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Influencing Housing Outcomes: Analyzing the Effects of Green Marketing Strategies

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Real estate agents provide unstructured information in marketing remarks for listed housing transactions that potential buyers may find valuable; however, research on their impact on housing outcomes is limited. This study provides empirical evidence on the impact of unstructured marketing remarks related to green housing features, specifically solar panels, on house prices and the number of days on the market. The results show that remarks about solar panels and financing options have a significant influence on prices and time on the market. After controlling for potential selection bias, our results indicate that properties including marketing comments related to owned, leased, or Power Purchase Agreement solar panels positively capitalize into higher selling prices, yet mentioning the presence of solar panels without mentioning the type of financing negatively impacts property prices. Other green attributes highlighted in marketing remarks show mixed price effects.

Keywords

Real estate agents, Marketing remarks, Green attributes, Solar panels

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1. Introduction

In recent years, the adoption of green housing features, particularly solar panels, has been widely promoted as an environmentally responsible and financially beneficial improvement. Yet, despite this positive framing, marketing solar panels does not always lead to higher property values. This study aims to address a central research question: Why does marketing a seemingly beneficial attribute, such as solar panels, sometimes decrease property values?

Previous studies have found that green features such as dual-pane windows (Aroul and Hansz, 2011) and photovoltaic solar panels (Dastrup et al., 2012; Hoen et al., 2013; Begley and Hoen, 2021; Asproudis et al., 2024) can significantly impact house prices, often leading to price premiums. For example, Dastrup et al. (2012) find that solar-equipped properties command a 3.5% premium in San Diego and Sacramento, while Hoen et al. (2013) estimate a premium of about $5.50 per installed watt in California. Similarly, Asproudis et al. (2024) document a 6% premium in the United Kingdom (U.K.), and Begley and Hoen (2021) note that homeowner-owned (HO) solar systems are correlated with higher sale prices, although premiums have narrowed as the market matures.

However, these findings focus on the presence of solar panels themselves, not on how they are marketed to potential buyers. The paradox that motivates this study is that marketing solar panels, a feature presumed to be beneficial, can sometimes result in lower prices or longer marketing times.

This paper examines how the description of solar panels in Multiple Listing Service (MLS) remarks, such as whether they are owned, leased, or under a Power Purchase Agreement (PPA), influences the perceptions of buyers of the listing and selling prices, and the number of days on the market (DOM). We also examine how other “green” features, such as low-maintenance landscaping, Energy Star certification, tankless water heaters, and solar-heated pools, influence these outcomes.

Housing transactions inherently depend on the exchange of information between buyers and sellers, with real estate agents acting as key intermediaries to bridge informational gaps. The marketing remarks of agents, especially those that highlight green features, serve as a primary source of qualitative information for buyers. These remarks can attract environmentally conscious buyers or, conversely, discourage others who perceive such features as costly or complicated.

In modern real estate marketing, the MLS listing remarks alongside photos, virtual tours, and open houses play a crucial role in signaling the features and desirability of a property. It is reasonable to expect that agents would emphasize the benefits of green attributes, particularly energy savings and environmental

appeal. Indeed, research shows that buyers are willing to pay more for energy-efficient homes that offer utility savings (Quint, 2021), and 63% of Realtors® recognize the value of promoting such features in listings (Yun et al., 2023).

Not all information disclosure is beneficial. Agents may strategically choose items of emphasis or omission. Bian et al. (2023) find that agents sometimes disclose less information about properties with more heterogeneity or taste-specific attributes, a strategy that paradoxically attracts more qualified buyers and yields higher returns. This logic may extend to green features, especially solar panels, where complexity or uncertainty about ownership, maintenance, or cost savings can make marketing remarks a double-edged sword. From the perspective of a buyer, solar ownership structures (owned vs. leased vs. PPA) introduce uncertainty about costs, maintenance, and long-term benefits. From the perspective of a seller or agent, emphasis on solar panels in marketing materials might deter some buyers who perceive them as risky or inconvenient (McMahon, 2018).

When homeowners choose to install solar panels on their homes, they have three options. The first option is to purchase the solar system outright, either with cash or through a financing arrangement. With this option, they own the panels, system, and energy produced. However, they have higher upfront costs and maintenance. The second option is to lease the system from a third party. This third party owns the system, and homeowners pay a fixed monthly fee to rent it. The third option is a PPA. Like a lease, a third party owns the solar system that is physically attached to the home. The homeowner pays for the electricity generated by the system at a rate that is hopefully lower than that of the local utility company. PPAs are not standardized, despite some regulatory agencies that require specific disclosures. The contracts are generally long-term but can vary in terms of length, pricing per kilowatt, maintenance responsibilities and requirements, and termination.

To investigate these dynamics, we analyze MLS marketing remarks from residential transactions in Fresno and Clovis in California, as these two regions have widespread solar adoption. We apply text-mining techniques to identify references to solar panels and other green features and estimate their effects on house prices and DOM by using a simultaneous equations model. By examining not just the presence but also the promotion of solar panels, this study contributes to understanding how marketing communication influences the economic outcomes of sustainable housing features. Our findings reveal when and how the marketing of green features enhances or diminishes property values.

The remainder of the paper is structured as follows. The next section reviews the relevant literature on the capitalization of green attributes, buyer heterogeneity, and the role of informational disclosure in housing markets. We then describe the data, methodology, and empirical findings, followed by a discussion of the implications, limitations, and future research directions.

2. Literature Review

Our study is grounded in two complementary strands of the literature: (1) studies that examine how "green" or environmental attributes capitalize into property values, and (2) research on informational disclosure and signaling behavior in real estate markets. Together, these frameworks explain not only how environmental features are priced but also why their marketing sometimes produces counterintuitive results.

2.1 Capitalization of Green Features

A substantial body of work demonstrates that "green" housing features, such as solar panels, energy-efficient windows, and environmental labels, often generate price premiums (Aroul and Hansz, 2011; Dastrup et al., 2012; Hoen et al., 2013, 2015, 2017; Kahn and Kok, 2014; Begley and Hoen, 2021; Asproudis et al., 2024; Gillingham and Watten, 2024). However, the magnitude and persistence of these premiums vary widely across contexts and ownership types.

For instance, Dastrup et al. (2012) find a 3.5% premium for solar-equipped homes in San Diego and Sacramento and show that environmental consciousness is correlated with both adoption and capitalization of solar features. Hoen et al. (2013) estimate a premium of roughly $17,000, while Hoen et al. (2015) report a premium of $15,000 across several states in the United States (U.S.). More importantly, these premiums decline in markets where solar ownership is common or replacement costs have fallen, thus suggesting a maturing technology effect (Begley and Hoen, 2021).

More recent studies, however, reveal that buyer perception of ownership and financing critically shape outcomes. Hoen et al. (2017) find no significant premium for third-party-owned or leased systems, while Begley and Hoen (2021) confirm that only HO systems consistently yield higher sale prices. This distinction highlights the importance of buyer uncertainty and information clarity, which are key elements in our theoretical framework.

Further evidence suggests that buyer heterogeneity plays a significant role. Dastrup et al. (2012) note that liberal and environmentally conscious households are more likely to adopt solar panels, thus implying that preferences, rather than just technology, shape market outcomes. Similarly, Asproudis et al. (2024) find a typical 6% premium in the U.K., but note regional and temporal variation, and Gillingham and Watten (2024) caution that omitted home improvements can bias estimated premiums. Together, these studies show that the economic value of green features is influenced not only by physical installation but also buyer interpretation, market maturity, and informational clarity, which aligns naturally with signaling and information

asymmetry theories. Collectively, this literature establishes the economic relevance of green features, but stops short of explaining why marketing them sometimes leads to lower values, which is the paradox that motivates this study.

2.2 Environmental Amenities and Market Context

In addition to household-level features, neighborhood environmental characteristics such as parks, water bodies, and trails have well-documented effects on property values (Crompton and Nicholls, 2020; Jauregui and Hite, 2010; Jauregui et al., 2019, 2021). These impacts are context dependent, beneficial in some locations but negative in others, depending on proximity, quality, and perception. Crompton and Nicholls (2020) find that parks can add measurable value, although the benefits depend on the type of park and its maintenance. Jauregui et al. (2021) find negative price effects for homes immediately adjacent to older stormwater retention basins but positive premiums near newer basins. This literature underscores that environmental features yield heterogeneous effects across space and buyer segments, an idea central to understanding why "green" marketing messages may also yield divergent outcomes.

2.3 Information Disclosure, Signaling, and Agent Behavior

The second body of literature draws on the economics of information disclosure, particularly the theory of information asymmetry in Akerlof (1970). Since real estate markets rely on the availability of information, agents serve as intermediaries who either mitigate or sometimes exploit these informational asymmetries. Research on brokerage effects has yet to reach consensus, with some arguing that agents improve outcomes (Janssen and Jobsen, 1980; Yinger, 1981), while others suggest that they merely redistribute surplus (Jud, 1983; Kamath and Yantek, 1982; Zumpano et al., 1996; Li and Motiwalla, 2009).

More recent studies shift their attention to the MLS, a structured information channel where agents strategically control property narratives. Beyond basic details such as square footage, bedrooms and bathrooms, marketing remarks, photos, and virtual tours significantly influence the first impressions of buyers (Carrillo, 2008; Benefield et al., 2011; Allen et al., 2015; Rutherford et al., 2005; Anderson et al., 2024), while marketing comments, in particular, operate as unstructured "signals" that not only reveal facts but also the tone, emotion, and intent (Haag et al., 2000; Goodwin et al., 2014 , 2018; Bian et al., 2023; Seo et al., 2020; Gordon and Winkler, 2020). These remarks shape buyer perceptions of value, quality, and seller motivation.

Empirical findings suggest that language choice has a significant impact on market outcomes. Haag et al. (2000) report that both positive and negative

remarks can lower prices, while Allen and Carter (2010) find that “below market value” language triggers discounts of 3% to 7%.

