DISTRIBUTIONAL ASPECTS OF FINANCING CLEAN ENERGY INFRASTRUCTURE

Can the British Feed-in Tariff for small scale PV systems be made fairer?

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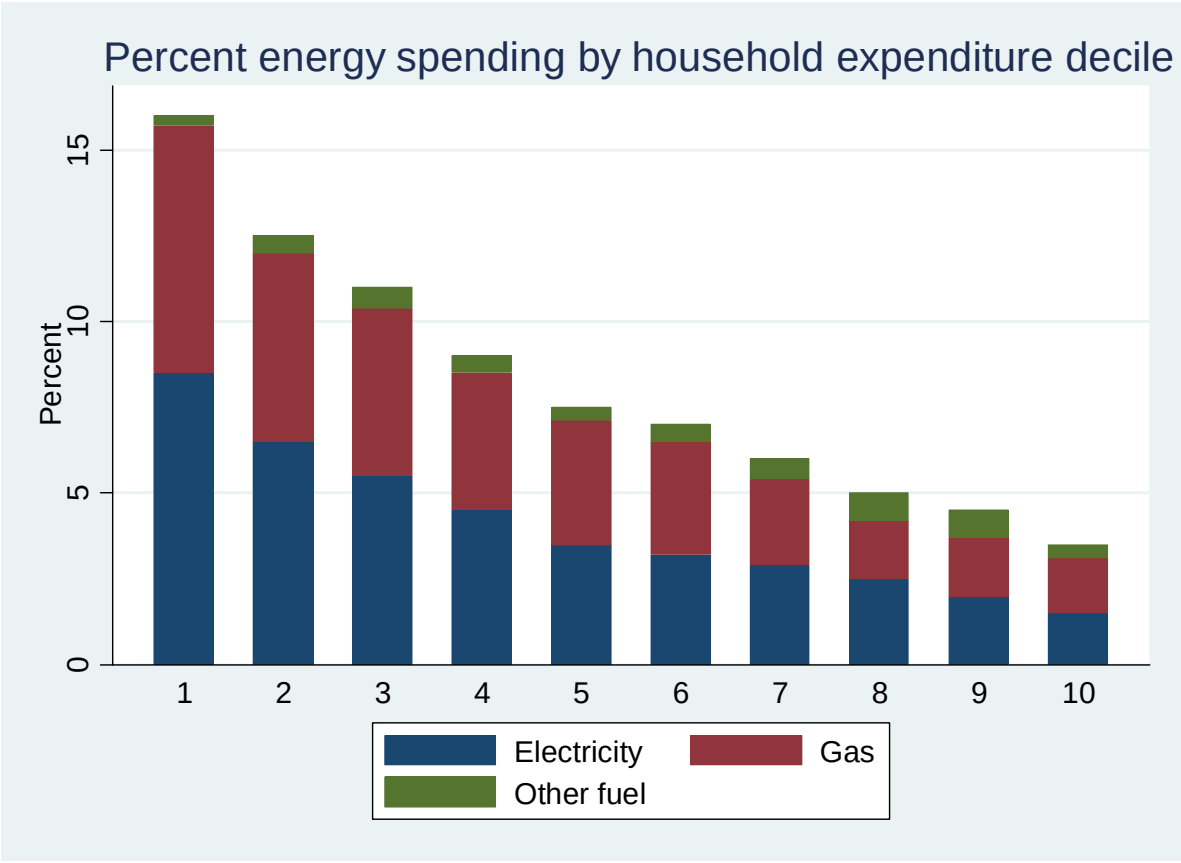
Motivation

- Major investment in clean energy infrastructure
  - UK Climate Change Act (2008)
  - EU Renewable energy Directive (2009)

- How should we finance it?
  - Tax payers or energy users
  - Equity for fairness
  - Equity to sustain political support for decarbonisation

Household energy expenditure

The way clean energy infrastructure is financed should at least not worsen this picture.



