	901	500	9,998	1,886	750	510	8,286
Lot Size (Sqft)	26,865	38,776	599	435,600	27,055	39,015	599	435,600	20,613	29,164	824	435,600
Age	58.2	36.5	2	211	57.9	36.5	2	211	68.2	34.4	2	211
Number of Bedrooms	3.32	0.83	1	9	3.32	0.84	1	9	3.30	0.77	1	9
Number of Bathrooms	2.18	0.98	1	8	2.18	0.98	1	8	2.18	0.87	1	8
Remodeled/Renovated	0.09	0.28	-	1	0.08	0.28	-	1	0.15	0.36	-	1
New Roof	0.07	0.25	-	1	0.06	0.25	-	1	0.07	0.26	-	1
Stone Counters	0.06	0.24	-	1	0.06	0.24	-	1	0.12	0.32	-	1
In-Law Apartment	0.05	0.22	-	1	0.05	0.22	-	1	0.05	0.21	-	1
Security/Smart Home	0.02	0.13	-	1	0.02	0.14	-	1	0.01	0.12	-	1
Country Club	0.01	0.08	-	1	0.01	0.08	-	1	0.01	0.09	-	1
Rental	0.01	0.12	-	1	0.01	0.12	-	1	0.01	0.10	-	1
Vacant	0.01	0.10	-	1	0.01	0.10	-	1	0.01	0.09	-	1
Estate	0.01	0.11	-	1	0.01	0.11	-	1	0.02	0.15	-	1
Flat Fee	0.02	0.12	-	1	0.02	0.13	-	1	0.01	0.07	-	1
Waterfront	0.03	0.18	-	1	0.03	0.18	-	1	0.02	0.14	-	1
HOA	0.04	0.19	-	1	0.04	0.19	-	1	0.02	0.15	-	1
Conventional Financing	0.85	0.36	-	1	0.85	0.36	-	1	0.82	0.38	-	1
Cash Financing	0.06	0.24	-	1	0.06	0.24	-	1	0.09	0.29	-	1
FHA Financing	0.08	0.27	-	1	0.08	0.27	-	1	0.07	0.25	-	1
VA Financing	0.02	0.13	-	1	0.02	0.13	-	1	0.02	0.13	-	1
Listing Density	1.23	1.54	-	26.2	1.24	1.56	-	26.2	0.76	0.94	-	12.3
Market Competition	73.47	169.30	-	32,975.0	75.24	171.45	-	32,975.0	15.45	32.99	-	1,557.7
Observations	747,989				725,939				22,050			

Table 2.2 :Difference in Means

	Standard Listing	Offer Deadline	Difference	Standard Error	*t*-value	*p*-value
List Price at Sale	435,011	534,186	99,175	1,909	(51.95)	0.00
Sales Price	426,790	565,732	138,942	2,048	(67.85)	0.00
Sale Price to List Price Ratio	0.98	1.06	0.08	0.00	(178.95)	0.00
Days on Market	55.97	18.47	(37.5)	0.13	299.00	0.00
Living Area (Sqft)	1,910	1,886	(24.6)	5.16	4.75	0.00
Lot Size (Sqft)	27,055	20,613	(6,442)	201.7	31.95	0.00
Age	57.946	68.214	10.268	0.25	(43.60)	0.00
Number of Bedrooms	3.32	3.30	(0.02)	0.01	3.45	0.00
Number of Bathrooms	2.18	2.18	(0.00)	0.01	0.60	0.55
Remodeled/Renovated	0.08	0.15	0.07	0.00	(28.70)	0.00
New Roof	0.07	0.07	0.01	0.00	(5.05)	0.00
Stone Counters	0.06	0.12	0.06	0.00	(26.45)	0.00
In-Law Apartment	0.05	0.05	(0.01)	0.00	3.15	0.00
Security/Smart Home	0.02	0.01	(0.01)	0.00	5.85	0.00
Country Club	0.01	0.01	0.00	0.00	(3.35)	0.00
Rental	0.01	0.01	(0.00)	0.00	4.60	0.00
Vacant	0.01	0.01	(0.00)	0.00	3.25	0.00
Estate	0.01	0.02	0.01	0.00	(9.80)	0.00
Flat Fee	0.02	0.01	(0.01)	0.00	22.40	0.00
Waterfront	0.03	0.02	(0.02)	0.00	15.75	0.00
HOA	0.04	0.02	(0.01)	0.00	14.80	0.00
Conventional Financing	0.85	0.82	(0.02)	0.00	9.05	0.00
Cash Financing	0.06	0.09	0.03	0.00	(16.20)	0.00
FHA Financing	0.08	0.07	(0.01)	0.00	5.25	0.00
VA Financing	0.02	0.02	0.00	0.00	(0.90)	0.36
Listing Density	1.24	0.76	(0.48)	0.01	73.00	0.00
Market Competition	75.24	15.45	(59.79)	0.30	199.45	0.00
Standard Listing Observations	725,939					
Offer Deadline Listing Observations	22,050					

Table 2.3: Transaction Price

	Ln(Price)	*t*-statistic
Offer Deadline	0.032**	(22.24)
Ln(Square Feet)	0.388**	(361.41)
Ln(Lot Size)	0.058**	(163.34)
Ln(Bedrooms)	0.064**	(53.25)
Ln(Bathrooms)	0.127**	(159.44)
Ln(Age)	-0.068**	(-197.68)
Cash Financing	-0.070**	(-72.90)
FHA Financing	-0.014**	(-16.07)
VA Financing	-0.000	(-0.04)
Rental	-0.030**	(-15.56)
Vacant	-0.036**	(-16.17)
Estate	-0.105**	(-52.23)
Flat Fee	0.033**	(11.50)
Waterfront	0.212**	(168.13)
HOA	0.047**	(36.48)
Atypical: Large Home	0.109**	(66.63)
Atypical: Large Lot	-0.001	(-0.51)
Atypical: Many Baths	0.136**	(45.26)
Atypical: Many Bedrooms	-0.001	(-0.36)
Atypical: Older Home	0.036**	(16.19)
Country Club	0.038**	(12.92)
Security/Smart Home	0.034**	(20.48)
New Roof	0.018**	(20.31)
In-Law Apartment	-0.042**	(-40.14)
Stone Counters	0.051**	(53.79)
Listing Density	-0.008**	(-43.74)
Observations	735,835	
Adjusted R^2	0.90	
ZIP Code FE	✓	
Month x Year FE	✓	
Agent FE	✓	

The table presents the OLS equation modeling the natural log of prices. The time period of the sample represented is from 2000-2021. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.4: Days on Market

	Ln(DOM)	*t*-statistic
Offer Deadline	-0.333**	(-48.18)
Ln(Square Feet)	0.230**	(44.12)
Ln(Lot Size)	0.040**	(23.27)
Ln(Bedrooms)	-0.012*	(-2.04)
Ln(Bathrooms)	0.032**	(8.24)
Ln(Age)	0.018**	(10.60)
Cash Financing	-0.162**	(-34.92)
FHA Financing	0.075**	(17.10)
VA Financing	0.094**	(11.22)
Rental	0.119**	(12.46)
Vacant	0.114**	(10.46)
Estate	-0.044**	(-4.50)
Flat Fee	-0.006	(-0.42)
Waterfront	0.133**	(21.73)
HOA	0.040**	(6.35)
Atypical: Large Home	0.131**	(16.52)
Atypical: Large Lot	0.033**	(2.66)
Atypical: Many Baths	0.089**	(6.10)
Atypical: Many Bedrooms	0.102**	(10.07)
Atypical: Older Home	0.137**	(12.84)
Country Club	0.030*	(2.10)
Security/Smart Home	0.029**	(3.53)
New Roof	0.028**	(6.33)
In-Law Apartment	0.116**	(23.01)
Stone Counters	-0.023**	(-4.99)
Market Competition	0.002**	(319.04)
Observations	735,835	
Adjusted R^2	0.31	
ZIP Code FE	✓	
Month x Year FE	✓	
Agent FE	✓	

The table presents the OLS equation modeling the natural log of days on market. The time period of the sample represented is from 2000-2021. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.5: Probability of Sale

	(1) Coefficients	(2) *t*-statistic	(3) Coefficients	(4) *t*-statistic
Offer Deadline	0.654**	(41.36)	0.683**	(38.25)
Living Area (Sqft)	-0.000**	(-43.79)	-0.000**	(-30.86)
Lot Size (Sqft)	-0.000**	(-5.63)	-0.000**	(-5.74)
Number of Bedrooms	-0.017**	(-7.50)	0.007	(1.78)
Number of Bathrooms	-0.036**	(-15.18)	-0.040**	(-9.50)
Rental	-0.414**	(-40.64)	-0.450**	(-24.77)
Vacant	-0.060**	(-4.60)	-0.036	(-1.42)
Estate	0.571**	(33.48)	0.517**	(18.13)
Flat Fee	-0.481**	(-54.06)	-0.218**	(-7.40)
Waterfront	-0.234**	(-35.70)	-0.211**	(-17.32)
HOA	-0.138**	(-20.01)	-0.262**	(-20.79)
Atypical: Large Home	0.013	(1.37)	0.006	(0.42)
Atypical: Large Lot	-0.108**	(-6.01)	-0.075*	(-2.39)
Atypical: Many Baths	0.063**	(4.15)	0.042	(1.80)
Atypical: Many Bedrooms	-0.064**	(-5.73)	-0.109**	(-5.81)
Atypical: Older Home	-0.080**	(-2.67)	-0.069	(-1.38)
Country Club	-0.087**	(-5.07)	-0.109**	(-4.12)
Security/Smart Home	0.014	(1.47)	-0.006	(-0.38)
New Roof	0.003	(0.48)	0.034**	(3.56)
In-Law Apartment	-0.207**	(-37.30)	-0.174**	(-18.60)
Stone Counters	0.091**	(15.31)	0.034**	(3.76)
Constant	1.486**	(8.88)	1.448**	(3.13)
Observations	1,075,483		406,540	
ZIP Code FE	✓		✓	
Month x Year FE	✓		✓	
Agent FE			✓	

The table presents the equation modeling the probability of sale using a probit model. Column (1) does not contain agent fixed effects. Column (3) contains agent fixed effects. The time period sample represented is from 2000-2021. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.6: Probability of Sale Marginals

	(1) Marginals	(2) *z*-statistic	(3) Marginals	(4) *z*-statistic
Standard Listing	0.667**	(1,561.93)	0.728**	(1,331.39)
Offer Deadline Listing	0.844**	(251.56)	0.880**	(297.81)
Observations	1,075,483		406,540	

The table presents the probability of sale marginals. Column (1) does not contain agent fixed effects. Column (3) contains agent fixed effects. The time period sample represented is from 2000-2021. Robust *z*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.7: Transaction Price – 2012 to 2021 Sample

	Ln(Price)	*t*-statistics
Offer Deadline	0.021**	(14.76)
Ln(Square Feet)	0.388**	(265.47)
Ln(Lot Size)	0.049**	(102.66)
Ln(Bedrooms)	0.069**	(42.19)
Ln(Bathrooms)	0.127**	(116.42)
Ln(Age)	-0.072**	(-140.95)
Cash Financing	-0.073**	(-65.61)
FHA Financing	-0.004**	(-3.58)
VA Financing	0.012**	(6.05)
Rental	-0.028**	(-12.07)
Vacant	-0.042**	(-13.34)
Estate	-0.102**	(-42.25)
Flat Fee	0.045**	(9.23)
Waterfront	0.234**	(137.56)
HOA	0.047**	(27.96)
Atypical: Large Home	0.084**	(41.66)
Atypical: Large Lot	-0.004	(-1.18)
Atypical: Many Baths	0.125**	(34.87)
Atypical: Many Bedrooms	-0.018**	(-6.29)
Atypical: Older Home	0.022**	(7.69)
Country Club	0.032**	(8.89)
Security/Smart Home	0.039**	(17.38)
New Roof	0.020**	(17.89)
In-Law Apartment	-0.041**	(-30.29)
Stone Counters	0.049**	(46.57)
Listing Density	-0.008**	(-26.47)
Observations	394,701	
Adjusted R^2	0.90	
ZIP Code FE	✓	
Month x Year FE	✓	
Agent FE	✓	

The table presents the OLS equation modeling the natural log of prices. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.8: Days on Market – 2012 to 2021 Sample

	Ln(DOM)	*t*-statistic
Offer Deadline	-0.309**	(-48.93)
Ln(Square Feet)	0.214**	(33.05)
Ln(Lot Size)	0.055**	(26.45)
Ln(Bedrooms)	-0.047**	(-6.44)
Ln(Bathrooms)	0.016**	(3.39)
Ln(Age)	0.012**	(5.49)
Cash Financing	-0.165**	(-33.28)
FHA Financing	0.086**	(16.76)
VA Financing	0.102**	(12.08)
Rental	0.123**	(11.99)
Vacant	0.112**	(8.15)
Estate	-0.022*	(-2.07)
Flat Fee	-0.004	(-0.19)
Waterfront	0.145**	(19.28)
HOA	0.054**	(7.27)
Atypical: Large Home	0.156**	(17.51)
Atypical: Large Lot	0.046**	(3.14)
Atypical: Many Baths	0.093**	(5.84)
Atypical: Many Bedrooms	0.136**	(10.96)
Atypical: Older Home	0.137**	(10.80)
Country Club	0.043**	(2.76)
Security/Smart Home	0.022*	(2.16)
New Roof	0.020**	(3.99)
In-Law Apartment	0.115**	(19.07)
Stone Counters	-0.020**	(-4.26)
Market Competition	0.004**	(275.81)
Observations	394,701	
Adjusted R^2	0.39	
ZIP Code FE	✓	
Month x Year FE	✓	
Agent FE	✓	

The table presents the OLS equation modeling the natural log of days on market. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.9: Transaction Price - Propensity Score Matched

	Ln(Price)	*t*-statistic
Offer Deadline	0.018**	(11.02)
Ln(Square Feet)	0.359**	(89.62)
Ln(Lot Size)	0.047**	(34.13)
Ln(Bedrooms)	0.082**	(18.73)
Ln(Bathrooms)	0.113**	(39.59)
Ln(Age)	-0.056**	(-38.84)
Cash Financing	-0.069**	(-24.17)
FHA Financing	-0.007*	(-1.96)
VA Financing	0.001	(0.12)
Rental	-0.041**	(-5.71)
Vacant	-0.029**	(-3.48)
Estate	-0.083**	(-14.76)
Flat Fee	0.027	(1.60)
Waterfront	0.155**	(28.73)
HOA	0.047**	(8.30)
Atypical: Large Home	0.082**	(12.06)
Atypical: Large Lot	-0.011	(-0.82)
Atypical: Many Baths	0.095**	(5.63)
Atypical: Many Bedrooms	-0.040**	(-4.72)
Atypical: Older Home	0.009	(1.04)
Country Club	0.023**	(2.63)
Security/Smart Home	0.028**	(4.15)
New Roof	0.016**	(5.33)
In-Law Apartment	-0.030**	(-8.01)
Stone Counters	0.047**	(18.85)
Listing Density	-0.009**	(-8.89)
Observations	40,342	
Adjusted R^2	0.90	
ZIP Code FE	✓	
Month x Year FE	✓	
Agent FE	✓	

The table presents the OLS equation modeling the natural log of prices using a balanced sample. The time period of the sample represented is from 2012-2021. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.10: Days on Market - Propensity Score Match

	Ln(DOM)	*t*-statistic
Offer Deadline	-0.271**	(-39.12)
Ln(Square Feet)	0.040*	(2.42)
Ln(Lot Size)	0.026**	(4.66)
Ln(Bedrooms)	-0.017	(-0.94)
Ln(Bathrooms)	0.026*	(2.14)
Ln(Age)	0.024**	(3.95)
Cash Financing	-0.129**	(-10.75)
FHA Financing	0.061**	(4.36)
VA Financing	0.079**	(3.36)
Rental	0.075*	(2.48)
Vacant	0.124**	(3.52)
Estate	0.015	(0.64)
Flat Fee	0.109	(1.53)
Waterfront	0.105**	(4.65)
HOA	0.001	(0.05)
Atypical: Large Home	0.120**	(4.20)
Atypical: Large Lot	0.033	(0.63)
Atypical: Many Baths	0.073	(1.04)
Atypical: Many Bedrooms	0.101**	(2.84)
Atypical: Older Home	0.068*	(1.97)
Country Club	0.003	(0.09)
Security/Smart Home	0.060*	(2.16)
New Roof	0.019	(1.54)
In-Law Apartment	0.057**	(3.61)
Stone Counters	-0.009	(-0.87)
Market Competition	0.007**	(85.05)
Observations	40,342	
Adjusted R^2	0.42	
ZIP Code FE	✓	
Month x Year FE	✓	
Agent FE	✓	

The table presents the OLS equation modeling the natural log of days on market using a balanced sample. The time period of the sample represented is from 2012-2021. Robust t-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.11: Weighted Repeat Sales

	Coefficient	*t*-statistic
Offer Deadline	0.010**	(2.83)
2013	0.080**	(21.41)
2014	0.148**	(39.70)
2015	0.200**	(54.99)
2016	0.266**	(74.63)
2017	0.340**	(94.67)
2018	0.403**	(111.83)
2019	0.459**	(128.95)
2020	0.557**	(158.38)
2021	0.712**	(200.23)
Observations	54,251	
R^2	0.63	

The dependent variable for the repeat sale equations if the difference in log transaction prices between the first and second sale. all equations contain dummies for the year of sale. Robust *t*-statistics are in parentheses. ** and * denote *p*-values <0.01 and <0.05 respectively.