Goodwin et al. (2014) observe that factual or positive comments can increase sales probabilities but lengthen time on the market. Brunson et al. (2019) find that descriptive words such as *"adorable"* increase prices, while words like *"motivated" or "reduced"* suggest distress. Luchtenberg et al. (2019) show that positive language enhances property visits. These findings confirm that MLS remarks are not neutral; they serve as strategic signals that influence buyer expectations and behaviors. Seo et al. (2020) show that certain phrases provide no additional informational value beyond quantitative listing data. Collectively, this literature underscores that the linguistic framing of property description materially shapes buyer interpretation.

2.4 Strategic Omission and Agent Incentives

A growing body of research employs textual analysis to investigate why agents selectively omit or disclose specific details. While more information is often assumed to improve market efficiency, recent evidence shows that selective disclosure can be a rational marketing strategy. Allen et al. (2018) find that more MLS information sharing increases the probability of a housing sale and prices. However, Gordon and Winkler (2020) show that agents sometimes omit the age of older properties to avoid signaling obsolescence. Similarly, Bian et al. (2023) argue that withholding details can be advantageous for highly differentiated homes, as doing so attracts buyers early in their search process and results in faster, higher-priced sales.

These findings indicate that omission can be a deliberate strategy rather than an oversight. From this perspective, real estate agents behave as strategic communicators who weigh the risks and rewards of disclosure. In green marketing, this logic suggests that an agent may choose to highlight solar panels or avoid doing so based on their expected reactions from buyers. For instance, a vague “solar included” remark might deter informed buyers from interpreting the lack of financing detail as a red flag, whereas specific comments like “owned solar” or “leased solar” can either attract or deter buyers depending on their financial constraints and risk tolerance (McMahon, 2018).

2.5 Emotional Framing and Buyer Heterogeneity

Recent studies have highlighted the role of emotion and heterogeneity in shaping responses to marketing messages. Aroul et al. (2025) find that emotive tone in listings is positively correlated with sale prices, thus confirming that real estate language influences buyer attachment and perceived value. This insight helps to explain why marketing green features may sometimes backfire; a

message intended to highlight sustainability can instead evoke perceived complexity or maintenance anxiety among certain buyer groups.

Buyer heterogeneity further amplifies these mixed effects. In lower-priced market segments, buyers may be more price-sensitive and interpret "owned solar" as implying higher upfront costs or future maintenance obligations. In contrast, high-income buyers may view the same feature as a signal of quality, efficiency, and environmental stewardship, thereby rewarding it with a price premium. This asymmetry aligns with the signaling theory, which posits that identical information produces divergent reactions depending on the preferences and constraints of the receiver.

2.6 Integrating the Two Streams

Together, the two strands of research on green feature capitalization and agent information disclosure, respectively, illustrate a critical gap. Previous studies have quantified the price effects of sustainable attributes, but rarely examined how marketing communication mediates these effects. Similarly, work on agent disclosure has broadly explored strategic signaling but not investigated green marketing as a specific signaling challenge.

This study bridges these studies by examining how the unstructured MLS marketing remarks of real estate agents about solar panels and other green features influence property outcomes. We integrate theories of information asymmetry, signaling, and buyer heterogeneity to explain why marketing a seemingly positive attribute, such as solar panels, can sometimes reduce property values. This conceptual synthesis provides the basis for the empirical models developed in the following section.

2.7 Contributions and Conceptual Framework

Our contribution is twofold. First, we extend the capitalization literature by showing that the effect of green features not only depends on their existence but also how they are communicated. Second, we advance the informational disclosure literature by framing agent remarks as strategic market signals shaped by both incentive structures and audience heterogeneity.

By integrating insights from information economics and the behavioral theory, this framework clarifies the conditions under which marketing green attributes enhances or diminishes property values. The following empirical analysis examines these relationships through a textual analysis of MLS remarks and transaction outcomes for residential properties in Fresno and Clovis, California.

3. Methodology

The hedonic price model (HPM) (Rosen, 1974) is regarded as the most widely recognized and frequently applied theoretical framework for assessing the value of both market and non-market attributes on housing prices. The model predicts that, in an equilibrium, housing characteristics determine house prices.

Furthermore, the real estate literature acknowledges that the time it takes to sell a house is contemporaneously correlated with house prices. Following the tradition of simultaneously modeling this relationship, we frame our empirical strategy similarly to that of Turnbull and Dombrow (2006), Zahirovic-Herbert and Turnbull (2008), Turnbull and Zahirovic-Herbert (2012), and Turnbull et al. (2013). Both house prices and DOM are simultaneously modeled as a system of seemingly unrelated regressions with cross-correlated error terms. This specification assumes that both equations are determined by the same set of variables, similar to estimating systems of consumer demand equations (Turnbull and Zahirovic-Herbert, 2012). Our final empirical specification takes the following form:

$$DOM_i = \alpha_1 P_i + \alpha_2 H_i + \alpha_3 M_i + \alpha_4 L_i + \alpha_5 T_i + \alpha_6 Competition_i + \epsilon_1 \quad (1)$$

$$P_i = \beta_1 DOM_i + \beta_2 H_i + \beta_3 M_i + \beta_4 L_i + \beta_5 T_i + \beta_6 ListingDensity_i + \epsilon_2 \quad (2)$$

where:
DOM_i = a vector of days on the market;
P_i = a vector of real housing prices (in log form);
H_i = a matrix of housing and neighborhood characteristics;
M_i = a matrix of agent marketing remarks;
L_i = a matrix of geographic controls;
T_i = a matrix of time of sale controls;
$ListingDensity_i$ = a vector of listing densities;
$Competition_i$ = a vector of competing houses;
$\alpha_{k=1,2,\ldots,6}$, $\beta_{k=1,2,\ldots,6}$ = parameters to be estimated; and
ϵ_i = vector of independent and identically distributed errors.

The competition ($Competition_i$) variable in the DOM equation [1] measures the number of contemporaneously competing houses for sale that are located within 1 mile of the subject house and exhibit a living area that is within +/- 20% of the living area of the subject house (Turnbull and Dombrow, 2006). The *listing density* ($ListingDensity_i$) variable included in the house price equation [2] intends to capture the "intensity of competition from other houses for sale per day on the market" (Turnbull and Zahirovic-Herbert, 2012). We follow the existing literature to calculate these variables as follows:

$$Competition_i = \sum_{j \epsilon I} \left(1 - D(i,j)\right)^2 O(i,j)$$

$$ListingDensity_i = \sum_{j \epsilon I} \frac{\left(1 - D(i,j)\right)^2 O(i,j)}{S(i) - L(i) + 1}$$

where *L(i)* and *S(i)* denote the listing and sales dates for house *i* respectively, *D(i,j)* is the distance in miles between house *i* and *j*, and $O(i,j) = min[S(i), S(j)] - max[L(i), L(j)]$ represents the overlapping DOM for contemporaneously listed houses *i* and *j*.

The housing characteristic variables include size, age, number of bathrooms and bedrooms, and whether the house features a fireplace, pool, garage, dual or triple-pane windows, tankless or solar water heater, and solar pool heater. The models also control for the different roofing materials, type of financing used to purchase the house, and whether the house is owned by a bank or a short sale. We also include several neighborhood attributes such as proximity to schools, parks, airports, and trails.

Regarding the marketing remarks of the real estate agent, we focus on comments that imply the presence of green attributes in the house. Our regression analysis includes indicators that operationalize various word constructs that refer to solar-powered attributes (such as solar panels), dual and triple-pane windows, tankless water heaters, low-maintenance landscaping, and attributes with green labels. Focusing on solar energy attributes, we specify word constructs that specifically mention the presence of *solar photovoltaic panels*. These constructs include phrases like *solar panels*, *photovoltaic panels*, *owned solar*, *leased solar*, and *PPA solar*, among other word combinations. Since real estate agents do not use standardized phrases to refer to solar panels, we consider multiple word combinations to capture the presence of solar panels in the property. For example, *"panel solar "* and *"solar panel"* can be used interchangeably. In some instances, the marketing comments mention the presence of solar panels with just the word "*solar*". For example, the comment would say "Solar included!" Generally, these remarks are intended to be exclamatory to capture the attention of the buyer. We also capture comments that specifically mention *owned solar panels*, *leased solar panels*, and *Power Purchase Agreement (PPA) solar panels*, as well as comments that refer to green labels such as Energy Star and LED lights (Kahn and Kok, 2014; Molina et al., 2020). Real estate agents may also mention the presence of other green housing attributes that may be attractive to certain homebuyers. We capture comments related to the presence of dual and triple-pane windows, tankless and solar water heaters, solar-heated pools, Seasonal Energy Efficiency Ratio (SEER) air conditioners (ACs), low-maintenance landscaping, and the inclusion of green labels such as Energy Star and LED lights. Lastly, we incorporate constructs from the comments of agents that are already established in the real estate literature. Following Haag et al. (2000), we consider comments that are based on the opinion of agents, such as comments that reflect the motivation of the seller to sell the house, as well as the condition, location, and

sale opportunity of the property. Table 1 presents the list of words and phrases used to construct each marketing remark dummy variable.

