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HOUSE ENERGY EFFICIENT CHARACTERISTICS: DO THEY MAKE A DIFFERENCE TO TRANSFER PRICES?

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ABSTRACT

Traditional housing is a major negative contributor to climate change through carbon emissions. This paper addresses the issue of energy efficient housing and, in particular, whether evidence exists that buyers are willing to pay a price premium for such housing as a result of the market process.

Utilising an extensive database of house advertisements between 2008 and 2015, ANOVA tests were conducted to ascertain if the mean sale price for properties that promoted energy efficient characteristics were greater than those without mention of such characteristics. Particularly, it examined if the average family income had any impact on the price premium paid for energy efficient properties. Results show that mean sale prices of houses that promoted energy efficient characteristics were significantly greater than those without. However, the findings significantly varied with the level of household income of the buyers where mid and high-income families paid a significantly higher price premium for energy efficient houses than low income families.

Whilst previous research remains inconsistent on whether price premiums exist for more energy efficient dwellings, this research emphasises the effectiveness of marketing process. Research limitations lay with its inability to consider nuances within specific houses such as condition, but the extent of the dataset is believed to be such that the evidence provided can be considered reliable.

Keywords: Energy efficient characteristics, property pricing, real estate agents, marketing, housing

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INTRODUCTION

The impact of anthropological activities upon the environment is well documented. Also, well documented is the impact of housing upon the environment through in-use Green House Gas (GHG) emissions. This study contributes to the discussion regarding the influence of residential energy efficient technologies, particularly solar technologies, on house transfer prices. It does this through the analysis of advertisements written and promulgated by real estate agents.

House advertisements scripted by real estate agents have been found to be useful in the interpretation of societal and market trends and have examined in numerous contexts (for examples see Pryce & Oates 2008; Collins & Kearns 2008; Beangstrom & Adendorff 2013). Therefore, advertisements are considered useful to interpret how house buyers are responding when energy efficient terminology is included within the advertisement. This is particularly so in house markets where energy performance disclosure is not mandatory, as is the case for Victoria, Australia, the region of interest for this research.

As these advertisements are purposed to be read by house buyers, they are scripted in a manner to appeal to, and solicit action by the buyer. To achieve this, agents would include, and where possible, highlight the unique features of the house they believe important to potential buyers. Thus, these advertisements can provide insight into how buyers are responding to the call for more energy efficient housing and whether or not they are paying a price premium to secure such housing. Residential real estate agents, as marketers of houses, are paid to facilitate successful exchange of ownership between willing sellers and willing buyers (Agboola, Ojo & Amidu 2012). How this is achieved differs from country to country but essentially the role is that of an intermediary and in many remunerated through success fees. Thus, the agent is incentivised to do all things appropriate to achieve successful outcomes for their clients (ibid). So, even though the agent may be personally indifferent about environmental issues, they will nonetheless seek to engage with the promotion of energy efficient technologies if they perceive it to be of benefit to the sales process.

However, as much of the world's housing stock was built prior to the growing concerns about climate change, homeowners need to retrofit energy efficient technologies into these existing houses if they sought to increase the efficiency of the dwelling. In doing so, they often believe their house should attain a price premium for the benefits they offer (Högberg 2013). This means low income buyers may be limited in their ability to acquire such housing and benefit from reduced energy bills. Therefore, it is important to understand if family income of house buyers influences a price premium for more energy efficient houses as doing so will further incentivise house owners to install such features where possible. If this is the case low income households are likely to be at a disadvantage and be subject to higher energy bills.

As described above, this research utilises a unique database of house advertisements to identify if there is a relationship between advertisements including lexis referring to energy efficient technologies and exchange price. The paper first proceeds with a review of the pertinent literature and then progresses to describe the rationale for the methodology adopted. Results are discussed together with findings and the paper concludes with recommendations for further research and government policy considerations.

