

Solar panels do not generate political attitudes*

Resul Umit†

19 October 2020

Abstract

In the fight against climate change, renewable energy has been subsidised in many countries. With the costs passed onto consumers, the governments are paying those, for example, who install domestic solar panels on top of their homes. Drawing on three panel datasets from Germany, UK, and Switzerland, this paper analyses whether installation of these solar panels causes meaningful changes in the households' various political attitudes. Using fixed-effect models as the identification strategy, the paper reports null results—solar installations do not seem to generate political attitudes.

*I wish to thank Erik Gahner Larsen for comments on previous versions of this manuscript. It is part of the project ‘Beyond Policy Adoption: Implications of Energy Policy on Parties, Publics, and Individuals’, funded by the Swiss National Science Foundation (PYAPP1–173642/1).

†University of Oslo. Website: resulimit.com. Email: resuluy@uio.no.

Introduction

Policies to fight climate change have created a new kind of energy producer—households with solar installations on their roof. There are more than four million solar systems installed in Germany alone, most of them on residential buildings. In addition to the subsidies available for households to install solar panels, in many countries they can also feed electricity back into the system at preferential rates. With the the costs passed onto the energy consumers, solar installations are essentially redistributive mechanisms. Indeed, evidence shows that substantial amounts of income flow into households with solar installations (Winter and Schlesewsky, 2019).

This paper analyses whether individuals develop distinct political attitudes as a result of living in households with solar panels over time. Political scientists have long been interested in policy feedback—how the policies of today might affect the politics of tomorrow through changes in, among others, political attitudes among the public. Béland (2010), Campbell (2012), and Larsen (2019) provide systematic reviews of the resulting literature, going as far back as to Schattschneider (1935), with the central argument that ‘new policies create new politics’ (Schattschneider, 1935, p. 288). Accordingly, public policies, once implemented, shape the politics that create them in the first place.

Pierson (1993) suggests that there might be two mechanisms behind policy feedback on political attitudes among the public. First, policies might alter the allocation of resources in a society, and therefore affect the ability and/or motivation of political actors to involve in the following political processes. For example, if solar installations generate income, individuals living in solar households will have increased resources—not only money but also time—to be informed about politics. They will also have the motivation to do so because their new income depends on a government programme, and they have a stake in how that programme would look in the future. Similar effects have been recorded elsewhere, such as the Social Security programme in the United States. Campbell (2003) shows that with additional

income and early retirement, the recipients of the programme become politically active, which is especially true for the recipients from low-income groups.

Second, public policies might have interpretive effects, changing the way people perceive the world around themselves. In this sense, households with solar installations are likely to learn more about not only the specific government programme, but also related issues such as energy transition and climate change. As a result, they might develop political attitudes. For example, Soss (1999) shows that the participants of badly administered programmes can develop mistrust towards governments, taking cues from their interactions with civil servants. Nevertheless, we know very little about the potential feedback from solar installations. In a recent study, Mildenerger, Howe, and Miljanich (2019) find that political participation is higher among the members of households with, compared to without, solar installations in the US. The differences between the two types of households are substantively large, with six to nine percentage points higher proportion of solar households voting in elections (Mildenerger et al., 2019, p. 3). What remains unknown is whether solar installations are the cause of such politically consequential differences. Comparison of households with and without solar panels might be misleading to answer this question, as these groups are likely different from one another in many aspects, some of which might account for the differences in political attitudes—a common problem in the policy feedback literature, with high concerns for reverse causality and omitted variable bias (Campbell, 2012; Larsen, 2019).

Using three panel datasets with repeated measures on households, this article offers a more plausible comparison: changes in political attitudes within individuals over a period of years, between those who start or stop living in a household with solar panels and those whose status do not change during that period. The results show no signs of meaningful effect of solar installations on political attitudes. Individuals living in solar households do not become more or less interested in politics. Neither do they experience a change in their political position, likelihood to turnout, or party identification.

Data and Estimation Strategy

The claims in this analysis are based on the German Socio-Economic Panel (SOEP), the UK Household Longitudinal Study (UKHLS), and the Swiss Household Panel (SHP)—each a widely-used source of data on households, whose members are surveyed repeatedly over time.¹ All three datasets include measures of political attitudes as well as demography, which I use as dependent and control variables respectively. What makes this selection particularly useful for this study, however, is that these datasets also include indicators for solar panel ownership, the key variable of interest in this study.

The time period varies from one case to another, depending on the survey waves that include the necessary indicators for solar panel ownership. In the SOEP, this occurs in each of the 11 waves between 2007 and 2018, as respondents in these waves are asked whether their dwelling has ‘solar collector, solar energy system’ or not. In the UKHLS, this variable is available for three waves (2008–2009, 2009–2011, and 2012–2014),² in which respondents were asked whether they have installed solar panels for electricity or water heating. For these two datasets, I code $Solar\ Panel_{it}$ as equals to 1 if an individual i lives in a dwelling with any kind of solar system at time t .

The coding of this variable is less straightforward for the SHP. Beginning with 2013, the household part of the survey indicates whether dwellings have been renovated with solar panels during the previous year. Assuming that once a dwelling is renovated with solar panels, these panels stay in place, I code $Solar\ Panel_{it}$ as 0 if a dwelling has not been renovated with solar panels, as 1 for the renovation year and every year after that until 2018, the latest available wave. To support this assumption, I limit the analysis the to those households who have not moved since 2013.

¹The data sources are described in detail elsewhere. See, for example, Goebel et al. (2019) for SOEP, Buck and McFall (2011) for UKHLS, and Tillmann et al. (2016) for SHP.

²The first of these waves, 2008–2009, was in fact a part of the British Household Panel Study, which has later been incorporated in to the UKHLS. For more details, see Buck and McFall (2011).

The resulting data set has 322,309 person-year observations in Germany (68,573 respondents from 39,149 households), 112,570 in the UK (72,869 respondents from 63,988 households), and 79,131 in Switzerland (19,234 respondents from 7,885 households).

In terms of outcomes, I focus on a variable that is common across all three datasets for the main part of the analysis: *Political Interest*. This variable measures how interested respondents are in politics, originally with a five-point scale in the SOEP and UKHLS but with an 11-point scale in the SHP. I have rescaled the variable in the SHP to facilitate comparisons across the cases. As I will also show, the results from this dependent variable do not change if the analysis is on various other variables, including left-right position, likelihood to turnout, or party identification.

Simple comparisons of political attitudes between those who live in a dwelling with and without solar systems are likely to be misleading. First, there might be systematic differences between these two groups of people, and these differences might affect both solar-system adoption and political attitudes. For example, research shows that solar systems are more likely to be adopted by people with high income and high environmental concerns (Jacksohn, Grösche, Rehdanz, and Schröder, 2019). At the same time, such characteristics can lead to certain political attitudes. Second, some other important factors, while constant for all individuals, would vary over time. These include for example, the amount of subsidies of feed-in-tariffs available for solar systems. Similarly, we might observe variations in political attitudes over years, such as increases in political interest in election years.

One way to address these concerns is to use linear fixed-effects regressions in the form of

$$Y_{it} = \beta_1 \times Solar\ Panel_{it} + \lambda_i + \delta_t + \epsilon_{it}, \quad (1)$$

where β_1 is the causal effect of interest—the effect of solar system ownership on political attitudes, based on within-individual variation associated with starting or stopping to live in

a dwelling with a solar system during the periods under analysis. In this setting, λ_i accounts for individual characteristics that does not change over time while δ_t accounts for changes that evolve from one year to another but are constant across individuals.

I also estimate models with covariates in the form of

$$Y_{it} = \beta_1 \times Solar\ Panel_{it} + \lambda_i + \delta_t + \theta_{it} + \epsilon_{it}, \quad (2)$$

where θ_{it} are the controls for education, head of households, unemployment, household income, households with children, home owners, and geographical regions.

