Online Appendix

Contents

A Details on Regional Data

In the following, we describe our regional level data. Table A.1 summarizes the corresponding data sources. All data is available for free. It can either be downloaded from the specified websites (see reference in the source column of Table A.1) or is available after personal request at the specified institutions.

We move on by giving details on the diffusion of green votes. Thereafter, we describe the diffusion of PV systems. Then, we explain the drivers of PV diffusion and our measures of PV roof appropriateness in Baden-Württemberg. Finally, we distinguish between the diffusion of household and industrial PV and describe the diffusion of other green technologies.

Table A.1: Sources of regional level data.

Data	Source & Availability
Federal Elections:	
2021 at LAU-2 municipality level	Statistical State Office of Baden-Württemberg (Statistik BW, 2021b); downloaded Nov. 8, 2021
2009, 2013, 2017 at LAU-2 municipality level	Federal Statistical Office (DESTATIS, 2021a); table 14111-01-03-5 downloaded Aug. 31, 2021; data license: dl-de/by-2-0
1998, 2002, 2005 at LAU-2 municipality level	Statistical State Office of Baden-Württemberg (Statistik BW, 2021a); freely available upon personal request
State Elections:	
2021 at LAU-2 municipality level	Statistical State Office of Baden-Württemberg (Statistik BW, 2021d); downloaded Sept. 7, 2021
2011, 2016 at LAU-2 municipality level	Federal Statistical Office (DESTATIS, 2021b); table 14338-01-03-5 downloaded Sept. 7, 2021; data license: dl-de/by-2-0
1996, 2001, 2006 at LAU-2 municipality level	Statistical State Office of Baden-Württemberg (Statistik BW, 2021c); freely available upon personal request
Maps:	
LAU-2 municipalities (Administrative areas 1:250,000 as of 31.12.2013)	Federal Agency for Cartography and Geodesy (BKG, 2016); downloaded Nov. 4, 2016; © GeoBasis-DE / BKG (2016)
Large rivers	European Environment Agency (EEA, 2021); downloaded Sept. 21, 2021
PV appropriateness:	
PV appropriateness, solar radiation and orientation at roof level	State Institute for the Environment, Survey and Nature Conservation Baden-Württemberg (LUBW, 2016); freely available upon personal request
solar radiation, 1km x 1km raster	German Meteorological Service (DWD, 2010); downloaded July 26, 2010
Renewable energy adoption:	
Installation date, place and capacity of renewable energy plants as of 2020 at plant level	Information platform of the German transmission system operators (TSO, 2021); downloaded Sept. 6, 2021
Verification on number of PV systems in municipality as of 2018	State Institute for the Environment, Survey and Nature Conservation Baden-Württemberg (LUBW, 2022); downloaded Sept. 28, 2022
Further:	
Altitude, dgm1000-001, 1km x 1km raster	Federal Agency for Cartography and Geodesy (BKG, 2023); downloaded April 16, 2023; © GeoBasis-DE / BKG (2023)
Income tax payments per capita for 2010 at LAU-2 municipality level	Federal Statistical Office (DESTATIS, 2017); table 368-01-5 downloaded June 26, 2017
Number of buildings and residential buildings	State Institute for the Environment, Survey and Nature Conservation Baden-Württemberg (LUBW, 2016); freely available upon personal request; verification through StatistikBW (2023)
Rural vs. urban at LAU-2 municipality level	State Agency for Political Education Baden-Württemberg (LpB, 2016); downloaded Oct. 25, 2022
Share of single-family houses at LAU-2 municipality level	Federal Statistical Office (DESTATIS, 2016b); table: 035-21-4 downloaded Jan. 25, 2016
Wind power potential, 1km x 1km raster	German Meteorological Service (DWD, 2012); downloaded May 18, 2012

A.1   Green Votes

The lowest level of aggregation on which we can obtain spatial panel data over a long period of federal and state elections in Germany is the (LAU-2) municipality level.

Federal elections .– We obtain data for the federal elections in 1998, 2002, 2005, 2009, 2013, 2017 and 2021 from Statistik BW (2021b), DESTATIS (2021a), and Statistik BW (2021a). We consider the number of second votes (*Zweitstimmen*) for the Green Party normalized by valid votes.[25] We illustrate aggregate trends of the share of green votes for federal elections in Baden-Württemberg in Figure A.1 Panel A.
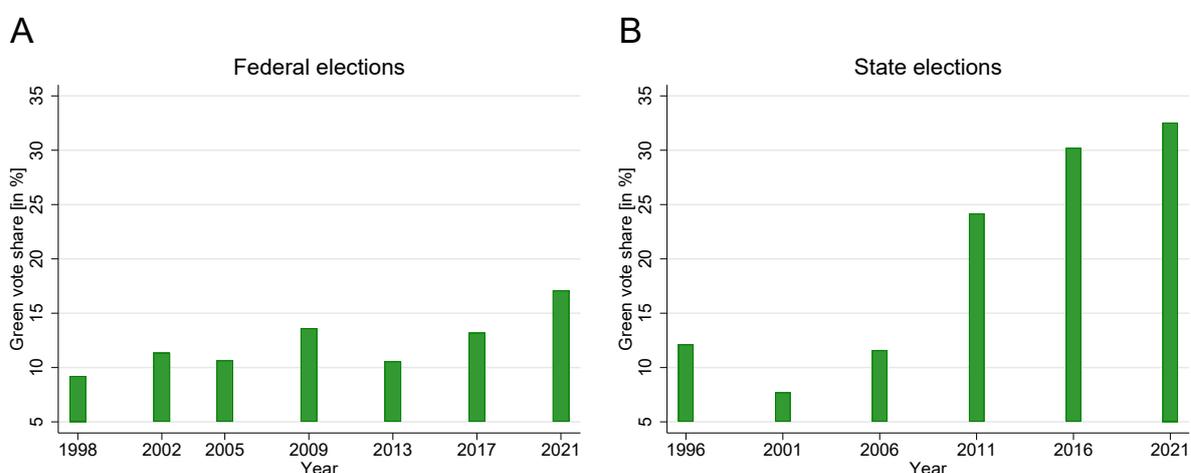
Figure A.1: Fraction of green votes at federal and at state elections in Baden-Württemberg over time.
Notes: We consider the number of second votes (*Zweitstimmen*) normalized by valid votes.

State elections .– We obtain municipality level data for the state elections in 1988, 1992, 1996, 2001, 2006, 2011, 2016 and 2021 from Statistik BW (2021d), DESTATIS (2021b), and Statistik BW (2021c). Again, we consider the number of second votes (*Zweitstimmen*) normalized by valid votes. We illustrate aggregate trends of the share of green votes for federal elections in Baden-Württemberg in Figure A.1 Panel B.

[25]As of 31.12.2013, Baden-Württemberg consists of 1104 LAU-2 municipalities. Due to the restructuring of municipalities, we do not have federal election data on all but nearly all of them. For almost all points in time, we have green voting data for 1099 municipalities. Only for the federal elections in 2013 and 2017, we do not have information on Green Party votes for Egesheim (Landkreis Tuttlingen) and for the federal elections in 2005 and 2009, we do not have information on Green Party votes for Lauda-Königshofen (Main-Tauber-Kreis).

In the 1998 elections, the Green Party received 9.2 percent of valid votes in federal elections. While there were decreases in green vote share in-between, we observe an increase to 13.6 percent in 2009 and 17.1 percent in 2021. There was significant regional variation in the increase of the support for the Green Party (Figure 1 Panels A and B). Across Baden-Württemberg, the largest increase in the share of green votes in federal elections between 1998 and 2021 took place in the city of Karlsruhe and the city of Konstanz. For state elections, the share of Green Party votes increased stronger. In 1996 the green vote share lay at 12.1 percent and in 2021 at 32.6 percent. We observe the largest increase in this time period in Wutöschingen and in Beuron.

A.2 Diffusion of PV Systems

As outlined in the main text, we focus on the diffusion of PVs at the level of the municipality. We denote by $F_{r,t}$ the number of PV installations in municipality r through t normalized by the number of residential buildings in the municipality. We first describe our raw data on PV diffusion and other green technologies. Then, we discuss the data on the number of residential buildings.

Raw Data on renewable energy systems.– We downloaded the data on the location and date of grid-connection of PV systems and other renewable energy installations from a joint portal of the German transmission system operators (TSO, 2021).[26] Table A.2 contains details on the number of systems by green technology in the raw data. The table illustrates that the data set contains some 2 million PV systems installed through 2020 across Germany and that almost 20 percent[27] of these were installed in Baden-Württemberg. Because the lowest level of aggregation on which we can obtain spatial long-term panel data on federal and state elections in Germany is the (LAU-2) municipality level, we are interested in the number of systems on the same level. The raw data set includes the LAU-2 municipality code for 98.6 percent of the PV systems. For Baden-Württemberg the data set contains the LAU-2 municipality code for 94.6 percent of the PV systems. We use the zip code to allocate the remaining systems to their LAU-2 municipality. The share of wind turbines and biogas plants for which we use the zip code is larger.

Table A.2: Number of renewable energy installations in Germany and Baden-Württemberg through 2020 according to the raw data from TSO (2021).

	Germany			Baden-Württemberg			
	# all	# with municipality code	share with municipality code	# all	# with municipality code	postal code used for allocation to municipality	share with municipality code
Biogas	15,539	14,522	93.5%	2,392	1,474	918	61.6%
PV	2,021,786	1,993,359	98.6%	378,330	358,010	20,320	94.6%
Wind	28,938	28,696	99.2%	889	715	174	80.4%

Notes: Wind turbines without offshore.

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[26] Since the amendment of the Renewable Energy Sources Act on the 25th of October 2008, the German transmission system operators (TSOs) are obliged by law to publish address data and the date of grid connection of all renewable energy systems supported through the feed-in tariff.

[27] 18.7 percent (or 378,330) in Baden-Württemberg out of 2,021,786 in Germany.

Raw Data on number of buildings.– LUBW (2016) provides us with the number of buildings in Baden-Württemberg, their exact location, their roof area and whether a building is residential or not. We focus on residential buildings because more than 90 percent of the PV systems installed in Baden-Württemberg in 2020 or before are small systems $\left(\text{at most }30\text{kW}_\text{p}\right)$.[28] These fit in terms of necessary roof area on residential roofs.[29] The exact locations of buildings allow us to calculate the number of residential buildings for each LAU-2 municipality.

We use all residential buildings to normalize $F_{r,t}$. According to LUBW (2016), these are 2,252,215 residential buildings in Baden-Württemberg, see Figure A.2.[30]
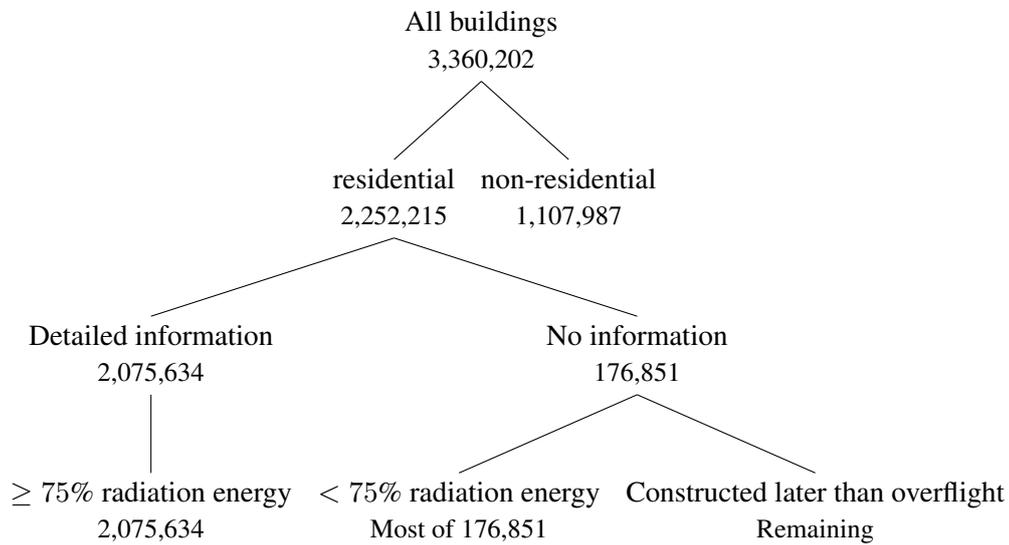

Figure A.2: The number of buildings in Baden-Württemberg according to LUBW (2016).

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[28]The capacity (or nominal power) of a PV system is specified in kilowatt-peak $\left[\text{kW}_\text{p}\right]$, i.e., the system's maximum power output under defined conditions. In contrast, produced electricity is measured in kilowatt-hours [kWh].

[29]We calculate the median and 90th percentile capacity for residential buildings in two steps. The median potential area for PV installations on residential buildings is 21 sqm, and the 90th percentile is 50 sqm. LUBW (2016) documents that it is necessary to install between 6.6 and 11 sqm of solar modules to reach a capacity of 1 kW$_\text{p}$. (Of course, PV modules got more efficient over time. In 2022, only 5 sqm of PV modules may suffice for a capacity of 1 kW$_\text{p}$ due to increased module efficiency. However, usually not the whole roof can be used for a PV system, e.g., because of chimneys or roof-lights.) Based on the range between 6.6 and 11 sqm, we use a value of 8 sqm per kW$_\text{p}$ in our calculations. This yields a median capacity supported by residential buildings of 2.6 kW$_\text{p}$, while for the 90th percentile it is 6.3 kW$_\text{p}$. That is why, we consider PV systems below 10 kW$_\text{p}$ (and as an upper bound PV systems below 30 kW$_\text{p}$) as small household systems.

[30]We verify this number. With 2,261,583 residential buildings, StatistikBW (2023) confirms almost the same number for 2005. In one of our robustness checks, we normalize with the 2,075,634 residential buildings for which we have detailed information. We discuss this approach in Online Appendix C.1.2.