LITERATURE REVIEW

Housing is a significant contributor to green gas emissions (GHG) (Fuller & Crawford 2011). Although there have been considerable efforts to reduce the negative effects GHG, governments globally have struggled to arrest the increasing levels, with some scientists warning we are approaching critical, irreversible levels (Rogelj et al 2012; Barrett & Dannenberg 2013). With regard to housing, numerous strategic and individual attempts have been made to design and construct houses that are less impactive on the environment. These efforts, generally implemented through policy, are normally customised to recognise climatic nuances in order

to maximise their effectiveness (Morrissey, Moore & Horne 2011) with such policy efforts usually implemented through design and construction of new and renovated houses (Clune, Morrissey & Moore 2012). With regard to marketing and transfer price of established houses, disparate efforts have been made to develop frameworks to encourage market participants to engage positively with sustainable house attributes. These frameworks range from mandated enforcement of disclosure of house energy efficiency performance, through to a belief that natural market forces will create positive change (Brounen & Kok 2011; Golubchikov & Deda 2012). This research focusses on a housing market where no house energy performance disclosure existed and therefore, the remainder of this literature review is in this context.

House markets are typically transacted via intermediaries, generally referred to as real estate agents, who negotiate between buyers and sellers to achieve successful outcomes. In this process, agents create bespoke marketing strategies that generally include advertising to highlight the benefits of the house to buyers actively seeking a house. How agents engage with energy efficient technologies when advertising houses for sale has not been the subject of significant interest by researchers. However, whether or not more energy efficient houses attract a price premium has been of interest (for examples see Cerin, Hassel & Semenova 2014; Fuerst et al 2015; Fuerst & Warren-Myers 2018). Emerging evidence suggests a price premium is being attained for more energy efficient houses though this is not consistent and appears to be more discernible in markets requiring mandated performance disclosure discussed above. In non-regulated markets the evidence is less clear. However, if a premium is being paid, one method of identifying its existence to compare houses sold without energy efficient characteristics to those with. Nonetheless, gathering data to create reliable statistical models in a non-regulated market can be problematic. One means of doing this is through house advertisements.

Advertisements have provided researchers a rich source of data to observe property market trends and agent engagement. Pryce and Oates (2008) for example used house advertisements to understand how agents apply rhetoric in advertising to achieve successful outcomes. Racial exclusion in housing (Williams, Qualls & Grier 1995), meaning of place (Perkins, Thorns & Newton 2008), and changes in perspectives of coastal views (Collins & Kearns 2008) are examples of the forms of research undertaken utilising house advertisement content as data. Examining these advertisements for house energy efficient terminology and aligning this data with transfer price should therefore provide indicative insight whether or not more efficient houses are being sold at higher prices in a non-regulated market.

Considering the practice of real estate agency, and in particular house advertising and what observations can be made from it, it is first necessary to provide context by positioning theories that underpin buyer behaviour as they apply to house purchase. To this end, this literature review now considers two relevant theories, namely economic utility theory and high-involvement consumer theory. Conventional economic wisdom dictates that when acquiring a good of any type, buyers will seek to maximise their utility from the good acquired (Boelhouwer 2011). Utility is generally considered to be a measure of the "usefulness" a consumer obtains and can therefore be considered a personal construct (Frederiks, Stenner & Hobman 2015). Thus, when buying a house for example, buyers will evaluate the range of potentially complex and diverse elements that constitute housing in order to identify and prioritise those most desirable to them. These house elements would normally include things such as location, accommodation, character and appeal, and potentially, energy efficient technologies which are sometimes attractive to buyers (Banfi et al 2008; Bruegge, Carrión-Flores & Pope 2016). With regard to energy efficient technologies, buyers accept a certain level risk as to their performance capabilities as they are generally not able to assess them with respect to their own occupancy behaviours; an important component GHG emissions in housing (Bond 2011). Thus, decisions regarding house purchase and energy efficient technologies add to the overall complexity and risk of choosing well. Consumer behaviour researchers often describe such purchase behaviour in terms of low or high involvement.

With regard to consumer behaviour theory when acquiring products or services, researchers typically categorise them as high-involvement or low-involvement decisions and align these in terms of the associated risks (Kokli$f$ç & Vida 2009). Further, they also state high-involvement products and services are those that represent the consumer's personality, status and justifying lifestyle (Jansson, Marell & Nordlund 2011). While on the other hand, low-involvement products and services are those that are more mundane and therefore typically carry less risk. Considering these classifications, purchasing a house is obviously a high-involvement decision and carries risk that the desired utility may not be attained by the buyer. Drawing these two paradigms

together when discussing the inclusion of energy efficient house technologies into accepted house market norms raises the question about how buyers are valuing house energy efficient technologies when purchasing.

