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Leasing Into the Sun

A Mixed Method Analysis of Transactions of Homes with Third Party Owned Solar

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Disclaimer

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Leasing Into The Sun: A Mixed-Method Analysis of Transactions of Homes With Third Party Owned Solar

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Acronyms

CEM	Coarsened Exact Matching
DOE	Department of Energy
LBNL	Lawrence Berkeley National Laboratory
PPA	Power Purchase Agreement
PV	Photovoltaic
RCP	Real Contract Price
SIZE	Size of the solar system (used in the hedonic pricing model)
TPO	Third Party Owner
TTS	Tracking the Sun (annual LBNL publication)
UCC	Uniform Commercial Code

Abstract

This analysis is the first to examine if homes with third-party owned (TPO) PV systems are unique in the marketplace as compared to non-PV or non-TPO PV homes. This is of growing importance as the number of homes with TPO systems is nearly a half of a million in the US currently and is growing. A hedonic pricing model analysis of 20,106 homes that sold in California between 2011 and 2013 is conducted, as well as a paired sales analysis of 18 pairs of TPO PV and non-PV homes in San Diego spanning 2012 and 2013. The hedonic model examined 2,914 non-TPO PV home sales and 113 TPO PV sales and fails to uncover statistically significant premiums for TPO PV homes nor for those with pre-paid leases as compared to non-PV homes. Similarly, the paired sales analysis does not find evidence of an impact to value for the TPO homes when comparing to non-PV homes. Analyses of non-TPO PV sales both here and previously have found larger and statistically significant premiums. These results might indicate the obligations under the TPO contract, both in terms of payments and other contract terms, offset whatever savings they enjoy, but not so much as to detract from the home's value. Collection of a larger dataset that covers the present period is recommended for future analyses so that smaller, more nuanced and recent effects can be discovered.

1 Introduction

As of the second quarter of 2016 there were over 1.1 million residential properties with solar photovoltaic energy systems (PV) installed in the US, almost 200,000 systems were installed in the first half of 2016 alone, roughly four times that in all of 2010 (SEIA & GTM, 2016). Some geographic densities of solar homes have grown beyond 20% (Hoen, 2016). This growth is in part related to the dramatic decrease in installed PV costs over the last 10 years as well as the increase in financing options for property owners installing PV, such as leased PV systems, those under a power purchase agreement and other zero- or low-money-down purchase options (Barbose and Darghouth, 2016; SEIA and GTM, 2016). As a percent of total number of installations in states where data are available, systems owned by a third party (TPO), which includes those under a lease or power-purchase agreement (PPA), represent approximately half of all systems in California, Massachusetts, and New York, three quarters of those in Arizona, and more than 90 percent in New Jersey. From those states alone it is estimated that almost half a million TPO PV homes exist (Barbose and Darghouth, 2016; SEIA and GTM, 2016).[1]

As TPO solar properties increase in number so does the number of real estate transactions involving those properties, yet there remains continuing uncertainty as to how the market reacts when these properties sell. Based on a number of anecdotes, large media outlets have seized on the TPO PV home transactions as being fraught with complications, including "scaring buyers" (Wade, 2014); that they "cast a shadow over a home's value" (Brady, 2014); or, can "complicate — or kill — a home sale" (Harney, 2015); or that they just might "not be a good idea" (Chodorov, 2015); however these anecdotal concerns have not previously been validated through empirical research.

Of course some of these scenarios likely do exist. The purchase of a home with a TPO solar system does require some additional steps that are not normally encountered during a home sale process. For example, the seller might need to purchase the system from the TPO so it can be transferred free and clear to the buyer, or the buyer needs to agree to assume the TPO obligation at the time of purchase, which requires them to be credit worthy to do so; UCC fixture filings might need to be removed to clear the title[2]; and, buyers who are unfamiliar with solar systems in general and TPO arrangements in particular might require additional education (Desmarais, 2013; Arreola et al., 2015). All of these could create difficulties at the time of sale and decrease prices.

On the other hand, the value in installing the TPO system in the first place comes from having

[1] TPO solar systems refer to both leased systems and systems under a power purchase agreement. The former requires the payment of a lease in exchange for lower energy bills from the utility – the solar system's production offsets the normal consumption of energy from the utility via a "net meter" – while the latter requires payment for the energy produced by the system in exchange for the reduced energy bills. One is slightly different from the other and therefore requires slightly different terminology (e.g., "lease payment" vs. "energy payment"), but for the purposes of the paper both TPO system types will be described using terminology for leases.

[2] A clear title is required for a sale, and UCC filings are often made by TPO installers to secure their asset from sale without their knowledge. Therefore in the case of a transfer, the filing will be temporarily removed.

lower home energy costs that are only partially offset by a lease or PPA payment. Therefore, on net, the house should have lower carrying costs, which should be positively reflected in the home's value. This value might be enhanced if there is a perception of lower transaction costs related to transferring the TPO contract as compared to installing a system from the start (as would be the case on a home without solar). But with the growing number of homes with TPO systems, even understanding if the market has tended on average to discount homes with TPO systems, increase their value or react to them with indifference is of paramount importance. This is the primary research question of this research.

To date the quantitative literature has focused on transactions of homes with host-owned solar systems (i.e., those not owned by a third party) finding clear premiums for the overwhelming majority of homes that are strongly correlated with solar system size (Watkins, 2011; Dastrup et al., 2012; Desmarais, 2013; Hoen et al., 2013; Hoen et al., 2015b; Adomatis and Hoen, 2016). Some qualitative information about TPO PV home transactions does exist, though. Desmarais (2013) surveyed 11 real estate agents in Colorado finding three who believed the lease adversely affected the sale, two that thought it improved the sale, and the remaining six that thought it had no effect. Arreola et al. (2015) surveyed realtors (n=15), sellers (n=11) and buyers (n=18) involved in transactions of homes with TPO systems in the San Diego area finding that TPO systems add complexity to the sale, but in terms of sale price and customer satisfaction are "largely neutral and in some cases a net positive" (p.1). Because of the obvious overlap of the TPO and non-TPO PV literature, comparing them in the same model is of interest.

The contractual arrangements between TPO system owners and the homeowner vary in a myriad of different ways that could influence the market value. For example, some TPO PV system buyers choose to partially or fully pre-pay the lease, therefore either reducing or eliminating the need for future lease payments over the term.[3] A pre-paid lease would have greater value to a prospective buyer than a lease that requires a full set of payments over the term, all else being equal. Similarly, the lease payment for a similarly sized system might differ between homes because of differences in hardware prices, incentives and market competition at the time of installation. These monthly payment differences could influence the market value. To what degree each of these potentially competing value influences are reflected in the market is unclear and will require a large number of transactions to disentangle. Though, a first order question might be whether the market reacts to fully prepaid leases, which require no additional financial obligation from the buyer.

Previous studies have found mixed results as to whether PV homes sell for faster than non-PV homes though that same question has not been applied to TPO PV homes. Using the sets of homes in the paired sales analysis, that question is investigated here.

In summary the present research seeks to answer four basic questions regarding these TPO PV home transactions, each of which is listed in Table 1. To do so, the research employs a mixed-method analysis of transactions involving TPO homes using both a small dataset paired-sales

[3]PPAs often do not have the option of being prepaid.

analysis and a larger dataset hedonic pricing model analysis. Which model applies to which of the research questions is shown in Table 1.