PV in Baden-Württemberg .– Since the year 2000, we have seen how photovoltaic systems have become wide-spread in Baden-Württemberg (and across Germany) while the support for the Green Party has increased significantly. Next we describe these trends as well as institutional settings in which they have taken place.
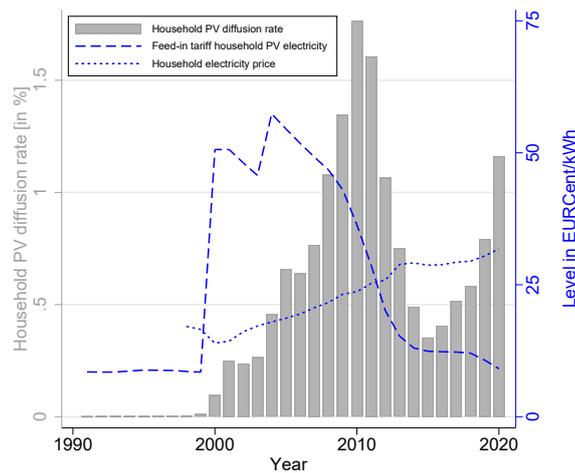
Figure A.3: Fraction of buildings with a new household PV system, level of the feed-in tariff for electricity from household PV and household electricity price in Germany from 1991 through 2020.

Notes: We show the feed-in tariff for systems with capacity of 30 kW$_p$ or below through March 2012. From April 2012 on, we show the feed-in tariff for systems with capacity of 10 kW$_p$ or below and build the average for each year because feed-in tariffs varied up to monthly. The household electricity price is a net average based on a yearly consumption of 3500kWh from BDEW (2016). The electricity price levels for 2008-2020 are confirmed by DESTATIS (2016a).

In 1998, the Social Democratic-Green coalition won the federal elections in Germany. Two years later, the government introduced a new law, the Renewable Energy Sources Act (Erneuerbare Energien Gesetz – EEG) (EEG, 2000), which raised the feed-in tariff for electricity produced from PV systems. For example, the feed-in tariff for systems with a capacity of at most 30 kW$_p$ was raised to 50 EUR-Cent/kWh (from 8.84 EURCent/kWh). The Renewable Energy Sources Act stipulated vintage-specific feed-in tariffs guaranteed for a twenty year period (Agnolucci, 2006; Altrock et al., 2011; Maurer et al., 2012).[31] In this system, feed-in tariffs were determined (for a period of twenty years) based on the year of installation of the PV system. Furthermore, changes in the system only affected new installations (i.e., they were non-retroactive). Additionally, between 1999 and 2003, the government provided low-

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[31]However, starting in 2002, new installations received a feed-in tariff 5 percent lower than installations put in place the previous year. See Figure A.3.

interest loans for PV roof installations through the 100,000 roofs program (Jacobsson and Lauber, 2006). By 2003, the fraction of residential buildings with PV systems was 0.9 percent in Baden-Württemberg, more than twenty times larger than in 1999. 2004's Amendment to the Renewable Energy Sources Act (EEG, 2004) further raised the feed-in tariff to 57 EURCent/kWh (see Figure A.3). By 2009, 6.3 percent of residential buildings had PV systems; and in 2020, 16.8 percent of buildings were equipped with PV (see Figure A.4).[32]
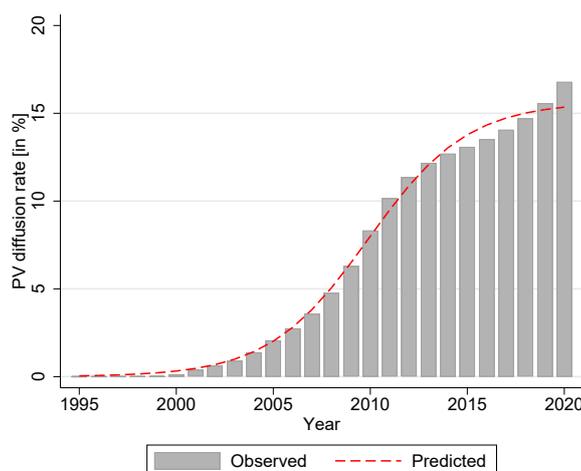
Figure A.4: Fraction of buildings with PV in Baden-Württemberg over time.

Underneath this trend there were important geographic differences across Baden-Württemberg. Figure 1 Panel C displays a map with the increase in PV diffusion between 1995 and 2020 on the LAU-2 level in Baden-Württemberg. By 2020, the highest adoption rates can be observed in the south-east (where solar radiation is higher, also see Figure A.6). In contrast, relatively few PV systems were installed in the north-west.

Panel A in the animated Figure A.5 shows how the PV adoption rate changed over time. While the adoption rate increased slowly in the 90s, it strongly increased since 2000 all over Baden-Württemberg. In the following, we discuss factors that drive the diffusion of PV systems.

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[32]The Renewable Energy Sources Act also introduced new feed-in tariff schemes for electricity from wind power and biogas plants, though they rose comparatively less than for PV systems (to 9.1 EURCent/kWh for wind power and to 10.2 EU-RCent/kWh for biogas) (EEG, 2000).

Figure A.5: Panel A shows the PV adoption rate and Panel B the increase in the fraction of green votes at federal elections for different time periods in Baden-Württemberg (LAU-2 level). The classes are cut at the 20th, 40th, 60th and 80th percentile of the full sample over all time periods. The animation changes the illustrated time periods.

Notes: Maps in Gauss-Krüger zone 3 projection (EPSG: 31467). The animation works with Adobe Acrobat Reader.

A.3 Appropriateness

A.3.1 Drivers of PV Diffusion – Solar Radiation

Several roof- and location-specific characteristics determine the suitability of a building for a PV installation based on the potential energy that a PV system can generate.[33] Such characteristics are solar radiation, roof orientation, inclination, altitude above the sea level, shadowing and roof size. We focus on the most important: solar radiation, roof orientation and roof inclination. Thereafter, we describe our measures of PV roof appropriateness.

Solar radiation is a measure of sun intensity. It refers to radiation on horizontal surface and is measured in kWh/sqm. We illustrate its regional variation across Baden-Württemberg in Figure A.6. We exploit data on average yearly solar radiation (1981-2000) from DWD (2010) for 1km times 1km raster cells across Germany.
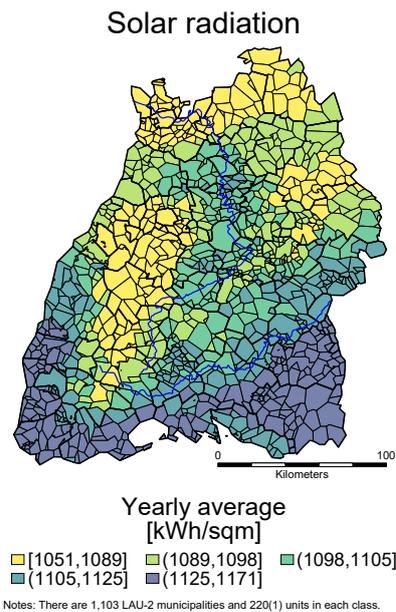
Figure A.6: Solar radiation (yearly average for 1981-2000) in Baden-Württemberg on LAU-2 level.

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[33]Subsidies also determine or have determined the returns from a PV system. We describe the subsidy system for PV in Germany in Online Appendix A.2. It applies to all PV systems across Germany. Because it is not location-specific, we cannot exploit it to explain regional variation in the increase of green votes.

A.3.2 Drivers of PV Diffusion – Roof Appropriateness

Besides solar radiation, there are several other drivers of the suitability of a building for PV. Figure A.7 illustrates that roof orientation and inclination shape the potential energy that a PV system can generate.
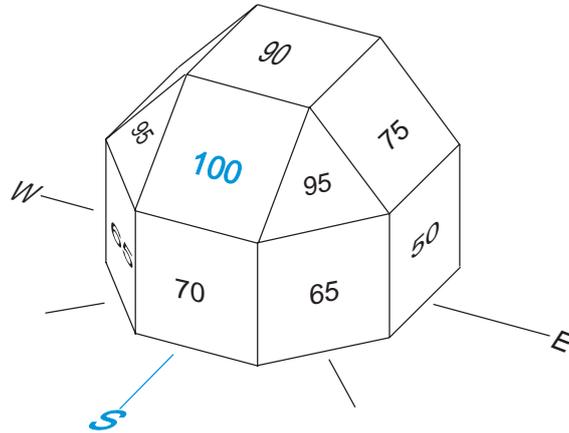
Figure A.7: Roof orientation and inclination shape the potential energy that a PV system can generate (Stark et al., 2005, p. 20).

Notes: The figure shows approximate ratios relative to the optimal orientation and inclination. In western Europe, the optimal orientation is to the south with an inclination of about 37 degrees. An inclination of 0 degrees refers to a flat roof.

The State Office for the Environment, Measurement and Nature Conservation of Baden-Württemberg (LUBW, 2016) conducted an aerial roof census that collected high-resolution data at the building level on these variables. The state office used this information to compute the solar energy potential of each residential building. Next, we describe the roof census in detail.

A.3.3 Raw Data on Appropriateness

Based on laser scan data from overflights between 2000 and 2005, the census uses information on the roof inclination, orientation, area, height above sea level, and shadowing to calculate whether a roof is suitable for PV.[34] Plausibly, LUBW (2016) uses the best suited roof area in a building to compute the building's solar energy potential.[35] The census considers buildings as appropriate for PV systems if they have a solar energy potential between 95 and 100 percent of the maximum solar radiation.[36]

Examples of the roof census data .– In Figure A.8, we illustrate the high level of detail of the raw appropriateness data. As an example, the figure shows the roof census information, which was available online, for Wolpertshausen. Wolpertshausen is a LAU-2 municipality in Baden-Württemberg with a high share of residential buildings with very good appropriateness for PV (52.1 percent). In the figure, red buildings have a very good appropriateness for PV. This corresponds to a solar energy potential between 95 and 100 percent of the maximum solar radiation. Orange buildings have a good appropriateness (solar energy potential between 80 and 94 percent), light blue a limited appropriateness (solar energy potential between 75 and 79 percent) and gray buildings have to be checked on-site (solar energy potential below 75 percent). Buildings with a solar energy potential below 75 percent are not considered as potentially appropriate for PV.

From Panel A, we learn that most buildings have a very good PV appropriateness in Wolpertshausen. In Panel B, we zoom in and observe the accurateness of the information with a satellite image below. In Panel C, we see the same details in map mode. When comparing Panels B and C, we observe several things. First, buildings in the same street located next to each other do not necessarily have the same appropriateness for PV. Second, there are buildings for which no appropriateness assessment is given (see lower part of Panels B and C). This can have different reasons. For buildings with inclined roofs,

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[34]The census builds on the location of buildings from the cadastral land register of Baden-Württemberg as of 2012. In consequence, buildings that were constructed before 2012 but after the laser scan (between 2000 and 2005) are all classified as inappropriate for PV. However, out of the 2.3 million residential buildings only 176,573 (7.8 percent) are inappropriate. Some of them will indeed be inappropriate, for others no information on appropriateness is available since the laser scan was conducted (2000-2005) before they were constructed. In Figure A.2, we give an overview on the number of buildings and on how many we have detailed information.

[35]The outer walls of a building define its contour. Overhanging roofs are not included.

[36]The maximum value is calculated for 12 sub-regions in Baden-Württemberg independently. Our baseline appropriateness measure is therefore calculated relative to the potential in each of the 12 sub-regions. We construct alternative measures on PV appropriateness which do not rely on maximum values for the 12 sub-regions below.

A Wolpertshausen

B Details with satellite image   **C** Details in map mode

Roof suitability for PV

■ Very good   ■ Good   ■ Limited   ■ On−site check

Figure A.8: Screenshots of information from roof-census for Wolpertshausen, which is a LAU-2 municipality in Baden-Württemberg with a high share (52.1 percent) of residential buildings with very good appropriateness for PV.

Notes: Wolpertshausen is located around 65km northeast of Stuttgart. It belongs to the district Landkreis Schwäbisch Hall. We took the screenshot on 30.08.2019 from the roof-census website, which is not online anymore.

areas have to allow for more than 10 sqm of PV modules to be included. Further, flat roofs are only included if they allow for more than 25 sqm of roof for PV systems because PV systems are usually built on stilts there, which requires more space. Finally, information for outer walls of buildings comes from cadastral maps from 2012, whereas the satellite image is newer. In consequence, we notice that some buildings in Figure A.8 are not included in the census.

In Figure A.9, we give another example for the high level of detail of the data. The figure shows the roof census information for Wannweil, which is a LAU-2 municipality in Baden-Württemberg with a low share of residential buildings with very good appropriateness for PV (15.7 percent). From Panel A, we learn that most buildings have a good or limited PV appropriateness in Wannweil. In Panel B, we zoom in again and observe the accurateness of the information with a satellite image below. In Panel C, we see the same details in map mode. When comparing Panels B and C, we again observe that buildings in the same street located next to each other do not necessarily have the same appropriateness for PV.