Results

Table 1 presents the regression models of political interest, three models for each country. The first models for each country (Models 1, 4, and 7) are calculated with pooled data—by pooling all individuals across time, without any fixed effects. For Germany and the UK, the coefficients for *Solar Panel* describe the differences in political interest between those who live in households with solar panels and those who do not. For Switzerland, the comparison is with those who had not acquired solar panels after 2013, who may or may not renovated their house with solar panels before that year. These coefficients are positive, relatively large, and in the case of Germany and the UK they are statistically significant. In Switzerland, the insignificant result might be due to the measurement error. Overall, nevertheless, this results suggest that people with solar panels are interested in politics more than those in the comparison groups. In the UK, for example, the differences are about a fifth of a point, over a four-point scale.

These results, however, are likely to be biased. Those who decide to have solar panels are probably different than those who do not, in various observable and unobservable ways. Moreover, the results from pooled models does not reveal the direction of causality: is

Table 1: Effect of solar system ownership on political interest

	Germany (1 - 3)			United Kingdom (4 - 6)			Switzerland (7 - 9)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Solar Panel	0.12*** (0.01)	0.01 (0.01)	0.01 (0.01)	0.17*** (0.03)	-0.02 (0.03)	-0.02 (0.03)	0.09 (0.08)	-0.004 (0.04)	-0.01 (0.04)
FEs—Individuals	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
FEs—Waves	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes	No	No	Yes
Cl. SEs—Individuals	Yes	No	No	Yes	No	No	Yes	No	No
Cl. SEs—Households	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	281,032	281,032	261,253	103,772	103,772	102,831	46,822	46,822	43,352
R ²	0.002	0.76	0.76	0.0005	0.88	0.88	0.0002	0.86	0.86
Adjusted R ²	0.002	0.69	0.69	0.0005	0.65	0.65	0.0001	0.81	0.81

Note: Standard errors are in parentheses. Control variables include education, head of households, unemployment, household income, households with children, home owners, and geographical regions. For variable descriptions, see the Appendix. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

political interest causing people acquire solar panels, or is living in a house with solar panels making people more interested in politics? The fixed-effects models, as specified in Equation 1, are an attempt to address these problems, as these models limit the analysis to within-individuals, comparing changes in individuals that experience a change with regard to solar panels (starting / stopping to live in a house with solar panels) to those individuals for whom the solar panel ownership remain constant (that is, they have always or never lived in solar households during the periods under analysis).

Indeed, when fixed effects are introduced (Models 2, 4, and 6), we observe a considerably change in the results, compared to the pooled estimates. First, the point estimates become much smaller. In comparison to the pooled models, where the coefficients range between 0.09 and 0.17, with fixed-effects these are reduced to a range from -0.02 to 0.01. These results suggest that after starting to live in a household with solar panels, people might become slightly less as well as slightly more interested in politics. These changes are not only substantively small, but they are also statistically insignificant.

In addition to fixed effects, the final models of each country include seven control variables as well, controlling for various individual and household level factors that change over time, such as household income as specified in Equation 2. This leads to a change in the coefficient for *Solar Panels* to change from 0.01 to -0.01 in Switzerland, but the overall results are the same: If solar panels affect how much residents in a household are interested in politics, this change is a substantively and statistically insignificant one.

Sensitivity Analysis

How sensitive are these results to the selection of dependent and control variables? *Political Interest* is only one of several alternative measures of political attitudes. Would the results change if we analyse a different measure of political attitude? Similarly, the preferred models include all seven control variables together to reduce selection bias, but the results might change if one or more of these control variables are excluded. Therefore, as a sensitivity analysis, I first gather five additional dependent variables from the three datasets, and regress all dependent variables on the mathematical power set of seven control variables. Note that not all dependent variables are available in all three datasets. This exercise results in 1,920 regression models.

Figure 1 plots the t-values from all possible regression models. In the upper-left box, we see that the results presented in Table 1 are robust to inclusion or exclusion of any of the control variables in the final models: most t-values are positive but all t-values are smaller than 2 in absolute value, indicating that the changes in *Political Interest* among people who start living under a solar panel is not significantly different from zero than people who experience no such change in their life.

The null results persists for other dependent variables as well. For example, in comparison to respondents who do not acquire solar systems during the time period under analysis, those who do become slightly more right-wing, but these changes are not statistically significant.

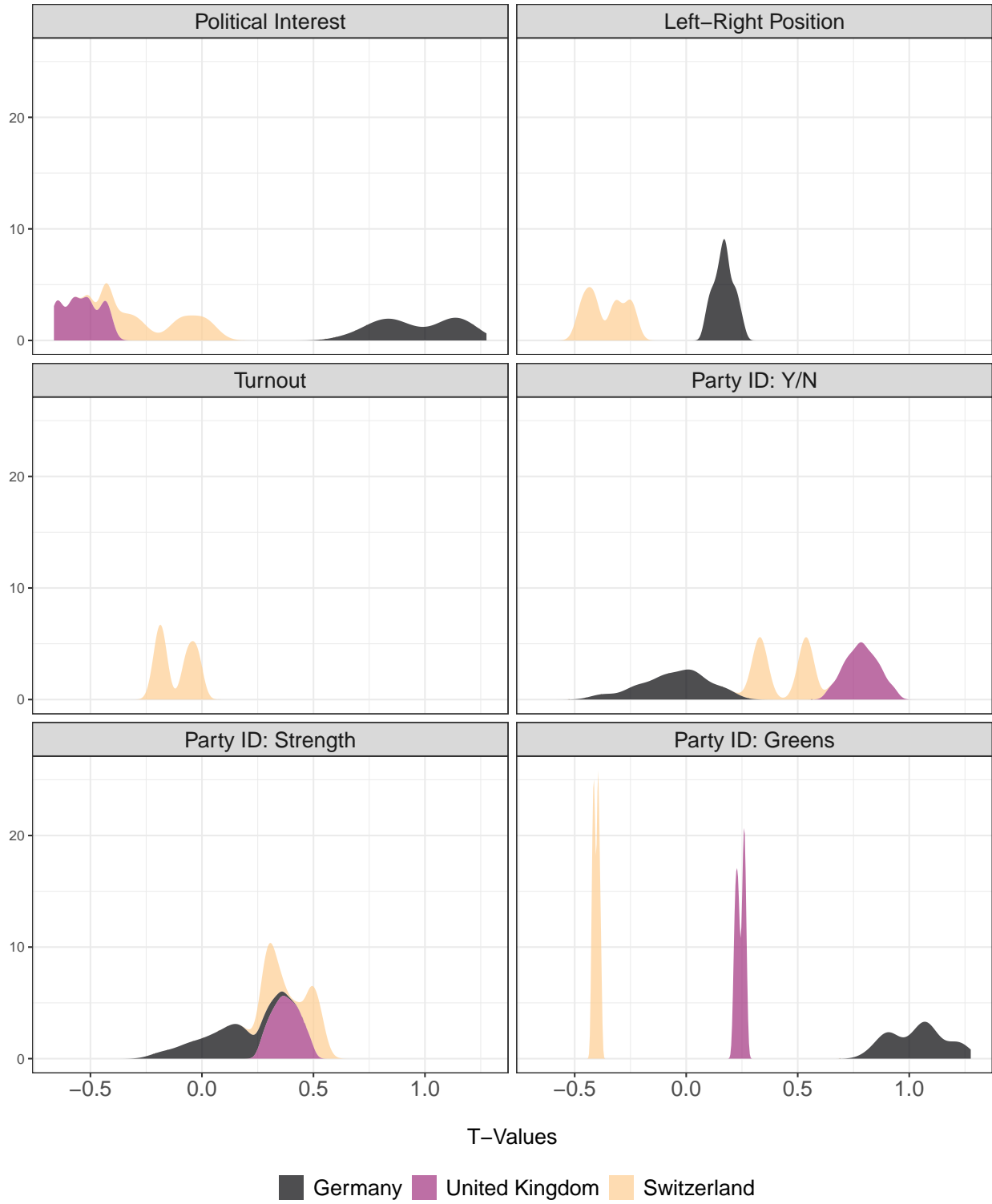


Figure 1: Distribution of t-values from sensitivity analyses.