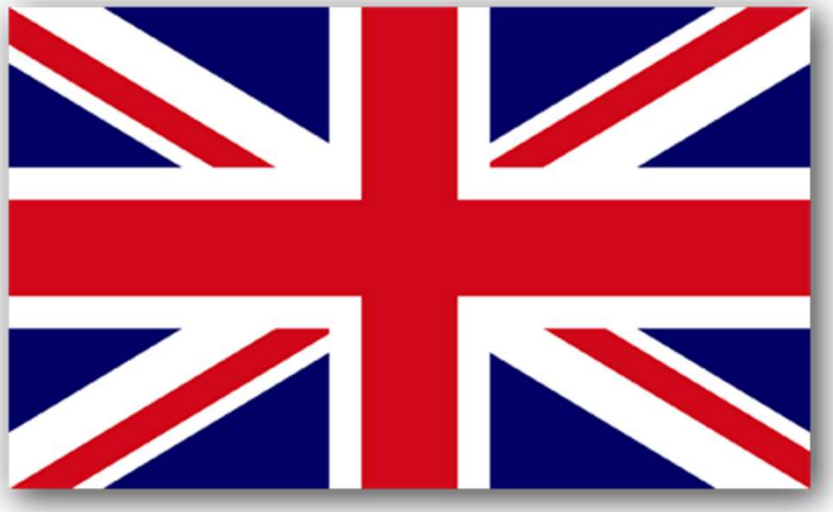
Research approach

- Distributional aspects of clean energy investment program
  - British Feed-in Tariff for small scale renewable energy installations
- Distribution of benefits
  - How are PV installations being taken up across household types
- Distribution of costs
  - Compare British FiT to programs in Australia and California

The British feed-in tariff (FiT)

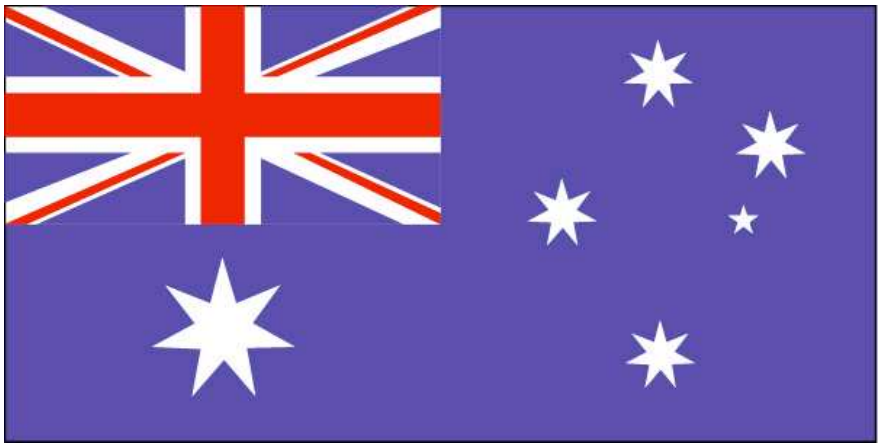
- Started April 1st, 2010
- Pays installation owners for electricity they generate
- Payments guaranteed for 20-plus years
- Several policy motivations

Who pays for FiTs



- British Feed-in-Tariff, 2010 – 2013
- 380,000 installations to date, GBP 500 million per year
- Paid for by electricity bill payers
- Electricity suppliers responsible for distributing cost

Who pays for FiTs



- Australian Solar Homes and Community Program, 2000 - 2009
- 110,000 installations registered, cost AUD 1.1 billion
- Paid for by Federal government
- Uptake restricted through means testing

