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Social Responsibility and the Needs for Tax Credits in the Adoption of Solar Panels

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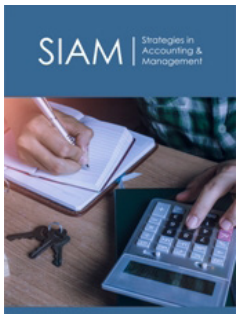

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Abstract

In the US tax credits are a powerful and popular, but costly, way to encourage the adoption of solar panels. In this study we show that social responsibility can also be a significant predictor of solar panel adoption, as are trust in the industry and that it is American. Demographics and familiarity with the technology were insignificant predictors of solar panel adoption, suggesting that investing on a societal level in social responsibility and creating trust in the company/ industry may be additional options to consider.

Keywords: Social responsibility; Tax credits; Trust; Solar panel adoption

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Introduction

This study looks at how important tax credits and consumer social responsibility are in convincing consumers to switch to solar energy. The context is the increasing concern about CO2 emissions EPA [1], the technical viability of solar panels as well as governmental initiatives to encourage its adoption DOE [2], and the high cost of such residential systems, estimated by the Solar Energy Industries Association (SEIA) at $16K-$21K for a 6-kilowatt-hour system [3]. Solar power accounts for only 3% of U.S. electricity generation DOE [4], but it could reach as high as 14% of total U.S. electricity production by 2035 and 22% by 2050 [5]. The Environmental Protection Agency (EPA) in their Affordable Clean Energy (ACE) initiative expect that ACE will result in annual net benefits of $120M-$170M, let alone climate and health related benefits [6]. To achieve those goals the US government provides up to a 30% tax credit for the installation of solar panels [2]. Indeed, solar panel usage is growing exponentially in the US [7]. The question addressed in this study is could that high cost of tax credits be mitigated through increased consumer social responsibility beliefs, i.e., individuals' perception of their role in helping the community through ethical and philanthropic behavior [8,9]. Socially responsible consumers display pro-environmental norms [10].

Data and Analysis

To study that issue we collected survey data throughout the US. After a pilot study verified that potential respondents understood the questionnaire items as expected, the survey was administered to a random representative sample of US adults through a data collection agency, resulting in 1,513 completed surveys. All the questionnaire items were on a 7 point Likert scale and were adapted from previously validated studies, as recommended by Creswell [11]. Awareness of tax credits was adapted from Hajawiyah [12], social responsibility from Huang [13]; Singh [14] combined with items from Kumar [15] on environmental responsibility, familiarity and trust in technology were adapted from Gefen [16]; Byungura [17] and Gefen [18], preference to buy American was adapted from Shimp [19], and intention to adopt solar panels was adapted from Verma [20] and Chao [21]. We added trust in technology company as another predictor on account of past research that shows how important that is in the adoption of new technologies Gefen [18] and, likewise, familiarity with the technology Gefen [18]; Huberman [22]; Komiak [23].

There were 552 male respondents, 601 female, 2 other, and 1 who preferred not to disclose. They were mostly in the 35-44 age range (154), 45-54 (174), 55-64 (317), and over 65 (432). Their education level varied across high school graduate, some college, 2-year degree, 4-year degree, professional degree, and doctorate at 169, 267, 144, 331, 196, and 40, respectively. 150 were single, 748 married, 10 separated, 95 widowed, and 153 divorced. By income, 381 earned below $50k, 252 between $50k and $75k, 178 between $75k and $100k, 181 between $100k and $150k, 99 between $150k and $200k, 25 between $200k and $250k, and 40 above $250k. By race, 1009 were Caucasians, 52 African Americans, 45 Asians, and the remainder other. The survey data were analyzed with a Principal Components Analysis (PCA). The PCA showed 6 eigenvalues above 1. The PCA shows convergent and discriminant validity, shown in Table 1. Descriptive statistics of the latent constructs created out of the principal components are shown in Table 2.

Table 1: Principal components analysis after varimax rotation.