When buying a house in which to live buyers will seek a property that meets their household requirements and personal values in order to maximise their utility (usefulness) whilst concurrently aiming to reduce the risk associated with high-involvement decisions. Houses are often seen as a representation of who we are and a potential display of our social status (Semeraro & Fregonara 2013). Typically, they do this by researching market offerings, evaluating suitable options and deciding which property best aligns to their articulated criterion (ibid). With this established norm in the house search process, how buyers' value, if at all, house energy efficient technologies is of increasing importance when considering the effects of GHG emission emanating from anthropogenic activity in housing. However, research investigating willingness to pay for energy efficient technologies has produced mixed results with mandatory reporting appearing to be an important consideration (for examples see Banfi et al 2008; Mandell & Wilhelmsson 2011). Income, education and attitudes all seem to have a positive impact buyer's willingness to pay a price premium for more energy efficient housing. With specific focus on income, positive correlation between family income and willingness to pay for energy efficient housing exists, although results seem to be impacted by the extent of house performance disclosure prior to sale (Marmolejo-Duarte 2018), thereby casting a shadow over regions that do not mandate energy performance disclosure.

Real estate agents, as part of the house transfer process, usually engage with sellers prior to the house being offered for sale and as a result of their appointment have opportunity to influence the marketing structure. If agents perceive a willingness to pay for energy efficient technologies, they would undoubtably include them in any advertisements designed to promote the house for sale. There is emerging evidence in the Australian context to suggest buyers are paying for these technologies (Fruest & Warren-Myers 2018). Therefore, reviewing real estate advertisements to quantify the extent of references made to energy efficient technologies, and any potential correlation to sale price, may provide further evidence of a developing market appetite for these technologies.

This research investigates if evidence exists that house prices are influenced by extant house energy efficient technologies and adopts a unique approach by examining house advertisements written by real estate agents. As this topic is both important and extensive, it can be approached from numerous perspectives. It is therefore important to identify the lens this research adopts to assist the reader's contextual understanding and to this end the following section presents to approach adopted.

RESEARCH METHODOLOGY

The aim of this research is to examine if the level of average annual family income in different suburbs had any implication on the price the buyers are prepared to pay for residential properties with energy efficiency features compared with the ones without them in those particular areas. It does not attempt to examine the actual effect of the advertisement itself upon price attained but rather if properties with advertised energy efficient technologies achieve higher sale prices. The research was confined to the Melbourne Metropolitan Area and the Local Government Areas (LGAs) for the analysis have been selected based on the average annual family income levels for each area as identified by the Australian Bureau of Statistics (ABS). Table 1 below illustrates the Local Government Areas selected for this study.

Table 1: Local Government Areas selected in the research

Annual family income	**Melbourne suburbs**			
	Northern	**Eastern**	**Southern**	**Western**
Low income ($41,600 - $64,999)	Cambellfield Reservoir	Springvale Dandenong	Frankston Rye	Albanvale Sunshine
Mid income ($65,000 - $103,999)	Gladstone Park Watsonia Greensborough	Doncaster Ringwood Blackburn	Seaford Chelsea Murrumbeena	Melton Sydenham Keilor

High income (Over $104,000)	Yarrambat Moonee Ponds	Balwyn Camberwell	Gardenvale Hampton	Wyndham Vale Williamstown

Data used in this study are real estate agent advertisements that were used to promote detached residential properties in these selected LGAs from July 2008 to June 2015. These advertisements were provided by the Real Estate Institute of Victoria (REIV); the REIV represent approximately 70% of all real estate agents in Victoria. From the advertisements, only the properties with 3, 4 or 5 bedrooms were selected for the analysis as these properties tend to have more energy efficiency features due to higher energy costs involved in such houses due to their physical size. The dataset used in this study consisted of 23,540 advertisements with 6,685 advertisements from 'low income areas', 11,992 advertisements from 'mid income areas' and 4,863 advertisements from 'high income' areas. This information was then constructed to form the required dataset for evaluation.