Additionally, the research contains a summary analysis of almost 300 TPO leases and power purchase agreements, providing practitioners insights into how instruments might vary in important ways and therefore what to look out for as they come upon them as part of transactions.

Table 1: Research Questions and Applicable Models

	Hedonic Pricing Model	Paired Sales Model
1) Do TPO PV homes sell for more or less than otherwise similar non-PV homes?	Yes	Yes
2) Is there evidence that TPO solar homes sold for more or less than comparable non-TPO PV homes?	Yes	No
3) Does the market exhibit any reaction to prepaid leases of TPO PV homes?	Yes	No
4) Is there any evidence that homes with TPO PV sold faster or slower than similar non-PV homes?	No	Yes

The report starts with a discussion of the methodological approach, the data used for analysis, and a presentation of the analysis results. Concluding remarks then follow as well as suggestions for future research.

2 Methodology

This study employs a mixed method approach to investigate the effect that TPO solar systems have on the sales prices of homes. The work combines an extensive review of almost 500 leases and PPAs across California, a sales price analysis of 18 transactions in San Diego employing a paired sales technique, and a hedonic pricing model estimation of 113 TPO sales across California. Each of the analyses draw from the same dataset of California solar and non-solar home sales used in Hoen et al. (2015a). As will be discussed in greater detail below, the sales span the period of 2002 to 2013, with all TPO PV sales occurring in 2011 through 2013. Therefore, they offer a first quantitative glimpse into how the real estate market, in this case in California, reacts to homes with TPO solar systems.

The two analytical methods used to conduct the analysis, namely paired sales analysis and hedonic pricing analysis are discussed below.

A paired sales analysis is relied on by appraisers who might be asked to value these types of properties at the time of sale (see text box). For the present analysis the approach relies on the market knowledge of two appraisers, one of which is intimately aware of the San Diego real estate market (Dordahl) and the other who is an expert in valuation of solar homes and serves as the reviewer of the first appraiser (Adomatis). These appraisers make adjustments to the selling prices of similar homes based on local market knowledge and experience.

> **What Is a Paired Sales Analysis?**
>
> A paired-sales analysis compares the sale price of a property with a feature of interest (in our case PV) to the price of a similar property sold at the same time without the feature, and after adjusting for home differences that affect market value.

> **What Is a Hedonic Model?**
>
> A house can be thought of as a bundle of home, site, neighborhood, and market characteristics. When a price is agreed upon between a buyer and seller, there is an implicit understanding that those characteristics have value. When data from a large number of sales are available, the average marginal contribution to the sales price of each characteristic can be estimated with a hedonic regression model. For example the average effect on sales prices of adding an additional bathroom or 1,000 ft^2 of area to a home can be estimated, as can the effect of having a PV system.

The hedonic pricing model, on the other hand, makes "adjustments" based on the relationships detected in the large sample (see text box). A detailed description of this model follows.

2.1 Hedonic Pricing Model

For the present research, the hedonic model uses the following set of home and site characteristics: size of the home (i.e., square feet of living area); age of the home at the time of sale (in years); age of the home squared (in years); size of the parcel (in acres) up to 1 acre; and any additional acres more than 1 (in acres).[4] It also includes the presence and size of the PV systems. To control for neighborhood, a census block group fixed effect variable is included, which, in all cases, includes at least one PV home and one non-PV home.[5] Finally, market characteristics are accounted for by including a dummy variable for the quarter and year (e.g., 2013 Q2, 2009 Q1, etc.) in which the sale occurred. This model form was chosen for its relative parsimony, its high adjusted R^2, and its transparency.[6] It is estimated as follows:

$$\ln(P_{itk}) = \alpha + \beta_1(T_i) + \beta_2(K_i) + \sum_a \beta_3(X_i) + \beta_4(TPO_i \cdot PV \cdot SIZE_i) + \varepsilon_{itk} \quad (1)$$

where

P_{itk} represents the sale price for transaction *i*, in quarter *t*, in block group *k,* and therefore $\ln(P_{itk})$ is the natural log of the sale price (lnsp),

α is the constant or intercept across the full sample,

T_i is the quarter *t* in which transaction *i* occurred,

K_i is the census block group *k* in which transaction *i* occurred,

X_i is a vector of *a* home and site characteristics for transaction *i,*

TPO_i is a fixed-effect variable indicating the PV system is owned by a third party in transaction *i*,

PV_i is a fixed-effect variable indicating a PV system is installed on the home in transaction *i*,

$SIZE_i$ is a continuous variable for the size (in kW) of the PV system installed on the home prior to transaction *i*,[7]

β_1 is a parameter estimate for the quarter in which transaction *i* occurred,

β_2 is a parameter estimate for the census block group in which transaction *i* occurred,

β_3 is a vector of parameter estimates for home and site characteristics *a*,

β_4 is a vector of two parameter estimates for the change in sale price for each kilowatt added to a TPO and non-TPO PV system, and

ε_{itk} is a random disturbance term for transaction *i,* in quarter *t*, in block group *k*.

The model estimates the effects of TPO PV and non-TPO PV systems on home value simultaneously. As such the two parameter estimates of primary interest are β_{4TPO} and $\beta_{4Non\text{-}TPO}$. They represent approximately the marginal percentage change in sale price over the average sale price of the comparable set of non-PV homes within the same census block group, with the addition of each

[4] Acres is entered into the model as a spline function using two variables, up to 1 acre (*acreslt1*) and any additional acres above 1 (*acresgt1*), to capture the different values of up to the first and additional acres of parcels in the sample. Therefore *acreslt1* = *acres* if *acres* ≤ 1 and 1 otherwise, while *acresgt1* = *acres*-1 if *acres* > 1 and 0 otherwise. Additionally, square feet and age squared are entered into the model in 1,000s to allow for easier interpretation of the coefficients.

[5] A census block group contains approximately 600 to 3,000 people. By including this fixed effect, and requiring each to contain at least one PV and one non-PV home, the PV estimates are, therefore, essentially a comparison of those two home types within the block group, while controlling for temporal and characteristic differences between them.

[6] Model choice for this work was based on extensive robustness model exploration in previous analysis (Hoen et al., 2013; Hoen and Adomatis, 2015; Hoen et al., 2015b).

[7] All references to the size of PV systems in this paper, unless otherwise noted, are reported in terms of direct-current watts or kilowatts under standard test conditions. A discussion of this convention is offered in Appendix A of Barbose et al. (2014).

kilowatt of PV for a third party owned solar system and a non-third party owned solar system.[8] If differences in selling prices exist between non-PV homes and either TPO PV (β_{4TPO}) or non-TPO PV ($\beta_{4Non\text{-}TPO}$), we would expect the coefficients to be positive and statistically significant. Further, if differences exist between TPO and non-TPO PV home premiums we would expect β_{4TPO} and $\beta_{4Non\text{-}TPO}$ to be statistically different.

Finally, to examine research question 3 (pre-paid TPO systems) the hedonic model analysis requires a term indicating if the TPO system was pre-paid or not, which is interacted with the TPO*PV*SIZE parameter estimate as described in Equation 1.