Table 2.12: Transaction Price - Urban vs. Rural

	(1) Ln(Price)	(2) *t*-statistic	(3) Ln(Price)	(4) *t*-statistic
Offer Deadline	0.021**	(14.70)	0.012	(0.35)
Ln(Square Feet)	0.388**	(264.58)	0.412**	(24.18)
Ln(Lot Size)	0.049**	(102.43)	0.049**	(8.94)
Ln(Bedrooms)	0.069**	(42.32)	0.031	(1.70)
Ln(Bathrooms)	0.127**	(115.68)	0.160**	(11.59)
Ln(Age)	-0.071**	(-139.50)	-0.094**	(-15.18)
Cash Financing	-0.074**	(-65.52)	-0.045**	(-4.02)
FHA Financing	-0.004**	(-3.26)	-0.020	(-1.31)
VA Financing	0.011**	(5.75)	0.043*	(2.16)
Rental	-0.028**	(-12.01)	-0.056*	(-2.15)
Vacant	-0.041**	(-13.10)	-0.057	(-1.01)
Estate	-0.102**	(-42.34)	-0.115*	(-2.55)
Flat Fee	0.045**	(9.20)	0.196*	(2.32)
Waterfront	0.233**	(135.16)	0.248**	(18.46)
HOA	0.047**	(27.83)	0.043*	(2.48)
Atypical: Large Home	0.084**	(41.92)	0.076	(1.64)
Atypical: Large Lot	-0.008*	(-2.34)	0.025	(1.70)
Atypical: Many Baths	0.125**	(35.14)	0.108	(1.34)
Atypical: Many Bedrooms	-0.018**	(-6.31)	-0.054	(-1.01)
Atypical: Older Home	0.023**	(7.94)	0.044	(1.94)
Country Club	0.032**	(9.05)	-0.184	(-1.21)
Security/Smart Home	0.039**	(17.49)	0.029	(0.60)
New Roof	0.020**	(18.02)	0.007	(0.46)
In-Law Apartment	-0.041**	(-30.30)	-0.033	(-1.52)
Stone Counters	0.048**	(46.33)	0.099**	(5.25)
Listing Density	-0.008**	(-26.51)	0.011	(1.05)
Observations	389,362		4,504	
Adjusted R^2	0.90		0.76	
Month x Year FE	✓		✓	
ZIP Code FE	✓		✓	
Agent FE	✓		✓	

The table presents the OLS equation modeling the natural log of prices. Column (1) is for urban areas and column (3) is for rural areas. The time period of the sample represented is from 2012-2021. Robust t-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.13: Days on Market - Urban vs. Rural

	(1) Ln(DOM)	(2) *t*-statistic	(3) Ln(DOM)	(4) *t*-statistic
Offer Deadline	-0.310**	(-49.06)	-0.282*	(-2.08)
Ln(Square Feet)	0.212**	(32.51)	0.289**	(4.42)
Ln(Lot Size)	0.055**	(26.21)	0.028	(1.35)
Ln(Bedrooms)	-0.045**	(-6.22)	-0.080	(-1.13)
Ln(Bathrooms)	0.016**	(3.32)	0.029	(0.54)
Ln(Age)	0.012**	(5.44)	0.008	(0.36)
Cash Financing	-0.167**	(-33.41)	-0.055	(-1.28)
FHA Financing	0.085**	(16.56)	0.153**	(2.62)
VA Financing	0.103**	(12.01)	0.103	(1.35)
Rental	0.124**	(12.05)	0.072	(0.71)
Vacant	0.110**	(7.95)	0.141	(0.65)
Estate	-0.022*	(-2.09)	0.094	(0.54)
Flat Fee	-0.007	(-0.34)	-0.393	(-1.21)
Waterfront	0.147**	(19.23)	0.010	(0.19)
HOA	0.053**	(7.14)	0.035	(0.52)
Atypical: Large Home	0.157**	(17.68)	-0.112	(-0.63)
Atypical: Large Lot	0.050**	(3.15)	0.026	(0.47)
Atypical: Many Baths	0.093**	(5.85)	0.422	(1.38)
Atypical: Many Bedrooms	0.135**	(10.87)	0.310	(1.51)
Atypical: Older Home	0.140**	(10.79)	0.064	(0.73)
Country Club	0.042**	(2.66)	1.123	(1.93)
Security/Smart Home	0.022*	(2.25)	0.052	(0.28)
New Roof	0.020**	(3.99)	-0.040	(-0.65)
In-Law Apartment	0.114**	(18.95)	0.171*	(2.09)
Stone Counters	-0.020**	(-4.39)	0.056	(0.77)
Market Competition	0.004**	(275.95)	0.006**	(16.57)
Observations	389,362		4,504	
Adjusted R^2	0.39		0.27	
Month x Year FE	✓		✓	
ZIP Code FE	✓		✓	
Agent FE	✓		✓	

The table presents the OLS equation modeling the natural log of days on market. Column (1) is for urban areas and column (3) is for rural areas. The time period of the sample represented is from 2012-2021. Robust t-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.14: Probability of Sale - Urban vs. Rural

	(1) Coefficients	(2) *t*-statistic	(3) Coefficients	(4) *t*-statistic
Offer Deadline	0.622**	(38.10)	0.791**	(2.86)
Living Area (Sqft)	-0.000**	(-33.75)	-0.000**	(-10.92)
Lot Size (Sqft)	-0.000**	(-4.99)	0.000	(0.78)
Number of Bedrooms	0.007*	(1.97)	0.060*	(2.50)
Number of Bathrooms	-0.040**	(-11.28)	0.012	(0.45)
Rental	-0.450**	(-36.22)	-0.340**	(-4.09)
Vacant	-0.138**	(-6.99)	-0.381*	(-2.00)
Estate	0.448**	(20.48)	0.721**	(2.90)
Flat Fee	-0.573**	(-44.59)	-0.360**	(-3.39)
Waterfront	-0.264**	(-27.68)	-0.181**	(-3.94)
HOA	-0.205**	(-21.33)	-0.032	(-0.57)
Atypical: Large Home	-0.000	(-0.03)	0.093	(0.70)
Atypical: Large Lot	-0.132**	(-4.89)	-0.041	(-0.55)
Atypical: Many Baths	0.083**	(4.35)	-0.059	(-0.25)
Atypical: Many Bedrooms	-0.139**	(-8.55)	-0.244	(-1.46)
Atypical: Older Home	-0.084	(-1.78)	-0.135	(-0.63)
Country Club	-0.113**	(-5.10)	-0.513	(-1.47)
Security/Smart Home	0.014	(0.96)	-0.060	(-0.38)
New Roof	0.028**	(3.58)	0.082	(1.31)
In-Law Apartment	-0.186**	(-22.83)	-0.188**	(-2.68)
Stone Counters	0.104**	(14.59)	0.093	(1.36)
Constant	-0.439	(-0.72)	-1.431	(-1.62)
Observations	528,064		9,321	
ZIP Code FE	✓		✓	
Month x Year FE	✓		✓	

The table presents the probability of sale marginals. Column (1) is for the urban areas, column (3) is for the rural areas. The time period sample represented is from 2012-2021. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.15: Probability of Sale Marginals – Urban vs. Rural

	(1) Marginals	(2) *z*-statistic	(3) Marginals	(4) *z*-statistic
Standard Listing	0.758**	(1339.89)	0.594**	(130.24)
Offer Deadline Listing	0.897**	(340.67)	0.816**	(13.20)
Observations	528,064		9,321	

The table presents the equation modeling the probability of sale. Column (1) is for the urban areas, column (3) is for the rural areas. The time period sample represented is from 2012-2021. Robust *z*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

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Table 2.16: Period of Rapid Price Increase January 2000 – April 2005

	(1) Ln(Price)	(2) *t*-statistic	(3) Ln(DOM)	(4) *t*-statistic
Offer Deadline	0.046**	(3.57)	-0.444**	(-5.67)
Ln(Square Feet)	0.385**	(195.40)	0.293**	(24.35)
Ln(Lot Size)	0.076**	(115.70)	0.007	(1.69)
Ln(Bedrooms)	0.058**	(26.33)	0.041**	(3.07)
Ln(Bathrooms)	0.119**	(82.69)	0.071**	(8.00)
Ln(Age)	-0.058**	(-100.60)	0.044**	(12.47)
Cash Financing	-0.010**	(-4.22)	-0.163**	(-10.98)
FHA Financing	-0.020**	(-11.87)	0.012	(1.15)
VA Financing	-0.018**	(-3.59)	0.013	(0.44)
Rental	-0.055**	(-12.11)	0.130**	(4.64)
Vacant	-0.034**	(-7.87)	0.164**	(6.27)
Estate	-0.071**	(-11.84)	-0.083*	(-2.28)
Flat Fee	0.009*	(2.41)	0.019	(0.80)
Waterfront	0.166**	(69.27)	0.130**	(8.88)
HOA	0.034**	(12.99)	0.040*	(2.45)
Atypical: Large Home	0.172**	(45.77)	0.092**	(4.02)
Atypical: Large Lot	0.014**	(2.92)	0.083**	(2.82)
Atypical: Many Baths	0.173**	(22.41)	0.048	(1.01)
Atypical: Many Bedrooms	0.018**	(4.75)	0.011	(0.45)
Atypical: Older Home	0.050**	(12.23)	0.107**	(4.27)
Country Club	0.052**	(7.15)	-0.019	(-0.42)
Security/Smart Home	0.028**	(8.78)	0.050**	(2.62)
New Roof	0.010**	(4.81)	0.038**	(2.89)
In-Law Apartment	-0.036**	(-17.48)	0.129**	(10.32)
Stone Counters	0.062**	(13.07)	-0.026	(-0.88)
Listing Density	-0.001*	(-2.16)		
Market Competition			0.001**	(95.98)
Observations	178,946		178,946	
Adjusted R^2	0.91		0.18	
ZIP Code FE	✓		✓	
Month x Year FE	✓		✓	
Agent FE	✓		✓	

The table presents the OLS equation modeling the natural log of prices, column (1), and OLS equation modeling the natural log of days on market, column (3). The continuously compounded annual growth rate in the period is 10.9 percent. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.17: Period of Steady State May 2005 – March 2006

	(1) Ln(Price)	(2) *t*-statistic	(3) Ln(DOM)	(4) *t*-statistic
Offer Deadline	-0.058	(-1.64)	-0.582**	(-2.92)
Ln(Square Feet)	0.367**	(70.17)	0.147**	(4.97)
Ln(Lot Size)	0.075**	(41.44)	0.082**	(8.08)
Ln(Bedrooms)	0.049**	(8.45)	-0.055	(-1.67)
Ln(Bathrooms)	0.108**	(28.87)	0.039	(1.83)
Ln(Age)	-0.059**	(-37.87)	-0.029**	(-3.32)
Cash Financing	-0.027**	(-3.76)	-0.181**	(-4.40)
FHA Financing	-0.069**	(-4.13)	-0.160	(-1.70)
VA Financing	-0.010	(-0.46)	0.152	(1.19)
Rental	-0.026	(-1.86)	-0.083	(-1.03)
Vacant	-0.030**	(-3.19)	0.093	(1.73)
Estate	-0.069**	(-4.73)	-0.066	(-0.81)
Flat Fee	0.067**	(3.20)	-0.064	(-0.54)
Waterfront	0.172**	(28.43)	0.051	(1.49)
HOA	0.041**	(6.18)	0.021	(0.57)
Atypical: Large Home	0.158**	(17.02)	0.026	(0.49)
Atypical: Large Lot	-0.024	(-1.90)	-0.101	(-1.38)
Atypical: Many Baths	0.200**	(11.04)	0.096	(0.94)
Atypical: Many Bedrooms	0.055**	(5.25)	0.111	(1.87)
Atypical: Older Home	0.019	(1.62)	0.142*	(2.13)
Country Club	0.031*	(2.06)	-0.042	(-0.50)
Security/Smart Home	0.029**	(4.27)	0.026	(0.66)
New Roof	0.010*	(2.33)	0.042	(1.68)
In-Law Apartment	-0.026**	(-5.14)	0.060*	(2.14)
Stone Counters	0.072**	(10.09)	0.026	(0.63)
Listing Density	-0.002**	(-2.80)		
Market Competition			0.002**	(84.00)
Observations	29,174		29,174	
Adjusted R^2	0.90		0.33	
ZIP Code FE	✓		✓	
Month x Year FE	✓		✓	
Agent FE	✓		✓	

The table presents the OLS equation modeling the natural log of prices, column (1), and OLS equation modeling the natural log of days on market, column (3). The continuously compounded annual growth rate in the period is negative 0.4 percent. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.18: Period of Price Decrease April 2006 – March 2009

	(1) Ln(Price)	(2) *t*-statistic	(3) Ln(DOM)	(4) *t*-statistic
Offer Deadline	0.019	(0.73)	-0.822**	(-6.69)
Ln(Square Feet)	0.374**	(85.42)	0.166**	(8.03)
Ln(Lot Size)	0.071**	(46.71)	0.051**	(7.25)
Ln(Bedrooms)	0.052**	(10.80)	-0.004	(-0.17)
Ln(Bathrooms)	0.125**	(38.75)	0.019	(1.24)
Ln(Age)	-0.072**	(-53.47)	-0.028**	(-4.39)
Cash Financing	-0.100**	(-19.56)	-0.101**	(-4.22)
FHA Financing	-0.023**	(-4.45)	0.124**	(5.12)
VA Financing	-0.018	(-1.41)	0.096	(1.64)
Rental	-0.032**	(-2.97)	0.182**	(3.58)
Vacant	-0.020*	(-2.27)	0.101*	(2.49)
Estate	-0.104**	(-11.36)	-0.132**	(-3.06)
Flat Fee	0.085**	(5.18)	-0.036	(-0.47)
Waterfront	0.207**	(40.53)	0.101**	(4.18)
HOA	0.062**	(11.12)	-0.009	(-0.35)
Atypical: Large Home	0.161**	(22.32)	0.110**	(3.25)
Atypical: Large Lot	-0.003	(-0.26)	-0.160**	(-3.25)
Atypical: Many Baths	0.151**	(10.55)	-0.005	(-0.07)
Atypical: Many Bedrooms	0.006	(0.70)	0.125**	(2.93)
Atypical: Older Home	0.043**	(4.64)	0.161**	(3.65)
Country Club	0.051**	(3.84)	-0.013	(-0.21)
Security/Smart Home	0.032**	(4.68)	0.031	(0.97)
New Roof	0.021**	(5.50)	0.030	(1.67)
In-Law Apartment	-0.045**	(-9.82)	0.129**	(6.02)
Stone Counters	0.070**	(14.08)	0.041	(1.73)
Listing Density	-0.005**	(-9.63)		
Market Competition			0.002**	(113.82)
Observations	54,434		54,434	
Adjusted R^2	0.88		0.31	
ZIP Code FE	✓		✓	
Month x Year FE	✓		✓	
Agent FE	✓		✓	