A Wannweil

B Details with satellite image

C Details in map mode

Roof suitability for PV

🟥 Very good   🟧 Good   🟦 Limited   ⬜ On−site check
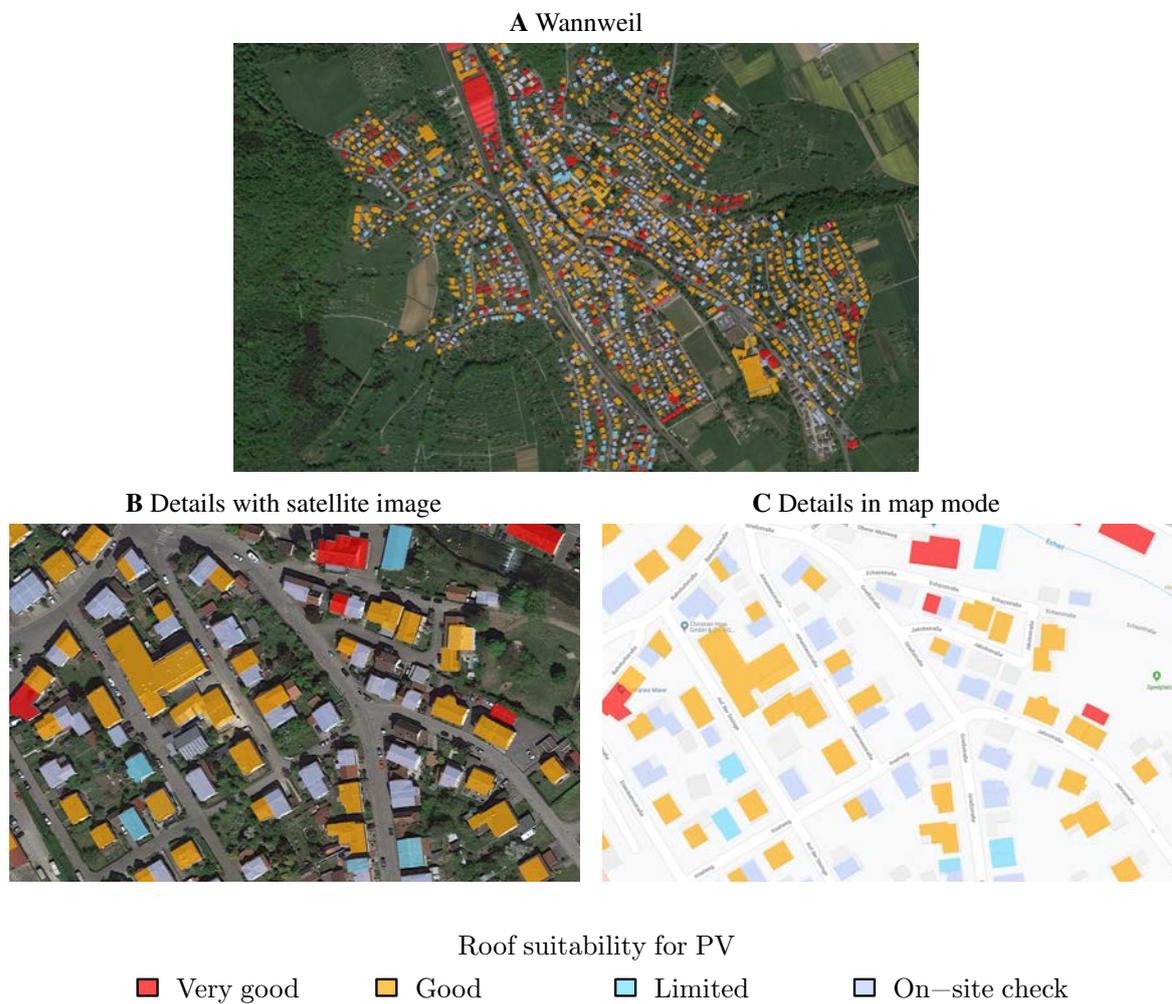
Figure A.9: Screenshots of information from roof-census for Wannweil, which is a LAU-2 municipality in Baden-Württemberg with a low share (15.7 percent) of residential buildings with very good appropriateness for PV.

Notes: Wannweil is located around 30km south of Stuttgart. It belongs to the district Landkreis Reutlingen. We took the screenshot on 30.08.2019 from the roof-census website, which is not online anymore.

A.3.4 Our Measures of Appropriateness

Baseline measure .– Our baseline PV appropriateness measure is the share of residential buildings in each municipality that have a solar energy potential between 95 and 100 percent of the maximum solar radiation. Figure 1 Panel D illustrates the regional variation in this measure. We also construct two alternative measures for PV appropriateness. The idea is to further eliminate anything from our measure that may be correlated with the green vote share.

PV appropriateness with orthogonalized solar radiation .– The first alternative measure filters solar radiation from the baseline measure. We do that by regressing the building-specific solar energy potential on solar radiation in the one-squared-KM area where the building is located.[37] Table A.3 contains the results. We use the residuals from this regression to construct a measure of roof appropriateness in a municipality that is orthogonal to solar radiation. The measure is the fraction of buildings in a municipality for which the residual solar energy potential is above the median residual in Baden-Württemberg.

Table A.3: Ordinary least squares estimation of building-specific solar energy potential on local solar radiation [1km x 1km] on residential building level.

	(1) Building-specific solar energy potential
Local solar radiation [1km x 1km]	0.74
	(0.00)
Constant: α	357.10
	(3.15)
Fixed effects	No
R^2	0.03
Adj. R^2	0.03
F	66286.84
N	2074619

Notes: Building-specific solar energy potential is from LUBW (2016) and refers to the *Mean solar radiation energy on the most appropriate roof area of a building. Minor shading on the surface is included in the calculation.* Local solar radiation comes from a 1km x 1km raster from DWD (2010). We use the location of the residential buildings to merge them to the 1km x 1km raster cells. Figure A.2 reveals there are 2,075,634 residential buildings in total. We can not merge a small share of them (2,075,634 - 2,074,619 = 1,015, or 0.05%). In the regression, we analyze the residential building level in the federal state Baden-Württemberg, Germany (for 2,074,619 residential buildings). Huber-White SE in parentheses.

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[37]We run a simple linear regression because solar radiation is almost proportional to the building-specific solar energy potential (STMWI, 2015, pp. 50-52).

A
PV appropriaten. based on roof
orientation only at extensive margin

B
PV appropriaten. based on roof
orientation only at intensive margin

0   100
Kilometers

Share residential buildings
with good orientation

☐ [26.5,50.3]	☐ (50.3,55.9]	☐ (55.9,61.4]
☐ (61.4,68.1]	☐ (68.1,100.0]	

Average deviation in orientation
of buildings with bad orientation

☐ [51.5,64.3]	☐ (64.3,67.7]	☐ (67.7,70.2]
☐ (70.2,73.8]	☐ (73.8,88.1]	

Notes: We define a good orientation as deviation from optimal orientation ≤30° (bad: >30°). Across panels,
there are 1,103 LAU-2 municipalities and 220 or 221 units in each class.

Figure A.10: Alternative PV appropriateness measures (based on roof orientation only) for
Baden-Württemberg on LAU-2 level.

Notes: An orientation deviation to optimal orientation of zero refers to an orientation to the South. An orientation deviation to
optimal orientation of 90 refers to an orientation to the East or West.

PV appropriateness based on roof orientation only .– As a final alternative, we only exploit the
orientation of residential buildings. The orientation is one determinant of the energy generation potential
of a roof. In western Europe, the optimal orientation is to the South. For example, a roof oriented to
the East with an inclination of 37 degrees produces a quarter less electricity than a roof with the same
inclination oriented to the South. We have information on the orientation of roofs in degrees, again from
the roof census (LUBW, 2016). Raw orientation is specified in non-negative integers between 0 and
359. 0 refers to the North, 90 to the East, 180 to the South and 270 to the West.[38] Because the optimal
orientation of a PV system in Germany is to the South and the orientation deviation to the South shapes
the electricity production of a PV system, we re-scale raw orientation to values between 0 (worst) and
180 (best [to south]).[39] We calculate the mean re-scaled orientation for residential buildings for each
LAU-2 municipality. Based on this, we construct two measures of appropriateness that only build on

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[38]On a flat, PV system can have any orientation. We assume the optimal South orientation for flat roofs.

[39]E.g., a PV system with raw orientation of 170 and one of 190 will result in the same solar energy potential (all else equal)
and the same re-scaled orientation.

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roof orientation. The first measure is on the extensive dimension. We use the fraction of residential roofs in a location with a deviation from the optimal orientation of 30 or smaller degrees. Figure A.10 Panel A shows the resulting measure for residential buildings in Baden-Württemberg. The second measure is on the intensive dimension. It is the average deviation from optimal orientation in the buildings with a deviation of more than 30 degrees from the optimal orientation. Figure A.10 Panel B plots the result.

Table A.4 reports the correlation between the appropriateness measures. It shows that the measures capture different variation in appropriateness.

Table A.4: Correlation between measures of PV appropriateness.

	Baseline PV appropriat.	PV appr. orth. solar radia.	PV appr. orientat. at extensive margin	PV appr. orientat. at intensive margin
Baseline PV appropriateness	1.00			
PV appr. orth. solar radiation	0.83	1.00		
PV appr. orientation only at extensive margin	0.78	0.70	1.00	
PV appr. orientation only at intensive margin	0.16	0.14	0.42	1.00

Notes: We consider the 1,099 LAU-2 municipalities.

We can distinguish domestic PV systems from industrial systems by exploiting their capacity. This allows us to conduct robustness and placebo tests. Again, the data comes from the German transmission system operators TSO (2021). We distinguish between the household PV adoption rate of very small PV systems $\left(\Delta F_{\text{PV}\leq 10\,\text{kW}_\text{p},t-1}\right)$, i.e., the adoption rate for PV systems with a capacity of at most 10 kW$_\text{p}$, the household PV adoption rate of small PV systems $\left(\Delta F_{\text{PV}\leq 30\,\text{kW}_\text{p},t-1}\right)$, i.e., the adoption rate for PV systems with a capacity of at most 30 kW$_\text{p}$, and the industrial PV adoption rate $\left(\Delta F_{\text{PV}>100\,\text{kW}_\text{p},t-1}\right)$, i.e., the adoption rate for large PV systems with a capacity of more than 100 kW$_\text{p}$. Because small PV systems can be installed on small and large houses, we calculate $\Delta F_{\text{PV}\leq 10\,\text{kW}_\text{p},t-1}$ and $\Delta F_{\text{PV}\leq 30\,\text{kW}_\text{p},t-1}$ by dividing the number of small PV systems by the number of residential buildings (as for the adoption rate in general). In contrast, we define $\Delta F_{\text{PV}>100\,\text{kW}_\text{p},t-1}$ to be the number of large PV systems divided by the number of large enough buildings.[40]

Figure A.11 illustrates the diffusion of household $\left(\leq 30\text{kW}_\text{p}\right)$ and industrial PV $\left(\geq 100\text{kW}_\text{p}\right)$ over time. The figures indicate that the adoption rate of industrial systems increased later than for household systems. We also see that the observed PV diffusion rate is S-shaped as indicated by the predicted diffusion rate in red. Finally, we learn that the household PV diffusion rate (Panel A Figure A.11) and the general diffusion rate (Figure A.4) are very similar whereas the industrial PV diffusion rate (Panel B Figure A.11) differs from the two former.

In Figure A.12, we show the increase in the household PV adoption rate $\left(\leq 30\text{kW}_\text{p}\right)$ and the industrial PV adoption rate $\left(\geq 100\text{kW}_\text{p}\right)$ between 1995 and 2020. Because we observe regional differences, we can exploit the diffusion of industrial PV systems as a placebo test for our hypothesis.

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[40]We approximate large enough buildings by those with a contour area larger than 800 sqm or an appropriate roof area for PV larger than 800 sqm. As explained in Footnote 29, we assume 8 sqm/kW$_\text{p}$ and expect that PV systems with at least 100 kW$_\text{p}$ can only be installed on buildings with at least 800 sqm of contour area. We use this approximation because houses with gabled roofs usually have a smaller roof area than the building's contour and not all parts of the roof are oriented to the south, which is most appropriate for PV. Of course, inclined roofs can also have a larger roof area than the contour of a building. However, this mainly applies to single-pitch roofs, which are usually not very steep and therefore do not come with a large difference between roof area and a buildings contour area.
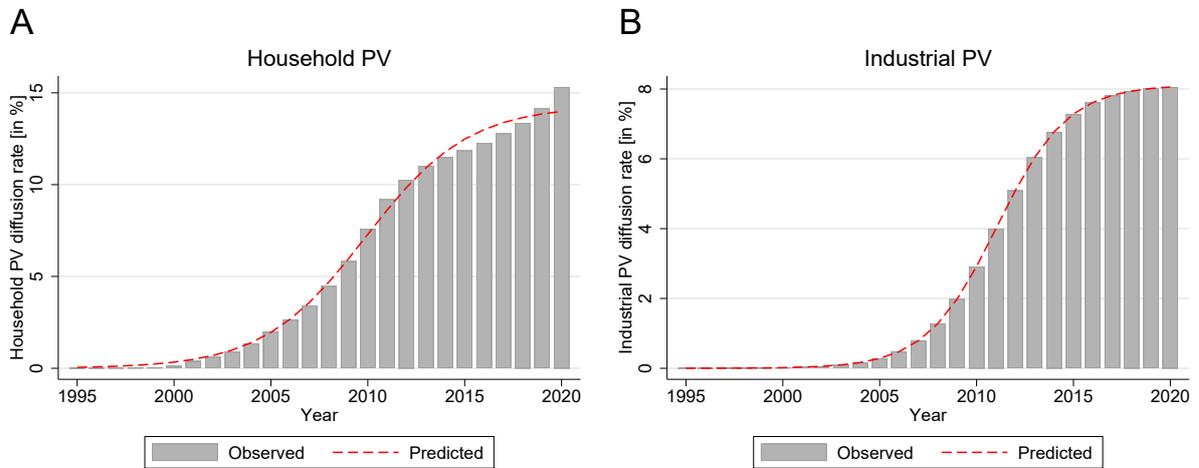
Figure A.11: Fraction of residential buildings with household PV $\left(\le 30\text{kW}_p\right)$ and fraction of large buildings with industrial PV $\left(\ge 100\text{kW}_p\right)$ in Baden-Württemberg over time.

We use solar radiation (see Figure A.6) as a measure of appropriateness for industrial PV in the Diffusion Model because investors can search for locations with the highest potential returns, and because industrial PV systems are not only installed on roofs.