2.2 Paired Sales Analysis

As described in the text box above, a paired-sales analysis compares the sale price of a property with a feature of interest (in our case TPO PV) to the price of a similar property sold recently without the feature (in our case non-PV). After adjusting for the myriad of value influencing home differences, the difference (a.k.a. "contributory value") in the sales prices attributed to the study feature can be identified.[9] Increasing the number of pairs evaluated increases the certainty of the feature's influence on value, as does a tight range of price premium results. This study compares 18 pairs which is adequate to examine the contributory value of this TPO PV feature (Research question #1). Paired-sales analysis is difficult and time consuming for the following reasons:

- Few sales of almost-identical properties, in the same area and selling within a reasonable period, occur on a regular basis. Therefore, considerable time is spent finding them.
- Home condition, motivation of buyer and seller, and financing can affect prices paid; these factors must also be accounted for to ensure both sales meet the definition of market value and do not skew the results.
- Finally, just as with the study feature (TPO PV), adjustments for non-study features must be quantifiable and market based to provide credible results.

Because of the relatively small number of data used for the paired sales analysis, as compared to the hedonic model, a statistical quantification is not appropriate. Instead, the paired homes are evaluated side by side for positive or negative contributory value of TPO PV, but those effects are not tested for statistical significance. Research questions one and four will be addressed using this methodology. To examine the number of days a property was listed before selling, the contract date and the most recent MLS listing date were compared. If a listed home price changed, or if the listing was removed and the home was relisted, only the most recent change was used.

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[8] To be exact, the conversion to percent is actually EXP(β_4)-1, but the differences are often *de minimis*.

[9] The types of features requiring adjustment in the paired-sales analysis include market conditions (such as date of sale), concessions paid by the seller, site size, view amenities, age, gross living area, bathrooms, bedrooms, pools, porches, garage size, quality, and condition. The adjustments are based on the local market's reaction to the feature, and they would vary with the market and housing price range. Appendix B shows the Gross percentages of adjustment which range from 0 to 12.4% with an average between 2 and 3.5%

3 Data

This section describes the process used to prepare the data used for these analyses—including PV home and non-PV home data, lease/PPA characteristics, and UCC filing data—followed by a data summary. The process started with all solar homes in CA that had been installed through 2013 and finished with only those TPO PV homes that sold and for which a transfer of the lease could be confirmed and a matching non-PV home could be found (see Table 1).

Table 2: Summary of Screening Process for Sales Used For Analysis[10]

Sale Type	Total Beginning Sales	Lease Discovered and Reviewed		Prepaid Lease?	Confirmed Transfer Via UCC Filings	Matched to Non-PV Home using CEM	**Total**
TPO PV	464	230	No-Prepay	177	152	96	**113**
			Prepay	53	26	17	
Non-TPO PV	3,769	n/a		n/a	n/a	2,914	**2,914**
	Total Beginning Sales					Matched to PV Home using CEM	
Non-PV	130,762					17,079	**17,079**

3.1 CA PV and Non-PV Homes Data

For the Tracking the Sun (TTS) report series (e.g., Barbose et al., 2013), Lawrence Berkeley National Laboratory was provided a set of approximately 200,000 California PV home addresses – both TPO and non-TPO addresses - along with information on PV system size, date the incentive was applied for, and the date the system was put into service.[11] These data span the years 2008–2012.[12]

These PV home addresses were matched to addresses maintained by CoreLogic,[13] which they aggregate from county-level assessment and deed recorder offices. Once the addresses were matched, CoreLogic provided, when available, real estate information on each of the PV homes as well as similar information on approximately 200,000 non-PV homes located in the same (census) block group as the PV homes. The data for both of these sets of homes included, but were not limited to:

- address (e.g., street, street number, city, state and zip+4 code);
- most recent sale date and amount;

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[10] CEM, or coarsened exact matching is described in detail in Section 3.4.
[11] For a full discussion of how these data are obtained, cleaned, and prepared, see Barbose et al. (2013).
[12] The TTS dataset also included data on PV homes from other states, but only data for CA were used for this analysis where the overwhelming number of transactions had occurred and where TPO lease data were available.
[13] More information about this product can be obtained from http://www.corelogic.com/.

- home characteristics (e.g., acres, square feet of living area, bathrooms, pool, and year built);
- assessed value of land and improvements as of 2013;
- parcel land use (e.g., commercial, residential);
- structure type (e.g., single-family residence, condominium, duplex); and,
- x/y coordinates.

These data were cleaned to ensure all data were populated and appropriately valued.[14] Using these data, along with the PV incentive provider data, a determination was made as to if a home sold after a PV system was installed, significantly reducing the usable sample because the majority of PV homes have not yet sold. Through this effort 464 TPO PV homes that had sold between 2009 and 2013 were identified and 3,769 non-TPO PV homes (these PV transactions after 2008 were the same used for Hoen et al. (2015; 2015b)).

3.2 Lease Review

The California Public Utilities Commission (CPUC) provided LBNL with pdf versions of all lease/PPA contracts it had stored though 2015. Among this set, contracts for the 464 TPO transactions that were installed from 2008 to 2012 were searched for. 230 (50%) of those contracts were found within their files. A summary of those contracts follows.

Contracts that were more recently issued (i.e. 2010-2012) were more likely to be successfully retrieved compared to older contracts (i.e. 2008-2009). 107 contracts from Pacific Gas and Electric (PGE) service territory we retrieved, 79 from Southern California Edison (SCE) territory, and 44 from San Diego Gas and Electric (SDGE) territory.[15] Of those that were found, PV system size was not significantly different (x = 5.26 kW) than the average of those that were not found (x = 5.13 kW; p = 0.735). Therefore, it appears that although not all data were accessible, the usable sample is representative of the population (at least in terms of system size).

Of the 230 contracts that were retrieved and examined, 198 (85%) were issued by just three companies: SolarCity (80), SunRun (59), and SunPower (56). The remaining 35 (15%) of contracts were split among a number of other TPO PV providers, which are referred to below as “other” providers.

The sample of TPO PV systems had a mean rated capacity of 5.26 kW. Mean system size showed a slight upward trend over time (+0.20 kW/year; p = 0.09). The mean system size was not statistically different between SolarCity, SunRun, SunPower, and “other” providers. However, TPO

[14] Because the CoreLogic data sometimes are missing or miscoded, the cleaning and preparation of these data were extensive and therefore not detailed here, but the process included the following screens: sale price greater than $165,000 and less than $900,000, size of the home between 1,000 and 5,000 square feet, sale price per square foot between $8 and $800, sale year after 2001, and size of the parcel between 0.05 and 10 acres.
[15] This distribution is similar to all residential systems in California that were installed between 2008 and 2013, and which were part of the CPUC incentive program: 46% PGE; 34% SCE and 19% SDGE.

PV systems installed on new homes (x = 3.82 kW) were significantly smaller than those on existing homes (x = 5.56 kW; $p < 0.01$).

Leases represent 77% of the contracts reviewed, with power purchase agreements (PPA) representing 23%. Many TPO providers offer a variety of terms. The majority (61%) of the contracts use a 20 year term, with the remainder split roughly between 18, 15 and 10 year terms. Shorter terms have become less common over time based on the sample; e.g., 2008-09 terms averaged 12.6 years, while 2011-12 terms averaged 18.9 years ($p < 0.01$). Escalation rates of lease payments are common (n = 220), and average about 1.6% annually. 76% (n = 177) of the contracts were not prepaid, while 10% (n = 22) were fully prepaid, with the remainder being partially (between 10% and 75%) prepaid (n = 31).[16] A prepayment could represent a significant value to a potential home buyer, who would enjoy lower or no monthly payments.