The same is also true if we look at whether and how much these respondents identify with a political party.

A final dependent variable measures political attitudes towards green parties. If solar panels cause changes in environmental attitudes, we are more likely to observe changes in political attitudes towards green parties—parties that own these issues. Moreover, solar panels are likely to be more economically beneficial for the owners under a green-party government. However, I find that solar panel ownership does not affect political attitudes towards green parties either: respondents with solar panels are not significantly more likely to identify with green parties. This could be because the solar panel ownership does not seem to change environmental attitudes in the first place, as I show in the Appendix.

Conclusion

Do solar installations have feedback on political attitudes? Individuals living in households with solar installations participate in government programmes with potentially high resource and interpretative effects. The policy feedback theory would therefore predict these individuals to experience changes in terms of attitudes.

To test whether solar installations have feedback over time, I analysed data from three household panels from Germany, Switzerland, and the United Kingdom. This allows testing for any significant changes in political attitudes within individuals over a period of years. Specifically, I compare the attitudes of those who start or stop living in a household with solar panels with those whose ownership status do not change during that period.

The results do not support the expectation that solar installations might have effects on political attitudes. I find that solar installations do not make residents more or less interested in politics—a result that holds if we control for various factors or analyse a set of different outcomes. The latter include respondents' left-right positions, likelihood to turnout at

elections, and party identification. This is good as well as bad news for actors looking to increase the amount of renewable energy produced through solar installations.

On the one hand, it is good news as solar installations with no feedback are less likely to attract opposition from political elites on the losing side of the debate. If individuals living in solar household started identifying with a certain party—say, the green parties—this would create incentives for other parties to oppose the renewable energy programmes for domestic solar energy production.

On the other hand, some might consider the null results as a missed opportunity. One potential outcome of policy feedback is the lock-in effect (Pierson, 1993), where beneficiaries of government programmes act as a political force to consolidate these programmes. If solar installations increased households' political interest and made them act together for their interest, this could have created incentives for political leaders to invest further resources in solar energy. However, the results in this paper suggests that solar installations do not have such effects.

References

- Béland, D. (2010). Reconsidering policy feedback: How policies affect politics. *Administration & Society*, 42(5), 568–590.
- Buck, N., and McFall, S. (2011). Understanding Society: Design overview. *Longitudinal and Life Course Studies*, 3(1), 5–17.
- Campbell, A. L. (2003). *How policies make citizens: Senior political activism and the American welfare state*. New Jersey: Princeton University Press.
- Campbell, A. L. (2012). Policy makes mass politics. *Annual Review of Political Science*, 15, 333–351.
- Goebel, J., Grabka, M. M., Liebig, S., Kroh, M., Richter, D., Schröder, C., and Schupp, J.

- (2019). The German Socio-Economic Panel (SOEP). *Journal of Economics and Statistics*, 239(2), 345–360.
- Jacksohn, A., Grösche, P., Rehdanz, K., and Schröder, C. (2019). Drivers of renewable technology adoption in the household sector. *Energy Economics*, 81, 216–226.
- Larsen, E. G. (2019). Policy feedback effects on mass publics: A quantitative review. *Policy Studies Journal*, 47(2), 372–394.
- Mildenberger, M., Howe, P. D., and Miljanich, C. (2019). Households with solar installations are ideologically diverse and more politically active than their neighbours. *Nature Energy*, 4, 1033–1039.
- Pierson, P. (1993). When effect becomes cause: Policy feedback and political change. *World Politics*, 45(4), 595–628.
- Schattschneider, E. E. (1935). *Politics, pressures and the tariff*. New York: Prentice-Hall.
- Soss, J. (1999). Lessons of welfare: Policy design, political learning, and political action. *American Political Science Review*, 93(2), 363–380.
- Tillmann, R., Voorpostel, M., Kuhn, U., Lebert, F., Ryser, V.-A., Lipps, O., . . . Antal, E. (2016). The Swiss household panel study: Observing social change since 1999. *Longitudinal and Life Course Studies*, 7(1), 64–78.
- Winter, S., and Schlesewsky, L. (2019). The German feed-in tariff revisited—an empirical investigation on its distributional effects. *Energy Policy*, 132, 344–356.

Online Appendix to 'Solar panels do not generate political attitudes'

Descriptive Statistics

Table A1 presents the summary statistics, by survey wave, for all variables in the main text—except *Region*, which is a categorical variable. The column *Original* lists the items in the original datasets that I use to create the variables here, for which I provide brief descriptions below. For further details, please see the documentation of the original datasets.

Dependent variables

Political Interest

- SOEP:
 - Item: ‘Generally speaking, how interested are you in politics?’
 - Note: The answer categories—*Very interested*, *Moderately interested*, *Not interested*, and *Disinterested*—are reverse coded so that higher values indicate increasing interest (i.e., *Disinterested* = 1 ... *Very interested* = 4).
- UKHLS:
 - Item: ‘How interested would you say you are in politics?’
 - Note: The answer categories—*Very Interested*, *Fairly interested*, *Not very interested*, and *Not at all interested*—are reverse coded so that higher values indicate increasing interest (i.e., *Not at all interested* = 1 ... *Very interested* = 4).

- SHP:
 - Item: ‘Generally, how interested are you in politics, if 0 means “not at all interested” and 10 “very interested”?’
 - Note: This variable has been rescaled to range from 1 to 4.

Left-Right Position

- SOEP:
 - Item: ‘In politics, people often talk about “left” and “right” when describing different political views. When you think about your own political views, how would you rate them on the scale below? 0: far left, 10: far right.’
- SHP:
 - Item: ‘When they talk about politics, people mention left and right. Personally, where do you position yourself, 0 means “left” and 10 “right”?’

Hypothetical Turnout

- SHP:
 - Item: ‘If there was an election for the National Council tomorrow, for which party would you vote?’
 - Note: This variable is coded as 0 if respondents indicated that they ‘wouldn’t vote’ or would vote ‘for no party’, as 1 otherwise.

Party ID: Y/N

- SOEP:
 - Item: ‘Do you lean towards a particular party?’
 - Note: This variable is coded as 0 for ‘No’, as 1 for ‘Yes’ answers.
- UKHLS:
 - Item: ‘Generally speaking do you think of yourself as a supporter of any one political party?’

– Note: This variable is coded as 0 for ‘No’, as 1 for ‘Yes’ answers.

- SHP:

– Item: ‘Overall, do you feel close to any political party?’

– Note: This variable is coded as 0 for ‘No’, as 1 for ‘Yes’ answers.

Party ID: Greens

- SOEP:

– Item: ‘Which party do you lean toward?’

– Notes: This question is asked only if respondents support a party (i.e., *Party ID* = 1). I code this variable as 1 if they support Alliance90/The Greens, and as 0 if (a) they do not support any party (i.e., *Party ID* = 0) or (b) they support a party other than Alliance90/The Greens. A small number of respondents indicate more than one party. In such cases, I code this variable as 1 if one of these parties are Alliance90/The Greens.

- UKHLS:

– item: ‘Which political party do you support?’

– Notes: This question is asked only if respondents support a party (i.e., *Party ID* = 1). I code this variable as 1 if they support Green Party, and as 0 if (a) they do not support any party (i.e., *Party ID* = 0) or (b) they support a party other than Green Party.

- SHP:

– Item: ‘Which party do you have in mind?’

– Notes: This question is asked only if respondents support a party (i.e., *Party ID* = 1). I code this variable as 1 if they support the Green Party of Switzerland, Socialist Green Alternative, or Green Liberal Party of Switzerland, and as 0 if (a) they do not support any party (i.e., *Party ID* = 0) or (b) they support a party other than the three green parties in Switzerland.

