The adoption of solar panels undermines the way in which we finance the next generation of energy infrastructure. That is the main conclusion drawn by Fabian Feger, Nicola Pavanini and Doina Radulescu in research to be presented at the annual congress of the European Economic Association in Geneva in August 2016.

Renewable energy production has taken off in recent years. By producing their own energy, solar panel owners can save on consumption-based grid charges that are currently the main financing tool of the energy grid in many countries. Therefore solar panel owners still rely on access to the energy grid, but they contribute less to its financing. The result: consumption-based charges would need to be doubled to make up for lost financing, negatively affecting the poorest in society.

The authors use energy and income data for 180,000 Swiss households in the years 2008-13 to evaluate the redistributive impact of different tariff designs, and propose alternative tariff schemes using a mix of consumption-based and fixed charges to secure grid financing while simultaneously reaching redistributive and renewable energy production goals.

The authors comment: ‘Policy-makers need to recognise the indirect redistributive effects of their renewable energy policies. Energy infrastructure is one of the areas where tariff designs need to be re-evaluated.’

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Many countries heavily subsidise renewable energy production. In Switzerland, for example, the government has set up a mechanism that directly buys renewable energy from producers at a cost-covering rate. Combined with declining purchasing and installation costs of solar panels it has led to an accelerating rate of adoption, as not only firms but also households can significantly profit from investing in solar panels.

While these policies succeed in their main goal, namely stimulating green energy production, their adverse impact on grid financing is often unknown or neglected. Furthermore, if some policies lead to a reduction in the variable prices that households face, an undesirable effect may arise as well – namely households raising their energy consumption, which runs counter to many countries’ energy strategies.

Detailed knowledge of households’ demand reaction to changes in energy prices is an important prerequisite to evaluate these welfare effects. Altering consumption-based grid charges essentially means changing the energy price. Thus, the authors make use of various econometric methods to estimate this demand reaction. The results show that a price increase of 1% leads to a decrease in consumption of 0.2%.

Future adoption of solar panels is another important piece of the puzzle. The study presents a model in which households base their decision about installing a solar panel on a comparison between financial gains and investment costs. A key factor of this assessment is the consumption-based grid charge. If households expect these charges to rise, producing their own energy becomes even more desirable.
While high consumption-based grid charges stimulate PV adoption they also provide a potential source of undesired redistribution. Richer households are more likely to buy a solar panel and therefore see a reduction in grid contributions. Put differently, without an adjustment in tariff design, a situation could occur where poor household end up financing the energy grid for high income classes.

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