The mean installed cost ($/watt) of TPO PV systems has decreased significantly, from over $9.7/watt in 2008 to $5.5/watt in 2012. Due to these declines in installed PV cost, the Year 1 marginal cost ($/kWh) to the customer also decreased slightly over time in the sample, from $0.24/kWh in 2008-09 to $0.21/kWh in 2011-12, but that difference was not statistically significant. The real contract price to customers was estimated, which accounts for closing costs, up-front payments, contract escalation rates, PV performance degradation, and a 7% discount rate over the term of the contract. The mean real contract price (RCP) in the sample was $3.06/watt.

Despite the rapid decline in installed PV costs, the mean RCP to the customer has increased over time, from $2.3/watt in 2008 to $3.4/watt in 2012. Davidson et al. (2015) reported comparable RCPs in their analysis of TPO PV, and similarly did not find evidence of a decline in RCP over time. A portion of this increase might be explained by CA state incentives, which decreased in the sample from $1.13/W in 2008 to $0.18 in 2012 ($p < 0.01$). The mean RCP of PPAs (x = $3.57/W) is significantly higher than that of leases (x = $2.95/W; $p < 0.01$), which corroborates findings of Davidson et al. (2015). However, unlike those authors a significant difference in the mean RCP of non-prepaid contracts compared to those were prepaid was not discovered.

63% of the contracts reviewed required closing costs, which averaged just less than $1,000. Over all the contracts, and including those that had no costs, they do appear to be increasing over time but not significantly ($118/year; p = 0.12). These closing costs are unlikely to be covered by the buyer in the event of a home sale.

In summary, a myriad of lease aspects could be considered when conducting an analysis of contributory market value. As discussed above, this would require a large dataset with hundreds if not thousands of transactions to disentangle the relative independent contribution of each of these aspects. This is beyond the scope of the present analysis and its relatively small dataset of TPO homes. Only the existence of any TPO premium is examined here, as well as if differences exist for pre-paid leases and leases of various system sizes.

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[16] Prepayment of a contract allows an elimination or reduction in future monthly payments.

3.3 UCC Filings

Arreola et al. (2015) found, in some cases, the seller would buy-out the lease at the time of sale and therefore transfer the home with the system paid off (i.e., free and clear). This, therefore would not be considered a transfer of the lease obligations. To examine if the TPO solar homes in the present dataset that had sold had also transferred their contract obligations to the buyer UCC filings were pulled using First American's DataTree online platform.[17] For each transaction two items had to be in place to confirm a transfer took place, which include:

- A filing showing the seller's name and the address prior to the sale date (likely near the date of installation)
- A filing showing the buyer's name and the address after the sale date

Of the 230 leases that were reviewed 178 had documentation of a transfer. 18 of these, all of which were located in the San Diego Market, were used for the paired sales analysis (as described in Section 2). A summary of these paired sales is presented in Table 5. Of the 178, 85% (n=152) were partially or not at all prepaid, while 15% (n=26) were prepaid.[18]

3.4 Coarsened Exact Matching & Screening

Ideally for the purposes of determining if a premium or some cost is associated with a sale of a home with a TPO PV system, an identical (i.e., all else being equal) non-PV home transaction would be found (i.e., "comparable sale"). In practice, this is very difficult, because not only can homes differ in a myriad of ways, so can the parcel on which they are located and the market into which they sell. Therefore practitioners often settle for a comparable sale that is "as similar as possible" (Adomatis, 2014). From there, adjustments can be made to account for the observable differences. For the paired sales analysis the search for a comparable home is done one at a time.

For the hedonic pricing model the bigger concern is non-observed characteristics that are correlated with observed characteristics resulting in biased results (i.e., omitted variable bias). Previous analysis found that a significant portion of the homes with solar are custom homes (Hoen et al., 2015b), which might have a number of additional features that are present for only these homes but are omitted from the model. Therefore, as described in greater detail in Hoen et al. (2015b), to minimize potential bias in the sample from non-observed characteristics, a Coarsened Exact Matching (CEM) process is employed (King et al., 2010). The goal of the matching is to restrict the sample to more standard housing stock where a sample of PV and non-PV homes that

[17] See http://www.datatree.com/

[18] A larger percentage of the prepaid leases did not have documentation of a transfer, which, it is assumed, is because they were bought out at the time of sale.

are statistically equal on their covariates is retained.[19] The covariates include being within the same block group, selling in the same year, and having similar values for size of the home, age of the home, size of the parcel, and ratio of assessed value of land to total assessed value.[20] This procedure results in a reduced sample of homes to analyze, but biases related to the selection of PV and non-PV homes are minimized. The resulting matched non-PV homes were not necessarily mutually exclusive between the sets of PV homes, but most importantly each block group contained at least one PV home and one non-PV home.

3.5 Data Summary For Hedonic Pricing Model

The CEM matched dataset—the one used for the hedonic analysis—has 17,079 non-PV homes, 2,914 non-TPO PV homes and 113 TPO PV homes totaling 20,106 transactions. Of the 113 TPO transactions used for the analysis, 17 were fully or near fully (>75% of the lease value) prepaid, with the remainder (*n*=96) being either partially or not at all prepaid. Summary statistics for the respective non-PV, non-TPO PV, and TPO PV groups are presented respectively in Table 3, Table 4, and Table 5. Table 6 presents summary statistics for the San Diego TPO PV transactions used for the paired sales analysis.

Table 3: Summary Statistics of Non-PV Transactions used for Hedonic Pricing Model

variable	description	N	mean	sd	min	median	max
sy	year of sale	17079	2011	1	2009	2011	2013
syq	year and quarter of sale	17079	20113	14	20091	20114	20134
sp	price of sale (dollars)	17079	$ 456,623	$ 195,193	$ 170,113	$ 415,000	$ 929,000
lnsp	natural log of sale price	17079	12.94	0.44	12.04	12.94	13.74
sfla	living area (square feet)	17079	2,366	722	1,001	2,248	4,990
sfla1000	living area (in 1000s of square feet)	17079	2.4	0.7	1.0	2.2	5.0
acres	size of parcel (in acres)	17079	0.41	0.83	0.05	0.18	9.2
age	age of the home at time of sale (years)	17079	19	20	0	10	100
agesq1000	age of the home squared (in 1000s of years)	17079	0.8	1.3	0	0.1	10.0
pv	if the home has a PV system (1 if yes)	17079	0	0	0	0	0

[19] The procedure used, as described in the referenced paper, is CEM in Stata, available at: http://ideas.repec.org/c/boc/bocode/s457127.html. Because this matching process excludes PV homes that are without a statistically similar non-PV match (and vice versa), a significant percentage of homes (approximately 36% of TPO PV homes) are *not* included in the resulting dataset. Pre-matching Multivariate Distance (0.95) compares favorably to post-matching Distance (0.82).

[20] The assessed value of land to total value ratio is expected to capture the unexplained within-block group locational variation that often is present, for example, due to being on a quiet road, abutting a park, or being on the waterfront. Assessed values, it is assumed, are consistently applied within the block group.