Party ID: Strength

- SOEP:
 - item: ‘To what extent?’
 - Notes. First, the answer categories are reverse coded so that higher values indicate increasing strength (i.e., *Very weakly* = 2 ... *Very strongly* = 6). Then, I have added the code 1 for respondents that do not support any party (i.e., *Party ID* = 0).
- UKHLS:
 - Item: ‘Would you call yourself a very strong supporter of [the party that you support], fairly strong or not very strong?’
 - Notes: First, the answer categories are reverse coded to that higher values indicate increasing strength (i.e., *Not very strong* = 2 ... *Very strong* = 4). Then, I have added the code 1 for respondents that do not support any party (i.e., *Party ID* = 0).
- SHP:
 - Item: ‘Do you feel “very close” to this party, “quite close” or “not very close”?’
 - Notes: First, the answer categories are reverse coded to that higher values indicate increasing strength (i.e., *Not very close* = 2 ... *Very close* = 4). Then, I have added the code 1 for respondents that do not support any party (i.e., *Party ID* = 0).

Independent variable

Solar Panel

- SOEP:
 - Item: ‘What amenities does your dwelling have?’
 - Note: This variable is coded one if respondents indicated that their household

have ‘solar collector, solar energy system’, as 0 otherwise.

- UKHLS: I code this variable as 0 if respondents live in a house with no ‘solar panels for electricity’ or ‘solar water heating’, as 1 otherwise.
- SHP:
 - Item: ‘Have you or your landlord done any larger modernizations in the flat since [month-year]? ... What kind of renovations have been made?’
 - Notes: *Month-Year* refers either to the date households were last surveyed in the previous year (for existing households) or to a date 12 months earlier (for new households). I have coded this variable as 0 if respondents replied ‘No’ to solar-panel modernisations. If they replied ‘Yes’, I have coded this variable as 1 for that survey wave *and* for any other wave that follows.

Control variables

Education

- SOEP:
 - Item: ISCED-1997-Classification
 - Note: This variable ranges between *In school* = 0 to *Higher education* = 6.
- UKHLS:
 - Item: ‘Current status: highest educational or vocational qualification’
 - Note: This variable is reverse coded so that it ranges between *No qualification* = 1 and *University degree* = 6.
- SHP:
 - Item: International standard classification of education ISCED 1997,
 - Note: This variable has been recoded to range between *Not completed primary (compulsory) education* = 0 to * *Second stage of tertiary education** = 9.

Head of Household

- SOEP:
 - Item: ‘Relationship to the head of household’
 - Note: This variable is coded as 1 for ‘Head Of HH, Contact Person’, as 0 for other household members.
- UKHLS:
 - Items: Conventional Head of Household Indicator (Wave 2008-2009); Household reference person (Waves 2009-2011 and 2012-2014)
 - This variable is coded as 1 for respondents who are ‘Head of household’ (Wave 2008-2009) or ‘Reference person’ (Waves 2009-2011 and 2012-2014), as 0 otherwise.
- SHP:
 - Item: Relation to the person of reference
 - Note: This variable is coded as 1 for ‘Reference person’, as 0 for other household members.

Unemployed

- SOEP:
 - Item: Occupational status
 - Note: This variable is coded as 1 if respondents are ‘Unemployed, Not Employer’, as 0 otherwise.
- UKHLS:
 - Item: ‘Which of these best describes your current employment situation?’
 - Note: This variable is coded as 1 if respondents are ‘Unemployed’, as 0 otherwise.
- SHP:
 - Item: Working status
 - Note: This variable is coded as 1 if respondents are ‘Unemployed’, as 0 otherwise.

Household Income

- SOEP:
 - Item: Monthly household net income
- UKHLS:
 - Items: Annual household net income (Wave 2008-2009), Monthly household net income (Waves 2009-2011 and 2012-2014)
 - Note: For the Wave 2008-2009, I have divided the annual household net income into 12 so that all values refer to monthly income.
- SHP:
 - Item: Yearly household income net
 - Note: I have divided the original values into 12 so that all values refer to monthly income.

Household with Children

- SOEP:
 - Item: Children under 16 years in household
 - Note: This variable is coded as 1 if there are one or more children under 16 years in household, as 0 otherwise.
- UKHLS:
 - Item: Number of children in household
 - Note: This item counts the children aged 15 or under. I have coded this variable as 0 for households with no children, as 1 otherwise.
- SHP:
 - Item: Number of children in household: 0 to 17 years
 - Note: This variable is coded as 1 for households with one or more children, as 0 otherwise.

House Owned

- SOEP:

- Item: Tenant or owner of dwelling
- Note: This variable is coded as 1 for owners, as 0 otherwise.
- UKHLS:
 - Item: ‘Does your household own this accommodation outright, is it being bought with a mortgage, is it rented or does it come rent-free?’
 - Note: This variable is coded as 1 for properties that are owned, owned with mortgage, or those that involve shared ownership, as 0 otherwise.
- SHP:
 - Item: ‘Are you, or another person living in your household, a tenant or owner of the accommodation you currently live in?’
 - Note: This variable is coded as 1 for those indicating ‘owner/co-owner’, and as 0 otherwise.

Region

- SOEP:
 - Item: *NUTS 1* regions of Germany
 - Note: This is a categorical variable, with 16 levels.
- UKHLS:
 - Item: *NUTS 1* regions of the UK
 - Note: This is a categorical variable, with 12 levels.
- SHP:
 - Item: *NUTS 2* regions of Switzerland
 - Note: This is a categorical variable, with 7 levels.