	Trust in Comp.	Social Resp.	Prefer American	Aware of Tax Credits	Fam. with Tech.	Int. to Adopt
I am familiar with how solar system works	0.183	0.103	0.048	0.214	0.81	-0.054
I am familiar with installing process of solar system	0.153	0.065	0.099	0.299	0.832	0.15
I am familiar with the process of selling extra electricity generated by solar system to the utilities	0.128	0.088	0.057	0.314	0.81	0.111
I believe that solar panels are an improvement in technology	0.178	0.168	0.097	0.352	0.665	0.185
Promises made by solar companies are likely to be reliable.	0.858	0.305	0.026	0.133	0.115	0.133
I do not doubt the honesty of solar companies.	0.851	0.292	0.064	0.078	0.104	0.016
I expect the solar companies will keep promises they make.	0.843	0.269	0.084	0.064	0.094	0.015
I expect that the advice given by solar company is their best judgment.	0.854	0.27	0.052	0.145	0.086	0.149
I can count on a solar company to be sincere.	0.801	0.296	0.073	0.139	0.121	0.145
I use solar energy because I feel that I have a social responsibility to conserve the environment	0.162	0.772	0.019	0.046	0.003	-0.137
I believe that it is socially responsible to adopt solar energy due to the ability to sell electricity as it leads to energy conservation.	0.172	0.783	0.062	0.076	0.148	-0.023
I believe that if we all used green energy, we would live in a better world	0.325	0.789	0.053	0.089	0.037	-0.066
It is very important for me to contribute to solar energy consumption	0.295	0.845	-0.018	0.073	0.007	0.041
I believe that we have a social responsibility to promote green energy for the generations to come.	0.341	0.721	0.032	0.166	0.132	0.314
I feel that we are obligated to protect the environment	0.26	0.679	0.034	0.215	0.225	0.331
Environment conservation is very important to me	0.343	0.735	0.007	0.141	0.137	0.224
The use of solar energy contributes to environment conservation	0.323	0.836	-0.02	0.105	0.038	0.113
I believe that if we all used green energy, we would live in a better and cleaner world.	0.312	0.751	0.038	0.178	0.138	0.316
I use solar energy because I feel that I have a responsibility to conserve the environment.	0.369	0.77	0.033	0.107	0.017	0.108
I would contribute to advocate for the use of solar energy as a social responsibility to my community.	0.287	0.851	-0.001	0.089	0.033	0.102
American people should always buy American-made products instead of imports.	0.045	0.006	0.846	0.071	0.088	-0.004
Only those products that are unavailable in the U.S. should be imported.	0.139	0.086	0.732	0.075	0.042	0.058
Keep American working.	0.057	0.119	0.703	-0.005	0.083	-0.309
It is not right to purchase foreign products, because it puts Americans out of jobs.	0.016	-0.051	0.816	0.059	-0.021	0.171
We should purchase products manufactured in America instead of letting other countries get rich off us.	0.016	-0.019	0.888	0.027	0.031	-0.006
Tariffs should be put on all imports.	0.035	-0.055	0.745	0.058	0.029	0.163
It may cost me in the long run, but I prefer to support American products.	0.064	0.064	0.828	0.097	0.043	0.009
I will purchase a solar panel in the next 6 months.	0.333	0.292	0.13	0.236	0.198	0.702
I am thinking about purchasing a solar system, I am just comparing with other energy sources.	0.318	0.3	0.106	0.218	0.185	0.688
I know of the federal government tax credits on solar energy.	0.107	0.169	0.083	0.844	0.261	-0.056

I know of the state government tax credits on solar energy.	0.1	0.165	0.091	0.864	0.245	0.026
I understand very well how to get solar energy tax credits.	0.164	0.106	0.126	0.819	0.305	0.155
I have taken advantage or know someone who has participated in the solar energy tax credit.	0.187	0.177	0.058	0.563	0.306	0.364
It is easy to understand the procedure about how to get tax credit	0.276	0.188	0.115	0.716	0.196	0.205

Table 2: Descriptive statistics.

Scale	Mean	Std. Deviation	Cronbach's Alpha
Familiarity with technology	4.25	1.6	0.85
Trust in the Technology Company	4.38	1.416	0.94
Social Responsibility	4.45	1.711	0.95
Preference to buy American	5.24	1.453	0.9
Intention to adopt solar energy	4.7	1.745	0.91
Awareness of tax credit	3.97	1.84	0.89

The data were then analyzed with a Generalized Linear Model (GLM) that included the averages of the items loading high on each principal component (shown in bold in Table 1) and demographics. Intention to adopt solar energy was significantly predicted ($F=13.512$, p-value<.001, $R2=.486$), by age ($F=46.877$, p-value<.001, $\beta=-.428$), trust in the company/ industry ($F=12.580$, p-value<.001, $\beta=.293$), awareness of tax credit ($F=5.545$, p-value=.019, $\beta=.183$), Preference for American ($F=14.523$, p-value<.001, $\beta=.292$), and by social responsibility ($F=4.239$, p-value=.040, $\beta=.203$), but not by ethnicity ($F=1.434$, p-value=.190), education ($F=.519$, p-value=.820), sex ($F=.530$, p-value=.589), income level ($F=.025$, p-value=.875), marital status ($F=1.705$, p-value=.193), or familiarity with technology ($F=.026$, p-value=.873). The analysis shows that across demographics, except for age where older people are less likely to adopt solar panels, the adoption of solar panels is increased by tax credits and by social responsibility, as well as a preference to buy American. This suggests that investing in increasing social responsibility as well as in buying local (many solar panels are currently important from China) might be an alternative to expensive tax credits. That familiarity with technology was insignificant suggests that initiatives should be aimed at improving trust in the companies installing it rather than the technology itself.

Conclusion

Tax credits to encourage the desired adoption of new technology, solar panels in this case, are common in the US, but costly. As we show in this study, such tax credits can be a powerful incentive, but so are social responsibility, trust in the company/ industry, and preference for American made. This may suggest alternative ways to encourage the adoption of solar panels through societal and industry level education.

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