Table 4: Summary Statistics of Non-TPO PV Transactions used for Hedonic Pricing Model

variable	description	N	mean	sd	min	median	max
sy	year of sale	2914	2011	1	2009	2011	2013
syq	year and quarter of sale (yyyyq)	2914	20112	14	20091	20114	20134
sp	price of sale (dollars)	2914	$ 479,241	$ 195,904	$ 171,000	$ 437,750	$ 928,000
lnsp	natural log of sale price	2914	12.99	0.42	12.05	12.99	13.74
sfla	living area (square feet)	2914	2,365	703	1,008	2,275	4,981
sfla1000	living area (in 1000s of square feet)	2914	2.4	0.7	1.0	2.3	5.0
acres	size of parcel (in acres)	2914	0.44	0.92	0.05	0.19	9.89
age	age of the home at time of sale (years)	2914	19	21	0	10	99
agesq1000	age of the home squared (in 1000s of years)	2914	0.8	1.4	0	0.1	9.8
pv	if the home has a PV system (1 if yes)	2914	1	-	1	1	1
size	size of the PV system (kilowatts)	2914	3.6	1.9	0.1	3.0	10.0
pvage	age of the PV system at time of sale (years)	2914	3.2	3.0	0	2.8	13.4

Table 5: Summary Statistics of TPO PV Transactions used for Hedonic Pricing Model

variable	description	N	mean	sd	min	median	max
sy	year of sale	113	2012	1	2009	2013	2013
syq	year and quarter of sale (yyyyq)	113	20122	13	20094	20131	20134
sp	price of sale (dollars)	113	$ 420,111	$ 167,793	$ 173,000	$ 396,500	$ 910,000
lnsp	natural log of sale price	113	12.87	0.40	12.06	12.89	13.72
sfla	living area (square feet)	113	2,547	726	1,060	2,492	4,824
sfla1000	living area (in 1000s of square feet)	113	2.5	0.7	1.1	2.5	4.8
acres	size of parcel (in acres)	113	0.25	0.24	0.09	0.20	2.27
age	age of the home at time of sale (years)	113	12	12	0	9	58
agesq1000	age of the home squared (in 1000s of years)	113	0.3	0.6	0	0.1	3.4
pv	if the home has a PV system (1 if yes)	113	1	-	1	1	1
size	size of the PV system (kilowatts)	113	5.1	2.0	2.4	4.8	10.0
pvage	age of the PV system at time of sale (years)	113	1.2	1.0	0	1.2	3.8

Table 6: Summary Statistics of TPO PV Transactions used for Paired Sales Analysis

variable	description	N	mean	sd	min	median	max
sy	year of sale	18	2013	0	2012	2013	2013
sp	price of sale (dollars)	18	$ 578,361	$ 150,824	$ 292,000	$ 575,750	$ 860,000
pv	if the home has a PV system (1 if yes)	18	1	-	1	1	1
size	size of the PV system (kilowatts)	18	4.7	1.4	1.8	4.6	7.7
pvage	age of the PV system at time of sale (years)	18	1.8	1.0	1.0	1.8	5.0

4 Results

Two separate analyses were conducted, the results from which are presented here. Initially the results from the Hedonic Model are presented, followed by those from the Paired Sales analysis.

4.1 Results From Hedonic Pricing Model

The model as defined in Equation (1) estimates, over the entire dataset, the marginal return to the sale price (as estimated using the natural log of the sale price, or lnsp, as is discussed in Section 2.1[21]) of each kilowatt of PV installed on a home for both TPO and non-TPO PV systems. The model is summarized in Table 7, with full results shown in Table 8.[22] Overall the model performs well, with an adjusted R^2 of 0.92, indicating that it captures approximately 92% of the price variation within the 20,106 California home sales located in the 1,524 census block groups that make up the sample.

Table 7: Full Hedonic Model Results Summary

Total *n*	20,106
PV Non-TPO *n*	2,914
PV TPO *n*	113
Non-PV *n*	17,079
Adjusted R^2	0.92
Dependent Variable	lnsp
Block Group Fixed Effects *n*	1,524

The full set of results is shown in Table 8. The controlling variables that account for size (*sfla1000*) and age of the home (*age, agesq1000*) and size of the parcel (*lt1acres*, for each acre up to 1, and *gt1acres*, for each acre over 1) are all highly statistically significant (i.e., *p*-value < 0.001). The model indicates that, in our sample, each additional 1,000 square feet adds approximately 21% to the selling price, while each acre up to 1 adds 39% and each additional acre beyond 1 adds 3%. Each year a home ages initially takes approximately 0.9% off its value, but this annual value reduction declines with time, and homes over approximately 60 years in age appreciate in value as they age.[23] Using the fourth quarter of 2013 as the reference category, in our sample, prices start approximately 14% lower (Q1 2009) and then increase to levels present in late 2013. This rise is entirely consistent with the national trends in housing prices. Combined, the various controlling characteristics are appropriately signed and leveled based on our expectations, giving us confidence that the model is acting appropriately and adequately capturing price differences across the sample.

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[21] Lnsp is conventionally used to account for the marginally decreasing contribution to sale price for each additional increase in the covariates, such as sqft, acres, and age, and also applies to PV.

[22] All models are estimated in Stata using *areg*, with block groups as the absorbed fixed effect and with robust standard errors. Linear combinations of coefficients to explore differences are tested using post-estimation *lincom* in Stata.

[23] Approximately 60 years is determined by dividing the age coefficient by the first derivative of the square term's (*agesq*) coefficient.

Turning to the variable of interest, *tpo*pv*size (*coefficients β_{4TPO} and $\beta_{4Non\text{-}TPO}$), the model estimates that, for each kilowatt of installed PV, sale prices of homes with non-TPO systems increase significantly by 0.01 (p-value < 0.001) while those of TPO homes increase by 0.0048 which is not statistically significant (p-value = 0.064). By using the mean sale price (in dollars) for non-PV homes (of $436,624), we can convert these estimates into dollars per watt, which are displayed in Table 9 and Figure 1.[24] Doing so leads to an estimated premium for non-TPO PV homes of $4.39/W, with a 95% confidence interval of +/- $0.64/W, which corresponds to a premium of approximately $16,000 for an average-sized system of 3.7 kW. The same for TPO PV homes leads to a premium of $2.11/W, with a 95% confidence interval of +/- $2.24/W; the premium is not statistically significant. Moreover, the TPO coefficient is not statistically different, though barely so, from the non-TPO coefficient (p-value = 0.055). These results might be driven by the sample size of TPO homes, which, in turn drives the size of the standard errors (TPO homes se=0.0026; non-TPO homes se=0.0008).

Therefore, although there is clear evidence that homes with non-TPO systems impact (by adding to) home values in the California 2011-2013 marketplace represented by this sample, there is an absence of clear evidence that TPO systems do the same, either positively or negatively.

[24] The formula for doing so is: $/W premium = ((exp (*pv*size* coefficient)-1)* *mean sale price in dollars for non-PV homes*)/1,000.