Table A1: Summary Statistics by Survey Wave

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SOEP	Solar Panel	2007	hlf0035	20216	0.05	0.23	0.000	0.00	1.00
SOEP	Solar Panel	2008	hlf0035	19034	0.06	0.24	0.000	0.00	1.00
SOEP	Solar Panel	2009	hlf0035	20390	0.08	0.26	0.000	0.00	1.00
SOEP	Solar Panel	2010	hlf0035	26244	0.09	0.28	0.000	0.00	1.00
SOEP	Solar Panel	2011	hlf0035	28285	0.10	0.30	0.000	0.00	1.00
SOEP	Solar Panel	2012	hlf0035	27661	0.11	0.31	0.000	0.00	1.00
SOEP	Solar Panel	2013	hlf0035	30772	0.10	0.30	0.000	0.00	1.00
SOEP	Solar Panel	2014	hlf0035	27178	0.11	0.31	0.000	0.00	1.00
SOEP	Solar Panel	2015	hlf0035	26840	0.11	0.32	0.000	0.00	1.00
SOEP	Solar Panel	2016	hlf0035	24393	0.11	0.32	0.000	0.00	1.00
SOEP	Solar Panel	2017	hlf0035	26670	0.12	0.33	0.000	0.00	1.00
SOEP	Solar Panel	2018	hlf0035	25562	0.12	0.33	0.000	0.00	1.00
SOEP	Political Interest	2007	plh0007	20841	2.32	0.80	2.000	1.00	4.00
SOEP	Political Interest	2008	plh0007	19624	2.27	0.81	2.000	1.00	4.00
SOEP	Political Interest	2009	plh0007	20728	2.29	0.85	2.000	1.00	4.00
SOEP	Political Interest	2010	plh0007	26632	2.33	0.81	2.000	1.00	4.00
SOEP	Political Interest	2011	plh0007	21030	2.36	0.84	2.000	1.00	4.00
SOEP	Political Interest	2012	plh0007	20773	2.35	0.81	2.000	1.00	4.00
SOEP	Political Interest	2013	plh0007	24075	2.27	0.84	2.000	1.00	4.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SOEP	Political Interest	2014	plh0007	27419	2.34	0.82	2.000	1.00	4.00
SOEP	Political Interest	2015	plh0007	27109	2.26	0.84	2.000	1.00	4.00
SOEP	Political Interest	2016	plh0007	28977	2.23	0.87	2.000	1.00	4.00
SOEP	Political Interest	2017	plh0007	32385	2.22	0.89	2.000	1.00	4.00
SOEP	Political Interest	2018	plh0007	30236	2.25	0.88	2.000	1.00	4.00
SOEP	Left-Right Position	2009	plh0004	19965	4.76	1.65	5.000	0.00	10.00
SOEP	Left-Right Position	2014	plh0004	25903	4.70	1.59	5.000	0.00	10.00
SOEP	Party ID: Y/N	2007	plh0011_h	20798	0.43	0.50	0.000	0.00	1.00
SOEP	Party ID: Y/N	2008	plh0011_h	19613	0.44	0.50	0.000	0.00	1.00
SOEP	Party ID: Y/N	2009	plh0011_h	20680	0.44	0.50	0.000	0.00	1.00
SOEP	Party ID: Y/N	2010	plh0011_h	26583	0.47	0.50	0.000	0.00	1.00
SOEP	Party ID: Y/N	2011	plh0011_h	20942	0.45	0.50	0.000	0.00	1.00
SOEP	Party ID: Y/N	2012	plh0011_h	20709	0.44	0.50	0.000	0.00	1.00
SOEP	Party ID: Y/N	2013	plh0011_h	23928	0.42	0.49	0.000	0.00	1.00
SOEP	Party ID: Y/N	2014	plh0011_h	27226	0.46	0.50	0.000	0.00	1.00
SOEP	Party ID: Y/N	2015	plh0011_h	26935	0.40	0.49	0.000	0.00	1.00
SOEP	Party ID: Y/N	2016	plh0011_h	24521	0.40	0.49	0.000	0.00	1.00
SOEP	Party ID: Y/N	2017	plh0011_h	29342	0.39	0.49	0.000	0.00	1.00
SOEP	Party ID: Y/N	2018	plh0011_h	29602	0.40	0.49	0.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SOEP	Party Support Amount	2007	plh0013_h	20342	2.43	1.74	1.000	1.00	6.00
SOEP	Party Support Amount	2008	plh0013_h	19220	2.45	1.76	1.000	1.00	6.00
SOEP	Party Support Amount	2009	plh0013_h	20162	2.46	1.77	1.000	1.00	6.00
SOEP	Party Support Amount	2010	plh0013_h	25920	2.57	1.78	1.000	1.00	6.00
SOEP	Party Support Amount	2011	plh0013_h	20416	2.51	1.79	1.000	1.00	6.00
SOEP	Party Support Amount	2012	plh0013_h	20229	2.47	1.76	1.000	1.00	6.00
SOEP	Party Support Amount	2013	plh0013_h	23461	2.40	1.75	1.000	1.00	6.00
SOEP	Party Support Amount	2014	plh0013_h	26526	2.52	1.77	1.000	1.00	6.00
SOEP	Party Support Amount	2015	plh0013_h	26377	2.33	1.73	1.000	1.00	6.00
SOEP	Party Support Amount	2016	plh0013_h	24160	2.34	1.74	1.000	1.00	6.00
SOEP	Party Support Amount	2017	plh0013_h	28299	2.29	1.75	1.000	1.00	6.00
SOEP	Party Support Amount	2018	plh0013_h	28301	2.27	1.73	1.000	1.00	6.00
SOEP	Supports Greens	2007	plh0012_h	8934	0.10	0.31	0.000	0.00	1.00
SOEP	Supports Greens	2008	plh0012_h	8470	0.10	0.30	0.000	0.00	1.00
SOEP	Supports Greens	2009	plh0012_h	8879	0.11	0.32	0.000	0.00	1.00
SOEP	Supports Greens	2010	plh0012_h	12164	0.15	0.36	0.000	0.00	1.00
SOEP	Supports Greens	2011	plh0012_h	9197	0.18	0.38	0.000	0.00	1.00
SOEP	Supports Greens	2012	plh0012_h	8986	0.16	0.36	0.000	0.00	1.00
SOEP	Supports Greens	2013	plh0012_h	9776	0.16	0.36	0.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SOEP	Supports Greens	2014	plh0012_h	12042	0.15	0.36	0.000	0.00	1.00
SOEP	Supports Greens	2015	plh0012_h	10400	0.15	0.36	0.000	0.00	1.00
SOEP	Supports Greens	2016	plh0012_h	9530	0.16	0.37	0.000	0.00	1.00
SOEP	Supports Greens	2017	plh0012_h	11011	0.13	0.34	0.000	0.00	1.00
SOEP	Supports Greens	2018	plh0012_h	11227	0.16	0.37	0.000	0.00	1.00
SOEP	Children in Household	2007	hlk0044	20869	0.27	0.44	0.000	0.00	1.00
SOEP	Children in Household	2008	hlk0044	19669	0.26	0.44	0.000	0.00	1.00
SOEP	Children in Household	2009	hlk0044	20777	0.25	0.43	0.000	0.00	1.00
SOEP	Children in Household	2010	hlk0044	26694	0.46	0.50	0.000	0.00	1.00
SOEP	Children in Household	2011	hlk0044	28691	0.43	0.50	0.000	0.00	1.00
SOEP	Children in Household	2012	hlk0044	27940	0.41	0.49	0.000	0.00	1.00
SOEP	Children in Household	2013	hlk0044	30934	0.43	0.49	0.000	0.00	1.00
SOEP	Children in Household	2014	hlk0044	27367	0.40	0.49	0.000	0.00	1.00
SOEP	Children in Household	2015	hlk0044	27108	0.40	0.49	0.000	0.00	1.00
SOEP	Children in Household	2016	hlk0044	28993	0.42	0.49	0.000	0.00	1.00
SOEP	Children in Household	2017	hlk0044	32397	0.40	0.49	0.000	0.00	1.00
SOEP	Children in Household	2018	hlk0044	25869	0.35	0.48	0.000	0.00	1.00
SOEP	Home Owner	2007	hgowner	20869	0.54	0.50	1.000	0.00	1.00
SOEP	Home Owner	2008	hgowner	19669	0.55	0.50	1.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SOEP	Home Owner	2009	hgowner	20777	0.55	0.50	1.000	0.00	1.00
SOEP	Home Owner	2010	hgowner	26694	0.51	0.50	1.000	0.00	1.00
SOEP	Home Owner	2011	hgowner	28691	0.52	0.50	1.000	0.00	1.00
SOEP	Home Owner	2012	hgowner	27940	0.52	0.50	1.000	0.00	1.00
SOEP	Home Owner	2013	hgowner	30934	0.47	0.50	0.000	0.00	1.00
SOEP	Home Owner	2014	hgowner	27370	0.49	0.50	0.000	0.00	1.00
SOEP	Home Owner	2015	hgowner	27108	0.47	0.50	0.000	0.00	1.00
SOEP	Home Owner	2016	hgowner	24558	0.48	0.50	0.000	0.00	1.00
SOEP	Home Owner	2017	hgowner	30145	0.44	0.50	0.000	0.00	1.00
SOEP	Home Owner	2018	hgowner	30220	0.41	0.49	0.000	0.00	1.00
SOEP	Head of Household	2007	stell_h	20886	0.56	0.50	1.000	0.00	1.00
SOEP	Head of Household	2008	stell_h	19684	0.56	0.50	1.000	0.00	1.00
SOEP	Head of Household	2009	stell_h	20792	0.57	0.50	1.000	0.00	1.00
SOEP	Head of Household	2010	stell_h	26720	0.58	0.49	1.000	0.00	1.00
SOEP	Head of Household	2011	stell_h	28733	0.59	0.49	1.000	0.00	1.00
SOEP	Head of Household	2012	stell_h	27983	0.59	0.49	1.000	0.00	1.00
SOEP	Head of Household	2013	stell_h	30956	0.58	0.49	1.000	0.00	1.00
SOEP	Head of Household	2014	stell_h	27465	0.58	0.49	1.000	0.00	1.00
SOEP	Head of Household	2015	stell_h	27183	0.59	0.49	1.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SOEP	Head of Household	2016	stell_h	29116	0.61	0.49	1.000	0.00	1.00
SOEP	Head of Household	2017	stell_h	32485	0.60	0.49	1.000	0.00	1.00
SOEP	Head of Household	2018	stell_h	30306	0.61	0.49	1.000	0.00	1.00
SOEP	Education	2007	pgiscd97	20540	3.68	1.47	3.000	0.00	6.00
SOEP	Education	2008	pgiscd97	19338	3.69	1.48	3.000	0.00	6.00
SOEP	Education	2009	pgiscd97	20439	3.70	1.48	3.000	0.00	6.00
SOEP	Education	2010	pgiscd97	26372	3.70	1.48	3.000	0.00	6.00
SOEP	Education	2011	pgiscd97	28262	3.69	1.48	3.000	0.00	6.00
SOEP	Education	2012	pgiscd97	27548	3.70	1.48	3.000	0.00	6.00
SOEP	Education	2013	pgiscd97	30388	3.65	1.53	3.000	0.00	6.00
SOEP	Education	2014	pgiscd97	26827	3.70	1.51	3.000	0.00	6.00
SOEP	Education	2015	pgiscd97	26510	3.74	1.52	3.000	0.00	6.00
SOEP	Education	2016	pgiscd97	28161	3.59	1.62	3.000	0.00	6.00
SOEP	Education	2017	pgiscd97	31523	3.56	1.64	3.000	0.00	6.00
SOEP	Education	2018	pgiscd97	29150	3.60	1.62	3.000	0.00	6.00
SOEP	Household Income	2007	hghinc	19824	2777.23	1879.08	2400.000	0.00	42667.00
SOEP	Household Income	2008	hghinc	18578	2831.84	2127.72	2500.000	0.00	99999.00
SOEP	Household Income	2009	hghinc	19440	2831.63	1872.40	2500.000	0.00	30000.00
SOEP	Household Income	2010	hghinc	24992	2846.58	1861.41	2500.000	0.00	35000.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SOEP	Household Income	2011	hghinc	27427	2896.88	1916.77	2500.000	40.00	55000.00