Table 1 Word Constructs of Marketing Remarks

Variable Name	Word Constructs
m_solar_panel	Solar, Solar panel, panel solar, photovoltaic, owned solar, own solar, owned panel, own panel, ownership solar, own photovoltaic, solar own, solar owned, panel owned, leased solar, lease solar, lease panel, leasing solar, solar lease, solar leased, Power Purchase, PPA, solar system, paid solar, solar paid, solar is owned, solar is leased, solar is PPA, solar included, solar power system, solar energy system, sun-powered electricity, energy generating solar panels, solar array
m_solar_panel_owned	Owned solar, own solar, owned panel, own panel, ownership solar, own photovoltaic, solar own, solar owned, panel owned, solar is owned
m_solar_panel_leased	Leased solar, lease solar, lease panel, leasing solar, solar lease, solar leased, solar is leased
m_solar_panel_PPA	Power Purchase, PPA, agmt
m_dual_triple_pane	Dual Pane, Double Pane, Double-Pane, Dual-Pane, Triple Pane, Triple Panel, Triple-Pane, Triple-Panel
m_tankless_heater	Tank less heater, tankless heater, tankless water heater
m_solar_water_heater	Solar water heater
m_solar_heated_pool	Solar pool, pool solar, solar heated pool, heated solar pool, solar heated, heated solar
m_solar_heated_pool	Solar pool, pool solar, solar heated pool, heated solar pool, solar heated, heated solar
m_seer_ac	SEER
m_low_maint_landscaping	Low maintenance landscaping, low maintenance landscape, low maintenance turf, water conserving landscaping, water saving landscaping, artificial turf, artificial grass, artificial lawn, synthetic grass, synthetic lawn, water saving drip irrigation, water saving irrigation, drip irrigation, water smart landscape irrigation, eco friendly landscaping, native landscaping, xeriscape landscaping, Drought tolerant landscaping, Drought resistant landscaping
m_green_labels	Energy Star, Energy-star, LED lights, LED bulbs, LED light, LED lighting

(Continued…)

(Table 1 Continued)

Variable Name	Word Constructs
m_motivated	Motivated seller, Seller motivated, Seller is motivated, must sell, anxious to sell, relocating, transferred, selling bonus, reduced price, sold as is, fast sale, Out of Town, Quick Sale, Quick closing, Reduced Price, fast sell, Substantial Discount
m_good_buy_opportunity	Super buy, fantastic buy, Great Buy, Good Buy, amazing buy, spectacular buy, excellent buy, amazing opportunity, great opportunity, fantastic opportunity, excellent opportunity
m_good_location	Good Location, Great Location, Ideal Location, Ideally located, Prime Location, Perfect location, location cannot be beat, location can't be beat, Excellent Location, Fantastic Location, Amazing Location, Fabulous Location
m_good_condition	Well Maintained, well kept, Good Condition, Good upkeep, mint condition, immaculate condition, flawless condition
m_high_quality_words	Updated, renovated, custom, unique, high-end, craftsmanship, attention to detail, luxury, luxurious, granite, quartz, marble, hardwood, stainless

Note: This table presents the words and phrases used to capture green marketing remarks in the transactions public comments.

4. Data

Our housing transactions come from the MLS in the cities of Fresno and Clovis, California. We have selected California for our study because it is the top producer of solar energy in the nation. According to the Solar Energy Industries Association, California ranks first nationwide in total installed solar capacity, with almost 28% of the electricity in the state generated from solar sources, and over 11 million homes powered by solar energy. In Fresno County, the solar cumulative capacity is approximately 930 MW, with 66% of residential solar panel installations owned, 25% under PPAs, and 8% leased.

After excluding properties sold for less than $30,000 and those sold for more than $2,000,000, as well as eliminating transactions with missing data, our final dataset comprises 14,469 residential transactions that occurred in 2018 and 2019. House prices are converted to real prices deflated by the monthly Consumer Price Index for the West Region. The average nominal transacted price is $299,901.89, while the average transacted house price in real terms is $114,443.88. The average number of cumulative DOM is 76.72 days. Of the total number of transactions, 2,363 (16.33%) include solar panels. Of this total,

37% are owned solar panels, 35% are leased panels, and 17% are PPA panels. With respect to the marketing remarks of the agent, 61% of the 2,363 transactions with solar panels include agent comments referring specifically to their presence, whereas 29% mention owned solar panels, 8% mention leased solar panels, and 3% mention PPA solar panels. The percentage of transactions with marketing remarks that only mention the presence of solar panels without mentioning their type (owned, leased, or PPA) is 21%. Comparatively, houses with solar panels are more expensive, take longer to sell, are larger, newer, and have slightly more bedrooms and bathrooms than properties without solar panels. Regarding the presence of other green housing attributes, 54% of the total transactions feature dual or triple-pane windows, yet only 12% of the transactions promote this attribute. The presence of other green attributes is limited, as well as their promotion in the marketing remarks. Table 2 presents the definitions and summary statistics of all the variables.

5. Results

We first examine how the green marketing remarks of the agent affect listing prices, then proceed to selling prices and the number of days that the property was on the market. Since the listing price is determined by the seller with the guidance of the listing agent, it is likely that the listing prices for houses that include green attributes command price premiums, as has been found in the literature. Furthermore, we expect that listing prices for properties with green attributes, as advertised in the marketing remarks, will also command additional price premiums. Table 3 presents the results for the hedonic listing price equation, which includes all housing transactions with zip code, school and month fixed effects. Focusing our attention on houses with solar panels, Model 1 includes two dummy variables that capture the effects of solar panels marketing: 1) comments that specifically refer to the presence of solar panels (whether owned, leased, PPA, or any other comment), and 2) all other phrases that refer to solar attributes, except for comments that mention solar water heaters and solar heated pools. Model 1 also accounts for marketing other green attributes such as green labels, dual or triple-pane windows, solar water heaters, SEER ACs, and low-maintenance landscaping.

We find statistically significant listing price premiums for housing transactions that include solar panels, dual- and triple-pane windows, tankless water heaters, solar-heated pools, and SEER-rated ACs. Housing transactions that include solar water heaters command listing price discounts. The presence of solar panels in the house results in a 3.04% listing price premium; double-pane and triple-pane windows command a 3.95% premium; solar-heated pools command a 6.21% premium; and SEER ACs, a 1.50% premium. Only properties with solar water heaters command discounts in the order of -8.52%. These results are consistent across different model specifications.

Table 2 Variable Descriptions and Descriptive Statistics

		All Transactions			No Solar Panels			Solar Panels		
Variable Name	**Description**	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**
r_listing_Price	Real listing price	14,469	$114,443.15	$63,234.90	12,106	$107,205.43	$58,372.00	2,363	$151,523.06	$73,396.34
r_selling_Price	Real selling price	14,469	$113,020.34	$60,594.95	12,106	$105,852.47	$55,875.21	2,363	$149,742.39	$69,843.35
CDOM	Cumulative Days on the Market	14,469	76.72	60.67	12,106	75.36	61.40	2,363	83.71	56.25
d_listing_selling	1 for properties with the same listing and selling agent; 0 otherwise	14,469	0.12	0.33	12,106	0.12	0.32	2,363	0.15	0.36
house_age	House age	14,469	38.46	25.12	12,106	41.55	24.76	2,363	22.65	20.58
square_footage	Square footage	14,469	1,801.51	710.38	12,106	1,712.84	660.56	2,363	2,255.83	779.84
bedrooms	Number of bedrooms	14,469	3.25	0.81	12,106	3.16	0.78	2,363	3.71	0.81
total_bathrooms	Number of bathrooms	14,469	2.10	0.67	12,106	2.02	0.64	2,363	2.50	0.68
d_fireplace	1 for properties with a fireplace; 0 otherwise	14,469	0.71	0.45	12,106	0.72	0.45	2,363	0.65	0.48
d_pool	1 for properties with a pool; 0 otherwise	14,469	0.30	0.46	12,106	0.28	0.45	2,363	0.38	0.49
d_garage	1 for properties with a garage; 0 otherwise	14,469	0.89	0.31	12,106	0.88	0.33	2,363	0.96	0.19
d_roof_comp	1 for properties with composition roofing; 0 otherwise	14,469	0.65	0.48	12,106	0.67	0.47	2,363	0.52	0.50
d_solar_panel	1 for properties with solar panels; 0 otherwise	14,469	0.16	0.37	12,106	0.00	0.00	2,363	1.00	0.00
d_solar_panel_owned	1 for properties with owned solar panels; 0 otherwise	14,469	0.06	0.24	12,106	0.00	0.00	2,363	0.37	0.48
d_solar_panel_leased	1 for properties with leased solar panels; 0 otherwise	14,469	0.06	0.23	12,106	0.00	0.00	2,363	0.35	0.48

(Continued…)

(Table 2 Continued)

		All Transactions			No Solar Panels			Solar Panels		
Variable Name	**Description**	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**
d_solar_panel_PPA	1 for properties with leased solar panels; 0 otherwise	14,469	0.03	0.16	12,106	0.00	0.00	2,363	0.17	0.38
d_solar_panel_other	1 for properties with other types of solar panels; 0 otherwise	14,469	0.02	0.13	12,106	0.00	0.00	2,363	0.11	0.31
d_dual_triple_pane_window	1 for properties with dual or triple pane windows; 0 otherwise	14,469	0.54	0.50	12,106	0.50	0.50	2,363	0.72	0.45
d_tankless_water_heater	1 for properties with tankless water heater; 0 otherwise	14,469	0.09	0.29	12,106	0.05	0.23	2,363	0.27	0.45
d_solar_water_heater	1 for properties with solar water heater; 0 otherwise	14,469	0.00	0.06	12,106	0.00	0.04	2,363	0.01	0.11
d_solar_heated_pool	1 for properties with solar pool heater; 0 otherwise	14,469	0.00	0.06	12,106	0.00	0.04	2,363	0.02	0.13
d_SEER_AC	1 for properties with SEER A/C; 0 otherwise	14,469	0.07	0.26	12,106	0.05	0.21	2,363	0.18	0.39
d_REO_bank_owned	1 for Real Estate Bank Owned properties; 0 otherwise	14,469	0.02	0.14	12,106	0.02	0.15	2,363	0.01	0.10
d_short_sale	1 for short sale properties; 0 otherwise	14,469	0.01	0.09	12,106	0.01	0.09	2,363	0.00	0.06
d_cash	1 for cash sale; 0 otherwise	14,469	0.17	0.38	12,106	0.18	0.39	2,363	0.10	0.30
d_conv	1 for conventional financing; 0 otherwise	14,469	0.56	0.50	12,106	0.53	0.50	2,363	0.67	0.47
d_FHA	1 for FHA financing; 0 otherwise	14,469	0.19	0.40	12,106	0.20	0.40	2,363	0.14	0.35
d_VA	1 for VA financing; 0 otherwise	14,469	0.06	0.23	12,106	0.05	0.23	2,363	0.06	0.25
dist_airport	Distance to closest airport (in miles)	14,469	20,702.21	10,729.35	12,106	20,075.13	10,504.67	2,363	23,914.79	11,281.72