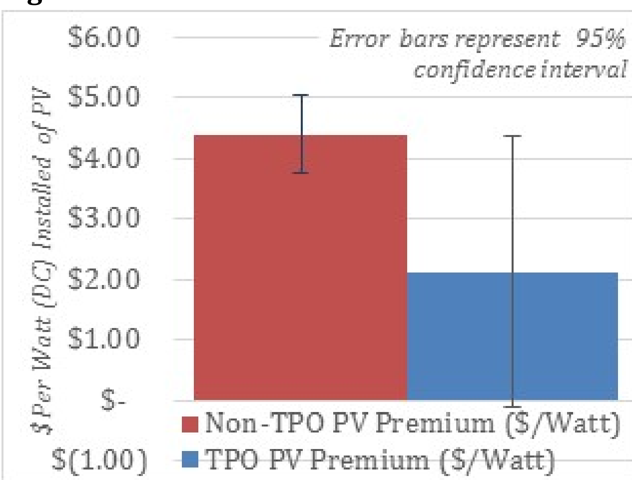
Table 8: Detailed Full Hedonic Model Results

Variable	Coefficient	Standard Error	*t* Statistic	*p*-value	- 95% CI	+ 95% CI
intercept	12.578	0.016	777.46	0.000	12.546	12.609
pv non-tpo*size	0.0100	0.0008	13.32	0.000	0.0085	0.0115
pv tpo*size	0.0048	0.0026	1.85	0.064	-0.0003	0.0100
sfla1000	0.209	0.004	55.30	0.000	0.201	0.216
lt1acre	0.385	0.027	14.29	0.000	0.332	0.438
gt1acre	0.031	0.006	5.13	0.000	0.019	0.043
age	-0.009	0.001	-11.60	0.000	-0.010	-0.007
agesq1000	0.078	0.008	9.38	0.000	0.062	0.094
syq						
20091	-0.138	0.013	-10.710	0.000	-0.164	-0.113
20092	-0.139	0.011	-12.400	0.000	-0.161	-0.117
20093	-0.151	0.012	-12.990	0.000	-0.174	-0.128
20094	-0.145	0.012	-12.470	0.000	-0.168	-0.122
20101	-0.140	0.012	-11.650	0.000	-0.163	-0.116
20102	-0.147	0.010	-14.650	0.000	-0.167	-0.128
20103	-0.163	0.011	-14.800	0.000	-0.185	-0.142
20104	-0.193	0.011	-17.200	0.000	-0.215	-0.171
20111	-0.183	0.010	-18.120	0.000	-0.203	-0.163
20112	-0.200	0.010	-19.780	0.000	-0.219	-0.180
20113	-0.198	0.010	-19.570	0.000	-0.218	-0.178
20114	-0.218	0.011	-20.770	0.000	-0.239	-0.198
20121	-0.221	0.010	-22.140	0.000	-0.241	-0.201
20122	-0.186	0.010	-18.140	0.000	-0.206	-0.166
20123	-0.164	0.010	-16.510	0.000	-0.183	-0.144
20124	-0.133	0.011	-12.430	0.000	-0.154	-0.112
20131	-0.094	0.009	-11.050	0.000	-0.111	-0.078
20132	-0.037	0.008	-4.470	0.000	-0.053	-0.021
20133	-0.004	0.008	-0.540	0.588	-0.021	0.012
20134	--- omitted ---					

Table 9: Dollars per Watt Results For the Full Hedonic Model

Non-TPO PV*Size Coefficient	0.0100
Non-TPO PV*Size Standard Error	0.0008
TPO PV*Size Coefficient	0.0048
TPO PV*Size Standard Error	0.0026
Mean Sale Price Non-PV ($)	$ 436,624
Non-TPO PV Premium ($/Watt)	$ 4.39
Non-TPO PV 95% CI ($/Watt)	$ 0.64
TPO PV Premium ($/Watt)	$ 2.11
TPO PV 95% CI ($/Watt)	$ 2.24

Figure 1: Dollar Per Watt Results of Full Hedonic Model



Turning to the model with the prepaid interaction we find similar overall results with an adjusted R^2 of 0.92 (see Table 10. Of the 113 homes with TPO systems, 17 are fully prepaid and 96 are not or are only partially. The variables of interest are presented in Table 10 as coefficients, and Figure 2 in dollars/Watt. Both include non-TPO PV (*pv non-tpo*size*), prepaid TPO PV (*pv pp tpo*size*), and non-prepaid TPO PV (*pv non-pp tpo*size*). The full set of the results are presented in Appendix A. The model estimates that non-TPO PV adds 0.01 to a home's value (*p*-value <0.000), while prepaid TPO adds 0.0074 and non-prepaid TPO adds 0.0042, neither of which are statistically significant (*p*-value 0.15).

These correspond respectively to premiums of $4.39, $3.23 and $1.84/watt, though only the non-TPO premium is statistically significant. Additionally, none of the PV coefficients nor premiums are statistically different from each other, though the non-TPO and the non-prepaid TPO are barely not so (*p*-value 0.058).

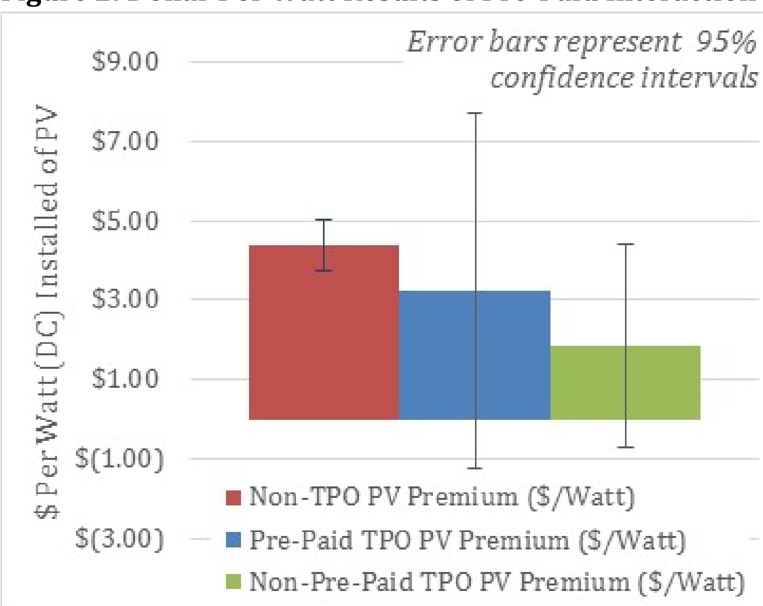
Table 10: Pre-Paid Interaction Model Results Summary

Total *n*	20,106
Non-TPO PV *n*	2,914
PP TPO PV *n*	17
Non-PP TPO PV *n*	96
Non-PV *n*	17,079
Adjusted R^2	0.92
Dependent Variable	lnsp
Block Group Fixed Effects *n*	1,523

Table 11: Detailed Pre-Paid Interaction Model Results

Variable	Coefficient	Standard Error	*t* Statistic	*p* -value	- 95% CI	+ 95% CI
pv non-tpo*size	0.0100	0.0008	13.32	0.000	0.0085	0.0115
pv pp tpo*size	0.0074	0.0052	1.42	0.156	-0.0028	0.0176
pv non-pp tpo*size	0.0042	0.0030	1.41	0.159	-0.0016	0.0100

Figure 2: Dollar Per Watt Results of Pre-Paid Interaction Model



4.2 Results from the Paired Sales Analysis

The full set of results of the paired sales analysis are displayed in Appendix B with a summary of that analysis presented in Table 12. As well, Figure 4 summarizes the estimated TPO PV contributory value frequencies.