A

Household PV adoption

B

Industrial PV adoption

Household PV adoption rate, 1995-2020 [in %]

☐ [0.00,12.55] ☐ (12.55,16.15] ☐ (16.15,20.19]
☐ (20.19,26.09] ☐ (26.09,61.96] ☐ No data

Industrial PV adoption rate, 1995-2020 [in %]

☐ [0.00,2.44] ☐ (2.44,6.78] ☐ (6.78,11.43]
☐ (11.43,19.05] ☐ (19.05,100.00] ☐ No data

Notes: Across panels, there are 1,103 LAU-2 municipalities. Because of 4 units with no data, there are 219 c
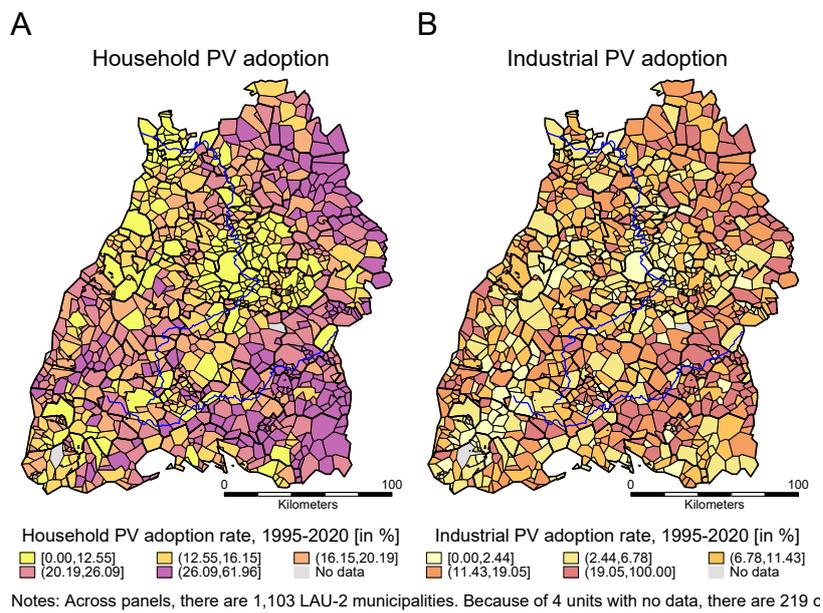
Figure A.12: Increase in household PV $(\leq 30\text{kW}_\text{p})$ adoption rate (1995-2020) and increase in industrial PV $(\geq 100\text{kW}_\text{p})$ adoption rate (1995-2020) in Baden-Württemberg on LAU-2 level.

A.5 Other Industrial Green Technologies

We study wind turbines and biogas plants, which are both industrial technologies. The 2000 EEG also introduced new feed-in tariff schemes for electricity from wind turbines and biogas plants, though they rose comparatively less than for PV systems. Figure A.13 illustrates the diffusion of wind turbines and biogas systems over time. Once again, we observe that the diffusion rate is S-shaped, especially for biogas systems.
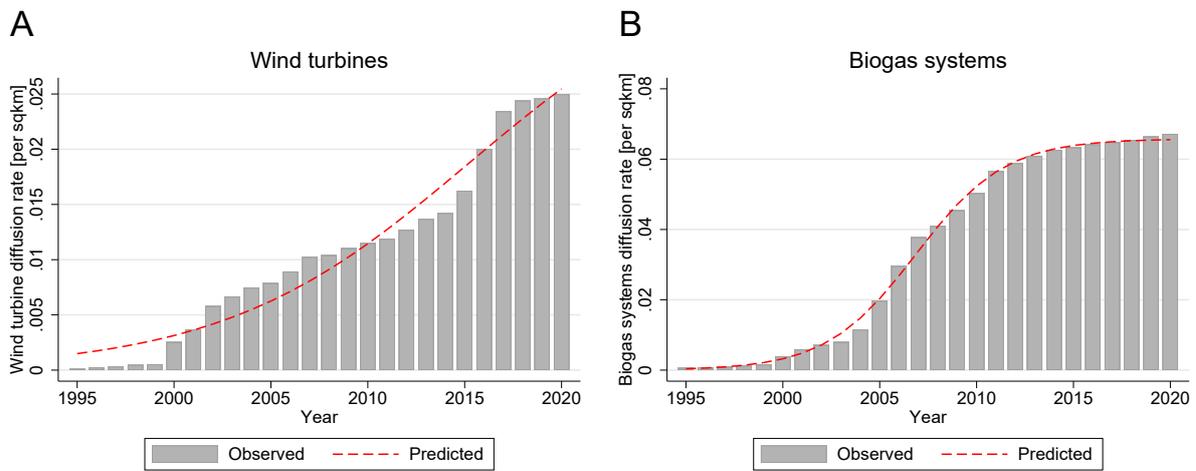
Figure A.13: Fraction of area [in sqkm] with wind turbines and fraction of area [in sqkm] with biogas systems in Baden-Württemberg over time.

In Figure A.14 Panel A, we show the average wind power potential (from DWD (2012)) by municipality, which is one major driver of wind turbine diffusion. We use solar radiation as a driver for biogas power (Figure A.6). In Figure A.14, we also show the wind turbine (Panel B) and biogas systems (Panel C) adoption rate between 1995 and 2020. Because wind turbines and biogas plants are not installed on roofs, we divide the number of systems by a municipality's area in sqkm to calculate adoption rates.

Notes: There are 1,103 LAU-2 municipalities. In A, there are 220(1) units in each class; in B and C, the number of units in each class is shown in brackets.
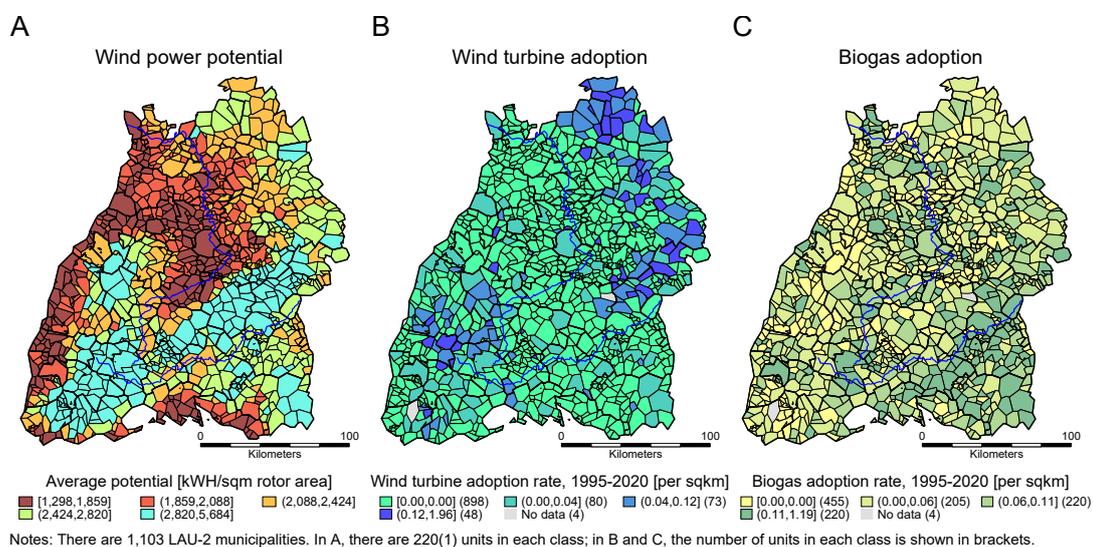
Figure A.14: Average wind power potential (based on 1km times 1km raster data from DWD (2012)), increase in wind turbine adoption rate (1995-2020) and increase in biogas systems adoption rate (1995-2020) in Baden-Württemberg on LAU-2 level.

B Details on Survey Data

Since 2007, the SOEP has included a question about whether households live in dwellings with solar energy systems. Solar energy includes both PV systems and solar thermal systems. We discuss the difference in Online Appendix B.1.

We only consider respondents who do not claim to have removed their solar system because there is strong evidence that this group best illustrates the effect under study. See Online Appendix B.2.

As outlined in the main text, we use two variables on the adoption of solar energy systems. The second is $\Delta Solar_{(t-3:t-1)}$. It measures whether a household did not have a solar system at $t-4$ and adopted one between $t-3$ and $t-1$. This measure conditions on not having a system. Doing so is relevant to prevent a downward bias in the estimates because for those that initially had a system, the independent variable is always 0, and the dependent can be either 0 or 1, forcing either a negative association or no association at all. Because SOEP started to ask households about solar energy systems only in 2007, we condition on not having a system in 2007. We consider a 2-year interval for 2009 and a 3-year interval afterwards. Table C.23 in the Online Appendix contains the descriptive statistics.

In all regressions run with SOEP, we include time and NUTS-1 dummies. Details on controls are available in Online Appendix B.3 and in Table Notes.

B.1 *PV and Solar Thermal Systems*

The difference between PV and solar thermal systems is that, while the latter produce energy that can only be used to heat water, the former produce electricity that can be either used or sold to the electric grid. For the purposes of the mechanisms explored in this paper, there is, a priori, no relevant difference between these two types of solar energy systems. Since 2007, a majority of the solar energy systems installed in Germany have been PV systems. According to BSW-Solar (2014), in 2007 there were 1 million solar thermal systems installed in Germany while there were only 360,000 PV systems. By end of 2022, the number of PV systems was 2.65 million (BSW-Solar, 2023a) while the number of solar thermal systems was 2.6 million (BSW-Solar, 2023b).

B.2 Removed PV Systems

We exclude respondents who claim that they have removed a PV system.[41] Figure B.1 compares the fraction of respondents who claim that they removed a solar system in the SOEP data set and those in the full sample of PV systems from the transmission system operators (TSO, 2021). The figure illustrates that, according to the SOEP (2022) data set, disproportionately many systems were removed.
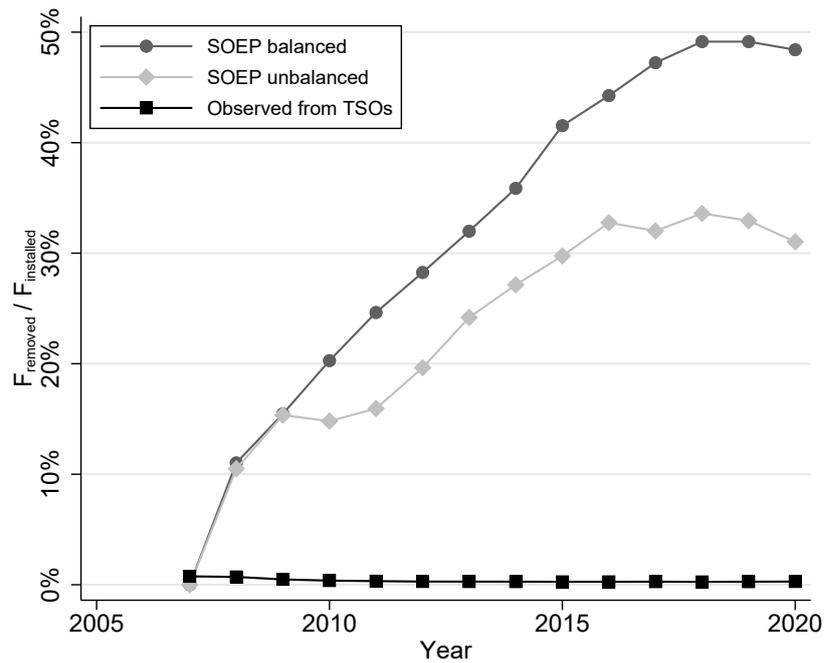
Figure B.1: Rate of cumulative removed divided by cumulative installed PV systems by year.

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[41]Removed refers to respondents that first claim to have a solar system and at some later point in time claim that they do not have one.

The SOEP estimations in columns (1), (3), and (5) of Table 3 and Table C.24 as well as those in columns (4) and (6) of Table 4 include the following controls:

- A dummy for vocational education. The dummy is set to one if the respondent states that she completed one of the following (zero otherwise): Lehre (Apprenticeship), Berufsfachschule, Gesundheitswesen (Vocational School), Schule Gesundheitswesen (bis 99) (Health Care School), Fachschule, Meister (Technical School), Beamtenausbildung (Civil Service Training), Sonstiger Abschluss (Other Training).

- A dummy for college education. The dummy is set to one if the respondent states that she completed one of the following (zero otherwise): Fachhochschule (Technical College), Universität, TH (University, Technical College), Hochschule im Ausland (College Not In Germany), Ingenieur-, Fachschule (Ost) (Engineering, Technical School (East)), Hochschule (Ost) (University (East)).

- A dummy for labor status. The dummy is set to one if the respondent states that she has a job (zero otherwise), in SOEP wording: Working (Working).

- Dummies for time t * NUTS-1. Because t is in years and we study the years 2009 through 2020, there are 12 time periods t and 16 NUTS-1 regions (federal states) in Germany.

The SOEP estimations in columns (2), (4), and (6) of Tables 3 and C.24 as well as those in columns (5) and (7) of Table 4 include dummies for time t * NUTS-1 and dummies for changes in college, in vocational degree and in labor status.

C Results

Table C.1 contains the descriptive statistics that correspond to the estimations shown in Table 1 and in Table 2 columns (1-3) in the main text.

Table C.1: Descriptive statistics, PV.

	Mean	St. Dev.	Min.	Max.
Panel A: Diffusion Model (Table 1 column (1))				
PV diffusion level: $F_{\text{PV},t-1}$	5.2	8.9	0	76
Predicted PV diffusion level: $\hat{F}_{\text{PV},t-1}$	5.2	7.5	4.6e-05	26
Baseline PV appropriateness	37	12	2.5	67
Mean(EligibleVoters)	6812	16839	80	3.7e+05
N	46158			
Panel B: Instrumental Variable Estimation (Table 1 columns (2-3) and Table 2 columns (1-3))				
Increase in share of green votes: $\Delta V_{e,t}$	2.3	4.7	-26	28
PV adoption rate: $\Delta F_{\text{PV},t-1}$	3.9	3.9	0	41
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$	6.8	7.3	.032	25
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1}\right)^2$	100	143	.001	608
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}$	2.8	3.1	-.67	7
Predicted PV adoption rate × lagged, pred. instr.: $\Delta \hat{F}_{\text{PV},t-1} \times \hat{F}_{\text{PV},t-k-1}/100$	.41	.52	-.0014	1.5
StateElection	.45	.5	0	1
EligibleVoters	6906	16840	72	3.8e+05
N	12085			

Notes: The Table contains the descriptive statistics that correspond to the estimations shown in Table 1 on the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. Panel A refers to the 42 years t between 1980 and 2021. Panel B focuses on 11 points in time (state or federal election e in year t), six when federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five when state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing) took place.

In the following, we explore the robustness of the estimated effect of PV adoption on green votes along various dimensions. In Online Appendix C.1.1, we use less comprehensive measures of roof-appropriateness as instruments of PV adoption. In Online Appendix C.1.2, we ignore the residential buildings for which we do not have detailed information for normalizing PV appropriateness, PV diffusion and PV adoption. In Online Appendix C.1.3, we verify the number of PV systems (based on another source), restrict the Diffusion Model to a shorter time period and correct instrument squared in the first stage regression (based on equation (4)).