(Continued…)

(Table 2 Continued)

		All Transactions			No Solar Panels			Solar Panels		
Variable Name	**Description**	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**
dist_park	Distance to closest park (in miles)	14,469	2,929.33	3,762.48	12,106	2,804.26	3,633.26	2,363	3,570.12	4,309.16
dist_school	Distance to closest school (in miles)	14,469	2,648.10	4,206.97	12,106	2,553.33	4,089.35	2,363	3,133.64	4,735.50
dist_trail	Distance to closest trail (in miles)	14,469	2,149.88	4,078.53	12,106	2,159.85	3,995.81	2,363	2,098.79	4,478.94
competition	Number of contemporaneously competing houses	14,469	213.26	288.58	12,106	206.43	289.61	2,363	248.30	280.73
listing_density	Days weighted number of competing listings	14,469	2.83	2.03	12,106	2.80	2.01	2,363	2.98	2.13
m_solar_panel	1 for properties with marketing remarks including words referring to "solar panels"; 0 otherwise	14,469	0.10	0.30	12,106	0.00	0.00	2,363	0.61	0.49
m_solar_panel_owned	1 for properties with marketing remarks including words referring to "owned solar panels"; 0 otherwise	14,469	0.05	0.21	12,106	0.00	0.00	2,363	0.29	0.45
m_solar_panel_leased	1 for properties with marketing remarks including words referring to "leased solar panels"; 0 otherwise	14,469	0.01	0.11	12,106	0.00	0.00	2,363	0.08	0.26
m_solar_panel_PPA	1 for properties with marketing remarks including words referring to "PPA solar panels"; 0 otherwise	14,469	0.00	0.07	12,106	0.00	0.00	2,363	0.03	0.17
m_solar_panel_only	1 for properties with marketing remarks including words referring to "solar panels" only; 0 otherwise	14,469	0.04	0.18	12,106	0.00	0.00	2,363	0.21	0.41
m_solar_other	1 for properties with marketing remarks including the word solar referring to attributes except solar panels; 0 otherwise	14,469	0.00	0.03	12,106	0.00	0.02	2,363	0.00	0.04

(Continued…)

(Table 2 Continued)

Variable Name	Description	All Transactions			No Solar Panels			Solar Panels		
		N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev
m_dual_triple_pane_window	1 for properties with marketing remarks including words referring to dual and triple pane windows; 0 otherwise	14,469	0.12	0.33	12,106	0.12	0.33	2,363	0.10	0.30
m_tankless_water_heater	1 for properties with marketing remarks including words referring to tankless water heaters; 0 otherwise	14,469	0.02	0.16	12,106	0.02	0.13	2,363	0.06	0.23
m_solar_water_heater	1 for properties with marketing remarks including words referring to solar water heater; 0 otherwise	14,469	0.00	0.03	12,106	0.00	0.02	2,363	0.00	0.05
m_solar_heated_pool	1 for properties with marketing remarks including words referring to solar heated pools; 0 otherwise	14,469	0.00	0.03	12,106	0.00	0.02	2,363	0.00	0.06
m_SEER_AC	1 for properties with marketing remarks including words referring to SEER AC; 0 otherwise	14,469	0.00	0.05	12,106	0.00	0.05	2,363	0.00	0.05
m_low_maint_landscaping	1 for properties with marketing remarks including words referring to low maintenance landscaping; 0 otherwise	14,469	0.03	0.16	12,106	0.02	0.15	2,363	0.05	0.22

(Continued…)

(Table 2 Continued)

Variable Name	Description	All Transactions			No Solar Panels			Solar Panels		
		N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev
m_green_labels	1 for properties with marketing remarks including words referring to eco labels; 0 otherwise	14,469	0.01	0.11	12,106	0.01	0.10	2,363	0.03	0.17
m_motivated	1 for properties with marketing remarks including words referring to motivated sellers; 0 otherwise	14,469	0.02	0.14	12,106	0.02	0.14	2,363	0.02	0.14
m_good_buy_opportunity	1 for properties with marketing remarks including words referring to good opportunity; 0 otherwise	14,469	0.02	0.15	12,106	0.03	0.16	2,363	0.01	0.11
m_good_location	1 for properties with marketing remarks including words referring to good location; 0 otherwise	14,469	0.04	0.19	12,106	0.04	0.19	2,363	0.03	0.16
m_good_condition	1 for properties with marketing remarks including words referring to good condition; 0 otherwise	14,469	0.06	0.23	12,106	0.06	0.23	2,363	0.04	0.21
m_high_quality_words	1 for properties with marketing remarks including high quality reference words; 0 otherwise	14,469	0.59	0.49	12,106	0.57	0.50	2,363	0.71	0.45

Note: FHA denotes Federal Housing Administration and VA denotes Veteran Affairs.

Table 3 Hedonic Listing Price Equation Results

Variable	ln_r_listing_price					
	Model 1			Model 2		
	Parameter Estimate		t Value	Parameter Estimate		t Value
Intercept	5.2569	***	30.60	5.2651	***	30.60
d_listing_selling	-0.0240	***	-3.42	-0.0252	***	-3.58
ln_house_age	0.0075	**	1.96	0.0059		1.53
ln_square_footage	0.7722	***	63.21	0.7706	***	63.11
ln_bedrooms	0.0989	***	7.46	0.0997	***	7.54
ln_total_bathrooms	0.0079		0.73	0.0079		0.72
d_fireplace	0.0651	***	11.17	0.0652	***	11.19
d_pool	-0.0421	***	-8.88	-0.0432	***	-9.12
d_garage	0.1665	***	16.30	0.1665	***	16.31
d_roof_comp	-0.0016		-0.31	0.0000		-0.01
d_solar_panel	0.0304	***	4.52			
d_solar_panel_owned				0.0602	***	4.09
d_solar_panel_leased				0.0202	***	2.68
d_solar_panel_PPA				0.0044		0.42
d_solar_panel_other				0.0465	***	3.40
d_dual_triple_pane_window	0.0395	***	10.69	0.0392	***	10.61
d_tankless_water_heater	0.0183	***	2.57	0.0193	***	2.72
d_solar_water_heater	-0.0852	***	-3.05	-0.0843	***	-2.99
d_solar_heated_pool	0.0621	**	2.34	0.0587	**	2.21
d_SEER_AC	0.0150	**	2.05	0.0169	**	2.32
d_REO_bank_owned	-0.1349	***	-9.34	-0.1349	***	-9.34
d_short_sale	-0.1007	***	-4.29	-0.0992	***	-4.23
d_cash	-0.1061	***	-6.16	-0.1054	***	-6.13
d_conv	0.0195		1.24	0.0202		1.28
d_FHA	0.0372	**	2.35	0.0375	**	2.37
d_VA	0.0192		1.17	0.0200		1.22
ln_dist_airport	-0.0153	***	-2.63	-0.0155	***	-2.66
ln_dist_park	0.0249	***	10.79	0.0248	***	10.75
ln_dist_school	0.0227	***	6.73	0.0233	***	6.92
ln_dist_trail	0.0005		0.26	0.0008		0.40
listing density	-0.0085	***	-8.59	-0.0086	***	-8.63
m_solar_panel	-0.0010		-0.13			
m_solar_panel_owned				-0.0026		-0.16
m_solar_panel_leased				-0.0102		-0.77
m_solar_panel_PPA				0.0045		0.21
m_solar_panel_only				-0.0231	***	-2.62
m_solar_other	0.0995		1.21	0.1082		1.23
m_dual_triple_pane_window	0.0024		0.44	0.0025		0.46
m_tankless_water_heater	0.0265	***	2.86	0.0262	***	2.82
m_solar_water_heater	0.0560		0.84	0.0414		0.65
m_solar_heated_pool	-0.0544		-0.84	-0.0649		-0.90
m_SEER_AC	0.0216		0.63	0.0182		0.53
m_low_maint_landscaping	0.0105		1.07	0.0100		1.03
m_green_labels	0.0370	**	2.34	0.0307	**	1.93
m_motivated	-0.0402	***	-3.27	-0.0383	***	-3.11
m_good_buy_opportunity	-0.0315	**	-2.35	-0.0313	**	-2.33
m_good_location	-0.0146	*	-1.80	-0.0149	*	-1.85

(Continued…)

(Table 3 Continued)

Variable	ln_r_listing_price					
	Model 1			Model 2		
	Parameter Estimate		t Value	Parameter Estimate		t Value
m_good_condition	-0.0255	***	-3.28	-0.0257	***	-3.30
m_high_quality_words	0.0666	***	17.79	0.0675	***	17.97
Zip Code Fixed Effects	Yes			Yes		
School Fixed Effects	Yes			Yes		
Time Fixed Effects	Yes			Yes		
N	14,469			14,469		
Adjusted R-Square	0.82			0.82		

Note: This table presents the hedonic listing price model results for housing characteristics and attributes (including solar panels and other green features) and marketing remarks used to promote the listing. These comments include green marketing remarks and other verifiable and non-verifiable comments. ***, ** and * denote 1%, 5% and 10% significance, respectively.

Regarding marketing comments on green attributes, the presence of any type of solar panel has a statistically insignificant yet negative effect on listing prices. Only two types of specific marketing remarks result in a statistically significant impact across all listing price equations. Transactions that mention the presence of *tankless water heaters* command a 2.65% listing premium. Transactions that mention the presence of *green labels* such as Energy Star, LED lights, and bulbs, command listing price premiums in the order of 3.70%. Marketing remarks that mention the presence of dual and triple-pane windows, SEER AC, and low-maintenance landscaping do not capitalize on listing prices.