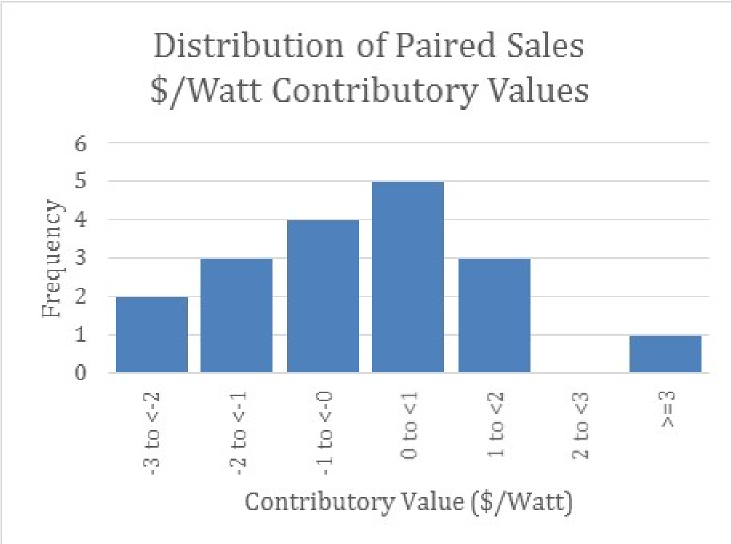
The San Diego sales of TPO PV homes that spanned mid-2012 to late 2013, and sales prices that ranged from almost $300,000 to almost $900,000, contributory values of TPO PV ranged from -$15,150 to $28,500, or -$2.99 to $5.45 when expressed as dollars per Watt (of PV installed). Two thirds (n=12) of the contributory values fell between -$1.00 and $1.00/Watt with a mean of -$0.07 and a median of -$0.16. There was no apparent relationship between the estimated contributory value and the amount prepaid for the lease (see table in Appendix B). The analysis of days on market was similarly directionless when comparing the number of days it took for the TPO PV home to sell less the same for the non-PV home. Across the 18 San Diego pairs the difference ranged from 42 days faster for a TPO PV home to 86 days slower; the median and mean days on market were, respectively, 8 and 3.

In summary, these data do not indicate that there is either a premium nor cost applied to homes with TPO PV systems in the 2012 to 2013 San Diego market in any consistent way. Nor is there any apparent difference in the number of days these two types of homes sell in this market.

Table 12: Summary Results From TPO and Non-PV Paired Sales Analysis

	Sale Date of PV Home	Sale Price of TPO PV House	Total TPO PV Contributory Value (CV)	CV in Dollars per Watt	Yrs Remaining on Lease	Monthly Payment Amount	Initial Prepaid Amount	Days on Market Difference (TPO PV less Non-PV)
Minimum	7/17/2012	$292,000	($15,150)	($2.99)	17	$0	$0	(42)
Median	8/1/2013	$575,750	($750)	($0.16)	19	$100	$500	3
Mean	6/19/2013	$578,361	($51)	($0.07)	18	$80	$4,892	8
Maximum	12/17/2013	$860,000	$28,500	$5.45	19	$205	$14,897	86

Figure 3: Distribution of Paired Sales Dollar per Watt Contributory Values



5 Discussion

Although there have been a number of analyses of non-TPO solar homes, there have been no such rigorous analyses of homes with TPO solar systems to-date, despite that the number of these homes is growing dramatically year over year. Without credible analyses, the press has, based on anecdotes, made claims that TPO systems slow or even kill sales opportunities. If this was the case, the market would show those homes selling for less than otherwise comparable non-solar homes.

This analysis, after a time-consuming process of data collection, offers a first glimpse at how the California real estate market reacts to these homes utilizing two methods: a paired sales analysis of homes in San Diego and a hedonic pricing model of sales across California. Four questions were considered each of which are addressed below:

Do TPO PV homes sell for more or less than otherwise similar non-PV homes?
Both the hedonic pricing model and paired sales model find no apparent difference in selling price of TPO PV homes as compared to non-PV homes. The hedonic model estimate for TPO PV home selling prices is not statistically significant when compared to the set of non-PV homes. Similarly, the paired sales analysis finds mean and median values for the contributory value of TPO solar very close to zero across the 18 pairs. Moreover, because both analyses also do not discover an effect that is statistically significantly negative, there is no evidence to support the press claim of a reduction in home values. These results contrast with those of non-TPO solar homes in the hedonic model, which are consistently found to be positive and statistically significant.

Is there evidence that TPO solar homes sold for more or less than comparable non-TPO PV homes?
In all the hedonic models a positive highly statistically significant effect is discovered for non-TPO PV homes, which confirms with previous analyses (Dastrup et al., 2012; Hoen et al., 2013; Adomatis and Hoen, 2015; Hoen et al., 2015b; Adomatis and Hoen, 2016).[25] This contrasts with those of the TPO PV homes, which are not found to be statistically significant. Moreover, the coefficients for TPO PV homes is smaller than that of non-TPO PV homes. Though, in all the models the TPO coefficient is not found to be statistically different from the non-TPO PV estimate. Therefore, we cannot say that we see a difference between the results.

Does the market exhibit any reaction to prepaid leases of TPO PV homes?
The Pre-Paid Interaction Hedonic Model explores if there is a difference between market effects of prepaid leases and those with no or only a small pre-payment. The results indicate a larger premium for homes with pre-paid TPO systems than for homes with non-prepaid TPO systems, but that difference is not statistically significant. It is reasonable to assume that the market would price in a prepaid amount because the buyer of the home would be afforded the lower costs of those systems as compared to others, but because this analysis only had 17 such homes as

[25] Although not presented here, a previously conducted paired sales analysis of non-TPO PV homes using the same set of appraisers found clear premiums for these homes (Adomatis and Hoen, 2015; 2016).

compared to 96 homes with non-prepaid systems the model was not able to differentiate the two statistically.

Is there any evidence that homes with TPO PV sold faster or slower than similar non-PV homes?

As part of the paired sales analysis, the appraisers investigated if solar homes sold faster than non-solar homes. Although some TPO PV homes sold faster than their non-PV counterparts, and vice versa, the mean and median values across all of the 18 pairs were very near zero indicating, for this San Diego sample, there was no evidence of a change in the speed at which homes sold for TPO PV homes as compared to non-PV homes.

What recommendations do the authors have for future analyses?

This analysis fails to uncover a statistically significant premium for TPO PV homes. It is worth noting, though, that an absence of evidence of a TPO effect does not necessarily construe evidence of an effect's absence; potentially more data might allow a smaller TPO effect to be discovered. It is therefore recommended that future analysis seek to gather a larger dataset. Secondly, examining the difference between the lease / energy payment and either the expected energy saving or the guaranteed energy savings, when a performance guarantee exists, would be useful. It is expected that the delta between these two constitutes the value of these systems. Our analysis of premiums based on the size of the systems and as well for those leases that were fully prepaid is a proxy for this more exacting analysis. With a larger dataset, these more nuanced relationships might be discoverable. Finally, it is recommended that any future analysis be conducted with sales as close to the present as possible. The lease and PPA instruments are changing as are the public knowledge and relationships with solar and therefore although this analysis gives us a first look at the market from 2011 to 2013, knowing how the market is reacting today would be extremely valuable.