SOEP	Household Income	2012	hghinc	26718	2978.51	2699.70	2500.000	0.00	200000.00
SOEP	Household Income	2013	hghinc	29512	2963.65	1982.67	2530.000	0.00	70000.00
SOEP	Household Income	2014	hghinc	26263	3067.32	2030.76	2700.000	150.00	65000.00
SOEP	Household Income	2015	hghinc	25813	3108.73	1958.88	2700.000	0.00	60000.00
SOEP	Household Income	2016	hghinc	27679	2898.75	2081.08	2500.000	0.00	45000.00
SOEP	Household Income	2017	hghinc	30867	3052.78	8308.01	2600.000	88.00	999999.00
SOEP	Household Income	2018	hghinc	28549	3131.94	2147.27	2800.000	100.00	60000.00
SOEP	Unemployed	2007	pgstib	20861	0.06	0.23	0.000	0.00	1.00
SOEP	Unemployed	2008	pgstib	19648	0.05	0.22	0.000	0.00	1.00
SOEP	Unemployed	2009	pgstib	20729	0.05	0.22	0.000	0.00	1.00
SOEP	Unemployed	2010	pgstib	26625	0.07	0.25	0.000	0.00	1.00
SOEP	Unemployed	2011	pgstib	28605	0.06	0.24	0.000	0.00	1.00
SOEP	Unemployed	2012	pgstib	27925	0.06	0.23	0.000	0.00	1.00
SOEP	Unemployed	2013	pgstib	30864	0.07	0.25	0.000	0.00	1.00
SOEP	Unemployed	2014	pgstib	27395	0.06	0.24	0.000	0.00	1.00
SOEP	Unemployed	2015	pgstib	27085	0.06	0.25	0.000	0.00	1.00
SOEP	Unemployed	2016	pgstib	28977	0.05	0.22	0.000	0.00	1.00
SOEP	Unemployed	2017	pgstib	32318	0.08	0.27	0.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SOEP	Unemployed	2018	pgstib	30096	0.09	0.29	0.000	0.00	1.00
UKLHS	Solar Panel	2008-2009	br_solar1/2	13607	0.01	0.08	0.000	0.00	1.00
UKLHS	Solar Panel	2009-2011	a_solar1/2	50837	0.01	0.10	0.000	0.00	1.00
UKLHS	Solar Panel	2012-2014	d_solar1/2	47039	0.03	0.16	0.000	0.00	1.00
UKLHS	Political Interest	2008-2009	br_vote6	14186	2.20	0.93	2.000	1.00	4.00
UKLHS	Political Interest	2009-2011	a_vote6	47530	2.27	0.97	2.000	1.00	4.00
UKLHS	Political Interest	2012-2014	d_vote6	43114	2.21	0.98	2.000	1.00	4.00
UKLHS	Party ID: Y/N	2008-2009	br_vote1	14186	0.35	0.48	0.000	0.00	1.00
UKLHS	Party ID: Y/N	2009-2011	a_vote1	47493	0.31	0.46	0.000	0.00	1.00
UKLHS	Party ID: Y/N	2012-2014	d_vote1	43084	0.30	0.46	0.000	0.00	1.00
UKLHS	Party Id: Strength	2008-2009	br_vote5	14078	1.57	0.88	1.000	1.00	4.00
UKLHS	Party Id: Strength	2009-2011	a_vote5	47155	1.53	0.89	1.000	1.00	4.00
UKLHS	Party Id: Strength	2012-2014	d_vote5	42902	1.50	0.86	1.000	1.00	4.00
UKLHS	support_green	2008-2009	br_vote4	14134	0.01	0.08	0.000	0.00	1.00
UKLHS	support_green	2009-2011	a_vote4	47156	0.01	0.10	0.000	0.00	1.00
UKLHS	support_green	2012-2014	d_vote4	42910	0.01	0.10	0.000	0.00	1.00
UKLHS	Children in Household	2008-2009	br_nkids_dv	14419	0.32	0.47	0.000	0.00	1.00
UKLHS	Children in Household	2009-2011	a_nkids_dv	50994	0.35	0.48	0.000	0.00	1.00
UKLHS	Children in Household	2012-2014	d_nkids_dv	47157	0.34	0.47	0.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
UKLHS	Home Owner	2008-2009	br_hsownd_bh	14318	0.76	0.43	1.000	0.00	1.00
UKLHS	Home Owner	2009-2011	a_hsownd_bh	50863	0.66	0.47	1.000	0.00	1.00
UKLHS	Home Owner	2012-2014	d_hsownd_bh	46723	0.72	0.45	1.000	0.00	1.00
UKLHS	Head of Household	2008-2009	br_hoh	14419	0.52	0.50	1.000	0.00	1.00
UKLHS	Head of Household	2009-2011	a_hrpj	50994	0.54	0.50	1.000	0.00	1.00
UKLHS	Head of Household	2012-2014	d_hrpj	47157	0.52	0.50	1.000	0.00	1.00
UKLHS	Education	2008-2009	br_hiqualb_dv	13873	3.40	1.62	3.000	1.00	6.00
UKLHS	Education	2009-2011	a_hiqualb_dv	50902	3.59	1.74	4.000	1.00	6.00
UKLHS	Education	2012-2014	d_hiqualb_dv	46937	3.75	1.68	4.000	1.00	6.00
UKLHS	Household Income	2008-2009	br_hhyneti	13683	2389.43	1517.73	2116.013	0.00	24215.51
UKLHS	Household Income	2009-2011	a_fihhmnnet1_dv	50952	2997.57	30906.76	2235.659	0.00	4001937.50
UKLHS	Household Income	2012-2014	d_fihhmnnet1_dv	47126	3246.65	4709.97	2642.720	0.00	199900.00
UKLHS	Unemployed	2008-2009	br_jbstat	14418	0.03	0.18	0.000	0.00	1.00
UKLHS	Unemployed	2009-2011	a_jbstat	50982	0.07	0.25	0.000	0.00	1.00
UKLHS	Unemployed	2012-2014	d_jbstat	47152	0.05	0.22	0.000	0.00	1.00
SHP	Solar Panel	2013	h13h44	17533	0.00	0.06	0.000	0.00	1.00
SHP	Solar Panel	2014	h14h44	14964	0.01	0.09	0.000	0.00	1.00
SHP	Solar Panel	2015	h15h44	13288	0.01	0.11	0.000	0.00	1.00
SHP	Solar Panel	2016	h16h44	11978	0.01	0.12	0.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SHP	Solar Panel	2017	h17h44	10878	0.02	0.13	0.000	0.00	1.00
SHP	Solar Panel	2018	h18h44	10490	0.02	0.15	0.000	0.00	1.00
SHP	Political Interest	2013	p13p01	5808	2.64	0.85	2.800	1.00	4.00
SHP	Political Interest	2014	p14p01	9803	2.60	0.85	2.800	1.00	4.00
SHP	Political Interest	2015	p15p01	8904	2.66	0.83	2.800	1.00	4.00
SHP	Political Interest	2016	p16p01	7917	2.67	0.85	2.800	1.00	4.00
SHP	Political Interest	2017	p17p01	7294	2.57	0.87	2.500	1.00	4.00
SHP	Political Interest	2018	p18p01	7096	2.67	0.83	2.800	1.00	4.00
SHP	Left-Right Position	2013	p13p10	5052	5.01	2.12	5.000	0.00	10.00
SHP	Left-Right Position	2014	p14p10	8492	5.04	2.16	5.000	0.00	10.00
SHP	Left-Right Position	2015	p15p10	7792	5.04	2.19	5.000	0.00	10.00
SHP	Left-Right Position	2016	p16p10	6992	4.97	2.19	5.000	0.00	10.00
SHP	Left-Right Position	2017	p17p10	6433	4.92	2.20	5.000	0.00	10.00
SHP	Left-Right Position	2018	p18p10	6254	4.88	2.09	5.000	0.00	10.00
SHP	Identifies with a Party	2014	p14p66	5646	0.31	0.46	0.000	0.00	1.00
SHP	Identifies with a Party	2017	p17p66	7230	0.31	0.46	0.000	0.00	1.00
SHP	Party Identification Amount	2014	p14p68	5628	1.56	0.90	1.000	1.00	4.00
SHP	Party Identification Amount	2017	p17p68	7207	1.57	0.91	1.000	1.00	4.00
SHP	Identifies with Greens	2014	p14p67	1726	0.14	0.35	0.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SHP	Identifies with Greens	2017	p17p67	2250	0.14	0.34	0.000	0.00	1.00
SHP	Would Turnout	2013	p13p19	5247	0.85	0.36	1.000	0.00	1.00
SHP	Would Turnout	2014	p14p19	8596	0.84	0.37	1.000	0.00	1.00
SHP	Would Turnout	2015	p15p19	8020	0.87	0.34	1.000	0.00	1.00
SHP	Would Turnout	2016	p16p19	7203	0.87	0.34	1.000	0.00	1.00
SHP	Would Turnout	2017	p17p19	6439	0.87	0.34	1.000	0.00	1.00
SHP	Would Turnout	2018	p18p19	6295	0.87	0.34	1.000	0.00	1.00
SHP	Children in Household	2013	nbkid13	17533	0.43	0.49	0.000	0.00	1.00
SHP	Children in Household	2014	nbkid14	14964	0.42	0.49	0.000	0.00	1.00
SHP	Children in Household	2015	nbkid15	13288	0.40	0.49	0.000	0.00	1.00
SHP	Children in Household	2016	nbkid16	11978	0.38	0.49	0.000	0.00	1.00
SHP	Children in Household	2017	nbkid17	10878	0.37	0.48	0.000	0.00	1.00
SHP	Children in Household	2018	nbkid18	10490	0.35	0.48	0.000	0.00	1.00
SHP	Home Owner	2013	h13h29	17166	0.61	0.49	1.000	0.00	1.00
SHP	Home Owner	2014	h14h29	14620	0.64	0.48	1.000	0.00	1.00
SHP	Home Owner	2015	h15h29	13089	0.65	0.48	1.000	0.00	1.00
SHP	Home Owner	2016	h16h29	11689	0.66	0.47	1.000	0.00	1.00
SHP	Home Owner	2017	h17h29	10644	0.65	0.48	1.000	0.00	1.00
SHP	Home Owner	2018	h18h29	10320	0.65	0.48	1.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SHP	Head of Household	2013	relarp13	17521	0.42	0.49	0.000	0.00	1.00
SHP	Head of Household	2014	relarp14	14963	0.41	0.49	0.000	0.00	1.00
SHP	Head of Household	2015	relarp15	13286	0.42	0.49	0.000	0.00	1.00
SHP	Head of Household	2016	relarp16	11974	0.42	0.49	0.000	0.00	1.00
SHP	Head of Household	2017	relarp17	10876	0.43	0.50	0.000	0.00	1.00
SHP	Head of Household	2018	relarp18	10490	0.44	0.50	0.000	0.00	1.00
SHP	Education	2013	iscd13	8808	4.18	2.46	4.000	0.00	9.00
SHP	Education	2014	iscd14	14912	4.18	2.46	4.000	0.00	9.00
SHP	Education	2015	iscd15	13244	4.23	2.46	4.000	0.00	9.00
SHP	Education	2016	iscd16	11938	4.29	2.45	4.000	0.00	9.00
SHP	Education	2017	iscd17	10838	4.34	2.44	4.000	0.00	9.00
SHP	Education	2018	iscd18	10445	4.38	2.43	4.000	0.00	9.00
SHP	Household Income	2013	i13htyn	14884	9650.78	6553.53	8500.000	0.00	183729.17
SHP	Household Income	2014	i14htyn	13377	10412.98	7198.26	9166.670	0.00	218702.50
SHP	Household Income	2015	i15htyn	11949	10349.85	6237.54	9216.670	60.83	153000.00
SHP	Household Income	2016	i16htyn	10733	10427.05	6417.87	9223.330	127.50	125333.33
SHP	Household Income	2017	i17htyn	9771	10420.52	6447.76	9250.000	150.00	93900.00
SHP	Household Income	2018	i18htyn	9417	10520.81	6687.09	9323.330	260.83	103550.83
SHP	Unemployed	2013	wstat13	6017	0.02	0.13	0.000	0.00	1.00