C.1.1 Alternative Appropriateness Measures

Next, we show the robustness of our results for alternative appropriateness measures. The following Tables correspond to Table 1 columns (5) and (6). Table C.2 contains the corresponding descriptive statistics.

Table C.2: Descriptive statistics, PV.

	Mean	St. Dev.	Min.	Max.
Panel A: Diffusion Model (Table C.3 column (1))				
Predicted PV diffusion level: $\hat{F}_{\text{PV},t-1}$	5.2	7.5	3.9e-05	27
PV appropriateness with orthogonalized solar radiation	46	14	3.3	81
N	46158			
Panel B: Instrumental Variable Estimation (Table C.3 columns (2-3) and Table 1 column (4))				
Predicted PV adoption rate: $\Delta\hat{F}_{\text{PV},t-1}$	2.8	1.8	.74	5.2
N	12085			
Panel C: Diffusion Model (Table C.4 column (1))				
Predicted PV diffusion level: $\hat{F}_{\text{PV},t-1}$	5.2	7.5	3.2e-05	28
PV approp. based on roof orientation at extensive margin	59	10	27	91
PV approp. based on roof orientation at intensive margin	69	5.8	51	88
N	46158			
Panel D: Instrumental Variable Estimation (Table C.4 columns (2-3) and Table 1 column (5))				
Predicted PV adoption rate: $\Delta\hat{F}_{\text{PV},t-1}$	2.8	5.4	-3.2	10
N	12085			

Table C.3 contains results for the alternative measure for PV appropriateness based on orthogonalized solar radiation. The measure is the share of residuals in a LAU-2 municipality above median. The residuals come from the regression from Table A.3 (Online Appendix) at the building level. There, we regress building-specific solar radiation on local solar radiation. Panels A and B in Table C.2 contain the corresponding descriptive statistics.

The estimated value of β is positive and significantly different from zero (column (3), Table C.3). It is in the same ballpark as the estimate obtained with the baseline measure of appropriateness in column (3) (Table 1).

Table C.3: Instrument variable estimation of increase in share of green votes on increase in PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections (alternative PV appropriateness with orthogonalized solar radiation).

	Diffusion Model	IV	
		1st stage	2nd stage
	(1)	(2)	(3)
	$F_{\text{PV},t-1}$	$\Delta F_{\text{PV},t-1}$	$\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}$			0.91
			(0.44)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$		0.56	
		(0.16)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1}\right)^2$		-0.02	
		(0.00)	
Constant: α		0.72	0.03
		(0.67)	(1.25)
Ceiling: a_0	10.65		
	(0.85)		
Ceiling (PV approp. orthogonalized solar radiation): a_1	0.21		
	(0.02)		
Speed: b	0.41		
	(0.00)		
Inflexion point: c	30.69		
	(0.03)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.79	0.75	0.82
Adj. R^2	0.79	0.70	0.78
Final log-likelihood $\mathcal{L}$	-136578.0	-21266.5	-25868.7
F		15.4	4.2
$F_{a_1=0}$ | $F^{\text{1st stage}}_{\hat{F}_{\text{PV},t-k-1},\hat{F}^2_{\text{PV},t-k-1}=0}$ (p-value)	107.4 (0.00)		15.4 (0.00)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state of Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002, along with 1998, due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001, along with 1996, due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for the alternative PV appropriateness with orthogonalized solar radiation, which is the share of residuals above median in a LAU-2 municiality. The residuals come from the regression from Table A.3, in which we regress roof-specific solar radiation on local solar radiation. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

Table C.4 shows results for the alternative measures for PV appropriateness based on roof orientation only. We use two measures. They both rely on the deviation to optimal orientation of buildings for PV. An optimal deviation of 0 degrees is best for PV, 180 degrees worst. The first measure reflects the extensive margin. It is the share of residential buildings with deviation to optimal orientation below or equal to 30 degrees. A larger share indicates better appropriateness for PV. The second measure is on the intensive margin. It is the average deviation from optimal orientation among the buildings with a deviation of more than 30 degrees from the optimal orientation. A smaller value indicates better appropriateness for PV. Panels C and D in Table C.2 contain the corresponding descriptive statistics.

Again, the estimated value of β is positive and significantly different from zero (column (3), Table C.4). It is in the same ballpark as the estimate obtained with the baseline measure of appropriateness in column (3) (Table 1).

Table C.4: Instrument variable estimation of increase in share of green votes on increase in PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections (alternative PV appropriateness based on roof orientation only).

| | Diffusion Model | IV | |
| | | 1st stage | 2nd stage |
	(1) $F_{\text{PV},t-1}$	(2) $\Delta F_{\text{PV},t-1}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}$			0.47
			(0.19)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$		1.48	
		(0.21)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1}\right)^2$		-0.04	
		(0.01)	
Constant: α		-3.22	1.25
		(0.86)	(0.55)
Ceiling:			
a_0	38.35		
	(3.97)		
PV approp. based on roof orientation at extensive margin: a_1	0.18		
	(0.04)		
PV approp. based on roof orientation at intensive margin: a_2	-0.41		
	(0.06)		
Speed:			
b	0.41		
	(0.00)		
Inflexion point:			
c	30.69		
	(0.03)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.79	0.76	0.82
Adj. R^2	0.79	0.70	0.78
Final log-likelihood $\mathcal{L}$	-137280.8	-21135.9	-25871.3
F		29.7	5.9
$F_{a_1=0}$ | $F^{\text{1st stage}}_{\hat{F}_{\text{PV},t-k-1},\hat{F}^2_{\text{PV},t-k-1}=0}$ (p-value)	23.9 (0.00)		29.7 (0.00)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state of Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t) as in Table 1 in the main part. Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0, a_1 and a_2 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 and a_2 are the coefficients for PV appropriateness based on roof orientation only. The measure at the extensive margin is based on the share of buildings with deviation to optimal orientation of 30 degrees or below and the measure at the intensive margin is the mean deviation to optimal orientation of buildings with at least 31 degrees deviation to optimal orientation. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

C.1.2 Normalization

In Figure A.2, we show that we do not have detailed information (e.g., on orientation) for 176,851 / 2,252,215 = 7.9 percent of the residential buildings. So far, we have assumed that all of these are inappropriate for PV. An alternative approach is to ignore these buildings. In the following, we show the robustness of our results for normalizing PV appropriateness, PV diffusion and PV adoption only by 2,252,215 - 176,851 = 2,075,634 residential buildings for which we have detailed information (although at least some of the 176,851 residential buildings will indeed be inappropriate for PV).

Our results are robust to this alternative normalization for our different PV appropriateness measures. Table C.5 show the estimates with the baseline PV appropriateness measure (the share of residential buildings with very good appropriateness for PV). Panels A and B in Table C.6 contain the corresponding descriptive statistics.

Table C.5: Instrument variable estimation of increase in share of green votes on increase in PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections (baseline appropriateness measure, alternative normalization).

	Diffusion Model	IV	
		1st stage	2nd stage
	(1) $F_{\text{PV},t-1}$	(2) $\Delta F_{\text{PV},t-1}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}$			1.24 (0.42)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$		0.89 (0.30)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1} \right)^2$		-0.02 (0.01)	
Constant: α		-0.77 (1.37)	-1.25 (1.29)
Ceiling: a_0	15.11 (1.22)		
Ceiling (Baseline PV appropriateness): a_1	0.17 (0.03)		
Speed: b	0.41 (0.00)		
Inflexion point: c	30.70 (0.03)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.79	0.75	0.82
Adj. R^2	0.79	0.70	0.78
Final log-likelihood $\mathcal{L}$	-140790.2	-22228.9	-25858.5
F		8.9	8.8
$\text{F}_{a_1=0}$ $\mid$ $\text{F}^{\text{1st stage}}_{\hat{F}_{\text{PV},t-k-1}, \hat{F}^2_{\text{PV},t-k-1}=0}$ (p-value)	29.9 (0.00)		8.9 (0.00)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for the baseline PV appropriateness, which is the share of residential buildings with very good appropriateness for PV. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

Table C.6: Descriptive statistics, PV.

	Mean	St. Dev.	Min.	Max.
Panel A: Diffusion Model (Table C.5 column (1))				
PV diffusion level: $F_{\text{PV},t-1}$	5.6	9.6	0	79
Predicted PV diffusion level: $\hat{F}_{\text{PV},t-1}$	5.7	8.1	5.8e-05	27
Baseline PV appropriateness	40	11	2.9	73
N	46158			
Panel B: Instrumental Variable Estimation (Table C.5 columns (2-3))				
Predicted PV adoption rate: $\Delta\hat{F}_{\text{PV},t-1}$	3	3.4	-.74	7.6
N	12085			
Panel C: Diffusion Model (Table C.7 column (1))				
Predicted PV diffusion level: $\hat{F}_{\text{PV},t-1}$	5.7	8.1	4.7e-05	28
PV appropriateness with orthogonalized solar radiation	50	15	3.7	82
N	46158			
Panel D: Instrumental Variable Estimation (Table C.7 columns (2-3))				
Predicted PV adoption rate: $\Delta\hat{F}_{\text{PV},t-1}$	3	1.9	.94	5.6
N	12085			
Panel E: Diffusion Model (Table C.8 column (1))				
Predicted PV diffusion level: $\hat{F}_{\text{PV},t-1}$	5.7	8.1	4.4e-05	28
PV approp. based on roof orientation at extensive margin	59	10	27	91
PV approp. based on roof orientation at intensive margin	69	5.8	51	88
N	46158			
Panel F: Instrumental Variable Estimation (Table C.8 columns (2-3))				
Predicted PV adoption rate: $\Delta\hat{F}_{\text{PV},t-1}$	3	6.9	-4.5	12
N	12085			

Table C.7 includes the alternative measure for PV appropriateness based on orthogonalized solar radiation. The measure is the share of residuals in a LAU-2 municipality above median. The residuals come from the regression from Table A.3 (Online Appendix) in which we regress building-specific radiation energy on local radiation energy. Panels C and D in Table C.6 contain the corresponding descriptive statistics.

Table C.7: Instrument variable estimation of increase in share of green votes on increase in PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections (alternative PV appropriateness with orthogonalized solar radiation, alternative normalization).

	Diffusion Model	IV	
		1st stage	2nd stage
	(1) $F_{\text{PV},t-1}$	(2) $\Delta F_{\text{PV},t-1}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}$			1.26
			(0.48)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$		0.52	
		(0.18)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1}\right)^2$		-0.01	
		(0.00)	
Constant: α		0.92	-1.31
		(0.81)	(1.49)
Ceiling: a_0	12.39		
	(0.97)		
Ceiling (PV approp. orthogonalized solar radiation): a_1	0.19		
	(0.02)		
Speed: b	0.41		
	(0.00)		
Inflexion point: c	30.69		
	(0.03)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.79	0.75	0.82
Adj. R^2	0.79	0.70	0.78
Final log-likelihood $\mathcal{L}$	-140082.2	-22229.6	-25858.1
F		9.0	6.8
$F_{a_1=0}$ | $F^{\text{1st stage}}_{\hat{F}_{\text{PV},t-k-1}, \hat{F}^2_{\text{PV},t-k-1}=0}$ (p-value)	84.7 (0.00)		9.0 (0.00)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state of Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002, along with 1998, due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001, along with 1996, due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for the alternative PV appropriateness with orthogonalized solar radiation, which is the share of the residual from the regression from Table A.3 above median. In Table A.3, we regress roof-specific solar radiation on local solar radiation. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

Table C.8 shows the alternative measures for PV appropriateness based on roof orientation. Here, we use two measures. They are both only based on the deviation to optimal orientation of buildings for PV. An optimal deviation of 0 degrees is best for PV, 180 degrees worst. The first measure is on the extensive margin. It is the share of residential buildings with deviation to optimal orientation below or equal to 30 degrees. A larger share indicates better appropriateness for PV. The second measure captures the intensive margin. It is the average deviation from optimal orientation among the buildings with a deviation of more than 30 degrees from the optimal orientation. A smaller value indicates better appropriateness for PV. Panels C and D in Table C.6 contain the corresponding descriptive statistics.

Table C.8: Instrument variable estimation of increase in share of green votes on increase in PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections (alternative PV appropriateness based on roof orientation only, alternative normalization).

| | Diffusion Model | IV | |
| | | 1st stage | 2nd stage |
	(1) $F_{\mathrm{PV},t-1}$	(2) $\Delta F_{\mathrm{PV},t-1}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\mathrm{PV},t-1}$			0.48
			(0.15)
Lagged, predicted instrument: $\hat{F}_{\mathrm{PV},t-k-1}$		1.72	
		(0.20)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\mathrm{PV},t-k-1}\right)^2$		-0.04	
		(0.01)	
Constant: α		-4.57	1.09
		(0.92)	(0.45)
Ceiling:			
a_0	44.41		
	(4.24)		
PV approp. based on roof orientation at extensive margin: a_1	0.11		
	(0.04)		
PV approp. based on roof orientation at intensive margin: a_2	-0.42		
	(0.07)		
Speed:			
b	0.41		
	(0.00)		
Inflexion point:			
c	30.70		
	(0.03)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.79	0.76	0.82
Adj. R^2	0.79	0.71	0.78
Final log-likelihood $\mathcal{L}$	-140596.1	-22070.3	-25865.8
F		36.8	11.0
$F_{a_1=0}$ $\mid$ $F^{\text{1st stage}}_{\hat{F}_{\mathrm{PV},t-k-1},\hat{F}^2_{\mathrm{PV},t-k-1}=0}$ (p-value)	8.5 (0.00)		36.8 (0.00)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state of Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t) as in Table 1 in the main part. Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0, a_1 and a_2 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 and a_2 are the coefficients for alternative PV appropriateness based on roof orientation only. The measure at the extensive margin is based on the share of buildings with deviation to optimal orientation of 30 degrees or below and the measure at the intensive margin is the mean deviation to optimal orientation of buildings with at least 31 degrees deviation to optimal orientation. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

C.1.3 Other Dimensions

Our results are also robust in other relevant dimensions. In the following, we stick to the baseline PV appropriateness measure in the Diffusion Model.