6 Conclusion

This analysis is the first to examine if homes with TPO PV systems are unique in the marketplace as compared to non-PV or non-TPO PV homes. This is of growing importance as the number of homes with TPO systems is nearly a half of a million in the US currently and is growing. A hedonic pricing model analysis of 20,106 homes that sold in California between 2011 and 2013 is conducted, as well as a paired sales analysis of 18 pairs of TPO PV and non-PV homes in San Diego spanning 2012 and 2013. The hedonic model examined 2,914 non-TPO PV home sales and 113 TPO PV sales and fails to uncover statistically significant premiums for TPO PV homes nor for those with pre-paid leases as compared to non-PV homes. Similarly, the paired sales analysis does not find evidence of an impact on value for the TPO homes when comparing to non-PV homes. Analyses of non-TPO PV sales both here and previously have found larger and statistically significant premiums. The results herein might indicate the obligations under the TPO contract, both in terms of payments and other contract terms, offset whatever savings they enjoy, but not so much as to detract from the home's value. Collection of a larger dataset that covers the present period is recommended for future analyses so that smaller, more nuanced and recent effects can be discovered.

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Appendix A. Detailed Results For Pre-Paid Hedonic Model

Variable	Coefficient	Standard Error	*t* Statistic	*p*-value	- 95% CI	+ 95% CI
intercept	12.578	0.016	777.10	0.000	12.546	12.610
pv non-tpo*size	0.0100	0.0008	13.32	0.000	0.0085	0.0115
pv pp tpo*size	0.0074	0.0052	1.42	0.156	-0.0028	0.0176
pv non-pp tpo*size	0.0042	0.0030	1.41	0.159	-0.0016	0.0100
sfla1000	0.209	0.004	55.28	0.000	0.201	0.216
lt1acre	0.385	0.027	14.29	0.000	0.332	0.438
gt1acre	0.031	0.006	5.13	0.000	0.019	0.043
age	-0.009	0.001	-11.60	0.000	-0.010	-0.007
agesq1000	0.078	0.008	9.38	0.000	0.062	0.094
syq						
20091	-0.138	0.013	-10.710	0.000	-0.164	-0.113
20092	-0.139	0.011	-12.400	0.000	-0.161	-0.117
20093	-0.151	0.012	-12.980	0.000	-0.174	-0.128
20094	-0.145	0.012	-12.470	0.000	-0.168	-0.122
20101	-0.140	0.012	-11.640	0.000	-0.163	-0.116
20102	-0.147	0.010	-14.650	0.000	-0.167	-0.128
20103	-0.163	0.011	-14.800	0.000	-0.185	-0.142
20104	-0.193	0.011	-17.200	0.000	-0.214	-0.171
20111	-0.183	0.010	-18.120	0.000	-0.203	-0.163
20112	-0.200	0.010	-19.770	0.000	-0.219	-0.180
20113	-0.198	0.010	-19.570	0.000	-0.218	-0.178
20114	-0.219	0.011	-20.770	0.000	-0.239	-0.198
20121	-0.221	0.010	-22.140	0.000	-0.241	-0.201
20122	-0.186	0.010	-18.130	0.000	-0.206	-0.166
20123	-0.164	0.010	-16.510	0.000	-0.183	-0.144
20124	-0.133	0.011	-12.420	0.000	-0.154	-0.112
20131	-0.094	0.009	-11.050	0.000	-0.111	-0.078
20132	-0.037	0.008	-4.460	0.000	-0.053	-0.021
20133	-0.004	0.008	-0.540	0.588	-0.021	0.012
20134	--- omitted ---					

Appendix B. Detailed Results For Paired Sales Model

Paired Sale	Location	Sale Date of PV Home	Sale Price of TPO PV House	Total TPO PV Contributory Value (CV)	Size of TPO PV System (kW)	CV in Dollars per Watt	Years Remaining on Lease	Monthly Payment Amount	Initial Prepaid Amount	Sale Price of Non-PV House	Percent Gross Adjustment Of Comp.	TPO PV Home Days on Market	Non-PV Home Days on Market	Days on Market Difference (TPO PV less Non-PV)
1	Carlsbad	8/20/2013	$720,000	($15,150)	5.1	($2.99)	18	$36	$8,459	$746,500	1.5%	5	1	4
2	Chula Vista	12/17/2013	$500,000	$11,500	6.9	$1.67	18.5	$150	$0	$480,000	1.8%	13	11	2
3	Chula Vista	7/31/2013	$515,000	($5,250)	7.7	($0.68)	18	$205	$0	$500,000	4.1%	6	3	3
4	El Cajon	5/7/2013	$292,000	($2,200)	1.8	($1.19)	19	$73	$0	$336,000	12.4%	12	16	(4)
5	Escondido	9/17/2013	$735,000	($10,100)	5.4	($1.87)	18	$0	$14,000	$750,000	0.7%	6	6	0
6	Escondido	8/17/2013	$405,000	($2,500)	4.1	($0.62)	18	$0	$6,274	$407,500	0.0%	5	7	(2)
7	Escondido	4/9/2013	$417,000	$0	5.4	$0.00	19	$0	$14,427	$425,000	1.9%	11	53	(42)
8	Escondido	2/23/2013	$550,000	($1,500)	4.6	($0.33)	19	$115	$0	$575,000	4.1%	39	4	35
9	Oceanside	3/18/2013	$500,000	$0	3.2	$0.00	18.5	$104	$1,000	$500,000	0.0%	12	6	6
10	Ramona	8/2/2013	$601,500	$1,200	4.6	$0.26	19	$0	$11,672	$580,000	8.7%	8	4	4
11	Ramona	5/28/2013	$730,000	$6,000	3.2	$1.86	18	$0	$12,335	$727,500	0.5%	90	4	86
12	San Diego	12/14/2013	$660,000	$1,932	4.2	$0.46	18	$99	$5,000	$615,000	7.0%	8	3	5
13	San Diego	9/18/2013	$542,500	$7,500	6.2	$1.20	19	$147	$0	$515,000	3.9%	4	17	(13)
14	San Diego	2/4/2013	$745,000	($7,000)	4.3	($1.63)	18.5	$0	$14,897	$735,000	2.3%	14	7	7
15	San Diego	3/21/2013	$372,500	($2,500)	3.2	($0.78)	18.5	$143	$0	$375,000	0.0%	2	9	(7)
16	Valley Center	9/19/2013	$625,000	($11,346)	5.6	($2.01)	17	$138	$0	$575,000	10.7%	7	6	1
17	Carlsbad	7/17/2012	$640,000	$0	3.5	$0.00	17.5	$100	$0	$640,000	0.0%	10	10	0
18	Oceanside	8/27/2013	$860,000	$28,500	5.2	$5.45	18.5	$123	$0	$785,000	5.9%	53	2	51

Minimum	7/17/2012	$292,000	($15,150)	1.8	($2.99)	17	$0	$0	$336,000	0.0%	2	1	(42)
Median	8/1/2013	$575,750	($750)	4.6	($0.16)	19	$100	$500	$575,000	2.1%	9	6	3
Mean	6/19/2013	$578,361	($51)	4.7	($0.07)	18	$80	$4,892	$570,417	3.6%	17	9	8
Maximum	12/17/2013	$860,000	$28,500	7.7	$5.45	19	$205	$14,897	$785,000	12.4%	90	53	86