Table A1: Summary Statistics by Survey Wave (*continued*)

Dataset	Variable	Wave	Origin	N	Mean	SD	Median	Min	Max
SHP	Unemployed	2014	wstat14	10138	0.01	0.12	0.000	0.00	1.00
SHP	Unemployed	2015	wstat15	9196	0.02	0.13	0.000	0.00	1.00
SHP	Unemployed	2016	wstat16	8167	0.02	0.12	0.000	0.00	1.00
SHP	Unemployed	2017	wstat17	7523	0.02	0.12	0.000	0.00	1.00
SHP	Unemployed	2018	wstat18	7306	0.01	0.12	0.000	0.00	1.00

Robustness Checks

Subgroups: House owners and heads of households

Would the null results change if we analyse relevant subgroups, such as those who live in a house that they own or those who are the head of the households. These groups of individuals are more likely to benefit, and therefore be affected, from living in a house with solar installations. To explore the possibility that the results might be heterogeneous with regard to these factors, I estimate interactions effects, between *Solar Panel* and *House Owner* (Table A2) and between *Solar Panel* and *Head of Household* (Table A3), for each of the tree models in Table 1.

The results show no signs of heterogeneity, with the interaction terms returning substantively and statistically insignificant estimates in all models. This suggests that the null results continue to hold if we limit the analysis house owners or tenants, heads or other members of households.

Solar system types

There are two main types of solar systems: solar photovoltaic (PV) and solar thermal (ST). PV systems produces electricity, which can be consumed in the dwelling and/or fed back into the electricity grid for compensation from the utility. In comparison, ST systems turn sunlight into heat, providing warm water or space heating for the dwelling. It is also possible to have both system on the same rooftop.