The table presents the OLS equation modeling the natural log of prices, column (1), and OLS equation modeling the natural log of days on market, column (3). The continuously compounded annual growth rate in the period is negative 6.0 percent. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.19: Period of Steady State April 2009 – April 2012

	(1) Ln(Price)	(2) *t*-statistic	(3) Ln(DOM)	(4) *t*-statistic
Offer Deadline	0.037**	(2.63)	-0.566**	(-9.01)
Ln(Square Feet)	0.422**	(110.05)	0.174**	(10.09)
Ln(Lot Size)	0.060**	(46.26)	0.095**	(16.49)
Ln(Bedrooms)	0.051**	(12.10)	-0.078**	(-4.08)
Ln(Bathrooms)	0.142**	(49.73)	0.018	(1.39)
Ln(Age)	-0.077**	(-60.66)	-0.017**	(-2.98)
Cash Financing	-0.101**	(-27.83)	-0.120**	(-7.31)
FHA Financing	-0.015**	(-4.80)	0.050**	(3.55)
VA Financing	0.004	(0.67)	0.058	(1.95)
Rental	-0.024**	(-3.05)	0.031	(0.88)
Vacant	-0.039**	(-4.63)	0.010	(0.26)
Estate	-0.115**	(-19.07)	-0.089**	(-3.28)
Flat Fee	0.071**	(5.59)	-0.039	(-0.69)
Waterfront	0.228**	(52.60)	0.121**	(6.20)
HOA	0.071**	(16.38)	-0.014	(-0.69)
Atypical: Large Home	0.099**	(18.01)	0.106**	(4.28)
Atypical: Large Lot	-0.005	(-0.55)	-0.014	(-0.33)
Atypical: Many Baths	0.133**	(13.31)	0.042	(0.94)
Atypical: Many Bedrooms	0.021**	(2.83)	0.177**	(5.33)
Atypical: Older Home	0.046**	(5.64)	0.117**	(3.22)
Country Club	0.066**	(5.94)	0.038	(0.76)
Security/Smart Home	0.031**	(5.08)	0.061*	(2.23)
New Roof	0.018**	(5.95)	0.007	(0.50)
In-Law Apartment	-0.059**	(-15.51)	0.121**	(7.02)
Stone Counters	0.060**	(17.62)	-0.011	(-0.75)
Listing Density	-0.003**	(-6.30)		
Market Competition			0.003**	(138.47)
Observations	72,834		72,834	
Adjusted R^2	0.89		0.34	
ZIP Code FE	✓		✓	
Month x Year FE	✓		✓	
Agent FE	✓		✓	

The table presents the OLS equation modeling the natural log of prices, column (1), and OLS equation modeling the natural log of days on market, column (3). The continuously compounded annual growth rate in the period is 0.04 percent. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.20: Period of Price Increase May 2012 – December 2019

	(1) Ln(Price)	(2) *t*-statistic	(3) Ln(DOM)	(4) *t*-statistic
Offer Deadline	0.023**	(10.93)	-0.380**	(-40.64)
Ln(Square Feet)	0.394**	(230.18)	0.223**	(28.96)
Ln(Lot Size)	0.050**	(90.09)	0.067**	(27.10)
Ln(Bedrooms)	0.067**	(35.37)	-0.061**	(-7.09)
Ln(Bathrooms)	0.128**	(100.73)	0.020**	(3.47)
Ln(Age)	-0.074**	(-123.90)	0.005	(1.85)
Cash Financing	-0.082**	(-59.95)	-0.163**	(-26.37)
FHA Financing	-0.008**	(-5.78)	0.075**	(12.01)
VA Financing	0.013**	(5.55)	0.101**	(9.86)
Rental	-0.028**	(-10.18)	0.115**	(9.25)
Vacant	-0.042**	(-10.92)	0.097**	(5.61)
Estate	-0.108**	(-38.21)	-0.027*	(-2.15)
Flat Fee	0.048**	(8.23)	-0.051*	(-1.97)
Waterfront	0.235**	(116.82)	0.141**	(15.69)
HOA	0.048**	(24.30)	0.056**	(6.27)
Atypical: Large Home	0.082**	(33.73)	0.167**	(15.27)
Atypical: Large Lot	-0.008	(-1.96)	0.045*	(2.56)
Atypical: Many Baths	0.124**	(28.28)	0.065**	(3.28)
Atypical: Many Bedrooms	-0.018**	(-5.47)	0.143**	(9.59)
Atypical: Older Home	0.023**	(6.65)	0.146**	(9.35)
Country Club	0.033**	(7.82)	0.040*	(2.15)
Security/Smart Home	0.039**	(15.19)	0.017	(1.45)
New Roof	0.021**	(16.29)	0.024**	(4.03)
In-Law Apartment	-0.040**	(-25.01)	0.124**	(17.42)
Stone Counters	0.052**	(42.18)	-0.014*	(-2.51)
Listing Density	-0.006**	(-16.65)		
Market Competition			0.004**	(253.41)
Observations	293,277		293,277	
Adjusted R^2	0.90		0.37	
ZIP Code FE	✓		✓	
Month x Year FE	✓		✓	
Agent FE	✓		✓	

The table presents the OLS equation modeling the natural log of prices, column (1), and OLS equation modeling the natural log of days on market, column (3). The continuously compounded annual growth rate in the period is 5.4 percent. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table 2.21: Period of Rapid Price Increase January 2020 – December 2021

	(1) Ln(Price)	(2) *t*-statistic	(3) Ln(DOM)	(4) *t*-statistic
Offer Deadline	0.017**	(8.09)	-0.220**	(-26.33)
Ln(Square Feet)	0.363**	(117.90)	0.185**	(14.75)
Ln(Lot Size)	0.046**	(46.88)	0.030**	(7.63)
Ln(Bedrooms)	0.071**	(20.67)	-0.041**	(-2.89)
Ln(Bathrooms)	0.120**	(51.31)	-0.007	(-0.71)
Ln(Age)	-0.066**	(-61.50)	0.045**	(10.37)
Cash Financing	-0.050**	(-24.34)	-0.157**	(-18.85)
FHA Financing	-0.003	(-1.43)	0.064**	(6.89)
VA Financing	0.010*	(2.57)	0.086**	(5.70)
Rental	-0.025**	(-5.56)	0.120**	(6.55)
Vacant	-0.036**	(-6.18)	0.113**	(4.76)
Estate	-0.082**	(-16.11)	0.013	(0.65)
Flat Fee	0.016	(1.17)	0.054	(0.97)
Waterfront	0.230**	(66.42)	0.160**	(11.32)
HOA	0.042**	(12.12)	0.033*	(2.35)
Atypical: Large Home	0.097**	(25.46)	0.170**	(10.97)
Atypical: Large Lot	0.010	(1.62)	0.068**	(2.60)
Atypical: Many Baths	0.131**	(20.08)	0.138**	(5.20)
Atypical: Many Bedrooms	-0.012*	(-2.23)	0.130**	(5.68)
Atypical: Older Home	0.015**	(2.80)	0.102**	(4.60)
Country Club	0.036**	(5.05)	0.044	(1.53)
Security/Smart Home	0.042**	(7.68)	0.049*	(2.20)
New Roof	0.015**	(5.91)	0.002	(0.20)
In-Law Apartment	-0.043**	(-15.16)	0.095**	(8.29)
Stone Counters	0.040**	(18.81)	-0.032**	(-3.70)
Listing Density	-0.002	(-1.37)		
Market Competition			0.010**	(112.44)
Observations	84,805		84,805	
Adjusted R^2	0.91		0.37	
ZIP Code FE	✓		✓	
Month x Year FE	✓		✓	
Agent FE	✓		✓	

The table presents the OLS equation modeling the natural log of prices, column (1), and OLS equation modeling the natural log of days on market, column (3). The continuously compounded annual growth rate in the period is 11.7 percent. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Appendix

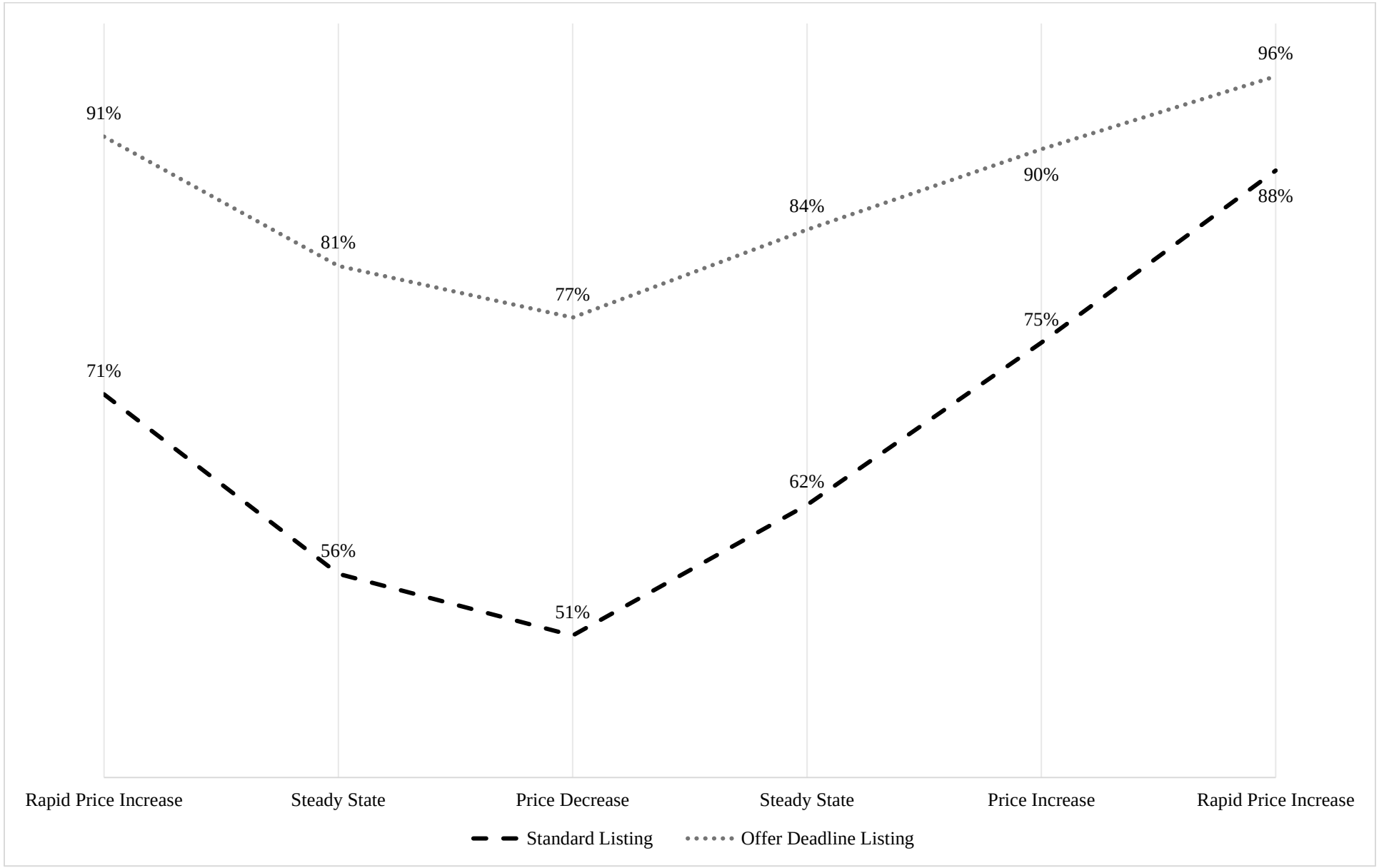

Figure B.1: Probability of Sale by over Price Real Business Cycles

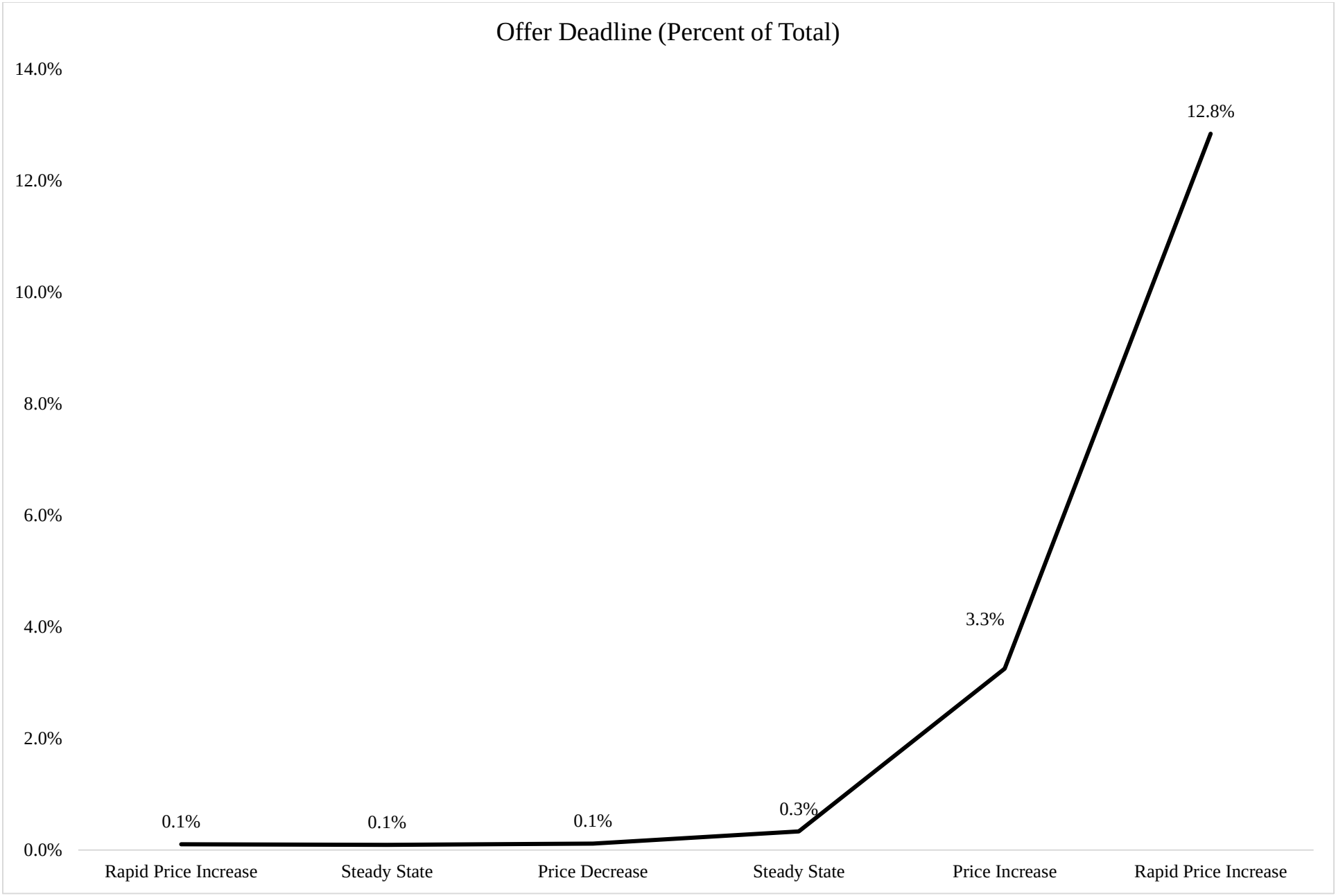

Figure B.2: Percentage Usage of Offer Deadline Listings over Real Business Cycles