The advertisements were then audited to examine the energy efficient characteristics stated in each advertisement. The most widely available and effective financial incentive available is the government's policies related to solar hot water rebate. Therefore, the energy efficient building technologies considered in this research are those relating to solar and hot water energy efficiency technologies. Energy efficiency related words and phrases within advertisements were first grouped into primary categories that identified the "nature" of the lexis used in order to further understand if the appearance of those words were affected by the introduction and modification of government policies related to solar hot water rebates. Table 1 illustrates the energy efficiency related words and phrases examined and their primary categories.

One limitation to this methodology is differences in house quality. Due to the positive nature of real estate house advertisements it is difficult to extract accurate descriptions of measured quality. Therefore, as this research is exploratory and seeks to ascertain if there is evidence of price differential between houses with and without energy efficient characteristics, it was considered discriminating by income would somewhat overcome this quality issue. That is, similarly priced houses broadly speaking would display similar qualities of finishing and character. Controlling for such attributes would require physical inspection.

Table 1: Energy efficiency variables examined in advertisements and their descriptors

Variable	**Word descriptors (words that SPSS looked for within the advertisement)**
Solar boosted	Solar boosted, Solar enhanced
Solar electricity	Solar electricity, Solar electric
Solar system	Solar system
Solar energy	Solar energy, Solar-energy
Solar HWS	Solar HWS, Solar hot water, Solar heated, Hot water
Solar power	Solar power, Solar-power
Solar panel	Solar panel

The dataset was then explored and tested to find insights on how real estate agents promote solar hot water energy efficient characteristics in their advertisements and, more particularly, to produce evidence whether the words and phrases promoting such characteristics were influenced by the economic characteristics of the area which was measured by the average annual family income. The appearances of solar hot water related words and phrases in the advertisements were first examined in relation to different income groups by using percentages. One-Way ANOVA test was then calculated to examine if there was a significant difference between the mean house prices of properties with and without solar technologies that are located in different income group areas. ANOVA tests compared the variance (variability in house prices) between different groups (believed to be due to the independent variable) with the variability within each of the group (believed to be due to chance) (Pallant 2004).

RESULTS AND DISCUSSION

The research focus was first placed on examining the appearance of previously identified solar technology keywords and phrases in the advertisements for dwellings in areas with different average annual family income. The results are illustrated in Table 2.

Table 2: Appearance of solar technology terms in advertisements by income group areas

Appearance of solar technology terms	**Income group**		
	Low	**Medium**	**High**
Advertisements with solar technology terms	6%	11%	11%
Advertisements without solar technology terms	94%	89%	89%

Despite the increasing legislative frameworks encouraging energy efficiency in housing, findings suggest that solar technologies are still not commonly used in residential properties. It is necessary here to state what may be considered obvious and that is real estate agents can only promote a given house characteristic if it actually exists. With the financial benefits associated with solar technologies, mention of such characteristics ought to be observed in real estate advertisements if such characteristics were available in the property. However, the findings indicate that properties located in areas with high to medium annual family income tend to have more solar technologies compared to properties located in areas with low annual family income. This suggests that people on low income or experiencing disadvantage may be more vulnerable to increasing energy costs as they have less choice and control to manage costs associated with installing solar technologies.

The research focus was then placed on examining how the appearance of solar technology related words and phrases in the advertisements for dwellings for sale varied over the study period. Results are illustrated in Table 3 and Figure 1.

Table 3: Appearance of solar technology terms over the study period

Year	**Low Income**		**Mid Income**		**High Income**	
	No. of ads with solar	**Annual % Change**	**No. of ads with solar**	**Annual % Change**	**No. of ads with solar**	**Annual % Change**
2008	8		29		17	
2009	70	775%	137	372%	76	347%
2010	72	3%	137	0%	67	-12%
2011	53	-26%	139	1%	56	-16%
2012	53	0%	123	-12%	48	-14%
2013	87	64%	252	105%	96	100%
2014	113	30%	382	52%	150	56%
2015	28	-75%	107	-72%	43	-71%