One concern is that the effects of solar systems might be heterogeneous, depending on the type of solar systems that households have on their rooftop perhaps because they generate different amounts of revenues. For example, Jacksohn, Grösche, Rehdanz, and Schröder (2019) show that, in Germany, PV systems used to generate almost twice as much revenue for households than ST systems in 2008, but this has been reversed in the recent years.

Table A2: Models of political interest—interaction with *House Owned*

	Germany (1 - 3)			United Kingdom (4 - 6)			Switzerland (7 - 9)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Solar Panel (SP)	0.07** (0.02)	0.004 (0.01)	0.004 (0.01)	-0.002 (0.08)	0.02 (0.09)	0.02 (0.09)	0.01 (0.19)	0.05 (0.09)	0.04 (0.10)
House Owned (HO)	0.19*** (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.32*** (0.01)	0.02 (0.02)	0.02 (0.02)	0.16*** (0.02)	0.01 (0.02)	0.01 (0.02)
SP x HO	-0.02 (0.03)	0.01 (0.02)	0.005 (0.02)	0.14 (0.08)	-0.05 (0.10)	-0.05 (0.10)	0.07 (0.21)	-0.06 (0.09)	-0.06 (0.10)
FEs—Individuals	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
FEs—Waves	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes	No	No	Yes
Cl. SEs—Individuals	Yes	No	No	Yes	No	No	Yes	No	No
Cl. SEs—Households	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	281,031	281,031	261,253	103,349	103,349	102,831	46,717	46,717	43,352
R ²	0.01	0.76	0.76	0.02	0.88	0.88	0.01	0.86	0.86
Adjusted R ²	0.01	0.69	0.69	0.02	0.65	0.65	0.01	0.81	0.81

Note:

The dependent variable is *Political Interest*. Standard errors are in parantheses. Control variables include education, head of households, unemployment, household income, households with children, home owners, and geographical regions. For variable descriptions, see the Appendix.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

While the information on the type of solar systems is available for all three UKLHS waves used for analysis, it is only available for the 2015 and 2016 waves in the SOEP. For SHP, this information is not available at all. Nevertheless, I repeat the models in Table 1 with the data available, differentiating between the types of solar systems. The results, as presented in Table A4, are similar: those who live in households with solar installations are significantly more interested in politics (Models 3 and 6), irrespective of the solar system type. However, these effects disappear with the fixed-effects: if we limit the analysis to within persons, and remove any changes common to all individuals from one survey wave to another, there is no meaningful effect of solar panels on political interest (Models, 2, 3, 4, and 6).

Table A3: Models of political interest—interaction with *Head of Household*

	Germany (1 - 3)			United Kingdom (4 - 6)			Switzerland (7 - 9)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Solar Panel (SP)	0.12*** (0.02)	0.02 (0.01)	0.01 (0.01)	0.15*** (0.04)	-0.02 (0.05)	-0.02 (0.05)	0.15 (0.10)	0.03 (0.05)	0.02 (0.05)
Head of Household (HH)	0.18*** (0.01)	0.01 (0.01)	0.01 (0.01)	0.18*** (0.01)	-0.001 (0.01)	-0.003 (0.01)	0.14*** (0.01)	-0.01 (0.01)	-0.01 (0.01)
SP x HH	0.04* (0.02)	-0.01 (0.01)	-0.01 (0.01)	0.05 (0.05)	0.002 (0.06)	0.01 (0.06)	-0.10 (0.08)	-0.05 (0.06)	-0.06 (0.06)
FES—Individuals	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
FES—Waves	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes	No	No	Yes
Cl. SEs—Individuals	Yes	No	No	Yes	No	No	Yes	No	No
Cl. SEs—Households	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	281,032	281,032	261,254	103,772	103,772	103,252	46,819	46,819	43,380
R ²	0.01	0.76	0.76	0.01	0.88	0.88	0.01	0.86	0.86
Adjusted R ²	0.01	0.69	0.69	0.01	0.65	0.65	0.01	0.81	0.81

Note:

Standard errors are in parantheses. Control variables include education, head of households, unemployment, household income, households with children, home owners, and geograpical regions. For variable descriptions, see the Appendix. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Environmental attitudes

Does solar panel ownership affect environmental attitudes? There is a large literature (see the literature review by Nilsson, Bergquist, and Schultz, 2017) showing that engaging in one environmental behaviour can have spillover effects, negative or positive. On the one hand, producing renewable energy with their solar panels, people might feel that they are personally contributing to the fight against climate change, and therefore worry less about the environment. On the other hand, committing themselves to the this fight, the cognitive dissonance theory (Festinger, 1957) would predict that they might be even more concerned than before.

I test whether solar panels affect environmental attitudes with data from the SOEP, which measures how worried the respondents are about environment (variable *plh0036* in the original dataset) and the consequences from climate change (*plh0037*). Both variables are measured

Table A4: Effect of different types of solar systems on political attitudes

	Germany (1 - 3)			United Kingdom (4 - 6)		
	(1)	(2)	(3)	(4)	(5)	(6)
PV	0.14*** (0.03)	-0.01 (0.02)	-0.02 (0.02)	0.12** (0.04)	0.001 (0.04)	0.0000 (0.04)
ST	0.18*** (0.02)	-0.003 (0.02)	-0.005 (0.02)	0.16** (0.06)	-0.08 (0.09)	-0.09 (0.09)
PV and ST	0.16*** (0.04)	0.02 (0.04)	0.01 (0.04)	0.28*** (0.06)	-0.05 (0.07)	-0.06 (0.07)
FEs—Individuals	No	Yes	Yes	No	Yes	Yes
FEs—Waves	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
Cl. SEs—Individuals	Yes	No	No	Yes	No	No
Cl. SEs—Households	Yes	Yes	Yes	Yes	Yes	Yes
Observations	257,720	257,720	239,538	103,770	103,770	102,829
R ²	0.001	0.76	0.76	0.001	0.88	0.88
Adjusted R ²	0.001	0.69	0.69	0.001	0.65	0.65

Note: Standard errors are in parantheses. Control variables include education, head of households, unemployment, household income, households with children, home owners, and geograpical regions. * p < 0.05, ** p < 0.01, *** p < 0.001.

with a three-point scale as 1 = *Very Concerned*, 2 = *Somewhat Concerned*, and 3 = *Not Concerned At All*. I have reversed coded this variable so that the higher values indicate increasing concern, and re-run the models in Table 1 with these two concerns as the dependent variables.

Table A5 presents the regression models, mirroring the results so far. The coefficient is positive and significant in the pooled model, but this significance disappears in the fixed-effect models. This suggest that those who are more concerned about the environmental or the climate change are more likely to adopt solar panels, but the solar panels alone do not cause a significant change in these environmental attitudes.

Table A5: Effect of solar system ownership on environmental attitudes

	Worry: Environment (1 - 3)			Worry: Climate Change (4 - 6)		
	(1)	(2)	(3)	(4)	(5)	(6)
Solar Panel	0.05*** (0.01)	-0.004 (0.01)	0.001 (0.01)	0.07*** (0.01)	-0.01 (0.01)	-0.01 (0.01)
FEs—Individuals	No	Yes	Yes	No	Yes	Yes
FEs—Waves	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
Cl. SEs—Individuals	Yes	No	No	Yes	No	No
Cl. SEs—Households	Yes	Yes	Yes	Yes	Yes	Yes
Observations	273,284	273,284	254,303	234,047	234,047	217,730
R ²	0.001	0.58	0.59	0.001	0.61	0.62
Adjusted R ²	0.001	0.47	0.48	0.001	0.50	0.50

Note: Standard errors are in parantheses. Control variables include education, head of households, unemployment, household income, households with children, home owners, and ge-ograpical regions. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

References

- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford: Stanford University Press.
- Jacksohn, A., Grösche, P., Rehdanz, K., and Schröder, C. (2019). Drivers of renewable technology adoption in the household sector. *Energy Economics*, 81, 216–226.
- Nilsson, A., Bergquist, M., and Schultz, W. P. (2017). Spillover effects in environmental behaviors, across time and context: A review and research agenda. *Environmental Education Research*, 23(4), 573–589.