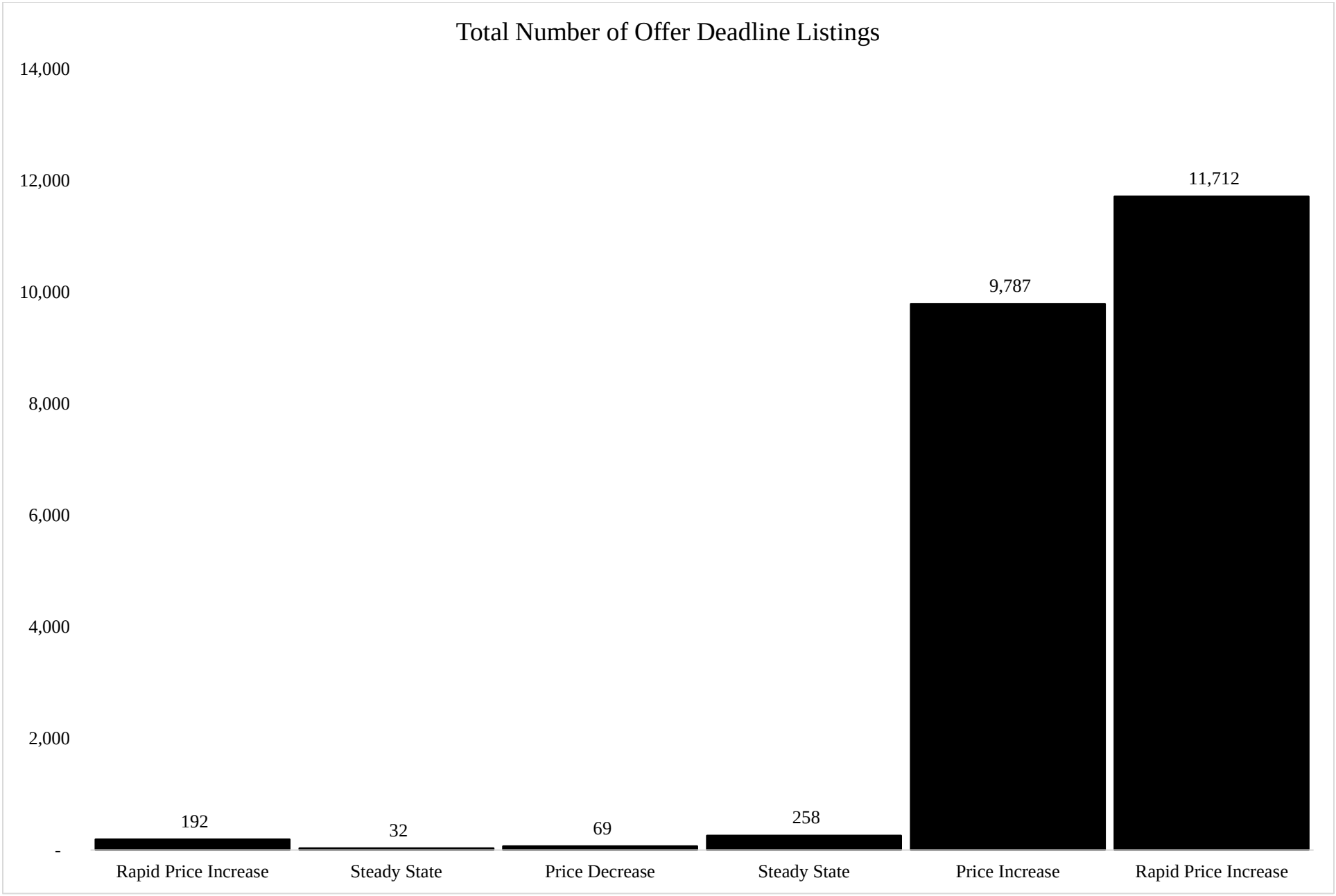

Figure B.3: Usage of Offer Deadline Listings over Real Business Cycles

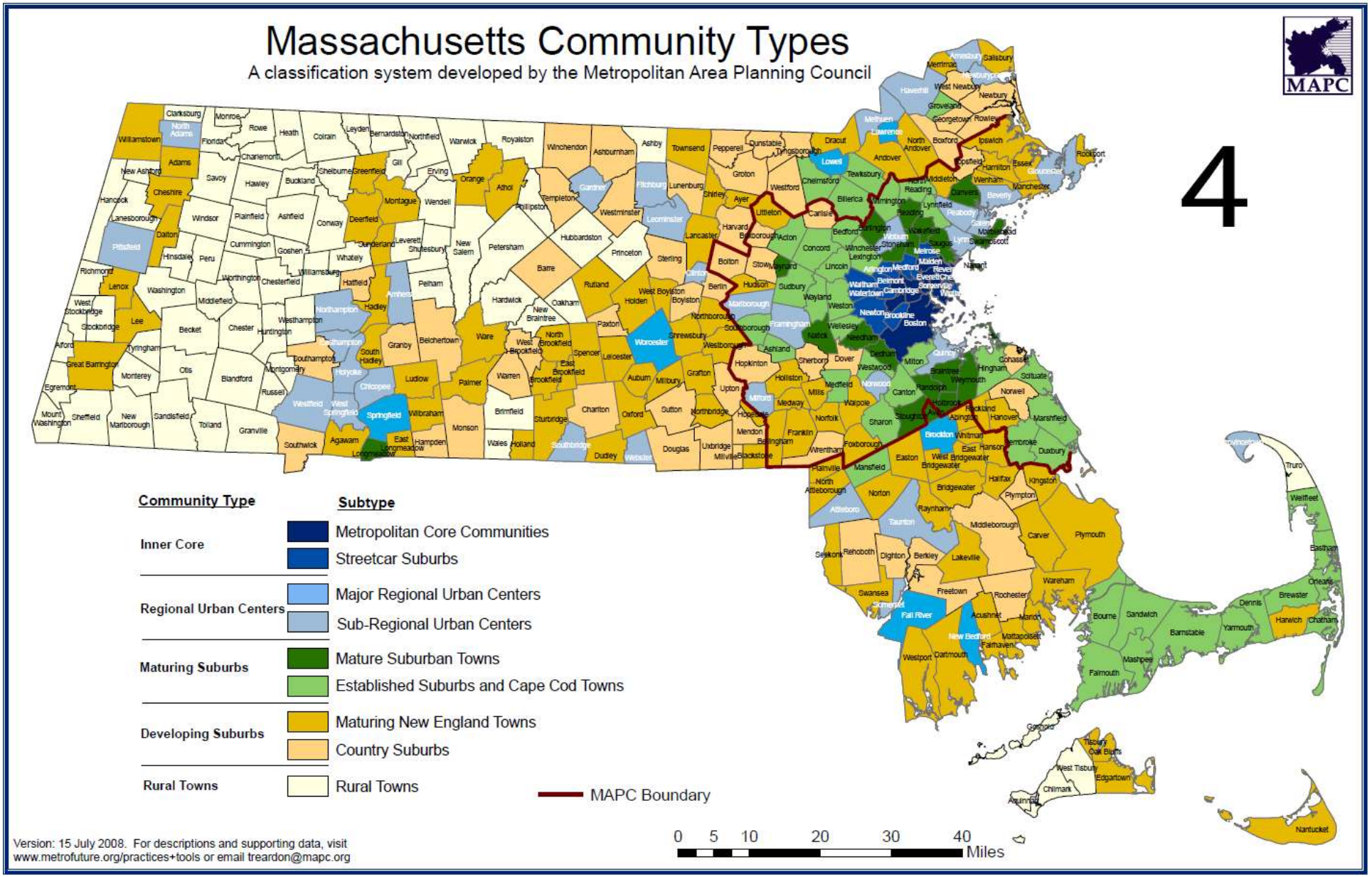

Figure B.4: MACP Massachusetts Community Types Map

Table B.1: Variable Definitions

Offer Deadline	Binary variable = 1 if an Offer Deadline Listing
Sales Price	Contracted selling price reported in MLS
DOM	Days on Market (List Date to Signed Agreement Date)
Square Feet	Property size measured in square feet
Lot Size	Property lot size measured in square feet
Age	Age of the property
Bedrooms	Number of total bedrooms
Bathrooms	Number of total bathrooms
Cash Purchase	Binary variable = 1 if purchased with cash
FHA Financing	Binary variable = 1 if purchased with Federal Housing Administration financing
VA Financing	Binary variable = 1 if purchased with Veterans Administration financing
Rental	Binary variable = 1 if non-owner occupied
Vacant	Binary variable = 1 if property vacant at time of listing
Estate	Binary variable = 1 if owned by an estate
Flat Fee	Binary variable = 1 if flat fee broker listed
Waterfront	Binary variable = 1 if property is fronted by water
HOA	Binary variable = 1 if property is part of homeowners' association
Atypical: Large Home	Binary variable = 1 if property is greater than 4,173 Square Feet
Atypical: Large Lot	Binary variable = 1 if property lot is greater than 221,898 Square Feet
Atypical: Many Baths	Binary variable = 1 if property has more than 5 bathrooms
Atypical: Many Bedrooms	Binary variable = 1 if property has more than 6 bedrooms
Atypical: Older Home	Binary variable = 1 if property is more than 166 years old
Country Club	Binary variable = 1 if property is located on or has access to a country club
Security/Smart Home	Binary variable = 1 if property is a smart home or has a security system
New Roof	Binary variable = 1 if property has a new roof
In-Law Apartment	Binary variable = 1 if property has in-law apartment or au-pair suite
Stone Counters	Binary variable = 1 if property has any type of stone countertops
Market Competition	Measure of Market Competition
Listing Density	Measure of Listing Density

Table B.2: Transaction Price – Fixed Effect Robustness

	(1) Ln(Price)	(2) Ln(Price)	(3) Ln(Price)
Offer Deadline	0.038**	0.030**	0.032**
	(27.52)	(22.05)	(22.24)
Ln(Square Feet)	0.402**	0.394**	0.388**
	(369.82)	(372.05)	(361.41)
Ln(Lot Size)	0.060**	0.059**	0.058**
	(168.95)	(168.06)	(163.34)
Ln(Bedrooms)	0.060**	0.062**	0.064**
	(48.89)	(52.53)	(53.25)
Ln(Bathrooms)	0.136**	0.131**	0.127**
	(167.70)	(165.73)	(159.44)
Ln(Age)	-0.067**	-0.067**	-0.068**
	(-192.06)	(-197.13)	(-197.68)
Cash Financing	-0.075**	-0.070**	-0.070**
	(-77.75)	(-74.26)	(-72.90)
FHA Financing	-0.019**	-0.014**	-0.014**
	(-21.33)	(-16.20)	(-16.07)
VA Financing	-0.006**	-0.001	-0.000
	(-3.41)	(-0.54)	(-0.04)
Rental	-0.027**	-0.029**	-0.030**
	(-13.74)	(-14.91)	(-15.56)
Vacant	-0.046**	-0.040**	-0.036**
	(-20.77)	(-18.17)	(-16.17)
Estate	-0.107**	-0.106**	-0.105**
	(-52.81)	(-53.27)	(-52.23)
Flat Fee	0.029**	0.026**	0.033**
	(15.68)	(9.29)	(11.50)
Waterfront	0.228**	0.218**	0.212**
	(177.73)	(174.01)	(168.13)
HOA	0.060**	0.050**	0.047**
	(46.61)	(39.64)	(36.48)
Atypical: Large Home	0.119**	0.118**	0.109**
	(71.50)	(72.36)	(66.63)
Atypical: Large Lot	0.000	-0.001	-0.001
	(0.02)	(-0.41)	(-0.51)
Atypical: Many Baths	0.158**	0.150**	0.136**
	(51.38)	(50.02)	(45.26)
Atypical: Many Bedrooms	0.000	0.001	-0.001
	(0.13)	(0.72)	(-0.36)
Atypical: Older Home	0.045**	0.040**	0.036**
	(20.09)	(18.11)	(16.19)
Country Club	0.044**	0.039**	0.038**
	(14.65)	(13.43)	(12.92)
Security/Smart Home	0.036**	0.033**	0.034**

	(21.49)	(20.39)	(20.48)
New Roof	0.021**	0.019**	0.018**
	(22.39)	(21.70)	(20.31)
In-Law Apartment	-0.051**	-0.046**	-0.042**
	(-47.83)	(-44.15)	(-40.14)
Stone Counters	0.051**	0.051**	0.051**
	(53.91)	(55.30)	(53.79)
Listing Density	-0.009**	-0.008**	-0.008**
	(-50.24)	(-43.76)	(-43.74)
Observations	747,642	745,451	735,835
Adjusted R^2	0.89	0.90	0.90
Month x Year FE	✓	✓	✓
ZIP Code FE	✓	✓	✓
Office FE		✓	
Agent FE			✓

The table presents the OLS equation modeling the natural log of prices. The time period of the sample represented is from 2000-2021. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table B.3: Days on Market – Fixed Effect Robustness

	(1) Ln(DOM)	(2) Ln(DOM)	(3) Ln(DOM)
Offer Deadline	-0.352**	-0.332**	-0.333**
	(-53.68)	(-50.01)	(-48.18)
Ln(Square Feet)	0.205**	0.212**	0.230**
	(39.89)	(41.28)	(44.12)
Ln(Lot Size)	0.039**	0.039**	0.040**
	(23.07)	(23.02)	(23.27)
Ln(Bedrooms)	-0.003	-0.006	-0.012*
	(-0.46)	(-1.09)	(-2.04)
Ln(Bathrooms)	0.027**	0.030**	0.032**
	(7.03)	(7.72)	(8.24)
Ln(Age)	0.015**	0.017**	0.018**
	(8.95)	(10.13)	(10.60)
Cash Financing	-0.156**	-0.164**	-0.162**
	(-34.03)	(-35.77)	(-34.92)
FHA Financing	0.087**	0.078**	0.075**
	(20.62)	(18.23)	(17.10)
VA Financing	0.100**	0.101**	0.094**
	(12.09)	(12.16)	(11.22)
Rental	0.125**	0.121**	0.119**
	(13.39)	(12.91)	(12.46)
Vacant	0.113**	0.113**	0.114**
	(10.81)	(10.67)	(10.46)
Estate	-0.039**	-0.042**	-0.044**
	(-4.05)	(-4.36)	(-4.50)
Flat Fee	0.006	0.004	-0.006
	(0.65)	(0.32)	(-0.42)
Waterfront	0.143**	0.137**	0.133**
	(23.65)	(22.64)	(21.73)
HOA	0.039**	0.037**	0.040**
	(6.30)	(6.06)	(6.35)
Atypical: Large Home	0.141**	0.137**	0.131**
	(17.82)	(17.45)	(16.52)
Atypical: Large Lot	0.043**	0.039**	0.033**
	(3.52)	(3.18)	(2.66)
Atypical: Many Baths	0.084**	0.082**	0.089**
	(5.78)	(5.66)	(6.10)
Atypical: Many Bedrooms	0.103**	0.102**	0.102**
	(10.27)	(10.23)	(10.07)
Atypical: Older Home	0.143**	0.137**	0.137**
	(13.52)	(12.95)	(12.84)
Country Club	0.038**	0.038**	0.030*
	(2.68)	(2.72)	(2.10)
Security/Smart Home	0.024**	0.022**	0.029**

	(3.00)	(2.75)	(3.53)
New Roof	0.030**	0.027**	0.028**
	(6.87)	(6.15)	(6.33)
In-Law Apartment	0.133**	0.126**	0.116**
	(26.47)	(25.22)	(23.01)
Stone Counters	-0.047**	-0.032**	-0.023**
	(-10.55)	(-7.14)	(-4.99)
Market Competition	0.002**	0.002**	0.002**
	(334.98)	(330.95)	(319.04)
Observations	747,642	745,451	735,835
Adjusted R^2	0.26	0.28	0.31
Month x Year FE	✓	✓	✓
ZIP Code FE	✓	✓	✓
Office FE		✓	
Agent FE			✓

The table presents the OLS equation modeling the natural log of days on market. The time period of the sample represented is from 2000-2021. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table B.4: Standardized Difference in Means for PSM

	Mean in Treated	Mean in Untreated	Standardized Difference
Ln(Sales Price)	13.14	13.12	0.044
Living Area (Sqft)	1885.95	1886.17	-0.000
Lot Size (Sqft)	20850.79	20818.54	0.001
Age	67.99	67.98	0.000
Number of Bedrooms	3.30	3.31	-0.013
Number of Bathrooms	2.18	2.18	-0.005