Verifying the number of PV systems .– In this robustness check, we verify the number of PV systems by municipality. LUBW (2022) reveals the numbers for 2018 and also accounts for removed PV systems. So far, we have neglected removed PV systems because their number is supposed to be low. We compare our data on the number of PV systems in 2018 with the one from LUBW (2022). We then focus only on municipalities which are below or above 2.5 percent of the number of PV systems in 2018 indicated by LUBW data. Table C.9 contains the results. The results are qualitatively similar to our baseline results in Table 1. Table C.10 reveals the corresponding descriptive statistics.

Table C.9: Instrument variable estimation of increase in share of green votes on increase in PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections (only regions which are below or above 2.5% of the number of PV systems in 2018 indicated by LUBW data [for verification]).

	Diffusion Model	IV	
		1st stage	2nd stage
	(1) $F_{\text{PV},t-1}$	(2) $\Delta F_{\text{PV},t-1}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}$			0.58
			(0.29)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$		0.74	
		(0.20)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1}\right)^2$		-0.02	
		(0.01)	
Constant: α		-0.09	0.88
		(0.86)	(0.83)
Ceiling: a_0	7.54		
	(0.47)		
Ceiling (Baseline PV appropriateness): a_1	0.13		
	(0.01)		
Speed: b	0.40		
	(0.00)		
Inflexion point: c	30.76		
	(0.03)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.88	0.75	0.83
Adj. R^2	0.88	0.70	0.79
Final log-likelihood $\mathcal{L}$	-84226.7	-18226.3	-21502.0
F		10.7	4.1
$F_{a_1=0}$ | $F^{\text{1st stage}}_{\hat{F}_{\text{PV},t-k-1}, \hat{F}^2_{\text{PV},t-k-1}=0}$ (p-value)	100.2 (0.00)		10.7 (0.00)
N	38934	10193	10193

Notes: Across columns, we analyze the LAU-2 level in the federal state Baden-Württemberg, Germany (for 927 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for the baseline PV appropriateness, which is the share of residential buildings with very good appropriateness for PV. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage (2SLS) estimates of the increase in green votes on the predicted PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. Table C.10 contains the descriptive statistics corresponding to this table. SE adjusted for clustering on LAU-2 level in parentheses.

Table C.10: Descriptive statistics, PV (only regions which are below or above 2.5% of the number of PV systems in 2018 indicated by LUBW data [for verification]).

	Mean	St. Dev.	Min.	Max.
Panel A: Diffusion Model (Table C.9) column (1)				
PV diffusion level: $F_{\mathrm{PV},t-1}$	3.2	5.1	0	38
Predicted PV diffusion level: $\hat{F}_{\mathrm{PV},t-1}$	3.2	4.5	3.2e-05	16
Baseline PV appropriateness	37	12	2.5	67
Mean(EligibleVoters)	6328	15848	113	3.7e+05
N	38934			
Panel B: Instrumental Variable Estimation (Table C.9) columns (2-3)				
Increase in share of green votes: $\Delta V_{e,t}$	2.3	4.7	-18	28
PV adoption rate: $\Delta F_{\mathrm{PV},t-1}$	4	4	0	41
Lagged, predicted instrument: $\hat{F}_{\mathrm{PV},t-k-1}$	6.9	7.4	.032	25
Lagged, predicted instrument squared: $\left(\hat{F}_{\mathrm{PV},t-k-1}\right)^2$	103	147	.001	624
Predicted PV adoption rate: $\Delta \hat{F}_{\mathrm{PV},t-1}$	2.8	2.6	-.066	6.4
EligibleVoters	6418	15808	106	3.8e+05
N	10193			

Notes: The Table contains the descriptive statistics that correspond to the estimations shown in Table C.9 on the LAU-2 level in the federal state Baden-Württemberg, Germany (for 927 LAU-2 municipalities r) and several points in time. Panel A focuses on 11 points in time (state or federal election e in year t), six when federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five when state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing) took place.

Restricting Diffusion Model .– Our Diffusion Model usually covers the time period 1980-2021. In this robustness check, we restrict the Diffusion Model to the period between 1990 and 2021. Table C.11 contains the results. They are qualitatively in line with our baseline results. Table C.12 shows the corresponding descriptive statistics.

Table C.11: Instrument variable estimation of increase in share of green votes on increase in PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections (restricted Diffusion Model).

	Diffusion Model	IV	
		1st stage	2nd stage
	(1) $F_{\text{PV},t-1}$	(2) $\Delta F_{\text{PV},t-1}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}$			0.83
			(0.35)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$		0.87	
		(0.21)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1} \right)^2$		-0.02	
		(0.01)	
Constant: α		-0.70	0.24
		(0.88)	(1.00)
Ceiling: a_0	12.47		
	(0.99)		
Ceiling (Baseline PV appropriateness): a_1	0.21		
	(0.03)		
Speed: b	0.41		
	(0.00)		
Inflexion point: c	30.70		
	(0.03)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.79	0.75	0.82
Adj. R^2	0.79	0.70	0.78
Final log-likelihood $\mathcal{L}$	-109296.8	-21256.4	-25869.0
F		14.5	5.5
$F_{a_1=0}$ $\mid$ $F^{\text{1st stage}}_{\hat{F}_{\text{PV},t-k-1}, \hat{F}^2_{\text{PV},t-k-1}=0}$ (p-value)	56.5 (0.00)		14.5 (0.00)
N	35168	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 32 years t between 1990 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for the baseline PV appropriateness, which is the share of residential buildings with very good appropriateness for PV. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. Table C.12 contains the descriptive statistics corresponding to this table. SE adjusted for clustering on LAU-2 level in parentheses.

Table C.12: Descriptive statistics, PV (restricted Diffusion Model).

	Mean	St. Dev.	Min.	Max.
Panel A: Diffusion Model (Table C.11 column (1))				
PV diffusion level: $F_{\text{PV},t-1}$	6.8	9.6	0	76
Predicted PV diffusion level: $\hat{F}_{\text{PV},t-1}$	6.8	7.9	.0028	26
Baseline PV appropriateness	37	12	2.5	67
Mean(EligibleVoters)	6812	16839	80	3.7e+05
N	35168			
Panel B: Instrumental Variable Estimation (Table C.11 columns (2-3))				
Increase in share of green votes: $\Delta V_{e,t}$	2.3	4.7	-26	28
PV adoption rate: $\Delta F_{\text{PV},t-1}$	3.9	3.9	0	41
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$	6.8	7.3	.032	25
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1}\right)^2$	100	143	.001	608
Linear prediction	2.8	3.1	-.67	7
StateElection	.45	.5	0	1
EligibleVoters	6906	16840	72	3.8e+05
N	12085			

Notes: The Table contains the descriptive statistics that correspond to the estimations shown in Table C.11 on the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. Panel A refers to the 32 years t between 1990 and 2021. Panel B focuses on 11 points in time (state or federal election e in year t), six when federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five when state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing) took place.

Correcting Instrument Squared .– In Table C.13, we correct instrument squared by the ceiling in the first stage in column (2) and use the predicted values from column (2) in columns (3). We do so because equation (4) implies this correction. The results based on this procedure are qualitatively similar to our baseline results. Table C.14 contains the corresponding descriptive statistics.

Table C.13: Instrument variable estimation of increase in share of green votes on increase in PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections (corrected instrument squared by the ceiling in the first stage in column (2)).

	Diffusion Model	IV	
		1st stage	2nd stage
	(1) $F_{\text{PV},t-1}$	(2) $\Delta F_{\text{PV},t-1}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}$			0.74
			(0.36)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$		0.92	
		(0.22)	
Lagged, pred. instr. squared: $\frac{\left(\hat{F}_{\text{PV},t-k-1}\right)^2}{a_0+a_1\times\text{Baseline PV Appropr.}}$		-1.03	
		(0.23)	
Constant: α		1.61	0.49
		(0.40)	(1.02)
Ceiling: a_0	12.47		
	(0.99)		
Ceiling (Baseline appropriateness): a_1	0.21		
	(0.03)		
Speed: b	0.41		
	(0.00)		
Inflexion point: c	30.70		
	(0.03)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.79	0.75	0.82
Adj. R^2	0.79	0.70	0.78
Final log-likelihood $\mathcal{L}$	-137176.1	-21255.7	-25873.3
F		13.9	4.2
$\text{F}_{a_1=0}$ | $\text{F}^{\text{1st stage}}_{\hat{F}_{\text{PV},t-k-1},\hat{F}^2_{\text{PV},t-k-1}=0}$ (p-value)	56.5 (0.00)		13.9 (0.00)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for the baseline PV appropriateness, which is the share of residential buildings with very good appropriateness for PV. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. Table C.14 contains the descriptive statistics corresponding to this table. SE adjusted for clustering on LAU-2 level in parentheses.

Table C.14: Descriptive statistics, PV (corrected instrument squared by the ceiling in first stage).

	Mean	St. Dev.	Min.	Max.
Panel A: Diffusion Model (Table C.13 column (1))				
PV diffusion level: $F_{\text{PV},t-1}$	5.2	8.9	0	76
Predicted PV diffusion level: $\hat{F}_{\text{PV},t-1}$	5.2	7.5	4.6e-05	26
PV appropriateness: Baseline PV appropriateness	37	12	2.5	67
Mean(EligibleVoters)	6812	16839	80	3.7e+05
N	46158			
Panel B: Instrumental Variable Estimation (Table C.13 columns (2-3))				
Increase in share of green votes: $\Delta V_{e,t}$	2.3	4.7	-26	28
PV adoption rate: $\Delta F_{\text{PV},t-1}$	3.9	3.9	0	41
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}$	6.8	7.3	.032	25
Lagged, predicted instrument squared: $\frac{\left(\hat{F}_{\text{PV},t-k-1}\right)^2}{a_0+a_1\times\text{Baseline PV Appropr.}}$	4.9	6.8	7.8e-05	23
Predicted PV adoption rate: $\Delta\hat{F}_{\text{PV},t-1}$	2.8	1.6	.61	6.8
StateElection	.45	.5	0	1
EligibleVoters	6906	16840	72	3.8e+05
N	12085			

Notes: The Table contains the descriptive statistics that correspond to the estimations shown in Table C.13 on the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. Panel A refers to the 42 years t between 1980 and 2021. Panel B focuses on 11 points in time (state or federal election e in year t), six when federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five when state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing) took place.

Table C.15: Implied cumulative effect of long-term increase in PV adoption on long-term increase in green votes.

	Observed changes		Predicted changes					
			Baseline		Orthogonal. Solar Rad.		Roof orientation	
Election type	Federal	State	Federal	State	Federal	State	Federal	State
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Average long-term increase Green vote share	7.79	20.36						
Average long-term increase times beta PV Adoption rate			12.92	12.90	14.09	14.07	7.36	7.35
Predicted, average long-term increase times beta PV Adoption rate			16.33	16.38	17.81	17.87	9.19	9.22

Notes: There are 1,099 observations. Results are weighted by the average of the number of eligible voters in 1998 and 2021 for federal elections, and by the average of the number of eligible voters in 1996 and 2021 for state elections.

C.3 Understanding the Mechanism

C.3.1 Household vs. Industrial Systems

We use the installed capacity and energy source to classify each system as household or industrial. We consider two cut-offs for household PV systems: 10 and 30 kilowatt-peak $\left(kW_p\right)$. For industrial PV systems, we use a conservative minimum threshold of $100\ kW_p$ of installed capacity. We further extend the analysis to the installation of industrial facilities that produce green energy using wind turbines and biogas.

Our key findings from this exercise are that the effect of PV diffusion on green votes is entirely driven by the diffusion of household systems, and that, in contrast to household systems, the installation of industrial systems (PV, wind or biomass) in a municipality is not associated with an increase in green votes. The Tables below contain the details.

Household PV .– Table C.16 contains results for household systems (smaller than 10kWp). We use our baseline PV appropriateness measure, which is the share of residential buildings with very good appropriateness for PV. Panels A and B in Table C.18 contain the corresponding descriptive statistics. Table C.16 column (3) corresponds to column (4) in Table 2 in the main text.

Table C.16: Instrument variable estimation of increase in share of green votes on increase in household PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections. Here, household PV refers to systems below 10 kWp.

| | Diffusion Model | IV | |
| | | 1st stage | 2nd stage |
	(1) $F_{\text{PV},t-1}^{\leq 10\text{kW}_p}$	(2) $\Delta F_{\text{PV},t-1}^{\leq 10\text{kW}_p}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}^{\leq 10\text{kW}_p}$			1.62
			(0.76)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}^{\leq 10\text{kW}_p}$		1.20	
		(0.32)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1}^{\leq 10\text{kW}_p}\right)^2$		-0.05	
		(0.01)	
Constant: α		-1.30	-0.45
		(0.90)	(1.42)
Ceiling: a_0	10.25		
	(0.52)		
Ceiling (Baseline PV appropriateness): a_1	0.08		
	(0.01)		
Speed: b	0.30		
	(0.00)		
Inflexion point: c	31.65		
	(0.04)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.87	0.79	0.82
Adj. R^2	0.87	0.74	0.78
Final log-likelihood $\mathcal{L}$	-97970.1	-12741.0	-25876.8
F		10.7	4.6
$F_{a_1=0}$ | $F_{\hat{F}_{\text{PV},t-k-1},\hat{F}_{\text{PV},t-k-1}^2=0}^{\text{1st stage}}$ (p-value)	30.5 (0.00)		10.7 (0.00)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing) took place. Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for the baseline PV appropriateness, which is the share of residential buildings with very good appropriateness for PV. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted household PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

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Table C.17 contains results for household systems (smaller than 30kWp). We use our baseline PV appropriateness measure, which is the share of residential buildings with very good appropriateness for PV. Panels C and D in Table C.18 contain the corresponding descriptive statistics. Table C.17 column (3) corresponds to column (5) in Table 2 in the main text.

Table C.17: Instrument variable estimation of increase in share of green votes on increase in household PV diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections. Here, household PV refers to systems below 30 kWp.