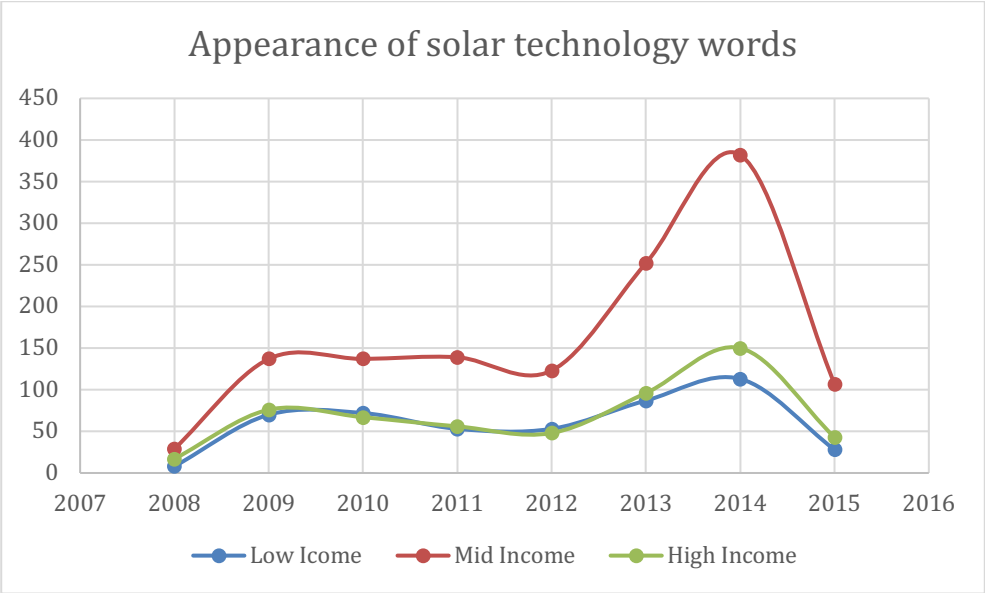

Figure 1: Appearance of solar technology words over the study period

The appearance of solar related energy efficient characteristics in housing advertisements showed some noticeable increases in all three income groups with the introduction of AUD 1000 Solar Hot Water Rebate system in July 2007 for the installation of solar and heat pump hot water systems in existing homes. To be eligible for this rebate, the dwelling had to be the principal place of residence and the applicant's taxable family income had to be less than AUD 100,000. The incentive was further enhanced in 2009 with a new policy with no income limitation and with the rebate increased to AUD 1600. As a result, the appearance of solar related words particularly witnessed a notable escalation during the period of 2009 – 2014. However, the government's financial incentives to promote the installation of solar hot water system were terminated in July 2012. As a result, the annual installations of solar systems in residential properties witnessed some decreases in all three groups as shown in Table 3 and Figure 1.

With further regard to Figure 1, appearances of solar technology keywords in advertisements in regions defined by middle income households is notably higher. This somewhat accords with literature. Higher income households are more likely to engage with environmental issues and technologies (Mills & Schleich 2012). Real estate agents appear to be detecting this engagement and aligning their marketing according. However, this alone does not explain the relatively low level of engagement by high income households. This particular observation could potentially be explained by households seeking to utilise house choice to symbolically demonstrate their values and social status as these households typically place significant importance location and house type in favour of other attributes (Gram-Hanssen & Bech-Danielsen 2004; Wu, Zhang & Dong 2013). Thus, given the limited advertising space, real estate agents in these higher-income areas are more likely to emphasise characteristics that highlight socially favourable attributes and less so specific energy efficient characteristics. Middle income households on the other hand are likely to seek ongoing cost saving through reduced energy consumption while lower income households are typically limited in their ability to purchase house energy efficient technologies (Ramos, Labandeira & Löschel 2016). A more thorough examination of the nuanced variances between each income category is required but beyond the scope of this research and is therefore recognized as a limitation.

