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Spatial-neighbour effects in the installation of solar photovoltaic technology in England and Wales

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A positive spatial-neighbour effect in the installation of domestic solar photovoltaic panels (PV) exists if households have a greater probability of installing solar PV if they have a greater installed base of solar PV - the cumulative number of completed installations - in their proximity. This can be, roughly, thought of as arising due a given household being more likely to install a solar PV if they see nearby households with solar panels. Conversely a negative spatial-neighbour effects may be observed, where a higher installed base is associated with a lower current installation rate. This might be because of a saturation effect or indeed negative local word of mouth on the outturn net benefits of installation.

We estimate spatial-neighbour effects using the first-difference method pioneered by Bollinger and Gillingham (2012) and Richter (2014), using data on 1.4 million solar PV systems, by far the largest dataset currently examined in the literature. The period we examine is 2010–2024, allowing us to study how spatial-neighbour effects change over time and after changes to subsidies or energy prices. As a robustness check, we extend our regression specifications by the squared installed base to investigate for non-linearities in spatial-neighbour effects and then evaluate spatial-neighbour effects at the postcode district level. For comparison, we also consider data on heat pump installations, which are a less visible technology than solar PV, but also a less common technology: only 0.94%of households in the UK have installed heat pumps as of December 2024 (MCS, 2025).

As an extension, the impact of the group-buying scheme ”Solar Together” on installation rates is evaluated, given that the literature has suggested that these schemes can utilise spatial-neighbour effects to significantly increase the number of solar PV systems in an area.

Our results confirm the presence of positive spatial-neighbour effects identified by other authors in the first period of study, 2010–2015, but identify negative spatial-neighbour effects in both 2016–2020 and 2021–2024. This is a concerning finding for the current Labour government's aim to triple solar capacity by 2030, suggesting that extremely high installation

rates in 2010–2015 were aided by strong peer effects but these peer effects have diminished over time as knowledge about solar PV technology becomes more widespread and so observational learning falls in importance. Negative spatial-neighbour effects instead suggest that there is a degree of saturation within the solar PV market, given the rise in the number of total solar PV systems in England and Wales to 1.4 million. These spatial-neighbour effects are the multiplier effects of government policy to increase solar PV capacity, and so given the most recent estimates, this suggests that extensive financial incentives may be required to increase solar PV capacity to the targeted level. The finding that schemes such as Solar Together have been unsuccessful in increasing solar PV installations given negative spatial-neighbour effects is a further cause of concern but these schemes may have been otherwise successful at reducing prices and search costs for participants.

However, this decrease in spatial-neighbour effects is likely not simply due to more widespread information about solar PV and the greater number of solar PV systems, but may also be caused by reductions in financial incentives to adopt solar PV, such as the cut in the FIT rate in January 2016. Reductions in these financial incentives may contribute to negative spatial-neighbour effects by reducing the pool of likely adopters of solar PV, thereby increasing saturation, and by leading to more critical word-of-mouth between neighbours around solar PV. This is indicated by the increase in spatial-neighbour effects in the period 2021–2024, following the energy cost crisis, which instead increased the financial incentives to adopt solar PV. This suggests that policies involving financial incentives to increase solar PV installation rates may increase the extent of their own multiplier effects and even lead to further installations as more positive spatial-neighbour effects increase the effectiveness of schemes such as Solar Together.

However, there is an important caveat. Autocorrelation in the errors of these regressions is sufficiently high to cause omitted variable bias in the estimation of these spatial-neighbour effects. If this bias is very large, our estimates of spatial-neighbour effects may be significantly incorrect. Further research should take care to report these tests to ensure that possible inconsistency in their results is taken into account.

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