	Diffusion Model	IV	
		1st stage	2nd stage
	(1) $F_{\text{PV},t-1}^{\leq 30\text{kW}_p}$	(2) $\Delta F_{\text{PV},t-1}^{\leq 30\text{kW}_p}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}^{\leq 30\text{kW}_p}$			0.93
			(0.41)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}^{\leq 30\text{kW}_p}$		0.90	
		(0.22)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1}^{\leq 30\text{kW}_p}\right)^2$		-0.03	
		(0.01)	
Constant: α		-0.79	0.18
		(0.87)	(1.06)
Ceiling: a_0	11.89		
	(0.89)		
Ceiling (Baseline PV appropriateness): a_1	0.18		
	(0.02)		
Speed: b	0.39		
	(0.00)		
Inflexion point: c	30.71		
	(0.03)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.80	0.76	0.82
Adj. R^2	0.80	0.70	0.78
Final log-likelihood $\mathcal{L}$	-130292.5	-19534.7	-25870.2
F		14.2	5.2
$F_{a_1=0}$ $\mid$ $F_{\hat{F}_{\text{PV},t-k-1},\hat{F}_{\text{PV},t-k-1}^2=0}^{\text{1st stage}}$ (p-value)	51.5 (0.00)		14.2 (0.00)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for the baseline PV appropriateness, which is the share of residential buildings with very good appropriateness for PV. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage (2SLS) estimates of the increase in green votes on the predicted household PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

Table C.18: Descriptive statistics, PV.

	Mean	St. Dev.	Min.	Max.
Panel A: Diffusion Model (Table C.16 column (1))				
Household PV diffusion level: $F_{\mathrm{PV},t-1}^{\leq 10\mathrm{kW}_p}$	3.1	4.8	0	35
Predicted household PV diffusion level: $\hat{F}_{\mathrm{PV},t-1}^{\leq 10\mathrm{kW}_p}$	3.1	4.3	.0007	15
PV appropriateness: Baseline PV appropriateness	37	12	2.5	67
N	46158			
Panel B: Instrumental Variable Estimation (Table C.16 columns (2-3) and Table 2 column (4))				
Household PV adoption rate: $\Delta F_{\mathrm{PV},t-1}^{\leq 10\mathrm{kW}_p}$	2.4	1.9	0	15
Predicted household PV adoption rate: $\Delta \hat{F}_{\mathrm{PV},t-1}^{\leq 10\mathrm{kW}_p}$	1.8	2.6	-1.2	5.6
N	12085			
Panel C: Diffusion Model (Table C.17 column (1))				
Household PV diffusion level: $F_{\mathrm{PV},t-1}^{\leq 30\mathrm{kW}_p}$	4.7	7.9	0	62
Predicted household PV diffusion level: $\hat{F}_{\mathrm{PV},t-1}^{\leq 30\mathrm{kW}_p}$	4.8	6.8	7.3e-05	23
PV appropriateness: Baseline PV appropriateness	37	12	2.5	67
N	46158			
Panel D: Instrumental Variable Estimation (Table C.17 columns (2-3) and Table 2 column (5))				
Household PV adoption rate: $\Delta F_{\mathrm{PV},t-1}^{\leq 30\mathrm{kW}_p}$	3.6	3.4	0	37
Predicted household PV adoption rate: $\Delta \hat{F}_{\mathrm{PV},t-1}^{\leq 30\mathrm{kW}_p}$	2.5	2.9	-.75	6.5
N	12085			
Panel E: Diffusion Model (Table C.19 column (1))				
Industrial PV diffusion level: $F_{\mathrm{PV},t-1}^{\geq 100\mathrm{kW}_p}$	2.3	6.7	0	100
Predicted industrial PV diffusion level: $\hat{F}_{\mathrm{PV},t-1}^{\geq 100\mathrm{kW}_p}$	2.4	3.9	2.0e-08	14
Solar radiation / 1000	1105	23	920	1172
N	45696			
Panel F: Instrumental Variable Estimation (Table C.19 columns (2-3) and Table 2 column (6))				
Industrial PV adoption rate: $\Delta F_{\mathrm{PV},t-1}^{\geq 100\mathrm{kW}_p}$	2.2	5.3	0	100
Predicted industrial PV adoption rate: $\Delta \hat{F}_{\mathrm{PV},t-1}^{\geq 100\mathrm{kW}_p}$	1.5	.39	1.3	2.7
N	11964			

Industrial PV.– Table C.19 contains results for industrial systems $\left(\geq 100\text{kW}_\text{p} \right)$. We normalize the number of industrial PV systems by the number of buildings with appropriate roof larger than 800 sqm, the results are as expected. As instrument for industrial PV, we use average solar radiation [from 1 km times 1km raster cells], see Figure A.6. Panels E and F in Table C.18 contain the corresponding descriptive statistics. Table C.19 column (3) corresponds to column (6) in Table 2 in the main text.

Table C.19: Instrument variable estimation of increase in share of green votes on increase in industrial PV diffusion (normalized by number buildings with appropriate roof larger than 800 sqm) for Baden-Württemberg (weighted by eligible voters) for federal and state elections. Industrial PV refers to systems above 100 kWp.

| | Diffusion Model | IV | |
| | | 1st stage | 2nd stage |
	(1) $F_{\text{PV},t-1}^{\geq 100\text{kW}_p}$	(2) $\Delta F_{\text{PV},t-1}^{\geq 100\text{kW}_p}$	(3) $\Delta V_{e,t}$
Predicted PV adoption rate: $\Delta \hat{F}_{\text{PV},t-1}^{\geq 100\text{kW}_p}$			-2.40
			(1.08)
Lagged, predicted instrument: $\hat{F}_{\text{PV},t-k-1}^{\geq 100\text{kW}_p}$		0.08	
		(0.38)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{PV},t-k-1}^{\geq 100\text{kW}_p}\right)^2$		0.00	
		(0.02)	
Constant: α		1.27	6.30
		(0.68)	(1.68)
Ceiling: a_0	-46.46		
	(14.99)		
Ceiling (Solar radiation): a_1	0.05		
	(0.01)		
Speed: b	0.55		
	(0.02)		
Inflexion point: c	32.12		
	(0.10)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.41	0.44	0.82
Adj. R^2	0.41	0.31	0.78
Final log-likelihood $\mathcal{L}$	-142122.9	-26814.8	-25600.1
F		1.2	4.9
$F_{a_1=0}$ | $F^{\text{1st stage}}_{\hat{F}_{\text{PV},t-k-1},\hat{F}^2_{\text{PV},t-k-1}=0}$ (p-value)	14.4 (0.00)		1.2 (0.30)
N	45696	11964	11964

Notes: Across columns, we analyze the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for solar radiation. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted industrial PV adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

Wind power .– In Table C.20, we focus on wind power plants normalized by a regions area in square kilometers. We use the average wind power potential (see Figure A.14 Panel A) in the diffusion model. Panels A and B in Table C.21 contain the corresponding descriptive statistics. Table C.20 column (3) corresponds to column (7) in Table 2 in the main text.

Table C.20: Instrument variable estimation of increase in share of green votes on increase in wind power diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections.

	Diffusion Model	IV	
		1st stage	2nd stage
	(1)	(2)	(3)
	$F_{\text{Wind},t-1}$	$\Delta F_{\text{Wind},t-1}$	$\Delta V_{e,t}$
Predicted wind power adoption rate: $\Delta \hat{F}_{\text{Wind},t-1}$			74.69
			(52.28)
Lagged, predicted instrument: $\hat{F}_{\text{Wind},t-k-1}$		0.44	
		(0.22)	
Lagged, predicted instrument suqared: $\left(\hat{F}_{\text{Wind},t-k-1}\right)^2$		-11.20	
		(4.34)	
Constant: α		0.00	2.40
		(0.00)	(0.13)
Ceiling: a_0	-0.04		
	(0.01)		
Ceiling (Wind power potential/1000): a_1	0.03		
	(0.01)		
Speed: b	0.16		
	(0.02)		
Inflexion point: c	34.07		
	(3.46)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.07	0.25	0.82
Adj. R^2	0.07	0.09	0.78
Final log-likelihood $\mathcal{L}$	89957.1	33562.4	-25888.5
F		3.8	2.0
$\text{F}_{a_1=0}$ | $\text{F}^{\text{1st stage}}_{\hat{F}_{\text{Wind},t-k-1},\hat{F}^2_{\text{Wind},t-k-1}=0}$ (p-value)	16.2 (0.00)		3.8 (0.02)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for wind power potential. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted wind power adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

Table C.21: Descriptive statistics, wind and biogas.

	Mean	St. Dev.	Min.	Max.
Panel A: Diffusion Model (Table C.20 column (1))				
Wind diffusion level: $F_{\text{Wind},t-1}$	.005	.035	0	2
Predicted wind diffusion level: $\hat{F}_{\text{Wind},t-1}$	.0053	.0079	-.0027	.082
Wind power potential	2394	654	1307	5684
N	46158			
Panel B: Instrumental Variable Estimation (Table C.20 columns (2-3) and Table 2 column (7))				
Wind turbine adoption rate: $\Delta F_{\text{Wind},t-1}$	.0033	.028	0	1.5
Predicted wind turbine adoption rate: $\Delta \hat{F}_{\text{Wind},t-1}$	.0028	.0014	-.02	.0052
N	12085			
Panel C: Diffusion Model (Table C.22 column (1))				
Biogas diffusion level: $F_{\text{Biogas},t-1}$	.02	.056	0	1.2
Predicted biogas diffusion level: $\hat{F}_{\text{Biogas},t-1}$	.02	.026	-.021	.093
Solar radiation / 1000	1105	23	920	1172
N	46158			
Panel D: Instrumental Variable Estimation (Table C.22 columns (2-3) and Table 2 column (8))				
Biogas adoption rate: $\Delta F_{\text{Biogas},t-1}$	.012	.035	0	.6
Predicted biogas adoption rate: $\Delta \hat{F}_{\text{Biogas},t-1}$	.013	.019	-.054	.035
N	12085			

Biogas plants .– In Table C.22, we focus on biogas normalized by a regions area in square kilometers. We use mean average solar radiation [from 1 km times 1km raster cells] in the diffusion model. Panels C and D in Table C.21 contain the corresponding descriptive statistics. Table C.22 column (3) corresponds to column (8) in Table 2 in the main text.

Table C.22: Instrument variable estimation of increase in share of green votes on increase in biogas systems diffusion for Baden-Württemberg (weighted by eligible voters) for federal and state elections.

	Diffusion Model	IV	
		1st stage	2nd stage
	(1) $F_{\text{Biogas},t-1}$	(2) $\Delta F_{\text{Biogas},t-1}$	(3) $\Delta V_{e,t}$
Predicted biogas adoption rate: $\Delta\hat{F}_{\text{Biogas},t-1}$			37.92
			(23.89)
Lagged, predicted instrument: $\hat{F}_{\text{Biogas},t-k-1}$		1.71	
		(0.55)	
Lagged, predicted instrument squared: $\left(\hat{F}_{\text{Biogas},t-k-1}\right)^2$		-15.31	
		(4.63)	
Constant: α		-0.01	2.08
		(0.01)	(0.32)
Ceiling: a_0	-0.44		
	(0.12)		
Ceiling (Solar radiation / 1000): a_1	0.45		
	(0.11)		
Speed: b	0.46		
	(0.01)		
Inflexion point: c	27.89		
	(0.15)		
LAU-2 x Election-type fixed effects	No	Yes	Yes
Year x Election-type fixed effects	No	Yes	Yes
R^2	0.31	0.38	0.82
Adj. R^2	0.31	0.24	0.78
Final log-likelihood $\mathcal{L}$	73037.6	28743.7	-25883.9
F		5.6	2.5
$F_{a_1=0}$ $\mid$ $F^{\text{1st stage}}_{\hat{F}_{\text{Biogas},t-k-1},\hat{F}^2_{\text{Biogas},t-k-1}=0}$ (p-value)	16.3 (0.00)		5.6 (0.00)
N	46158	12085	12085

Notes: Across columns, we analyze the LAU-2 level in the federal state Baden-Württemberg, Germany (for 1,099 LAU-2 municipalities r) and several points in time. In column (1), we include the 42 years t between 1980 and 2021. In columns (2-3), we focus on 11 points in time (state or federal election e in year t): six with federal elections (2021, 2017, 2013, 2009, 2005, and 2002 (and 1998 due to differencing) and five with state elections (2021, 2016, 2011, 2006, and 2001 (and 1996 due to differencing). Column (1) shows the estimates of the Diffusion Model (equation (3)) with non-linear least squares. a_0 and a_1 affect the diffusion ceiling, b the speed and c the inflexion point. a_1 is the coefficient for solar radiation. Column (2) presents the first stage (2SLS) estimates with the lagged, predicted instrument and the lagged, predicted instrument squared. The lagged instrument is predicted according to the Diffusion Model from column (1). Column (3) shows the second stage estimates (2SLS) of the increase in green votes on the predicted biogas adoption rate (from column (2)). Columns (2)-(3) are weighted by the number of eligible voters at election e in year t. SE adjusted for clustering on LAU-2 level in parentheses.

C.3.2 Own vs. Rent Dwelling

Table C.23 contains the descriptive statistics for the balanced panel (shown in column (1) of Table 3 in the main text).

Table C.23: Descriptive statistics, SOEP.

	Mean	Std. Dev.	Min.	Max.
$\Delta Green_t$	.029	.17	0	1
$Solar_{t-1}$	.086	.28	0	1
$\Delta Solar_{t-3:t-1}$	.026	.16	0	1
$\Delta Solar_t$	.006	.077	0	1
$\Delta Green_{t-3:t-1}$	.14	.35	0	1
N	57933			

Notes: There are 4930 individuals from 3573 households in the balanced sample. We focus on the years 2020 through 2009 (along with 2008 and 2007, due to differencing).

Table C.24 contains the logit coefficient estimates for the unbalanced panel. In Table C.25, we show the corresponding descriptive statistics (for Panel A column (1), Table C.24).