Table B.5: Phrases Identifying Offer Deadline Listings

All Offers Review
All Offers Reviewed
Best Offers Due
Final And Best
Final Offers Due
Offer Due
Offers Due
Offers Review
Offers Reviewed
Offers To Be Review
Offers To Be Reviewed

Table B.6: Sections of the Listing Searched for Identifying Phrases

Remarks
Direction
Disclosures
Exclusions
Firm Remarks
Showing Instruction

Table B.7: Examples of Listings with Offer Deadline Phrases

MLS # 72841827 - Sold
Single Family - Detached

35 Prentiss St
Cambridge, MA: Agassiz, 02140
Middlesex County

List Price: **$2,575,000**
Sale Price: **$3,500,000**

Style: **Victorian**
Color:
Grade School:
Middle School:
High School:
Approx. Acres: **0.13 (5,736 SqFt)**
Handicap Access/Features:

Total Rooms: **9**
Bedrooms: **4**
Bathrooms: **3f 1h**
Main Bath:
Fireplaces: **1**
Approx. Street Frontage:

Directions: **From Mass Ave - head east on Sacramento St, then North on Oxford, then west onto Prentiss (one way)**

Remarks

OFFERS DUE 6/8 @ 2PM. Built in 1878 for a Boston merchant tailor, this Queen Anne Victorian single family in the Agassiz neighborhood maintains its original architectural majesty while offering updated systems and modern touches. The first floor is home to a remarkably open living/dining/kitchen area for a home of this style, with two sets of French doors that open to the deck and patio. On the second level are three bedrooms, a reading alcove, and full bath with custom plantation shutters. The top floor is a world of its own, home to the primary bedroom, full marble bath, and office, lit with brilliant skylights. On the finished lower level is another full bath, laundry and utility room. The property has 2 zones FHA gas heating and central AC. One car off street parking on a red brick driveway. Both the front and back gardens have irrigation systems. A new Bryant boiler was installed in 2018 as well as a new 50-gallon hot water heater. The chimney was rebuilt in 2019 with a copper top

Property Information

Approx. Living Area Total: **2,745 SqFt**
Approx. Above Grade:
Living Area Disclosures: **includes finished lower level**

Living Area Includes Below-Grade SqFt: **Yes**
Approx. Below Grade:

Living Area Source: **Measured**

Heat Zones: **2 Forced Air**
Parking Spaces: **1 Off-Street**
Disclosures:

Cool Zones: **2 Central Air**
Garage Spaces: **0**

Room Levels, Dimensions and Features

Room	Level	Size	Features

Features

Appliances: **Range, Dishwasher, Refrigerator, Washer, Dryer, Vent Hood**
Area Amenities: **Public Transportation, Shopping, Park, Walk/Jog Trails, Bike Path, Highway Access, T-Station, University**
Basement: **Yes Full, Finished, Sump Pump**
Beach: **No**
Construction: **Frame**
Electric: **200 Amps**
Exterior: **Clapboard**
Exterior Features: **Porch, Deck, Patio, Fenced Yard**
Flooring: **Hardwood**
Foundation Size:
Foundation Description: **Fieldstone**
Hot Water: **Natural Gas, Tank**
Interior Features: **French Doors**
Lot Description: **Level**
Road Type: **Public**
Roof Material: **Slate**
Sewer Utilities: **City/Town Sewer**
Water Utilities: **City/Town Water**
Waterfront: **No**

Other Property Info

Disclosure Declaration: **No**
Exclusions:
Facing Direction: **South**
Home Own Assn:
Lead Paint: **Unknown**
UFFI: Warranty Features:
Year Built: **1878** Source: **Public Record**
Year Built Description: **Actual**
Year Round: **Yes**
Short Sale w/Lndr. App. Req: **No**
Lender Owned: **Undisclosed**

Tax Information

Pin #:
Assessed: **$2,022,300**
Tax: **$12,167.82** Tax Year: **2021**
Book: **65357** Page: **520**
Cert:
Zoning Code: **B**
Map: Block: Lot:

Compensation

Sub-Agent: **Not Offered** Buyer Agent: **2.5%**
Facilitator: **0**
Compensation Based On: **Gross/Full Sale Price**

Office/Agent Information

Listing Office: **Compass** **(617) 303-0067**
Listing Agent: **The Carol Kelly Team (617) 835-5008**
Team Member(s): **Carol Kelly** **(617) 835-5008**
Sale Office: **Coldwell Banker Realty - Boston** **(617) 266-4430**
Sale Agent: **Richard Egan (617) 216-0996**
Listing Agreement Type: **Exclusive Right to Sell**
Entry Only: **No**
Showing: Sub-Agent: **Sub-Agency Relationship Not Offered**
Showing: Buyer-Agent: **Call List Agent, Accompanied Showings, Appointment Required, Sign, Email List Agent**
Showing: Facilitator:
Special Showing Instructions:

Firm Remarks

OFFERS DUE 6/8 @ 2PM. Please email to thecarolkellyteam@compass.com as a single pdf. 2021 tax amount does not include res exemption.

Market Information

Listing Date: **6/2/2021**
Days on Market: Property has been on the market for a total of **13** day(s)
Expiration Date:
Original Price: **$2,575,000**
Off Market Date: **6/15/2021**
Sale Date: **6/18/2021**
Sale Price: **$3,500,000**
Offer Date: **6/9/2021** Days to Offer: **7**

Listing Market Time: MLS# has been on for **13** day(s)
Office Market Time: Office has listed this property for **13** day(s)
Cash Paid for Upgrades:
Seller Concessions at Closing:
Financing: **Withheld**
Sale-to-List Ratio: **135.92%**

Market History for 35 Prentiss St, Cambridge, MA: Agassiz, 02140

MLS #	Date			DOM	DTO	Price
72841827	6/2/2021	Listed for **$2,575,000**	The Carol Kelly Team			$2,575,000
CTG	6/9/2021	Status Changed to: **Contingent**	Zarya Miranda	7		
UAG	6/15/2021	Status Changed to: **Under Agreement**	Zarya Miranda	13		
SLD	6/18/2021	Status Changed to: **Sold**	Zarya Miranda	13		
	6/18/2021	Sold for **$3,500,000**	Zarya Miranda	13	7	**$3,500,000**
		Market History for Compass (AN2606)		**13**	**7**	**$3,500,000**
		Market History for this property		**13**	**7**	**$3,500,000**

MLS # 72796174 - Sold
Single Family - Detached

38 Hamblett Ave
Dracut, MA 01826
Middlesex County

List Price: **$200,000**
Sale Price: **$275,000**

Style: **Colonial**
Color: **Yellow**
Grade School:
Middle School:
High School:
Approx. Acres: **0.24 (10,454 SqFt)**
Handicap Access/Features:
Directions: **Lakeview Ave, Dinley to Hamblett**

Total Rooms: **6**
Bedrooms: **3**
Bathrooms: **1f 0h**
Main Bath: **No**
Fireplaces: **0**
Approx. Street Frontage:

Remarks

MULTIPLE OFFER NOTIFICATION - H&B Offers due 3/14 by 6pm. It's official - SPRING is right around the corner! Now is a great time to pick your next project. With some attention this home could be a gem. The structure sits at the front corner of the lot, meaning the yard is HUGE! Fix it up, add-on or put up a pool. The possibilities are endless. Come see this property and create your own vision.

Property Information

Approx. Living Area Total: **1,064 SqFt**
Approx. Above Grade:
Living Area Disclosures:

Living Area Includes Below-Grade SqFt: **Unspecified**
Approx. Below Grade:

Living Area Source: **Public Record**

Heat Zones: **1 Steam**
Parking Spaces: **4 Off-Street**

Cool Zones: **None**
Garage Spaces: **1 Attached, Under**

Disclosures: **Include POF or pre-approval with offers. Email offers to the list agent. Buyer to verify all information and do their own due diligence. Upon submission of the New Offer, Buyer Agent will be required to accept terms for a $150.00 offer submission technology fee TBP at closing.**

Room Levels, Dimensions and Features

Room	Level	Size	Features
Living Room:	1		-
Dining Room:	1		-
Kitchen:	1		-
Main Bedroom:	2		-
Bedroom 2:	2		-
Bedroom 3:	2		-
Laundry:	B		-

Features

Appliances: **Range, Refrigerator**
Basement: **Yes Walk Out, Interior Access, Garage Access**
Beach: **No**
Construction: **Frame**
Exterior: **Vinyl**
Exterior Features: **Porch - Enclosed, Storage Shed**
Flooring: **Wood, Vinyl, Wall to Wall Carpet**
Foundation Size:
Foundation Description: **Fieldstone**
Hot Water: **Tank**
Lot Description: **Paved Drive**
Roof Material: **Asphalt/Fiberglass Shingles**
Sewer Utilities: **City/Town Sewer**
Terms: **Contract for Deed**
Water Utilities: **City/Town Water**
Waterfront: **No**

Other Property Info

Adult Community: **No**
Disclosure Declaration: **No**
Exclusions:
Green Certified: **Unknown**
Home Own Assn: **No**
Lead Paint: **Unknown**
UFFI: **Unknown** Warranty Features:
Year Built: **1886** Source: **Public Record**
Year Built Description: **Approximate**
Year Round:
Short Sale w/Lndr. App. Req: **No**
Lender Owned: **Yes**

Tax Information

Pin #:
Assessed: **$222,500**
Tax: **$3,060** Tax Year: **2019**
Book: **34079** Page: **146**
Cert:
Zoning Code: **R3**
Map: Block: Lot:

Compensation

Sub-Agent: **Not Offered**
Buyer Agent: **3**
Facilitator: **0**
Compensation Based On: **Net Sale Price**

Office/Agent Information

Listing Office: **RE/MAX Encore** **(978) 988-0028**
Listing Agent: **Jessica Sherman-Anderson** **(978) 808-8282**
Team Member(s):
Sale Office: **Simes City Realty (978) 420-8410**
Sale Agent: **Kristyn Rudolph (978) 606-7719**
Listing Agreement Type: **Exclusive Right to Sell**
Entry Only: **No**
Showing: Sub-Agent: **Sub-Agency Relationship Not Offered**
Showing: Buyer-Agent: **Schedule with ShowingTime or Call 888-627-2775**
Showing: Facilitator: **Schedule with ShowingTime or Call 888-627-2775**
Special Showing Instructions:

Firm Remarks

All contracts and offers are subject to final review and approval of seller, all offers or contracts are not binding unless the entire agreement is ratified by all parties. Seller will not supply smoke/carbon certificate for closing.

Market Information

Listing Date: **3/10/2021**
Days on Market: Property has been on the market for a total of **9** day(s)
Expiration Date:
Original Price: **$200,000**
Off Market Date: **3/18/2021**
Sale Date: **4/23/2021**
Sale Price: **$275,000**
Offer Date: **3/18/2021** Days to Offer: **8**

Listing Market Time: MLS# has been on for **9** day(s)
Office Market Time: Office has listed this property for **9** day(s)
Cash Paid for Upgrades:
Seller Concessions at Closing:
Financing: **Cash**
Sale-to-List Ratio: **137.5%**

Market History for 38 Hamblett Ave, Dracut, MA 01826

MLS #	Date			DOM	DTO	Price
72796174	3/10/2021	Listed for **$200,000**	Jessica Sherman-Anderson			$200,000
UAG	3/19/2021	Status Changed to: **Under Agreement**	Jessica Sherman-Anderson	9		
SLD	4/23/2021	Status Changed to: **Sold**	Jessica Sherman-Anderson	9		
	4/23/2021	Sold for **$275,000**	Jessica Sherman-Anderson	9	8	**$275,000**
			Market History for RE/MAX Encore (B95079)	**9**	**8**	**$275,000**
			Market History for this property	**9**	**8**	**$275,000**

MLS # 72789713 - Sold

Single Family - Detached

34 Cleveland Ave
Saugus, MA: Lynnhurst, 01906
Essex County

List Price: **$509,999**
Sale Price: **$520,000**

Style: **Colonial, Dutch Colonial**
Total Rooms: **7**
Color:
Bedrooms: **4**
Grade School:
Bathrooms: **1f 1h**
Middle School:
Main Bath: **No**
High School:
Fireplaces: **0**
Approx. Acres: **0.25 (10,890 SqFt)**
Approx. Street Frontage:
Handicap Access/Features:
Directions: **Walnut Street east off of Rte 1. Right on Fairmount Ave, Left onto Washington Ave, Left on Cleveland**

Rare opportunity to own a double lot, 0.25 acres, in the desirable Lynnhurst neighborhood of Saugus. This 4 bed, 1 and a 1/2 bath Dutch colonial home about 10 miles north of Boston and 6 miles from local beaches, shops and restaurants. Short walk to Lynnhurst Elementary School, Lynn Woods Reservation & the MBTA bus. A big dining area walks out to a beautiful backyard with a fire pit that will suit all your entertaining needs. Plenty of parking in the 2 driveways so no one needs to park on the street. Extra storage space can be found in the attic and basement which also features a workbench and laundry hookups. OPEN HOUSE on 2/27/2021 from 11AM - 2PM and 2/28/2021 12PM - 3PM. All final and best offers due by 5PM on 3/1/2021

Property Information

Approx. Living Area Total: **1,662 SqFt**
Living Area Includes Below-Grade SqFt: **Yes**
Living Area Source: **Appraiser**
Approx. Above Grade:
Approx. Below Grade:
Living Area Disclosures:

Heat Zones: **Hot Water Baseboard, Electric Baseboard**
Cool Zones: **Window AC**
Parking Spaces: **6 Off-Street, Paved Driveway, On Street Without Permit**
Garage Spaces: **0**
Disclosures: **OPEN HOUSE on 2/27/2021 from 11AM - 2PM and 2/28/2021 12PM - 3PM. Please follow all COVID-19 guidelines and protocols. Mask at all times when in the home.**

Room Levels, Dimensions and Features

Room	Level	Size	Features
Living Room:	**1**		**-**
Dining Room:	**1**		**-**
Kitchen:	**1**		**-**
Main Bedroom:	**1**		**-**
Bedroom 2:	**2**		**-**
Bedroom 3:	**2**		**-**
Bedroom 4:	**2**		**-**
Bath 1:	**1**		**-**
Bath 2:	**2**		**-**
Foyer:	**1**		**-**

Features

Basement: **Yes** **Full, Unfinished Basement**
Beach: **No**

Other Property Info

Disclosure Declaration: **No**
Exclusions:

Firm Remarks

Sellers prefer only open house but will make some exceptions if possible for showings. However all showings are delayed at least until open house.