The extant literature suggests there is an increasing body of evidence that better energy performance in housing positively affects their values and hence selling prices (Cerin, Hassel & Semenova 2014; Fuerst et al 2015; Fuerst & Warren-Myers 2018). Contemporary literature also suggests higher income buyers are more prepared to pay a price premium for more energy efficient houses (Högberg 2013). While these findings may vary regionally with regulatory disclosure and climate potentially influencing results, the researchers considered that household wealth will influence attitudes towards house energy efficient technologies in some way. In the next step of data analysis, one-way between-groups of analysis of variance (ANOVA) was conducted to examine if there was a significant difference between the house prices paid for properties with solar technologies compared to the properties without them for the properties located in areas with different annual

family income. Firstly, the house prices of properties with and without solar technologies were examined and the results are illustrated in Table 3 below.

Table 3: Mean house prices with and without solar technology

Descriptives

salePrice

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Low icome no tech	6253	435771.21	149362.715	1888.852	432068.41	439474.01	5656	3175000
Low income with tech	432	466646.19	154358.157	7426.560	452049.41	481242.97	49100	1300002
Mid income no tech	10777	554265.88	226975.120	2186.398	549980.13	558551.62	29000	4200000
Mid income with tech	1215	617798.16	264058.836	7575.522	602935.59	632660.73	195000	4450000
High income no tech	4367	1105326.53	659465.469	9979.309	1085762.03	1124891.04	177000	6620000
High income with tech	496	1361983.63	874881.869	39283.356	1284800.95	1439166.30	215000	6350000
Total	23540	643709.50	443243.709	2888.946	638046.97	649372.02	5656	6620000

The results show that in the mean house prices of properties with solar technologies were higher in all three groups compared to the properties without solar technologies. The highest price difference of $256,657 was observed in suburbs located in high income group areas while the lowest price difference of $30,875 was identified in properties located in low income suburbs. The price difference was $63,532 was recorded in properties located in mid income suburbs.

ANOVA test was then conducted to explore the impact of the average annual family income in the suburbs on the price premium paid for houses with solar technologies compared to the houses without such features. Advertisements were divided into six groups according to the average annual family income (Group 1: houses with no solar in low income areas; Group 2: houses with solar in low income areas; Group 3: houses with no solar in mid income areas; Group 4: houses with solar in mid income areas; Group 5: houses with no solar in high income areas; Group 6: houses with solar in high income areas). The results are shown in Table 4.

Table 4: ANOVA test results

Multiple Comparisons

Dependent Variable: salePrice

Tukey HSD

(I) Income	(J) Income	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Low icome no tech	Low income with tech	-30874.984	17959.181	.519	-82057.59	20307.62
	Mid income no tech	-118494.668*	5738.998	.000	-134850.47	-102138.86
	Mid income with tech	-182026.947*	11318.574	.000	-214284.21	-149769.68
	High income no tech	-669555.325*	7119.481	.000	-689845.42	-649265.22
	High income with tech	-926212.415*	16840.562	.000	-974207.02	-878217.81
Low income with tech	Low icome no tech	30874.984	17959.181	.519	-20307.62	82057.59
	Mid income no tech	-87619.683*	17713.914	.000	-138103.29	-37136.08
	Mid income with tech	-151151.963*	20222.680	.000	-208785.40	-93518.52
	High income no tech	-638680.340*	18208.066	.000	-690572.25	-586788.43
	High income with tech	-895337.431*	23758.181	.000	-963046.84	-827628.02
Mid income no tech	Low icome no tech	118494.668*	5738.998	.000	102138.86	134850.47
	Low income with tech	87619.683*	17713.914	.000	37136.08	138103.29
	Mid income with tech	-63532.279*	10925.231	.000	-94668.54	-32396.02
	High income no tech	-551060.657*	6475.923	.000	-569516.65	-532604.66
	High income with tech	-807717.747*	16578.754	.000	-854966.21	-760469.28
Mid income with tech	Low icome no tech	182026.947*	11318.574	.000	149769.68	214284.21
	Low income with tech	151151.963*	20222.680	.000	93518.52	208785.40
	Mid income no tech	63532.279*	10925.231	.000	32396.02	94668.54
	High income no tech	-487528.378*	11709.466	.000	-520899.66	-454157.09
	High income with tech	-744185.468*	19236.141	.000	-799007.33	-689363.61
High income no tech	Low icome no tech	669555.325*	7119.481	.000	649265.22	689845.42
	Low income with tech	638680.340*	18208.066	.000	586788.43	690572.25
	Mid income no tech	551060.657*	6475.923	.000	532604.66	569516.65
	Mid income with tech	487528.378*	11709.466	.000	454157.09	520899.66
	High income with tech	-256657.090*	17105.730	.000	-305407.41	-207906.77
High income with tech	Low icome no tech	926212.415*	16840.562	.000	878217.81	974207.02
	Low income with tech	895337.431*	23758.181	.000	827628.02	963046.84
	Mid income no tech	807717.747*	16578.754	.000	760469.28	854966.21
	Mid income with tech	744185.468*	19236.141	.000	689363.61	799007.33
	High income no tech	256657.090*	17105.730	.000	207906.77	305407.41