With respect to comments reflecting the opinion of the agent on the house, similar to previous findings in the literature, word constructs related to the *motivation* of the seller, *opportunity*, and *good condition* result in lower listing prices, while words referring to the *high quality* of the property result in higher listing prices. Comments that refer to the ideal location of the property do not capitalize on listing prices. These results are consistent across all listing price specifications.

Model 2 categorizes the solar panel marketing remarks by type of purchase, specifically mentioning *owned*, *leased*, or *PPA* solar panels. We also include a dummy variable for comments that do not mention any specific type of solar panel (such as owned, leased, or PPA solar panels), but still include the words "solar panel". We find that none of the specific solar comments have a statistically significant impact on listing prices. The results indicate that properties with owned and leased solar panels are listed at higher prices; however, marketing comments that highlight their presence do not add a price premium. Mentioning the presence of solar panels without specifying the type of solar panel commands statistically significant listing price discounts of -

2.31%. This may indicate that informed homebuyers are less likely to consider these properties, and as a result, less informed and motivated homebuyers may bid down the price for a housing attribute that is less desirable.

We next model house prices and DOM simultaneously and review the dummy variable specifications related to solar marketing comments. Model 3 in Table 4 considers comments with word combinations that specifically mention solar panels. The variable *m_solar_panel* includes comments that refer to the presence of solar panels in the house such as owned, leased or PPA solar panels as well as comments that exclude mentioning the solar type. The variable *m_solar_other* includes other solar attributes. We do not find that mentioning solar panels command higher price premiums beyond the actual attribute effect, nor have an impact on the DOM. The only other green marketing remarks that are statistically significant are *tankless water heaters* and *green labels*, both resulting in positive effects on house prices.

Model 4 considers specific comments related to the presence of solar panels by type of purchase. Specific marketing comments about solar panel types do not capitalize into house prices nor on the DOM. Only marketing comments without specific mention of solar type negatively impact property prices, that is, sell at a discount. Providing additional information beyond the existence of solar panels in the house does not appear to provide additional value to buyers. Once again, only *tankless water heaters* and *green labels* result in statistically significant house price premiums. With respect to the variables that capture the verifiable opinions of the agent, all of the model specifications (Models 3-4) confirm that words that refer to the motivation of the seller, good condition of the house, and good opportunity buys command price discounts which is similar to the results in the literature. Using high-quality words in the house description results in higher house prices across all model specifications. Only words related to the motivation of the seller have a statistically significant effect on the DOM, thereby increasing the time that it takes to sell a house.

5.1 Sample Selection Correction

Focusing on housing transactions that include solar panels, real estate agents are likely to price them by considering comparable houses with existing solar panels. The previous uncorrected results consider the impact of marketing remarks for solar panels and other green attributes relative to all other transactions, both with and without solar panels. A more appropriate comparison would be to compare houses with solar panels that include marketing remarks to properties that have solar panels but do not include such comments. In other words, agents could be systematically selecting which properties to include solar panels and other green marketing comments, and which properties to exclude those comments.

Table 4 Hedonic House Price and Days on the Market Equations Results

Variable	Model 3						Model 4					
	ln_r_selling_price			ln_CDOM			ln_r_selling_price			ln_CDOM		
	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value
Intercept	5.2407	***	46.04	1.4511	***	4.82	5.2553	***	46.19	1.3959	***	4.63
ln_cdom	-0.0200	***	-6.89	-0.0984	***	-4.70	-0.0198	***	-6.80	-0.0945	***	-4.51
ln_r_house_price	-0.0350	***	-6.52	-0.1014	***	-7.48	-0.0364	***	-6.78	-0.1029	***	-7.58
d_listing_selling	0.0034		1.05	0.0857	***	10.49	0.0022		0.66	0.0868	***	10.48
ln_house_age	0.7603	***	77.68	0.4497	***	15.42	0.7585	***	77.51	0.4498	***	15.43
ln_square_footage	0.1030	***	10.14	-0.1284	***	-5.02	0.1038	***	10.23	-0.1309	***	-5.11
ln_bedrooms	0.0104		1.11	0.1104	***	4.69	0.0104		1.11	0.1089	***	4.63
ln_total_bathrooms	0.0661	***	13.80	-0.0767	***	-6.33	0.0662	***	13.84	-0.0768	***	-6.34
d_fireplace	-0.0417	***	-9.98	-0.0410	***	-3.88	-0.0428	***	-10.24	-0.0385	***	-3.64
d_pool	0.1743	***	28.36	-0.1192	***	-7.52	0.1745	***	28.41	-0.1195	***	-7.54
d_garage	0.0360	***	4.69	0.0580	***	3.00	0.0615	***	3.83	-0.0587		-1.45
d_solar_panel	0.0399	***	10.24	-0.0343	***	-3.48	0.0243	***	2.63	0.0985	***	4.22
d_solar_panel_owned	0.0177	**	2.23	-0.0137		-0.69	0.0084		0.63	-0.0015		-0.04
d_solar_panel_leased	-0.0848	***	-2.62	0.0545		0.67	0.0614	***	4.13	0.0851	**	2.27
d_solar_panel_PPA	0.0624	**	2.05	0.0555		0.73	0.0396	***	10.18	-0.0335	***	-3.40
d_solar_panel_other	0.0142	*	1.85	0.0960	***	4.97	0.0183	**	2.31	-0.0149		-0.75
d_dual_triple_pane_window	-0.0009		-0.20	-0.0166		-1.50	-0.0840	***	-2.60	0.0496		0.61
d_tankless_water_heater	-0.1001	***	-8.09	0.1437	***	4.60	0.0594	**	1.96	0.0626		0.82
d_solar_water_heater	-0.0794	***	-3.94	0.8321	***	16.54	0.0161	***	2.10	0.0986	***	5.10
d_solar_heated_pool	-0.1199	***	-10.00	-0.3299	***	-10.93	0.0007		0.16	-0.0145		-1.31
d_SEER_AC	0.0287	***	2.49	-0.0694	*	-2.39	-0.1003	***	-8.11	0.1415	***	4.53
d_roof_comp	0.0517	***	4.32	-0.0186		-0.62	-0.0781	***	-3.88	0.8278	***	16.46
d_REO_bank_owned	0.0342	***	2.54	-0.0008		-0.02	-0.1190	***	-9.94	-0.3299	***	-10.93

(Continued…)

(Table 4 Continued)

Variable	Model 3						Model 4					
	ln_r_selling_price			ln_CDOM			ln_r_selling_price			ln_CDOM		
	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value
d_short_sale	-0.0184	***	-3.34	0.0354	***	2.54	0.0294	***	2.55	-0.0705	**	-2.43
d_cash	0.0242	***	9.89	0.0194	***	3.14	0.0520	***	4.35	-0.0202		-0.67
d_conv	0.0219	***	6.71	0.0426	***	5.20	0.0351	***	2.61	-0.0039		-0.12
d_FHA	0.0016		0.86	-0.0013		-0.29	-0.0186	***	-3.37	0.0362	***	2.61
d_VA	-0.0075	***	-7.88	1.4511	***	4.82	0.0241	***	9.85	0.0192	***	3.10
ln_dist_airport	5.2407	***	46.04	-0.0984	***	-4.70	0.0226	***	6.93	0.0423	***	5.16
ln_dist_park	-0.0200	***	-6.89	-0.1014	***	-7.48	0.0018		0.99	-0.0016		-0.34
ln_dist_school	-0.0350	***	-6.52	0.0857	***	10.49	-0.0076	***	-7.97	1.3959	***	4.63
ln_dist_trail	0.0034		1.05	0.4497	***	15.42	5.2553	***	46.19	-0.0945	***	-4.51
listing density	0.7603	***	77.68				-0.0198	***	-6.80			
competition				0.0011	***	65.49				0.0011	***	65.24
m_solar_panel	-0.0058		-0.65	-0.0202		-0.90						
m_solar_panel_owned							-0.0030		-0.17	0.0603		1.35
m_solar_panel_leased							-0.0169		-0.96	0.0244		0.55
m_solar_panel_PPA							0.0045		0.16	0.1207	*	1.73
m_solar_panel_only							-0.0261	**	-2.24	0.0064		0.22
m_solar_other	0.0870		0.77	0.0834		0.29	0.0958		0.85	0.0973		0.34
m_dual_triple_pane_window	0.0044		0.76	-0.0114		-0.78	0.0043		0.75	-0.0126		-0.86
m_tankless_water_heater	0.0282	**	2.40	0.0493	*	1.66	0.0283	**	2.40	0.0468		1.58
m_solar_water_heater	0.0557		0.77	0.0267		0.15	0.0405		0.56	0.0490		0.27
m_solar_heated_pool	-0.0520		-0.54	-0.2130		-0.89	-0.0619		-0.65	-0.2123		-0.88
m_SEER_AC	0.0296		0.84	-0.0648		-0.73	0.0263		0.75	-0.0602		-0.68
m_low_maint_landscaping	0.0107		1.00	-0.0103		-0.38	0.0104		0.97	-0.0097		-0.36

(Continued…)

(Table 4 Continued)

Variable	Model 3						Model 4					
	ln_r_selling_price			ln_CDOM			ln_r_selling_price			ln_CDOM		
	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value
m_green_labels	0.0532	***	3.41	0.0407		1.03	0.0467	***	2.99	0.0467		1.18
m_motivated	-0.0422	***	-3.48	0.1697	***	5.55	-0.0403	***	-3.32	0.1661	***	5.44
m_good_buy_opportunity	-0.0304	***	-2.69	0.0108		0.38	-0.0303	***	-2.67	0.0084		0.29
m_good_location	-0.0124		-1.35	0.0143		0.62	-0.0127		-1.39	0.0145		0.63
m_good_condition	-0.0241	***	-3.23	0.0036		0.19	-0.0241	***	-3.23	0.0032		0.17
m_high_quality_words	0.0706	***	18.69	0.0085		0.89	0.0716		18.93	0.0081		0.84
Zip Code Fixed Effects	Yes						Yes					
School Fixed Effects	Yes						Yes					
Time Fixed Effects	Yes						Yes					
N	14,469						14,469					
System Weighted R-Square	0.73						0.73					

Note: This table presents the hedonic price model and cumulative days on the market seemingly unrelated regression results for housing characteristics and attributes (including solar panels and other green features) and marketing remarks used to promote the listing. These comments include green marketing remarks and other verifiable and non-verifiable comments. ***, ** and * denote 1%, 5% and 10% significance, respectively.