Electric: **100 Amps**
Exterior: **Vinyl**
Exterior Features: **Porch - Enclosed, Deck - Wood, Gutters**
Flooring: **Tile, Wall to Wall Carpet, Laminate, Hardwood**
Foundation Size:
Foundation Description: **Concrete Block**
Hot Water: **Oil**
Lot Description: **Level**
Sewer Utilities: **City/Town Sewer**
Utility Connections: **for Electric Range, for Electric Dryer, Washer Hookup**
Water Utilities: **City/Town Water**
Waterfront: **No**

Home Own Assn: **No**
Lead Paint: **Unknown**
UFFI: Warranty Features:
Year Built: **1920** Source: **Public Record**
Year Built Description: **Approximate**
Year Round:
Short Sale w/Lndr. App. Req: **No**
Lender Owned: **No**

Tax Information

Pin #:
Assessed: **$410,300**
Tax: **$4,891** Tax Year: **2020**
Book: **23115** Page: **298**
Cert: **7/12/2004**
Zoning Code: **SNGL-FAM-R**
Map: Block: Lot:

Compensation

Sub-Agency: **Not Offered** Buyer's Broker: **2**
Facilitator: **1**
Compensation Based On: **Gross/Full Sale Price**

Office/Agent Information

Listing Office: **Coco, Early & Associates** **(978) 687-8484**
Listing Agent: **Nicholas Brigham (603) 634-9010**
Team Member(s):**Nicholas Brigham (603) 634-9010**
Sale Office: **Lamacchia Realty, Inc.** **(339) 645-9300**
Sale Agent: **Kiki Carrabes (954) 854-8243**
Listing Agreement Type: **Exclusive Right to Sell**
Entry Only: **No**
Showing: Sub-Agency:
Showing: Buyer's Broker: **Call List Agent**
Showing: Facilitator: **Call List Agent**
Special Showing Instructions:

Market Information

Listing Date: **2/24/2021**
Listing Market Time: MLS# has been on for **6** day(s)
Days on Market: Property has been on the market for a total of **6** day(s)
Office Market Time: Office has listed this property for **6** day(s)
Expiration Date:
Cash Paid for Upgrades:
Original Price: **$509,999**
Seller Concessions at Closing:
Off Market Date: **3/3/2021**
Financing: **Conv. Fixed**
Sale Date: **5/28/2021**
Sale-to-List Ratio: **101.96%**
Sale Price: **$520,000**
Offer Date: **3/3/2021** Days to Offer: **7**

Market History for 34 Cleveland Ave, Saugus, MA: Lynnhurst, 01906

MLS #	Date			DOM	DTO	Price
72789713	2/24/2021	Listed for **$509,999**	Nicholas Brigham			$509,999
UAG	3/3/2021	Status Changed to: **Under Agreement**	Nicholas Brigham	7		
SLD	6/2/2021	Status Changed to: **Sold**	Claire Prudhomme	7		
	5/28/2021	Sold for **$520,000**	Claire Prudhomme	6	7	**$520,000**
		Market History for Coco, Early & Associates (G61700)		**6**	**7**	**$520,000**
			Market History for this property	**6**	**7**	**$520,000**

Table B.8: Massachusetts Community Types – Summary Description

Inner Core	**Metropolitan Core Communities** *High density inner cities* • Urban environment with mix of apartment buildings, multifamily houses, single family houses • Completely "built-out" • New growth: redevelopment, infill, and conversion from industrial uses to residential • Large minority and immigrant populations; recovering from urban disinvestment/suburban flight in the 1960s and 1970s
	Streetcar Suburbs *Historic, high-density suburbs near the urban core* • Village-oriented residential neighborhoods dominated by multifamily homes and smaller apartment buildings • All are essentially built-out • Very little new growth: limited redevelopment, infill, and expansion of existing structures • Moderately diverse population; stable or losing population due to decreasing household size.
Regional Urban Centers	**Major Regional Urban Centers** *Large, high-density urban centers not proximate to Boston* • Large urban communities (>70,000 residents) with a mix of housing types (predominantly multifamily) • Nearly built out; scattered parcels of vacant developable land (<15% of land area is vacant & developable) • New growth: redevelopment, infill, and conversion from industrial uses to residential uses • Have been growing slowly or losing population; low tax base per capita
	Sub-Regional Urban Centers *Small/mid-sized urban downtowns, diverse neighborhoods* • Urban-scale downtown core surrounded by more suburban residential neighborhoods • May be built out, or may have undeveloped land around the periphery • New growth: redevelopment in downtown/industrial areas; greenfield development on periphery • "Built-out" cities have been stable or growing slowly; those with undeveloped land growing more rapidly
Maturing Suburbs	**Mature Suburbs** *Moderate density, nearly built out* • Mid-century suburbs; owner-occupied single family homes on ¼ - ½ acre lots • Nearly built out; scattered parcels of vacant developable land (<15% of land area is vacant & developable) • New housing units: infill development, some redevelopment, teardowns • Population is relatively stable
	Established Suburbs and Cape Cod Towns *Lower density, approaching buildout* • Lower density suburbs; owner-occupied single family homes on ¾ - 1 acre lots • Approaching buildout; limited amounts of vacant land (<20% of land area is vacant & developable) • New growth: teardowns, small-scale greenfield development, some redevelopment. • Population is stable or growing moderately
Developing Suburbs	**Maturing New England Towns** *Well-defined town center, mixed densities, room to grow* • Mixed-use town center surrounded by compact neighborhoods (¼ - ½ acre lots); low-density outlying areas • Large amounts of vacant developable land (>25% of total town area is vacant & developable) • New growth: conventional subdivision development on vacant land • Population and households growing rapidly; adding residential land rapidly
	Country Suburbs *Very low density, room to grow, country character* • Low density communities with no significant town center and no compact neighborhoods • Large amounts of vacant developable land (>35% of total town area is vacant & developable) • New growth: conventional low-density subdivision development on vacant land • Generally growing rapidly (population and households)
Rural Towns	**Rural Towns** *Small, scattered population; slow growth* • Very low density communities with no significant town center and scattered "farmstead" settlements; very few subdivisions; very limited economic development • Very large amounts of vacant developable land (>40% of total town area is vacant & developable) • New growth: small amounts of scattered residential development (average below 15 acres/year) • Population less than 2,500 and growing slowly

Table B.9: Descriptive Statistics – 2012 through 2021

	Pooled Sample				Standard-Listing Sample				Offer Deadline Sample			
	Mean	Std. Dev.	Minimum	Maximum	Mean	Std. Dev.	Minimum	Maximum	Mean	Std. Dev.	Minimum	Maximum
List Price at Sale	487,362	371,547	65,000	5,995,000	484,727	376,069	65,000	5,995,000	534,016	275,456	72,500	3,650,000
Sales Price	484,926	363,604	65,000	5,000,000	480,346	366,474	65,000	5,000,000	566,028	296,900	65,000	3,958,000
Sale Price to List Price Ratio	1.00	0.06	0.61	1.51	0.99	0.05	0.61	1.51	1.06	0.06	0.68	1.50
Offer Deadline	0.05	0.23	-	1	-	-	-	-	1	-	1	1
Days on Market	48.3	48.7	1	270	50.0	49.4	1	270	18.3	15.7	1	243
Living Area (Sqft)	1,984	944	500	9,922	1,990	954	500	9,922	1,883	749	510	8,286
Lot Size (Sqft)	27,574	39,646	599	435,600	27,961	40,115	599	435,600	20,718	29,316	824	435,600
Age	61.7	36.2	2	211	61.3	36.2	2	211	68.2	34.4	2	211
Number of Bedrooms	3.35	0.83	1	9	3.35	0.84	1	9	3.30	0.76	1	9
Number of Bathrooms	2.27	1.01	1	8	2.28	1.02	1	8	2.18	0.86	1	8
Remodeled/Renovated	0.12	0.32	-	1	0.12	0.32	-	1	0.15	0.36	-	1
New Roof	0.08	0.27	-	1	0.08	0.27	-	1	0.07	0.26	-	1
Stone Counters	0.10	0.30	-	1	0.10	0.29	-	1	0.12	0.33	-	1
In-Law Apartment	0.05	0.23	-	1	0.05	0.23	-	1	0.05	0.21	-	1
Security/Smart Home	0.02	0.13	-	1	0.02	0.13	-	1	0.01	0.12	-	1
Country Club	0.01	0.09	-	1	0.01	0.08	-	1	0.01	0.09	-	1
Rental	0.02	0.13	-	1	0.02	0.13	-	1	0.01	0.10	-	1
Vacant	0.01	0.10	-	1	0.01	0.10	-	1	0.01	0.09	-	1
Estate	0.02	0.12	-	1	0.02	0.12	-	1	0.02	0.15	-	1
Flat Fee	0.02	0.12	-	1	0.02	0.12	-	1	0.01	0.07	-	1
Waterfront	0.03	0.18	-	1	0.03	0.18	-	1	0.02	0.14	-	1
HOA	0.04	0.20	-	1	0.04	0.20	-	1	0.02	0.15	-	1
Conventional Financing	0.81	0.39	-	1	0.81	0.40	-	1	0.82	0.38	-	1
Cash Financing	0.08	0.28	-	1	0.08	0.27	-	1	0.09	0.29	-	1
FHA Financing	0.09	0.28	-	1	0.09	0.28	-	1	0.07	0.25	-	1
VA Financing	0.03	0.16	-	1	0.03	0.16	-	1	0.02	0.13	-	1
Listing Density	1.01	1.26	-	22.8	1.02	1.27	-	22.8	0.74	0.91	-	12.3
Market Competition	53.12	111.03	-	3,475.0	55.30	113.52	-	3,475.0	14.62	28.62	-	769.4
Observations	403,310				381,755				21,555			

Table B.10: Difference in Means – 2012 through 2021

	Standard Listing	Offer Deadline	Difference	Standard Error	t-value	p-value
List Price at Sale	484,727	534,016	49,289	1,972	(25.00)	0.00
Sales Price	480,346	566,028	85,681	2,107	(40.65)	0.00
Sale Price to List Price Ratio	0.99	1.06	0.07	0.00	(155.65)	0.00
Days on Market	50.03	18.33	(31.70)	0.13	237.00	0.00
Living Area (Sqft)	1,990	1,883	(107)	5	20.00	0.00
Lot Size (Sqft)	27,961	20,718	(7,243)	210	34.50	0.00
Age	61.328	68.16	6.832	0.241	(28.30)	0.00
Number of Bedrooms	3.35	3.30	(0.05)	0.01	9.05	0.00
Number of Bathrooms	2.28	2.18	(0.10)	0.01	16.70	0.00
Remodeled/Renovated	0.12	0.15	0.04	0.00	(15.35)	0.00
New Roof	0.08	0.07	(0.00)	0.00	0.80	0.42
Stone Counters	0.10	0.12	0.03	0.00	(11.45)	0.00
In-Law Apartment	0.05	0.05	(0.01)	0.00	5.70	0.00
Security/Smart Home	0.02	0.01	(0.00)	0.00	5.40	0.00
Country Club	0.01	0.01	0.00	0.00	(0.70)	0.49
Rental	0.02	0.01	(0.01)	0.00	10.55	0.00
Vacant	0.01	0.01	(0.00)	0.00	2.20	0.03
Estate	0.02	0.02	0.01	0.00	(6.15)	0.00
Flat Fee	0.02	0.01	(0.01)	0.00	20.00	0.00
Waterfront	0.04	0.02	(0.02)	0.00	15.60	0.00
HOA	0.04	0.02	(0.02)	0.00	18.30	0.00
Conventional Financing	0.81	0.82	0.01	0.00	(5.60)	0.00
Cash Financing	0.08	0.09	0.01	0.00	(5.05)	0.00
FHA Financing	0.09	0.07	(0.02)	0.00	10.10	0.00
VA Financing	0.03	0.02	(0.01)	0.00	7.60	0.00
Listing Density	1.02	0.74	(0.29)	0.01	44.00	0.00
Market Competition	55.30	14.62	(40.68)	0.27	151.90	0.00
Standard Listing Observations	381,755					
Offer Deadline Listing Observations	21,555					

Table B.11: Probability of Offer Deadline Listing

	(1) Coefficients	(2) *t*-statistic	(3) Coefficients	(4) *t*-statistic	(5) Coefficients	(6) *t*-statistic
Living Area (Sqft)E-04	-0.106**	(-12.001)	-0.105**	(-11.809)	-0.596**	(-3.267)
Lot Size (Sqft)E-04	-0.001**	(-3.707)	-0.001**	(-3.707)	-0.002	(-1.388)
Number of Bedrooms	-0.003	(-0.550)	-0.004	(-0.611)	0.162	(1.448)
Number of Bathrooms	-0.017*	(-2.509)	-0.017**	(-2.590)	0.127	(1.037)
Age	-0.001**	(-6.011)	-0.001**	(-5.907)	-0.005*	(-2.055)
Rental	-0.157**	(-4.727)	-0.159**	(-4.753)	0.138	(0.417)
Vacant	-0.148**	(-3.811)	-0.148**	(-3.823)	-0.233	(-0.286)
Estate	0.119**	(4.549)	0.118**	(4.497)	0.518	(1.190)
Flat Fee	-0.452**	(-10.418)	-0.450**	(-10.381)		
Waterfront	-0.102**	(-4.148)	-0.101**	(-4.101)	-0.129	(-0.531)
HOA	-0.072**	(-3.048)	-0.067**	(-2.829)	-1.306**	(-2.863)
Atypical: Large Home	-0.196**	(-5.894)	-0.198**	(-5.946)		
Atypical: Large Lot	0.041	(0.632)	0.031	(0.450)	0.333	(1.076)
Atypical: Many Baths	-0.230**	(-3.137)	-0.229**	(-3.126)		
Atypical: Many Bedrooms	-0.000	(-0.002)	0.000	(0.007)		
Atypical: Older Home	-0.063	(-1.613)	-0.063	(-1.609)	0.450	(0.989)
Country Club	-0.028	(-0.654)	-0.028	(-0.660)		
Security/Smart Home	-0.050	(-1.730)	-0.049	(-1.695)		
New Roof	0.001	(0.100)	0.002	(0.115)	-0.053	(-0.192)
In-Law Apartment	-0.045**	(-2.604)	-0.044*	(-2.535)	-0.572	(-1.329)
Stone Counters	0.074**	(6.426)	0.075**	(6.488)	-0.501	(-1.425)
Observations	698,579		692,227		982	
Month x Year FE	✓		✓		✓	
ZIP Code FE	✓		✓		✓	

The table presents the equation modeling the probability of an offer deadline listing using a probit model. Column (1) is for the full sample. Column (3) is for the urban region sample. Column (5) is for the rural region sample. The time period of the sample represented is from 2000-2021. Robust *t*-statistics are in parentheses. ** and * denote p-values <0.01 and <0.05 respectively.

Table B.12: Difference in Means – Urban Areas

	Standard Listing	Offer Deadline	Difference	Standard Error	t-value	p-value
List Price at Sale	487,240	534,862	47,622	1,978	(24.05)	0.00
Sales Price	482,910	566,897	83,987	2,114	(39.75)	0.00
Sale Price to List Price Ratio	0.99	1.06	0.07	0.00	(154.80)	0.00
Days on Market	49.75	18.33	(31.41)	0.13	234.45	0.00
Living Area (Sqft)	1,993	1,884	(108)	5.35	20.25	0.00
Lot Size (Sqft)	26,894	20,392	(6,502)	203	32.00	0.00
Age	61.44	68.23	6.79	0.24	(28.05)	0.00
Number of Bedrooms	3.35	3.30	(0.05)	0.01	9.55	0.00
Number of Bathrooms	2.28	2.18	(0.10)	0.01	17.05	0.00
Remodeled/Renovated	0.12	0.15	0.04	0.00	(15.10)	0.00
New Roof	0.08	0.07	(0.00)	0.00	0.80	0.41
Stone Counters	0.10	0.12	0.03	0.00	(11.30)	0.00
In-Law Apartment	0.05	0.05	(0.01)	0.00	5.75	0.00
Security/Smart Home	0.02	0.01	(0.00)	0.00	5.50	0.00
Country Club	0.01	0.01	0.00	0.00	(0.60)	0.55
Rental	0.02	0.01	(0.01)	0.00	10.55	0.00
Vacant	0.01	0.01	(0.00)	0.00	2.30	0.02
Estate	0.02	0.02	0.01	0.00	(6.05)	0.00
Flat Fee	0.02	0.01	(0.01)	0.00	19.90	0.00
Waterfront	0.03	0.02	(0.02)	0.00	14.75	0.00
HOA	0.04	0.02	(0.02)	0.00	17.60	0.00
Conventional Financing	0.81	0.82	0.01	0.00	(5.25)	0.00
Cash Financing	0.08	0.09	0.01	0.00	(5.30)	0.00
FHA Financing	0.09	0.07	(0.02)	0.00	10.05	0.00
VA Financing	0.03	0.02	(0.01)	0.00	7.30	0.00
Listing Density	1.03	0.74	(0.30)	0.01	45.20	0.00
Market Competition	55.85	14.67	(41.18)	0.27	152.60	0.00
Standard Listing Observations	376,508					
Offer Deadline Listing Observations	21,474					