*. The mean difference is significant at the 0.05 level.

Results show that there was a statistically significant difference at the $p<0.05$ level in residential house prices for the six groups (F (5, 23,534) = 2390, p = 0.0). The findings suggest that the mean sale price for properties with solar technologies in properties located in high income areas (M = 1,361,984; SD = 874,882) was significantly higher from the mean sale price of houses without solar technologies (M = 1,105,327; SD = 659,465). Similar findings were observed in properties located in mid income areas with a significantly higher mean sale price for properties with solar technologies (M = 617,798; SD = 264,059) compared to the mean sale price of properties without such features (M = 554,266; SD = 226,975). Interestingly, the findings identify that the actual difference in the mean sale prices with and without solar technologies in the properties located in the areas with low income was not statistically different (properties with solar technologies: M = 466,646; SD = 154,358 and properties without solar technologies: M = 435,771; SD = 149,363).

The observation of no statistical variance between means of house prices with and without solar technologies in low-income households is considered to be pragmatic and somewhat expected. Lower income households in Victoria are typically restricted in regard to housing choice. Smaller, more uniformly designed and constructed houses are representative of this market segment. Therefore, variations in house quality and size would be the result of greater care and possible extensions when householders are able to afford that. On the other hand, households with higher incomes logically have greater choice regarding house design and construction and as a result tend to create more customised dwellings. Therefore, with less access to funds, housing stock would be expected to remain somewhat similar and exhibit fewer solar technologies as lower income households are characteristically restricted in their ability to engage with these technologies. With regard to access to solar technologies, this cohort is heavily reliant on government subsidies. Overall, these results appear to be confirming literature presented in that a price premium for more energy efficient housing in non-regulated markets is emergent (Gardener et al 2019). This is particularly so in areas that are characteristic of higher income households.

CONCLUSION (Implications)

The aim of this paper was to examine if evidence existed that buyers are paying a premium for houses with existing energy efficient technologies, in particular, solar technologies and this was done with regard to levels of family income defined by the ABS in Victoria, Australia. Further, this research was conducted in a housing market where it is not regulated that house energy efficiency performance be disclosed. The approach adopted was to examine advertisements written by real estate agents. This approach was justified through the behavioural practices of agents of promoting house features that are perceived as being sought after by buyers in their respective marketplace. By examining the means of house transfer prices for houses with and without solar lexis within advertisements, it was found there was a statistically significant difference in areas of relatively higher family income. It is also noted that advertisements in middle and high-income areas had a greater frequency of appearances of solar terminology. This finding supports the discourse of previous literature in that higher income families are more likely to engage with house energy efficient characteristics and there is emergent evidence of price premium for such houses (Mandell & Wilhelmsson 2011).

The paper concludes with the acknowledgement that the methodology adopted in this research cannot provide conclusive evidence that house buyers are willing to pay for more energy efficient houses. Rather, it has achieved its aim to add to the body of knowledge regarding this important topic from the unique perspective of how real estate agents are engaging with these technologies in advertising and in this, show evidence of positive growth towards a developing market appetite for more energy efficient housing. To the extent of the researchers' knowledge, attempts to ascertain the influence of energy efficient technologies on house prices using advertisements as the unit of analysis has not been done previously. It was for this reason this research was somewhat exploratory in nature. Therefore, further research is required to better understand the impact of house energy efficient technologies on transfer prices.

Finally, the results also highlight that income levels remain a barrier for engagement with house energy efficient technologies and that future policy must in some way address this obstacle, and in doing so address the potential of issue of energy poverty among lower income families.

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