To address potential selection bias in the properties advertised as having solar panels, we follow the methodology established by Gordon and Winkler (2020). First, we estimate the predicted number of days that the property will be on the market. This model includes property characteristics, marketing remark dummy variables, a variable that captures the percentage of overpricing, as well as a dummy variable that indicates listings where the agent acts as both the listing and selling agent. The predicted DOM is subsequently included in a solar marketing remark probit model to generate the inverse Mills ratio (IMR). Lastly, we estimate a selling price regression model that includes the predicted DOM and green marketing remarks variables, and the IMR to correct for potential selection bias. We perform this process for four sub-samples of properties with solar panels: 1) considering all properties that have solar panels; 2) properties with owned solar panels; 3) properties with leased solar panels; and 4) properties with PPA solar panels.

Tables 5, 6, and 7 present the results by using the sample selection correction methodology highlighted in Gordon and Winkler (2020). First, Table 5 presents the regression results for the cumulative DOM. Model 7 considers only transactions with solar panels, regardless of their financing type (owned, leased, or PPA). The remaining models split the transactions into subsamples by type of financing for solar panels. Like Gordon and Winkler (2020), the overpricing variable is positive yet not statistically significant in considering Model 7. Furthermore, properties where the agent acts as both the listing and selling agent also take longer to sell. Regarding the solar marketing variables, only marketing remarks related to properties with PPA solar panels (Model 10) have a positive and statistically significant effect on the DOM compared to transactions with PPA solar panels that do not include these marketing remarks. We also find that marketing properties with green labels increase the time to sell them, relative to those that omit these labels.

The probit models in Table 6 indicate the factors that determine whether remarks on solar panels are included in the marketing remarks of the transaction. From this model, the IMR is calculated and subsequently included in the selling price regression to correct for potential sample selection bias. Considering all types of solar panel financing, a 1% increase in the predicted DOM reduces the likelihood of including solar panel marketing remarks by 4.36%. This suggests that properties with solar panels that have a longer marketing time are less likely to be advertised for solar panels. Results for the owned, leased, and PPA solar panels indicate the opposite effect. A 1% increase in the predicted DOM increases the likelihood of advertising for owned solar panels by 5.57%. The marginal effect is 0.35% for leased solar panels and 0.66% for PPA solar panels.

Table 5 Cumulative Days on the Market Equation Results

Variable	Model 7 All Solar Panels ln_cdom			Model 8 Owned Solar Panels ln_cdom			Model 9 Leased Solar Panels ln_cdom			Model 10 PPA Solar Panels ln_cdom		
	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value
Intercept	0.2928		0.39	-0.1742		-0.18	-0.2428		-0.21	0.3542		0.18
overprice	0.0154		1.61	0.0018		0.12	0.0400	**	2.26	-0.0296		-0.91
d_listing_selling	0.0623	*	1.83	-0.0575		-0.95	0.1376	**	2.29	0.0160		0.14
ln_house_age	-0.0081		-0.43	-0.0105		-0.26	-0.0032		-0.09	0.0469		0.82
ln_square_footage	0.4740	***	6.56	0.4968	***	4.42	0.6010	***	4.57	0.4168	*	1.73
ln_bedrooms	-0.1632	**	-2.17	-0.1888		-1.56	-0.2307	*	-1.70	-0.1581		-0.73
ln_total_bathrooms	0.0719		0.94	0.0198		0.16	0.0797		0.58	0.2104		0.99
d_fireplace	-0.0589		-1.61	-0.0678		-1.05	-0.0453		-0.79	0.0236		0.19
d_pool	-0.1299	***	-4.70	-0.0520		-1.20	-0.1374	***	-2.81	-0.0699		-0.85
d_garage	-0.0313		-0.51	-0.0832		-0.86	-0.0872		-0.80	0.0334		0.15
d_dual_triple_pane_window	0.0365		1.32	0.0173		0.39	0.0514		1.09	0.0493		0.61
d_tankless_water_heater	-0.0031		-0.08	-0.0280		-0.42	0.0217		0.33	0.1398		1.10
d_solar_water_heater	0.1528		1.34	0.2916		1.54	0.2045		1.00			
d_solar_heated_pool	-0.0003		0.00	-0.0647		-0.47	0.0962		0.54	-0.2570		-0.43
d_SEER_AC	0.0505		1.34	0.0905		1.37	0.1494	**	2.33	-0.0728		-0.58
d_roof_comp	-0.0691	***	-2.48	0.0065		0.14	-0.0621		-1.26	-0.1018		-1.22
d_REO_bank_owned	0.2187	*	1.88	0.2155		0.65	0.2714		1.62	-0.5969		-1.02
d_short_sale	1.1786	***	6.79				1.0733	***	5.27	0.4590		0.74
d_cash	-0.2609	***	-2.78	-0.2809	**	-2.00	-0.1783		-1.02	-0.8582	*	-1.85
d_conv	-0.1092		-1.24	-0.1123		-0.86	-0.1246		-0.77	-0.6592		-1.44

(Continued…)

(Table 5 Continued)

Variable	Model 7 All Solar Panels ln_cdom			Model 8 Owned Solar Panels ln_cdom		Model 9 Leased Solar Panels ln_cdom			Model 10 PPA Solar Panels ln_cdom		
	Parameter Estimate		t Value	Parameter Estimate	t Value	Parameter Estimate		t Value	Parameter Estimate		t Value
d_FHA	0.0130		0.14	0.1042	0.72	-0.0140		-0.08	-0.5346		-1.15
d_VA	-0.0434		-0.45	0.0651	0.43	-0.1575		-0.90	-0.6142		-1.30
ln_dist_airport	-0.0034		-0.09	0.0700	1.13	0.0070		0.10	0.0595		0.58
ln_dist_park	0.0122		0.72	0.0248	0.95	0.0105		0.36	-0.0430		-0.92
ln_dist_school	0.0537	***	2.55	0.0469	1.37	0.0055		0.15	0.1063		1.93
ln_dist_trail	0.0315	***	2.69	-0.0132	-0.66	0.0584	***	2.88	0.0633	*	1.91
m_solar_panel	-0.0456	*	-1.66								
m_solar_panel_owned				0.0936	1.55						
m_solar_panel_leased						-0.0039		-0.08			
m_solar_panel_PPA									0.1624	*	1.74
m_solar_panel_only	0.0144		0.46	0.1556	1.71	-0.0559		-1.13	0.0657		0.90
m_solar_other	0.0534		0.13	-0.1690	-0.35	0.9090		1.14			
m_dual_triple_pane_window	0.0442		1.07	-0.0340	-0.48	-0.0377		-0.49	0.2588	**	2.13
m_tankless_water_heater	-0.0283		-0.55	-0.0332	-0.37	-0.0271		-0.31	0.0048		0.03
m_solar_water_heater	-0.1264		-0.47	-0.3472	-1.03						
m_solar_heated_pool	-0.0761		-0.29	-0.0463	-0.15	-0.0267		-0.05			
m_SEER_AC	0.0015		0.01	0.1814	0.62	-0.4367		-0.77			
m_low_maint_landscaping	0.0266		0.52	0.0124	0.16	0.1033		1.13	0.1756		1.32
m_green_labels	0.3771	***	4.97	0.1469	1.09	0.3375	**	2.20	-0.0675		-0.16
m_motivated	0.2977	***	3.69	0.0366	0.21	0.3718	***	3.06	0.4645	**	2.22
m_good_buy_opportunity	-0.0354		-0.34	0.1260	0.62	-0.0528		-0.35	0.0818		0.23

(Continued…)

(Table 5 Continued)

Variable	Model 7 All Solar Panels ln_cdom		Model 8 Owned Solar Panels ln_cdom		Model 9 Leased Solar Panels ln_cdom			Model 10 PPA Solar Panels ln_cdom	
	Parameter Estimate	t Value	Parameter Estimate	t Value	Parameter Estimate		t Value	Parameter Estimate	t Value
m_good_location	0.0235	0.33	-0.0778	-0.75	0.2043		1.49	-0.0944	-0.51
m_good_condition	-0.0691	-1.26	0.0215	0.25	-0.1703	**	-2.00	-0.0503	-0.26
m_high_quality_words	-0.0380	-1.39	-0.0079	-0.17	-0.0892	*	-1.90	0.0219	0.27
Zip Code Fixed Effects	Yes		Yes		Yes			Yes	
School Fixed Effects	Yes		Yes		Yes			Yes	
Time Fixed Effects	Yes		Yes		Yes			Yes	
N	2363		864		825			405	
Adjusted R-Square	0.15		0.10		0.18			0.07	

Note: This table presents the results from the estimation of the natural log of cumulative days on the market by type of solar panel present in the house. This is the first step of the Gordon and Winkler (2020) methodology to correct for potential selection bias. ***, ** and * denote 1%, 5% and 10% significance, respectively.