Table B.13: Difference in Means – Rural Areas

	Standard Listing	Offer Deadline	Difference	Standard Error	t-value	p-value
List Price at Sale	304,400	309,612	5,213	9,825	(0.55)	0.60
Sales Price	296,390	335,610	39,220	11,545	(3.40)	0.00
Sale Price to List Price Ratio	0.97	1.08	0.11	0.01	(12.05)	0.00
Days on Market	70.42	19.16	(51.26)	1.82	28.20	0.00
Living Area (Sqft)	1,808	1,641	(167)	64	2.60	0.01
Lot Size (Sqft)	104,550	107,190	2640	9,760	(0.25)	0.79
Age	53.23	50.31	(2.93)	4.054	0.70	0.47
Number of Bedrooms	3.07	3.00	(0.07)	0.07	0.90	0.37
Number of Bathrooms	2.05	2.01	(0.04)	0.09	0.40	0.68
Remodeled/Renovated	0.07	0.11	0.04	0.04	(1.25)	0.22
New Roof	0.07	0.05	(0.02)	0.03	0.70	0.49
Stone Counters	0.05	0.03	(0.03)	0.02	1.50	0.14
In-Law Apartment	0.04	0.01	(0.03)	0.01	2.05	0.05
Security/Smart Home	0.01	0.00	(0.01)	0.00	6.60	0.00
Country Club	0.00	0.00	(0.00)	0.00	2.25	0.03
Rental	0.03	0.04	0.01	0.02	(0.55)	0.59
Vacant	0.01	0.01	0.01	0.01	(0.55)	0.59
Estate	0.01	0.03	0.02	0.02	(0.95)	0.35
Flat Fee	0.01	0.00	(0.01)	0.00	8.60	0.00
Waterfront	0.12	0.07	(0.04)	0.03	1.35	0.18
HOA	0.09	0.01	(0.07)	0.01	5.65	0.00
Conventional Financing	0.71	0.68	(0.03)	0.05	0.60	0.57
Cash Financing	0.16	0.25	0.09	0.05	(1.80)	0.08
FHA Financing	0.09	0.05	(0.04)	0.03	1.45	0.16
VA Financing	0.05	0.03	(0.02)	0.02	1.25	0.21
Listing Density	0.20	0.06	(0.13)	0.02	6.40	0.00
Market Competition	15.91	1.36	(14.55)	0.81	17.90	0.00
Standard Listing Observations	5,247					
Offer Deadline Listing Observations	81					

Table B.14: Difference in Means Period of Rapid Price Increase January 2000 – April 2005

	Standard Listing	Offer Deadline	Difference	Standard Error	*t*-value	*p*-value
List Price at Sale	354,930	617,680	262,750	18,873	(13.90)	0.00
Sales Price	345,797	634,593	288,796	17,954	(16.10)	0.00
Sale Price to List Price Ratio	0.98	1.02	0.04	0.00	(15.25)	0.00
Days on Market	50.93	20.20	(30.73)	3.46	8.90	0.00
Living Area (Sqft)	1,781	2,051	270	57.40	(4.70)	0.00
Lot Size (Sqft)	25,755	17,831	(7,924)	2,723	2.90	0.00
Age	52.64	62.28	9.638	2.65	(3.65)	0.00
Number of Bedrooms	3.29	3.64	0.35	0.06	(5.75)	0.00
Number of Bathrooms	2.03	2.39	0.36	0.07	(5.55)	0.00
Remodeled/Renovated	0.03	0.05	0.02	0.01	(1.20)	0.24
New Roof	0.04	0.02	(0.03)	0.01	1.70	0.09
Stone Counters	0.01	0.01	0.00	0.01	(0.45)	0.65
In-Law Apartment	0.05	0.05	0.01	0.02	(0.45)	0.64
Security/Smart Home	0.02	0.02	(0.00)	0.01	0.25	0.82
Country Club	0.00	0.01	0.00	0.00	(0.50)	0.63
Rental	0.01	0.01	(0.00)	0.01	0.45	0.65
Vacant	0.01	0.02	0.01	0.01	(0.75)	0.46
Estate	0.01	0.05	0.04	0.01	(8.35)	0.00
Flat Fee	0.01	0.01	(0.01)	0.01	1.05	0.30
Waterfront	0.03	0.03	(0.00)	0.01	0.10	0.92
HOA	0.03	0.02	(0.01)	0.01	1.10	0.27
Conventional Financing	0.88	0.90	0.02	0.02	(0.80)	0.42
Cash Financing	0.03	0.08	0.05	0.01	(3.65)	0.00
FHA Financing	0.08	0.02	(0.06)	0.02	3.00	0.00
VA Financing	0.01	0.00	(0.01)	0.01	1.15	0.24
Listing Density	1.11	1.11	(0.01)	0.10	0.05	0.94
Market Competition	59.20	26.97	(32.23)	14.21	2.25	0.02
Standard Listing Observations	183,678					
Offer Deadline Listing Observations	192					

Table B.15: Difference in Means Period of Steady State May 2005 – March 2006

	Standard Listing	Offer Deadline	Difference	Standard Error	t-value	p-value
List Price at Sale	421,271	571,715	150,444	50,460	(3.00)	0.00
Sales Price	407,499	585,839	178,340	47,359	(3.75)	0.00
Sale Price to List Price Ratio	0.97	1.01	0.04	0.01	(5.40)	0.00
Days on Market	69.57	27.16	(42.42)	10.40	4.10	0.00
Living Area (Sqft)	1,790	1,648	(141)	142.96	1.00	0.32
Lot Size (Sqft)	25,144	12,031	(13,114)	6,453	2.05	0.04
Age	55.06	73.81	18.75	6.39	(2.95)	0.00
Number of Bedrooms	3.28	3.06	(0.21)	0.15	1.45	0.15
Number of Bathrooms	2.05	2.00	(0.04)	0.16	0.25	0.79
Remodeled/Renovated	0.05	0.06	0.02	0.04	(0.40)	0.68
New Roof	0.06	0.00	(0.06)	0.04	1.45	0.14
Stone Counters	0.02	0.06	0.04	0.03	(1.55)	0.12
In-Law Apartment	0.05	0.00	(0.05)	0.04	1.35	0.18
Security/Smart Home	0.03	0.00	(0.03)	0.03	0.90	0.36
Country Club	0.01	0.00	(0.01)	0.01	0.40	0.70
Rental	0.01	0.00	(0.01)	0.02	0.45	0.65
Vacant	0.02	0.03	0.02	0.02	(0.75)	0.45
Estate	0.01	0.00	(0.01)	0.01	0.45	0.66
Flat Fee	0.02	0.00	(0.02)	0.02	0.70	0.48
Waterfront	0.03	0.00	(0.03)	0.03	1.05	0.29
HOA	0.03	0.00	(0.03)	0.03	1.00	0.31
Conventional Financing	0.97	0.97	(0.00)	0.03	0.05	0.98
Cash Financing	0.02	0.03	0.01	0.03	(0.30)	0.76
FHA Financing	0.01	0.00	(0.01)	0.01	0.40	0.69
VA Financing	0.00	0.00	(0.00)	0.01	0.25	0.79
Listing Density	2.10	2.34	0.25	0.40	(0.60)	0.54
Market Competition	145.21	63.10	(82.11)	41.26	2.00	0.05
Standard Listing Observations	34,386					
Offer Deadline Listing Observations	32					

Table B.16: Difference in Means Period of Price Decrease April 2006 – March 2009

	Standard Listing	Offer Deadline	Difference	Standard Error	t-value	p-value
List Price at Sale	402,425	471,077	68,652	36,475	(1.90)	0.06
Sales Price	385,221	482,358	97,137	34,117	(2.85)	0.01
Sale Price to List Price Ratio	0.96	1.03	0.07	0.01	(10.75)	0.00
Days on Market	79.31	33.91	(45.40)	7.85	5.80	0.00
Living Area (Sqft)	1,851	2,018	167	102.88	(1.60)	0.11
Lot Size (Sqft)	27,068	17,692	(9,377)	4,650	2.00	0.04
Age	55.48	70.51	15.026	4.38	(3.45)	0.00
Number of Bedrooms	3.29	3.38	0.09	0.10	(0.90)	0.37
Number of Bathrooms	2.10	2.20	0.10	0.12	(0.85)	0.38
Remodeled/Renovated	0.06	0.12	0.06	0.03	(2.20)	0.03
New Roof	0.06	0.02	(0.05)	0.03	1.65	0.10
Stone Counters	0.04	0.03	(0.01)	0.02	0.30	0.78
In-Law Apartment	0.05	0.06	0.01	0.03	(0.50)	0.61
Security/Smart Home	0.02	0.00	(0.02)	0.02	1.15	0.25
Country Club	0.01	0.00	(0.01)	0.01	0.60	0.56
Rental	0.01	0.00	(0.01)	0.01	0.75	0.46
Vacant	0.01	0.02	0.00	0.01	(0.05)	0.95
Estate	0.01	0.04	0.03	0.01	(2.60)	0.01
Flat Fee	0.02	0.00	(0.02)	0.02	1.15	0.24
Waterfront	0.04	0.03	(0.01)	0.02	0.30	0.76
HOA	0.03	0.04	0.01	0.02	(0.50)	0.63
Conventional Financing	0.92	0.86	(0.07)	0.03	2.15	0.03
Cash Financing	0.04	0.10	0.07	0.02	(3.05)	0.00
FHA Financing	0.04	0.04	0.01	0.02	(0.35)	0.74
VA Financing	0.01	0.00	(0.01)	0.01	0.60	0.53
Listing Density	1.92	2.14	0.22	0.26	(0.85)	0.39
Market Competition	147.13	91.86	(55.27)	29.25	1.90	0.06
Standard Listing Observations	59,819					
Offer Deadline Listing Observations	69					

Table B.17: Difference in Means Period of Steady State Market April 2009 – April 2012

	Standard Listing	Offer Deadline	Difference	Standard Error	t-value	p-value
List Price at Sale	412,423	507,173	94,751	20,311	(4.65)	0.00
Sales Price	395,723	516,346	120,624	18,987	(6.35)	0.00
Sale Price to List Price Ratio	0.96	1.02	0.06	0.00	(19.05)	0.00
Days on Market	75.50	25.05	(50.45)	3.87	13.05	0.00
Living Area (Sqft)	1,943	1,933	(10)	56.74	0.15	0.86
Lot Size (Sqft)	26,713	13,985	(12,729)	2,352	5.40	0.00
Age	56.82	78.97	22.157	2.22	(10.00)	0.00
Number of Bedrooms	3.34	3.41	0.07	0.05	(1.35)	0.18
Number of Bathrooms	2.23	2.20	(0.03)	0.06	0.45	0.67
Remodeled/Renovated	0.08	0.13	0.05	0.02	(2.90)	0.00
New Roof	0.07	0.06	(0.01)	0.02	0.70	0.49
Stone Counters	0.06	0.05	(0.01)	0.02	0.75	0.46
In-Law Apartment	0.05	0.03	(0.02)	0.01	1.40	0.16
Security/Smart Home	0.02	0.00	(0.01)	0.01	1.60	0.10
Country Club	0.01	0.02	0.01	0.01	(3.35)	0.00
Rental	0.01	0.00	(0.01)	0.01	1.10	0.28
Vacant	0.01	0.00	(0.01)	0.01	1.55	0.12
Estate	0.02	0.03	0.01	0.01	(1.55)	0.12
Flat Fee	0.02	0.00	(0.02)	0.01	2.35	0.02
Waterfront	0.04	0.02	(0.01)	0.01	1.10	0.27
HOA	0.04	0.01	(0.03)	0.01	2.60	0.01
Conventional Financing	0.85	0.90	0.05	0.02	(2.15)	0.03
Cash Financing	0.05	0.07	0.01	0.01	(0.95)	0.34
FHA Financing	0.08	0.03	(0.05)	0.02	3.00	0.00
VA Financing	0.01	0.00	(0.01)	0.01	1.40	0.17
Listing Density	1.78	2.21	0.43	0.12	(3.70)	0.00
Market Competition	130.55	56.92	(73.62)	12.96	5.70	0.00
Standard Listing Observations	77,347					
Offer Deadline Listing Observations	258					

Table B.18: Difference in Means Period of Price Increase May 2012 – December 2019

	Standard Listing	Offer Deadline	Difference	Standard Error	t-value	p-value
List Price at Sale	456,700	503,696	46,996	3,572	(13.15)	0.00
Sales Price	449,057	525,245	76,188	3,455	(22.05)	0.00
Sale Price to List Price Ratio	0.99	1.04	0.06	0.00	(112.90)	0.00
Days on Market	54.73	20.53	(34.20)	0.52	65.55	0.00
Living Area (Sqft)	1,964	1,825	(139)	9.42	14.80	0.00
Lot Size (Sqft)	27,652	16,239	(11,413)	401	28.45	0.00
Age	60.66	71.40	10.735	0.37	(29.15)	0.00
Number of Bedrooms	3.34	3.29	(0.05)	0.01	5.75	0.00
Number of Bathrooms	2.26	2.13	(0.13)	0.01	12.65	0.00
Remodeled/Renovated	0.11	0.16	0.05	0.00	(15.10)	0.00
New Roof	0.08	0.08	(0.00)	0.00	0.90	0.36
Stone Counters	0.10	0.12	0.02	0.00	(7.80)	0.00
In-Law Apartment	0.05	0.04	(0.01)	0.00	4.70	0.00
Security/Smart Home	0.02	0.02	(0.00)	0.00	3.05	0.00
Country Club	0.01	0.01	0.00	0.00	(1.35)	0.18
Rental	0.02	0.01	(0.01)	0.00	5.65	0.00
Vacant	0.01	0.01	(0.00)	0.00	1.00	0.33
Estate	0.02	0.02	0.01	0.00	(6.30)	0.00
Flat Fee	0.02	0.01	(0.01)	0.00	8.25	0.00
Waterfront	0.03	0.02	(0.02)	0.00	9.30	0.00
HOA	0.04	0.02	(0.03)	0.00	12.40	0.00
Conventional Financing	0.82	0.87	0.04	0.00	(11.25)	0.00
Cash Financing	0.07	0.07	0.00	0.00	(0.40)	0.71
FHA Financing	0.08	0.04	(0.04)	0.00	12.85	0.00
VA Financing	0.02	0.02	(0.01)	0.00	6.15	0.00
Listing Density	1.14	1.04	(0.10)	0.01	7.65	0.00
Market Competition	64.03	22.14	(41.89)	1.23	34.10	0.00
Standard Listing Observations	291,177					
Offer Deadline Listing Observations	9,787					

Table B.19: Difference in Means Period of Rapid Price Increase Market Price Market January 2020 – December 2021

	Standard Listing	Offer Deadline	Difference	Standard Error	t-value	p-value
List Price at Sale	592,965	559,160	(33,805)	4,225	8.00	0.00
Sales Price	602,141	599,959	(2,181)	4,188	0.50	0.60
Sale Price to List Price Ratio	1.02	1.07	0.05	0.00	(82.80)	0.00
Days on Market	29.73	16.46	(13.27)	0.29	45.55	0.00
Living Area (Sqft)	2,073	1,932	(141)	10.08	14.00	0.00
Lot Size (Sqft)	29,023	24,500	(4,523)	410	11.05	0.00
Age	64.45	65.39	0.94	0.37	(2.60)	0.01
Number of Bedrooms	3.38	3.31	(0.07)	0.01	8.55	0.00
Number of Bathrooms	2.35	2.22	(0.13)	0.01	12.75	0.00
Remodeled/Renovated	0.13	0.15	0.02	0.00	(4.65)	0.00
New Roof	0.07	0.07	0.00	0.00	(1.20)	0.22
Stone Counters	0.10	0.12	0.02	0.00	(7.30)	0.00
In-Law Apartment	0.06	0.05	(0.01)	0.00	3.70	0.00
Security/Smart Home	0.01	0.01	(0.00)	0.00	1.15	0.25
Country Club	0.01	0.01	(0.00)	0.00	1.20	0.24
Rental	0.02	0.01	(0.01)	0.00	7.80	0.00
Vacant	0.01	0.01	(0.01)	0.00	4.45	0.00
Estate	0.02	0.02	0.01	0.00	(3.60)	0.00
Flat Fee	0.01	0.00	(0.01)	0.00	5.90	0.00
Waterfront	0.04	0.02	(0.02)	0.00	8.75	0.00
HOA	0.05	0.03	(0.02)	0.00	8.80	0.00
Conventional Financing	0.74	0.78	0.04	0.01	(10.35)	0.00
Cash Financing	0.12	0.11	(0.01)	0.00	3.20	0.00
FHA Financing	0.11	0.09	(0.03)	0.00	7.90	0.00
VA Financing	0.03	0.02	(0.01)	0.00	5.95	0.00
Listing Density	0.50	0.48	(0.03)	0.01	3.70	0.00
Market Competition	15.19	8.17	(7.02)	0.32	22.20	0.00
Standard Listing Observations	79,532					
Offer Deadline Listing Observations	11,712					

Auction Literature Review

Auction Theory

A foundational understanding of auction theory and its applications in public marketing and resource allocation comes from Vickrey (1961) helps frame the discussion about real estate auctions. Vickrey (1961) explores the complexities of achieving Pareto-optimal outcomes in imperfect markets, particularly through auction mechanisms and competitive bidding processes. The paper emphasizes the challenges posed by asymmetrical information among bidders and the implications for pricing strategies.