The results are in line with those obtained with the balanced panel: (i) the estimates confirm that a household's adoption of a solar energy system is positively associated with an increase in its support for the Green Party (column (1) in Panel A of Table C.24). (ii) Columns (3) through (6) in Panel A of Table C.24 show that, while for home owners there is a strong positive association between the adoption of a solar system support for the Green Party, there is no association for non-home owners. (iii) In columns (1), (3) and (5) of Panel B of Table C.24, we see that Green Party supporters are not more likely to adopt solar systems than those who do not support the Green Party. (iv) Columns (2), (4) and (6) of Panel B of Table 3 illustrate that individuals who became greener were not more likely to install solar energy systems than those who did not become greener in a previous three-year period.

Table C.24: Logit coefficient estimates for Socio-Economic Panel (unbalanced panel), which is a representative longitudinal survey.

Panel A: Estimates of solar level and solar change on change in green attitude

	All		Home owners		Non-home owners	
	(1) $\Delta Green_t$	(2) $\Delta Green_t$	(3) $\Delta Green_t$	(4) $\Delta Green_t$	(5) $\Delta Green_t$	(6) $\Delta Green_t$
$Solar_{t-1}$	0.36		0.39		-0.06	
	(0.06)		(0.07)		(0.17)	
$\Delta Solar_{t-3:t-1}$		0.45		0.57		-0.34
		(0.15)		(0.15)		(0.68)
ln (Real Income$_t$)	0.20		0.18		0.19	
	(0.04)		(0.05)		(0.05)	
Δ ln (Real Income$_t$)		-0.04		-0.28		0.19
		(0.08)		(0.10)		(0.11)
N	231,111	106,130	116,200	56,800	114,648	45,131
# individuals	42,748	15,049	22,244	8,913	24,816	7,859
# households	25,305	9,675	12,211	5,272	16,045	5,687
DF$_M$	196	189	195	176	193	166
Final log-likelihood $\mathcal{L}$	-27994.2	-11492.2	-14796.6	-6198.4	-13065.2	-5162.0

Panel B: Reverse causality: Estimates of level and change in green attitude on solar change

	All		Home owners		Non-home owners	
	(1) $\Delta Solar_t$	(2) $\Delta Solar_t$	(3) $\Delta Solar_t$	(4) $\Delta Solar_t$	(5) $\Delta Solar_t$	(6) $\Delta Solar_t$
$Green_{t-1}$	0.01		0.03		-0.02	
	(0.15)		(0.19)		(0.27)	
$\Delta Green_{t-3:t-1}$		0.18		0.20		0.19
		(0.12)		(0.15)		(0.21)
ln (Real Income$_t$)	0.74		0.48		0.96	
	(0.09)		(0.13)		(0.14)	
Δ ln (Real Income$_t$)		0.20		0.09		0.56
		(0.19)		(0.24)		(0.27)
N	92,748	91,620	46,601	46,043	31,174	30,406
# individuals	15,140	15,061	8,726	8,671	7,360	7,283
# households	9,711	9,652	5,100	5,069	5,304	5,243
DF$_M$	139	138	115	114	95	91
Final log-likelihood $\mathcal{L}$	-4146.5	-4201.5	-2779.2	-2788.4	-1212.6	-1245.7

Notes: We study the years 2020 through 2009 (along with 2008 and 2007, due to differencing). In columns (1), (3) and (5), we include time∗NUTS-1, college, vocational degree and labor status dummies and control for age. In columns (2), (4) and (6), we include time∗NUTS-1 and dummies for changes in college, in vocational degree and in labor status. We only examine those who did not have a solar system in 2007. Table C.25 in this Online Appendix contains the corresponding descriptive statistics. SE adjusted for clustering on household level in parentheses.

Table C.25: Descriptive statistics, SOEP, unbalanced panel.

	Mean	Std. Dev.	Min.	Max.
$\Delta Green_t$	.029	.17	0	1
$Solar_{t-1}$	.076	.26	0	1
$\Delta Solar_{t-3:t-1}$	.023	.15	0	1
$\Delta Solar_t$	.0074	.086	0	1
$\Delta Green_{t-3:t-1}$	.099	.3	0	1
$\ln(\text{Real Income}_t)$	7.9	.58	2.3	12
$\Delta \ln(\text{Real Income}_t)$	.024	.29	-7	3.9
Vocational education$_t$	.66	.48	0	1
College education$_t$	.24	.43	0	1
Labor status$_t$	.6	.49	0	1
Age$_t$	50	17	18	105
N	231111			

Notes: There are 42748 individuals from 25305 households in the unbalanced sample. We examine the years 2020 through 2009 (along with 2008 and 2007, due to differencing).

C.3.3 Votes for Money

The Green Party was the key proponent of the feed-in tariff scheme, EEG, implemented in 2000. The EEG was significantly more generous than the previous system (see Figure A.3). One possibility is that agents that adopted PV systems after 2000 voted for the Green Party in subsequent elections to reward the party for the income they accrued by selling the electricity they produced at the higher tariffs.

We consider this is an unlikely rationale for our findings. Our estimated effect of PV adoption on change in Green Party votes is unaffected by controlling for changes in the profitability of the PV systems (see Table 4 column (1) in the main text). If the votes for money mechanism lies behind our effect, one would expect that controlling for variation in electricity income should make the effect of PV adoption on green votes insignificant. Instead, we observe that the effect of instrumented adoption is unaffected by controlling for the changes in the profitability of PV system adoption.

To further explore this issue we calculate the net income from installing a PV system relative to household income. (See Table C.26 for a definition of the parameters in expression (6), their value and source.)

$$
\begin{aligned}
\text{Profit Income Ratio} = \text{Capacity} * \Bigg[\ & \sum_{t=0}^{T=19} \left(\frac{1-v}{1+r}\right)^t \Big[\text{\# Full-load Hours} \ * \ (\text{Feed-in Tariff} \\
& * \ (1 - \text{Self-consumption share}) + \text{Household electricity price} \\
& * \ \text{Self-consumption share} \ * \ (1+d)^t) \Big] - \text{Investment per kW}_\text{p} \\
& * \left(1 + \sum_{t=0}^{T=19} \frac{b}{(1+r)^t}\right) \Bigg] / (\text{Household Income} * 20).
\end{aligned}
\tag{6}
$$

 In this formula, both the costs and revenues from PV systems are proportional to the capacity of the PV system. The first term in the numerator is the present discounted value of revenues per unit of capacity installed,[42] while the second term is the cost of installing and operating the PV system per unit

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[42]We use a standard value for the annual discount rate, 5 percent per year (e.g., Cooley and Prescott (1995)).

of capacity. Because we want to evaluate the economic significance of the net revenues from PV systems, we scale them by the annual average household income (DESTATIS, 2022).

Revenues from PV systems are calculated by multiplying the level of the feed-in tariff times the number of full-load hours the system operates per year. The feed-in tariff varies with the year of installation of the system. The number of full-load hours mainly depends on the location, the orientation and the inclination of the installation. The median number of full-load hours for roof areas suitable for PV on residential buildings in Baden-Württemberg is 1117 hours (LUBW, 2016). We also consider a value for the full-load hours of 1,245, which is at the 90th percentile for roof areas suitable for PV on residential buildings in Baden-Württemberg. For the profit Income Ratio since 2012, we also account for the Household electricity price and the self-consumption share of PV electricity because around 2012 the household electricity price surpassed the level of the feed-in tariff (see Figure A.3). Before it was more attractive to feed all PV electricity into the grid, since then households had the incentive to consume PV electricity themselves.[43]

The costs of installing PV systems dropped very significantly between 2000 and 2020 (Janzing, 2010; BSW-Solar, 2012; Solaranlagen Ratgeber, 2022). In 2000, the cost of installing one kW_p was 8,000 EUR while in 2009 it was approximately 4,000 EUR and in 2020 it was approximately 1670 EUR. In addition to the installation costs, there is an annual cost of operation and maintenance (b) which amounts to 1 percent of the cost of installation (BMU, 2011; Wirth, 2013).

We calculate the median and 90th percentile capacity installed in residential buildings in two steps. The median potential area for PV installation in residential buildings is 21 sqm, and the 90th percentile is 50 sqm. LUBW (2016) documents that it is necessary to install between 6.6 and 11 sqm of solar modules to reach a capacity of 1 kW_p. Based on this range, we use a value of 8 sqm per kW_p in our calculations. This yields a median capacity supported by residential buildings of 2.6 kW_p, while for the 90th percentile it is 6.3 kW_p.[44]

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[43]We use the average increase of the household electricity price between 1998 and 2021, which is 3 percent per year, as the annual discount rate in the electricity price (d).

[44]We verify our calculation: For this second attempt, we again calculate the median and 90th percentile capacity installed in residential buildings in two steps. First, we use the information from another roof census conducted by the Karlsruher Energie- und Klimaschutzagentur (KEK, 2010) for Karlsruhe in Baden-Württemberg (Karlsruhe is a 300,000 city (among the 25 largest in Germany) with a solar radiation similar to the average in Baden-Württemberg (DWD, 2010)), to calculate the potential area

Table C.26: Details on the calculation of PV profits.

Definition	Parameter	Value	Source
Household Income	Disposable income per household [EUR]	Yearly	DESTATIS (2022)
Feed-in Tariff	Level feed-in tariff [EUR]	Yearly	StromEinspG (1990); EEG (2000, 2004, 2009, 2011, 2012, 2014, 2017)
Household electricity price	Level [EUR]	Yearly	BDEW (2016); DESTATIS (2016a)
Investment per kW$_p$	Investment costs [EUR]	Yearly	2000-05: Janzing (2010); 2006-09: BSW-Solar (2012), pvX (2012) 2012-20: Solaranlagen Ratgeber (2022)
r	Weighted average cost of capital	5.0 percent	Cooley and Prescott (1995), BMU (2011),Wirth (2013)
b	Yearly operating costs	1.0 percent	BMU (2011), Wirth (2013)
d	Yearly increase in electricity price	3.0 percent	average increase for households between 1998 and 2021: BDEW (2016)
$T+1$	Life span [years]	20	EEG (2000, 2004, 2009, 2011, 2012, 2014, 2017), BMU (2011),Wirth (2013)
v	Yearly decrease in revenue	0.5 percent	BMU (2011), Wirth (2013)
Capacity	Median capacity $\left[\text{kW}_p\right]$	3	LUBW (2016)
	90th percentile capacity $\left[\text{kW}_p\right]$	7.1	LUBW (2016)
Full-load Hours	Median (for roof areas suitable for PV) on residential buildings in Baden-Württemberg [hours/year]	1117	LUBW (2016)
	90th percentile (for roof areas suitable for PV) on residential buildings [hours/year]	1245	LUBW (2016)
Potential module area	Median potential module area (of roof areas suitable for PV) on residential buildings in Baden-Württemberg [sqm]	21	LUBW (2016)
	90th percentile of potential module area (of roof areas suitable for PV) on residential buildings in Baden-Württemberg [sqm]	50	LUBW (2016)
Self-consumption share	for 2.6 kW$_p$ and for 6.3 kW$_p$ PV system	30 percent	based on Weniger et al. (2012), who specify a self-consumption share of 30 percent for a 5 kW$_p$ PV system

Table C.27 reports the value of the profit to income ratio (equation 6) for four combinations of full-load hours and capacity, that represent the median and 90th percentile values in each dimension. Given the time series variation in the feed-in tariff and installation costs, we report the ratios for six years over the period 2000-2020. The profit to income ratio ranges from -1.9 percent to 2.0 percent with lower values for earlier years and for systems with lower capacity and full-load hours.

Table C.27: Yearly profits from investment in PV as share of yearly average household income according to yearly full load hours and time of installation.

Year of installation	PV system with 2.6 kW$_p$		PV system with 6.3 kW$_p$	
	Full load hours [h/a]		Full load hours [h/a]	
	Median	90th percentile	Median	90th percentile
	1117	1245	1117	1245
2000	-0.8 percent	-0.5 percent	-1.9 percent	-1.1 percent
2004	0.2 percent	0.6 percent	0.4 percent	1.3 percent
2006	0.3 percent	0.6 percent	0.7 percent	1.4 percent
2010	0.6 percent	0.8 percent	1.5 percent	2.0 percent
2015	0.2 percent	0.3 percent	0.4 percent	0.6 percent
2020	0.2 percent	0.3 percent	0.5 percent	0.7 percent

The main conclusion we extract from this exercise is that, even for systems with high capacity and installed in areas with high solar radiation, the net revenues from PV electricity production are relatively negligible for households. Therefore, we do not consider plausible that PV adopters are compensating to the Green Party with their votes *in exchange for* the net income they earn from PV systems.

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in residential buildings' roofs to install PV systems. In particular, the census used information on the roof inclination, area, orientation and solar radiation to calculate the potential capacity of PV systems on each roof. The census covered 40,043 residential buildings in Karlsruhe. DESTATIS (2013) reports that in 2010 there were 17,631 single-family homes in Karlsruhe. We now focus on single-family homes because for these one household can easily decide whether to install a PV systems. In contrast, the coordination between several households is a relevant barrier to adoption. KEK does not identify which of the residential buildings correspond to single-family dwellings. We assume in our calculations that they are the 17,631 residential buildings with smaller potential roof area for PV installation. It follows that the median potential area for PV installation in single household residences is 37 sqm, and the 90th percentile is 58 sqm in Karlsruhe. KEK (2010) documents that it is necessary to install between 8 and 10 sqm of solar modules to reach a capacity of 1 kW$_p$. Based on this range, we again use a value of 8 sqm per kW$_p$ in our calculations. This yields a median capacity supported by single-family residences of 4.6 kW$_p$, while for the 90th percentile it is 7.3 kW$_p$. Both values are within or close to the range of our first attempt (median of 2.6 kW$_p$ and the 90th percentile of 6.3 kW$_p$.

C.3.4 Periods with high feed-in tariffs and high profitability

Feed-in tariffs were high before 2012, and profitability was high in 2004 and 2006-2011. We define high profitability as a PV profit-to-income ratio of more than 1 percent for systems with installed capacity and potential solar radiation (full load hours) at the 90th percentile (shown in the last column of Table C.27). We calculate averages for consecutive elections of a given kind and observe that the time periods before the federal elections in 2009 and 2013 and the period before the state election in 2011 were periods with high average PV profitability.