Table 6 Probit Model Results

Variable	Model 11 All Solar Panels Probit Model				Model 12 Owned Solar Panels Probit Model				Model 13 Leased Solar Panels Probit Model				Model 14 PPA Solar Panels Probit Model			
	Parameter Estimate		t Value	Marginal Effects	Parameter Estimate		t Value	Marginal Effects	Parameter Estimate		t Value	Marginal Effects	Parameter Estimate		t Value	Marginal Effects
Intercept	1.2695		0.75		1.9011		0.74		-8.61		-0.32		-10.9679		-0.02	
pred_ln_dom	-4.3606	***	-11.79	-1.40	5.0527	***	5.17	1.26	1.36	***	2.96	0.34	3.6741	***	5.39	0.54
d_listing_selling	-0.1014		-1.15	-0.03	0.1927		1.07	0.05	-0.51	***	-2.60	-0.13	0.4057		1.03	0.06
ln_house_age	0.2037	***	4.34	0.07	0.3128	***	2.89	0.08	0.36	***	3.57	0.09	-0.0359		-0.16	-0.01
ln_square_footage	1.8125	***	7.33	0.58	-2.5862	***	-4.50	-0.64	-0.32		-0.68	-0.08	-1.4187	*	-1.67	-0.21
ln_bedrooms	-0.7278	***	-3.71	-0.23	0.4949		1.37	0.12	0.20		0.50	0.05	-0.4124		-0.51	-0.06
ln_total_bathrooms	0.7324	***	3.78	0.24	0.7512		2.12	0.19	-0.15		-0.39	-0.04	-0.2438		-0.33	-0.04
d_fireplace	-0.3914	***	-4.16	-0.13	0.5924	***	3.16	0.15	-0.21		-1.28	-0.05	0.0421		0.11	0.01
d_pool	-0.6120		-7.34	-0.20	0.0089		0.07	0.00	-0.06		-0.42	-0.02	0.3350		1.28	0.05
d_garage	-0.0131		-0.09	0.00	0.6149	**	2.38	0.15	0.36		1.07	0.09	0.3841		0.49	0.06
d_dual_triple_pane_window	0.2759	***	3.98	0.09	-0.0994		-0.77	-0.02	0.17		1.30	0.04	-0.6353	***	-2.48	-0.09
d_tankless_water_heater	-0.0932		-0.99	-0.03	0.1898		1.08	0.05	0.22		1.27	0.06	-0.2563		-0.63	-0.04
d_solar_water_heater	0.3885		1.42	0.12	-1.0868	***	-2.51	-0.27	-0.10		-0.18	-0.02				
d_solar_heated_pool	0.0470		0.21	0.02	0.0798		0.24	0.02	-0.47		-0.95	-0.12				
d_SEER_AC	0.4054	***	4.22	0.13	-0.6695	***	-3.44	-0.17	0.00		0.03	0.00	-0.3873		-0.83	-0.06
d_roof_comp	-0.2390	***	-3.23	-0.08	-0.0737		-0.55	-0.02	-0.19		-1.36	-0.05	0.0973		0.35	0.01
d_REO_bank_owned	-0.0859		-0.27	-0.03	1.8299		0.11		-0.90		-1.50	-0.22				
d_short_sale	4.5502	***	7.42	1.46					-0.95		-1.34	-0.23				
d_cash	-1.2785	***	-4.98	-0.41	1.9022	***	4.11	0.47	1.23	*	1.82	0.30	6.7658		0.01	1.00

(Continued…)

(Table 6 Continued)

Variable	Model 11 All Solar Panels Probit Model				Model 12 Owned Solar Panels Probit Model				Model 13 Leased Solar Panels Probit Model			Model 14 PPA Solar Panels Probit Model			
	Parameter Estimate		t Value	Marginal Effects	Parameter Estimate		t Value	Marginal Effects	Parameter Estimate	t Value	Marginal Effects	Parameter Estimate		t Value	Marginal Effects
d_conv	-0.5387	**	-2.40	-0.17	0.9874	***	2.78	0.25	0.91	1.43	0.23	6.3941		0.01	0.94
d_FHA	0.0254		0.11	0.01	-0.3332		-0.84	-0.08	0.94	1.43	0.23	5.7179		0.01	0.84
d_VA	-0.2539		-1.03	-0.08	0.4418		1.04	0.11	0.68	1.01	0.17	6.8298		0.01	1.01
ln_dist_airport	0.0675		0.71	0.02	-0.3535		-1.94	-0.09	-0.12	-0.63	-0.03	0.1762		0.48	0.03
ln_dist_park	-0.0375		-0.88	-0.01	-0.2456	***	-3.12	-0.06	0.05	0.58	0.01	0.0896		0.57	0.01
ln_dist_school	0.2619	***	4.63	0.08	-0.3802	***	-3.43	-0.09	-0.09	-0.90	-0.02	-0.4797	**	-2.40	-0.07
ln_dist_trail	0.1830	***	5.93	0.06	0.1507	***	2.67	0.04	-0.01	-0.19	0.00	-0.1341		-1.04	-0.02
Zip Code Fixed Effects	Yes				Yes				Yes			Yes			
School Fixed Effects	Yes				Yes				Yes			Yes			
Time Fixed Effects	Yes				Yes				Yes			Yes			
N	2363				864				825			405			
Log Likelihood	-1335.00				-381.27				-367.39			-108.15			

Notes: This table presents the probit model results as part of the second step in the Gordon and Winkler (2020) methodology to account for potential selection bias. The dependent variable is the different types of solar panels included in the house. Results are used to calculate the inverse Mills ratio. ***, ** and * denote 1%, 5% and 10% significance, respectively.

Table 7 Sample Selection Corrected Hedonic Price Equation Results

Variable	Model 15 All Solar Panels ln_r_selling_price			Model 16 Owned Solar Panels ln_r_selling_price			Model 17 Leased Solar Panels ln_r_selling_price			Model 18 PPA Solar Panels ln_r_selling_price		
	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value
m_solar_panel	0.1213	***	5.52									
m_solar_panel_owned				-0.1339	***	-3.41						
m_solar_panel_leased							-0.0123		-0.98			
m_solar_panel_PPA										0.1410	***	4.34
m_solar_panel_only	-0.0495	***	-5.94	-0.2417	***	-3.98	0.0086		0.73	0.0573	***	3.01
m_solar_other	-0.0592		-0.46	0.2902		1.46	-0.3884	***	-3.30			
m_dual_triple_pane_window	-0.1043	***	-4.77	0.0449	**	2.25	0.0020		0.14	0.1926	***	4.41
m_tankless_water_heater	0.0702	***	4.45	0.0431	*	1.85	0.0222		1.33	0.0788	***	2.56
m_solar_water_heater	0.3308	***	4.34	0.6971	***	4.67						
m_solar_heated_pool	0.0328		0.34	0.0142		0.17						
m_SEER_AC	-0.0896	**	-2.41	-0.3197	***	-3.53						
m_low_maint_landscaping	-0.0336	**	-2.18	0.0121		0.55	-0.0326		-1.46	0.1249	***	3.06
m_green_labels	-1.0738	***	-5.20	-0.1986	***	-3.79	-0.0630		-1.22	0.0474		0.47
m_motivated	-0.7845	***	-5.23	-0.0878	**	-2.38	-0.1796	***	-3.45	0.4500	***	4.51
m_good_buy_opportunity	0.0301		1.02	-0.2377	***	-3.69	-0.0505		-1.30	0.1981	***	2.62
m_good_location	-0.0661	***	-4.10	0.0952	***	2.84	-0.1150	***	-2.59	-0.0371		-1.21
m_good_condition	0.1261	***	3.75	-0.0320		-1.52	0.0585	**	2.16	0.0383		1.16
m_high_quality_words	0.1358	***	8.10	0.0489	***	3.96	0.1003	***	6.87	0.0814	***	5.24
Zip Code Fixed Effects	Yes			Yes			Yes			Yes		
Inverse Mills Ratio	Yes			Yes			Yes			Yes		
School Fixed Effects	Yes			Yes			Yes			Yes		
Time Fixed Effects	Yes			Yes			Yes			Yes		
N	2363			864			825			405		
Adjusted R-Square	0.90			0.88			0.88			0.88		

Note: ***, ** and * denote 1%, 5% and 10% significance, respectively.

Table 7 presents the regression results for the corrected selling price of the selected sample. All four models include the calculated IMR. Model 15 presents the results for the solar marketing remarks, excluding consideration of the type of solar panel. The results indicate that making specific marketing remarks increases the selling price of properties with solar panels by 12.13%. Including remarks about the presence of solar panels without mentioning the type of solar panel financing decreases the selling price by 4.95%, while mentioning the presence of other solar attributes does not statistically impact house prices. The presence of tankless and solar water heaters has a positive effect on the selling price, while remarks on dual and triple-pane windows, SEER AC, and green labels have a negative and statistically significant effect.

Looking at Model 16 in Table 7, properties with marketing remarks of the presence of owned solar panels sell at a discount of -13.39%, while those of the presence of solar panels without mentioning whether they are owned result in a -24.17% discount, all relative to properties with owned solar panels that do not advertise. These are significant effects which is quite surprising considering that owned solar panels do not come with complicated leasing contracts. Hoen et al. (2017) note that third-party-owned solar panels, such as leased and PPA panels, present additional complications for buyers, and as a result, media outlets have highlighted them. These results indicate that advertising for owned solar panels may attract home buyers who are able to significantly bargain the price down, most likely considering factors related to the age and performance of the system. Buying a house with an already paid solar panel system implies that the new property owner is acquiring responsibility for its maintenance and replacement costs. Interested home buyers may perceive this as an added nuisance. All other green marketing remarks are also statistically significant. Advertising for dual- and triple-pane windows, tankless and solar water heaters, and solar-heated pools has a positive effect on selling prices. Advertising for SEER ACs, low-maintenance landscaping, and green labels has a negative impact on the selling price.

Models 17 and 18 present the results for the marketing remarks of non-owned solar panel systems. Mentions of leased solar panels do not capitalize on the selling price. Properties with PPA solar panels that mention their presence sell at a premium of 14.10% relative to properties that do not mention PPA solar panels. Remarks that do not specify the presence of PPA but mention the presence of solar panels sell at a 5.73% premium. Altogether, even though PPA solar panels are not popular among potential buyers and real estate agents due to their potentially lengthy and complicated contracts with third-party energy contractors, using the right words to attract buyers who are willing to navigate these potential nuisances pays off with higher selling prices.