He argues that in scenarios where bidders either want a fixed quantity or none at all, establishing a price based on the first rejected bid can lead to Pareto-optimal results. This method, while initially appearing to yield lower prices, ultimately encourages higher bids, aligning with outcomes from Dutch auctions and other pricing methods when bidders have symmetrical information about the value distributions of the items being auctioned.

The analysis also highlights the potential benefits of second-price auction methods, which can simplify the bidding process by allowing bidders to focus solely on their valuation of the item, rather than estimating competitors' valuations. This can lead to increased participation and better resource allocation, ultimately benefiting both buyers and sellers. Findings suggest that modifications to current auction practices, such as adopting second-price bidding, could enhance efficiency without significantly disadvantaging any party involved.

Milgrom and Weber (1982) contribute to the theoretical foundation of auction design and provides valuable insights into the strategic behavior of bidders, the impact of information on auction outcomes, and the potential for collusion in competitive bidding scenarios. A comprehensive analysis of various auction formats, including English, Dutch, first-price sealed-bid, and second-price sealed-bid auctions are provided.

Auction formats are ranked based on their expected revenues, revealing that English auctions typically generate higher prices than first-price auctions. This is attributed to the way information is revealed and how bidders adjust their bids based on the estimates of others. It is argued by the authors that the disclosure of information significantly impacts auction outcomes. Theorems presented in the paper indicate that revealing seller information tends to increase expected prices, as it links the auction price to the bidders' value estimates.

Questions are raised about which formats are more susceptible to collusive behavior and the dynamics of bidding syndicates. The implications of repeated bidding and potential collusion among bidders, particularly in contexts where bidders have ongoing relationships, such as in timber rights auctions.

The analysis is grounded in the assumption that bidders' valuations are affiliated, meaning that a high valuation by one bidder increases the likelihood of high valuations among others. This assumption is crucial for understanding the strategic interactions in auctions and the resulting price dynamics.

McAfee and McMillan (1987) serves as a foundational piece for researchers interested in the economic literature surrounding auctions providing a comprehensive overview of auction theory and its applications. The authors emphasize the need for empirical studies to test existing theories and predictions, particularly in contexts where auction formats vary, such as mineral rights auctions and government contracting, noting that many real-world auctions do not conform to the assumption of independent private values, which is prevalent in theoretical models. Instead, they suggest that affiliated values, where bidders' valuations are interdependent, are more common and warrant further investigation.

The study also discusses the implications of different auction types, such as first-price sealed-bid and English auctions, and their effects on bidder behavior and revenue outcomes. The authors call for more data-driven research, including laboratory experiments, to better understand bidding dynamics and the impact of factors like risk aversion and reserve prices on auction outcomes.

Real Estate Auctions

An early paper on auction theory that is tangential to real estate is Hansen (1986) with his investigation of the revenue equivalence between sealed-bid and open auctions using data from U.S. Forest Service timber auctions. It is not uncommon for timber research to be conducted by real estate scholars. The study tests proposition from Vickrey (1961) that both auction formats yield equal revenue, employing three estimation methods: ordinary least squares (OLS), two-stage least squares (TSLS), and maximum likelihood estimation (MLE). While sealed-bid auctions yield slightly higher revenue than open auctions, the difference is statistically and economically insignificant, suggesting that the revenue equivalence theorem holds in this context.

The research addresses potential biases in previous studies by correcting for selection bias in the auction format choice, which had not been adequately considered in earlier analyses. Also explored are two hypotheses related to auction performance: the collusion hypothesis, which posits that open auctions are more susceptible to cartel formation, and the asymmetry of beliefs hypothesis, which suggests that differing beliefs about costs and values among bidders can affect auction outcomes. The findings indicate no strong evidence supporting these hypotheses, reinforcing the conclusion that auction format does not significantly impact revenue.

Vanderporten (1992a) examines the dynamics of pooled auctions for condominium units. The study introduces a simple pooled auction model involving two homes and two bidders, emphasizing the strategic considerations that bidders must navigate, such as determining optimal bidding strategies based on their valuations and the perceived preferences of rival bidders. Highlighting that unlike traditional English auctions, where bidders compete for specific items, pooled auctions allow bidders to choose from a collection of items, which alters the bidding strategy significantly. The research indicates that while the expected revenue from pooled auctions may be lower than that from English auctions—potentially by as much as 14%—the primary advantage lies in reduced revenue variance, which mitigates the seller's risk of buyer default.

The paper also discusses the application of hedonic pricing models to forecast rival bidder preferences, enabling bidders to tailor their strategies to maximize expected gains. Despite the growing interest in multi-object auctions, the author notes a lack of theoretical work specifically addressing pooled auctions, suggesting a gap in the literature that warrants further exploration.

Vanderporten (1992b) presents a compliment to the prior purely theoretical work showing the theory with an empirical analysis, again studying the condominium units. The research highlights that when multiple similar properties are auctioned, bidders' strategies are influenced by their expectations of rival bidders' behavior and their personal valuations of the properties. The theoretical model is developed this time featuring three active bidders and three units for sale. Empirical analysis is conducted using data from a condominium auction involving 53 units sold over three separate dates. The findings indicate that the best deals are typically found in the middle of the auction, while bidders tend to overpay at both the beginning and the end of the

auction. The study suggests that the observed price anomalies may not solely be due to bidder error; rather, they may reflect rational behavior influenced by factors such as risk aversion and concerns about future occupancy.

Introduced in the study is the slow Dutch auction, where sellers gradually lower prices over an extended period, allowing for the arrival of new potential buyers. This approach contrasts with traditional auction methods, where prices are typically reduced rapidly. Argued by Adams, Kluger and Wyatt (1992) is that in a market characterized by an unlimited arrival of new buyers, it is often more beneficial for sellers to maintain a fixed asking price rather than resorting to auctions, which may not be optimal.

The findings suggest that the optimal pricing strategy for sellers is to set a price based on market conditions and hold it steady until the property is sold. This challenges the conventional wisdom that auctions are the preferred selling institution in real estate. The authors also discuss the implications of buyer behavior and market microstructure, emphasizing the importance of understanding the arrival rates of potential buyers and their independent valuation of properties.

Other important contributions of the paper include: The concept of bidding equilibria, particularly focusing on Wilson (1992), linear symmetric equilibrium bidding function. This function illustrates how bidders adjust their bids based on the distribution of their signals and the number of competitors, highlighting the importance of bid shading in maximizing expected utility, practical considerations for auction design, such as the role of reserve prices and information disclosure. These elements are crucial for sellers aiming to maximize revenue while navigating the complexities of bidder behavior and market conditions and review of various empirical studies that investigate the dynamics of real estate auctions, including the "afternoon effect," which refers to observed patterns of declining prices in multiple-object auctions.

Common to traditional listings of properties for sale, an initial price for an auction must be set. McAfee, Quan and Vincent (2002) examine this process of minimum bids for an auction with applications to real estate. The authors propose a methodology that leverages historical auction data to enhance seller revenue beyond traditional ad hoc formulas. much of the existing literature often assumes an exogenous set of bidders and does not account for correlations in valuations influenced by common factors. Auctions with a fixed number of bidders are analyzed, employing a model that incorporates affiliated values and endogenous participation.

A procedure for determining minimum acceptable bids (reserve prices) that is distribution-free, meaning it does not rely on specific knowledge of the distributions of bidders' signals or utility functions is introduced. This approach is particularly relevant in real-world auction environments where such information is often unavailable.

Illustrations are presented through examples from various auction contexts, including real estate, offshore oil leases, and timber rights with emphasis on the importance of using historical data to inform reserve price adjustments for future auctions, thereby potentially increasing revenue. The proposed method is presented as more robust and practical than traditional optimal auction approaches, as it requires fewer assumptions and less specific knowledge from the seller. This makes it applicable to a broader range of auction scenarios.

Looking at the following factors of number of bidders, market conditions and the operating auctioneer in one study is undertaken by Ong, Lusht and Mak (2005). Noted are the key fundamental studies from Vickrey (1961) and subsequent analyses by McAfee and McMillan (1987), emphasizing the importance of understanding how auction revenues compare to private negotiations.

Success in auctions, defined as the probability of a sale, is influenced by various factors including market conditions, property characteristics, and the auctioning agent. The authors call attention to a significant gap in empirical research regarding the effect of bidder turnout on auction outcomes. Theoretical literature suggests that an increase in bidders typically leads to higher prices, empirical findings (Burns 1985) present counterintuitive results where fewer bidders can sometimes yield higher average prices. Discusses is the critical role of market conditions in determining auction outcomes, referencing studies that show how negative market trends can drastically reduce the likelihood of successful sales, underscoring the importance of timing and market sentiment in auction strategies. The auction house also plays a significant factor influencing auction success, suggesting different auction houses may have varying levels of effectiveness in attracting bidders and facilitating sales.

Use of an auction to sell real estate is not a guarantee of sale. Even with a winning bid is has been shown there can be a failure in the completion of the transaction. Ong (2006) investigates the dynamics of real estate auctions, focusing on properties that fail to sell during the auction process. Half of the properties that do not sell at auction are eventually sold through private negotiations, often at prices higher than the last bids received during the auction, suggesting that the auction mechanism plays a significant role in price discovery, as it provides a centralized platform for buyers and sellers in a decentralized market.

Several key factors influencing post-auction sales are highlighted. The probability of a subsequent transaction is significantly higher for certain property types, such as apartments and terrace houses, and is positively correlated with higher auction turnout. Conversely, the absence of bids during the auction negatively impacts the likelihood of a successful sale afterward.

Additionally, the study finds that downward revisions to the opening bid can enhance the chances of a subsequent sale.

The author also tests the information signaling model proposed by Horstmann and LaCasse (1997), which posits that the average price for re-auctioned properties should increase with time to resale. Findings support this model, indicating that sellers engage in a renewed search process for buyers after unsuccessful auctions. However, also noted is that transaction prices tend to decline with increased time to sale, reinforcing the notion that prolonged negotiations may lead to lower final prices.

Utilizing data from Singapore's Sale of Sites (SOS) program Ooi, Sirmans and Turnbull (2006) study first-price sealed-bid auctions of single properties. This context allows for a clearer understanding of price formation without the complications introduced by multiple property offerings in a single auction. The authors argue that traditional auction models, which assume a large number of bidders leading to competitive equilibrium, do not adequately capture the complexities of real estate auctions where the number of participants is finite.

The empirical analysis reveals that bid prices often fall below the expected present value of the land, indicating that factors such as bidder characteristics and experience significantly influence bidding strategies. Publicly listed companies tend to submit higher bids compared to privately held firms, suggesting that winning an auction can enhance the capitalized value of closely held companies more than publicly traded ones. Also, inexperienced bidders may either overestimate or underestimate the potential returns from the land, which can result in higher or lower bids, respectively, which can lead to biased estimates of land value, affecting bidding behavior.

Studing the interplay between market sentiments Tse, Pretorius and Chau (2011) investigate the winner's curse phenomenon, and bidding outcomes in land auctions, specifically focusing on open-bid English auctions for redevelopment sites in Hong Kong. Empirically testing auction theory predictions using a comprehensive dataset and addresses three primary objectives: Bidder Responses to Uncertainty, Impact of Competition on Bidding. And Market Interpretation of Auction Outcomes.

Increased uncertainty leads to lower bids, supporting the winner's curse hypothesis. Joint bidding does not result in higher bids due to pooled information but rather reduces competition, which can lower auction revenues. Increased competition among bidders positively correlates with higher winning bids, thereby enhancing auction revenues. the presence of additional bidders significantly raises the ultimate winning bid compared to both the expected revenue and the opening bid.

Finally Utilizing event study methodology, the authors assesses how the stock market perceives successful auction outcomes. It explores whether these outcomes are viewed as instances of the winner's curse, acquisitions of positive net present value (NPV) projects, or signals regarding future market prospects. Findings suggest that the market interprets auction results as informative events that reflect developers' expectations about future property market conditions.

The literature on real estate auctions and fixed price sales reveals a complex interplay between different marketing systems and their impact on property prices. Key studies have examined the price effects associated with various auction formats, particularly the English auction system.

Wang (1993) investigates the conditions under which sellers prefer auctions over posted-price selling. The paper presents a dynamic model focusing on independent private values,

demonstrating that auctions are generally more advantageous when the distribution of buyers' valuations is more dispersed. A uniformly steeper marginal-revenue curve incentivizes sellers to opt for auctions, as it allows for higher potential profits by attracting more bidders over time.

The optimal selling mechanism is influenced by the dispersion of buyer valuations, confirming the common belief that auctions are favored in scenarios where valuations vary widely among buyers. Additionally, the study discusses the implications of these findings for monopoly sellers, suggesting that the choice of selling mechanism can significantly impact revenue outcomes.

Quan (2002) investigates the mechanisms of real estate transactions comparing auction sales to search market transactions, emphasizing the importance of understanding how various factors, such as search costs and holding costs, influence buyers' and sellers' decisions in selecting a sales method. The choice between auction and search market mechanisms is influenced by the self-selection of agents, where buyers and sellers opt for the method that aligns with their valuation and cost considerations. This choice is endogenous, being affected by the characteristics of the market and the participants.

The hypothesis that properties sold at auction command higher prices than those sold in the search market is empirically tested. Initial hedonic regression models suggested that auctioned properties sold for lower prices, contradicting the model's predictions. When accounting for the endogeneity of the mechanism choice, the results indicated that auctioned properties sold for approximately 30% more on average. This builds on previous studies, such as those by Ashenfelter and Genesove (1992)and Lusht (1996) which documented higher prices in auction settings.

Investigating the decision-making processes of real estate sellers regarding their choice of selling mechanisms, specifically auctions versus reservation prices Gan (2013) uses a mean-variance analysis to understand how risk aversion, holding costs, and downside risk influence these choices. Sellers with higher levels of risk aversion are more likely to choose auction mechanisms, while those with lower risk aversion tend to set reservation prices. This distinction highlights the importance of individual seller characteristics in determining optimal selling strategies.

Holding costs significantly affect the choice of selling mechanism. As holding costs increase, more sellers are inclined to opt for auctions, suggesting that the urgency to sell can drive sellers towards mechanisms that may yield quicker sales, despite potential auction discounts. While auctions may lead to lower sale prices, they also reduce uncertainty regarding the time on market, which can be beneficial for sellers facing liquidity constraints, challenging the conventional view of auction discounts as inherently negative. Numerical methods to derive comparative statics, indicating that market conditions—such as a hotter market—can influence the prevalence of auction sales. Sellers with lower holding costs and higher risk aversion are more likely to wait longer for better sale prices. The findings suggest that when controlling for risk aversion in empirical models, auction discounts may diminish, indicating that traditional hedonic models may not fully capture the complexities of seller behavior in real estate markets.

Exploring the comparative effectiveness of two auction formats in the context of land sales Chow, Hafalir and Yavas (2015) study the Revenue Equivalence Theorem, which posits that under certain conditions, different auction formats yield the same expected revenue for sellers. Noted by the authors this theorem holds only when bidders are risk-neutral, valuations are independent, and there is no collusion among bidders.

Empirical results from the study indicate that the English open auction generates higher sales revenue than the first-price sealed-bid tender, with revenue increases ranging from 1.2% to 9.6% across different phases of land sales. This outcome supports the theoretical predictions that open auctions can leverage bidders' ability to infer information from observed bids, thereby driving up prices. The potential for self-selection among bidders is based on auction type, indicating that bidders may choose their participation strategy based on their perceived strengths and the auction format. This aspect introduces an element of endogeneity in the choice of auction type, which could influence the outcomes of land sales.