5.2 Stratification by House Prices

Following Bian et al. (2023), we further stratify transactions with solar panels by low- and high-priced houses. We use the median listed house price with solar panels to split the sample. We intend to find out whether comments on green attributes have differing effects on low-end (less differentiated) versus high-end (more differentiated) houses. Bian et al. (2023) find that sellers of high-end (low-end) houses tend to disclose less (more) information on housing attributes as a strategy to attract buyers early in the purchase process. The results from Model 19 in Table 8 indicate that comments that mention the presence of solar panels have a positive effect on low-priced properties (less differentiated) and a negative effect on high-priced houses (more differentiated). Furthermore, mentioning the presence of solar panels without specifying the type of solar financing results in negative effects on low-priced houses and positive effects on high-priced houses.

These results support the theory in Bian et al. (2023) that more information is expected and beneficial for less differentiated properties than for more differentiated properties. For low-priced properties, the specific comments of real estate agents tend to attract buyers interested in specific types of solar panels, whereas generic comments tend to attract buyers who are willing to bargain on prices. In contrast, for high-priced properties, less specific information attracts buyers who are willing to pay price premiums.

Breaking down the data into subsamples by type of solar panel financing provides additional insights into the consumer preferences for specific solar panels. Model 20 presents the results for low-priced and high-priced properties with owned solar panels. Buyers interested in low-priced properties with owned solar panels pay house price discounts of 9.21%. Buyers of high-priced properties with owned solar panels pay house price premiums of 31.03%. The asymmetry in the results likely reflects the heterogeneity of buyers in terms of their preferences for owning solar panels rather than differences in home quality. There are financial benefits to owning the panels on your property; however, potential concerns over maintenance, including costs, may deter more price-sensitive buyers in the lower-priced housing range than in the higher-priced homes. Buyers of high-priced homes are more likely to have the financial means to maintain the panels and, therefore, may view owning the panels as a sign of quality and environmental consciousness. The same asymmetry in results is observed with generic marketing remarks that do not mention the presence of owned solar panels; yet, comparatively, the negative marginal impact is higher for low-priced properties (-18.34%), and the positive impact is lower for high-priced properties (16.53%). This reaffirms that generic information may attract low-priced property buyers who are more price-sensitive to the way that solar panels are advertised. Conversely, buyers of high-priced properties may consider generic advertisements a sign of relatively lower quality housing yet still be willing to pay price premium

Table 8 Sample Selection Corrected Hedonic Price Equation Results by Low and High Listing Prices

Variable	Model 19						Model 20					
	All Solar Panels						Owned Solar Panels					
	Low Listing Price			High Listing Price			Low Listing Price			High Listing Price		
	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value
m_solar_panel	0.0258	***	2.83	-0.0131		-0.82						
m_solar_panel_owned							-0.0921	***	-2.75	0.3103	***	4.63
m_solar_panel_leased												
m_solar_panel_PPA												
m_solar_panel_only	-0.0192	***	-2.52	-0.0247		-1.17	-0.1834	***	-3.31	0.1653	***	3.59
m_solar_other				-0.1301		-0.95	0.5098	***	3.92	-0.9370	***	-5.00
m_dual_triple_pane_window	-0.0016		-0.21	-0.0208		-0.57	0.0644	***	3.22	-0.1260	***	-3.99
m_tankless_water_heater	-0.0011		-0.11	-0.0212		-0.54	-0.0554	**	-2.43	-0.3445	***	-4.49
m_solar_water_heater	0.0854		1.42	0.0341		0.24	0.3753	***	4.14	-0.3220	**	-2.06
m_solar_heated_pool	-0.4604	***	-4.89	0.0718		0.75	-1.0667	***	-4.41	-0.0490		-0.61
m_SEER_AC	-0.3549	***	-5.36	-0.0292		-0.68	-0.4398	***	-3.87	-0.9207	***	-4.77
m_low_maint_landscaping	0.0121		1.22	0.0170		0.76	0.0654	***	3.67	0.0161		0.56
m_green_labels	-0.1608	***	-2.58	0.1035		1.56	-0.1842	***	-3.82	-0.6050	***	-3.54
m_motivated	-0.0559	***	-3.21	0.0125		0.08	0.0374		1.17	0.0835		0.63
m_good_buy_opportunity	-0.0299		-0.51	-0.0755	*	-1.86	-0.1815	***	-2.80	-0.1773	***	-5.17
m_good_location	0.0080		0.90	-0.0141		-0.52	0.0502	**	2.08	-0.1459	***	-3.38
m_good_condition	0.0030		0.27	-0.0054		-0.21	0.0277	*	1.68	0.2680	***	4.57
m_high_quality_words	0.0480	***	8.34	0.0347		1.61	-0.0305	*	-1.80	0.0047		0.17
Zip Code Fixed Effects	Yes			Yes			Yes			Yes		
Inverse Mills Ratio	Yes			Yes			Yes			Yes		
School Fixed Effects	Yes			Yes			Yes			Yes		
Time Fixed Effects	Yes			Yes			Yes			Yes		
N	1181			1182			432			432		
Adjusted R-Square	0.81			0.76			0.79			0.78		

(Continued…)

(Table 8 Continued)

	Model 21						Model 22					
	Leased Solar Panels						PPA Solar Panels					
	Low Listing Price			High Listing Price			Low Listing Price			High Listing Price		
	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value	Parameter Estimate		t Value
m_solar_panel												
m_solar_panel_owned												
m_solar_panel_leased	0.0021		0.18	-0.0463	**	-2.26						
m_solar_panel_PPA							0.0086		0.32	-0.2725	**	-2.43
m_solar_panel_only	-0.0056		-0.67	-0.0458	***	-3.08	0.0553	***	4.49	-0.0405		-1.39
m_solar_other				-0.8121	***	-2.86						
m_dual_triple_pane_window	-0.0434	***	-4.24	0.0471		1.10	0.1133	***	4.93	-0.1227		-1.64
m_tankless_water_heater	0.0020		0.12	0.1371	*	1.92	0.0585		1.50	0.1014	**	2.20
m_solar_water_heater				-0.2820		-1.11	0.1405	***	4.47	-0.0775		-1.45
m_solar_heated_pool												
m_SEER_AC				0.5481	**	2.32						
m_low_maint_landscaping	0.0036		0.20	-0.1920	**	-1.95						
m_green_labels	0.0626	***	2.63	0.2681	***	3.78				0.1281		1.47
m_motivated	0.0266		1.29	-0.6196	**	-2.29	0.1850	***	3.88	-0.1491		-1.30
m_good_buy_opportunity	-0.1125	**	-1.98	-0.3320	***	-3.30	-0.4076	***	-5.04	0.2224	***	2.57
m_good_location	0.1255	***	5.07	-0.4245	**	-2.16	-0.1112	***	-5.97	0.1313		1.52
m_good_condition	-0.0507	***	-3.28	0.0990		1.53	-0.1926	***	-5.21	0.1780	***	4.35
m_high_quality_words	0.0533	***	6.33	0.1730	***	2.53	0.0262	**	2.45	-0.0292		-0.93
Zip Code Fixed Effects	Yes			Yes			Yes			Yes		
Inverse Mills Ratio	Yes			Yes			Yes			Yes		
School Fixed Effects	Yes			Yes			Yes			Yes		
Time Fixed Effects	Yes			Yes			Yes			Yes		
N	410			415			203			200		
Adjusted R-Square	0.85			0.78			0.89			0.79		

Notes: This table presents the sample selection corrected results that splits the sample into high and low listing prices. The dependent variable is the natural log of the real house price. ***, ** and * denote 1%, 5% and 10% significance, respectively.

Advertising specifically of leased solar panels in low-priced houses does not capitalize on property prices, whereas non-specific solar panels have a negative impact on property prices. For high-priced houses, specific remarks about leased panels have a negative impact on house prices, although non-specific remarks do not have a statistically significant impact. Lastly, low-priced properties with PPA solar panels, accompanied by a generic remark, sell at a price premium relative to properties with PPA solar panels that do not advertise. Meanwhile, specific and generic marketing remarks for high-priced properties with PPA solar panels also sell at a premium.

6. Conclusions

Unstructured marketing remarks provide buyers with significant information to make informed decisions about their housing purchases. In California, agents are required to mark the existence of solar panels in the MLS profile; however, it is the decision of the agent to add specific solar panel and other green attribute comments to the public marketing remarks. Our results indicate that the green attribute remarks of an agent add value to the property listing beyond the information provided by the basic property descriptors on MLS. Listing and selling prices are significantly impacted by these specific green remarks. After accounting for potential selection bias, we find that specific comments related to owned solar panels have a positive impact on the selling prices of differentiated properties, but a negative impact on those of less differentiated properties. Our results also support the unpopularity of leased solar panels, yet specific as well as generic remarks on properties with PPA solar panels attract buyers who are willing to pay price premiums. These results provide significant practical information for agents.

Future research should consider replicating this study in other states where the adoption of solar panels may not be as prevalent as it is in California to determine if the findings are replicable in markets under different conditions. Although this study focuses on price capitalization, future research could explore how homebuyer characteristics (e.g., environmental attitudes, income, or homeownership experience) mediate the effect of green marketing remarks on their purchasing decisions. A natural extension would be to examine why agents choose to include or omit information about green attributes. Surveys or interviews with agents could uncover behavioral or strategic motivations behind these marketing choices. While the current study focuses on text-based MLS remarks, future research could evaluate whether other forms of marketing, such as photos, videos, virtual tours, or green badges, influence buyer perceptions or enhance price premiums for green features. Additional research could explore how green marketing remarks influence appraised values, loan underwriting, or buyer financing conditions - especially for third-party-owned systems.

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