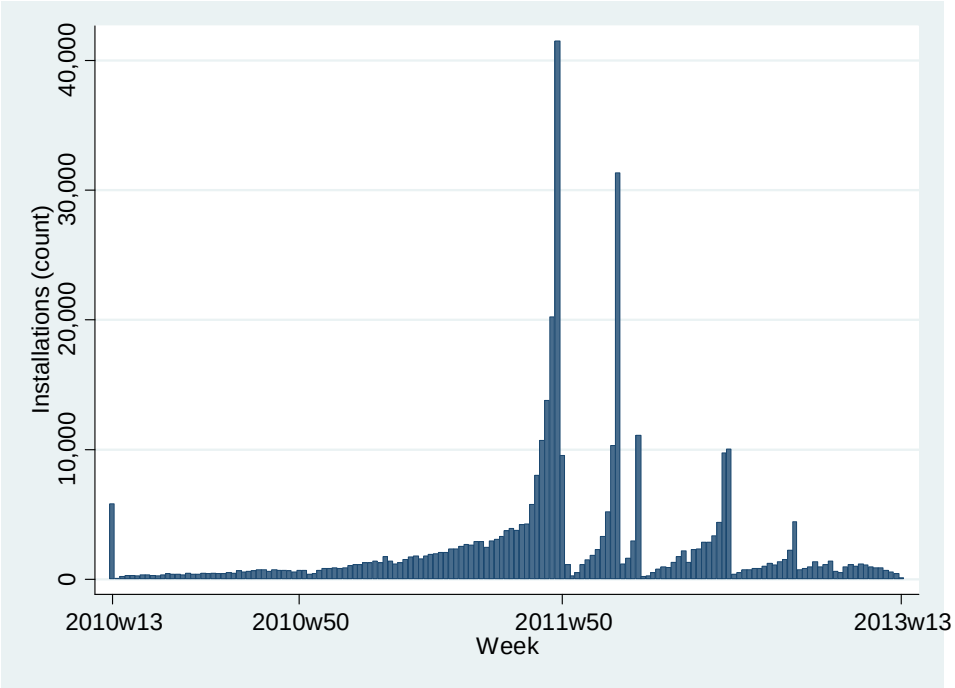
Who pays for FiTs

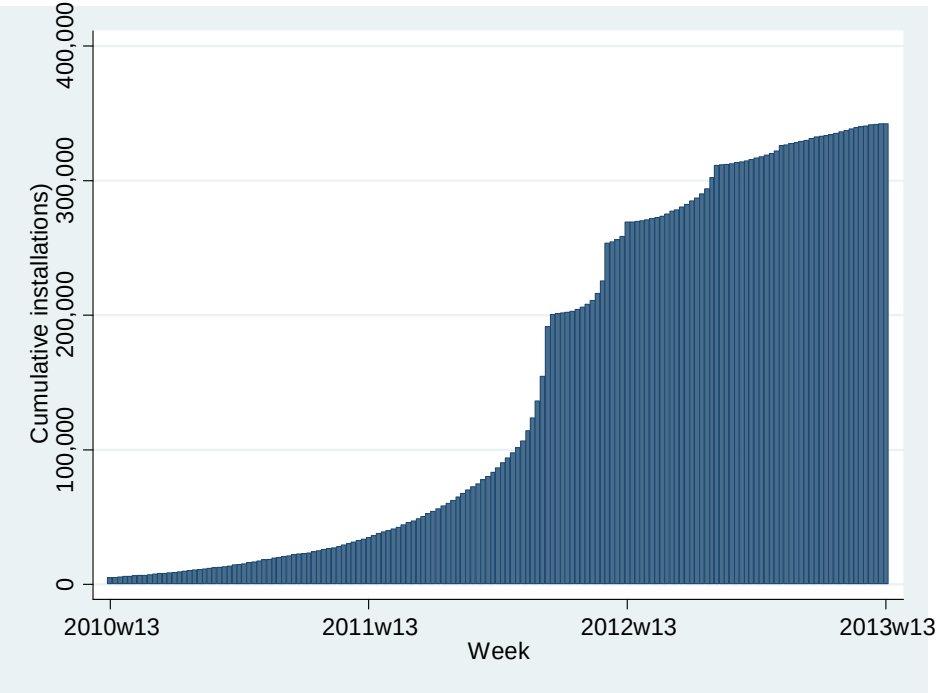
- California Solar Initiative, 2006 - 2016
- 156,000 installations registered, cost USD 2.1 billion
- Funded by electricity customers
- Ten percent earmarked for low income households

British FiT: distribution of costs

- The British FiT is both:
  - Funded by electricity bill payers
  - Without safeguard to ensure cost distribution is not regressive
- Is cost distribution regressive?
  - Interviewed civil servants who designed policy
  - Spoke with electricity suppliers
  - A: We cannot say - data access issues
- But it appears that responsibility for how the cost of the scheme is spread has been relinquished to electricity suppliers

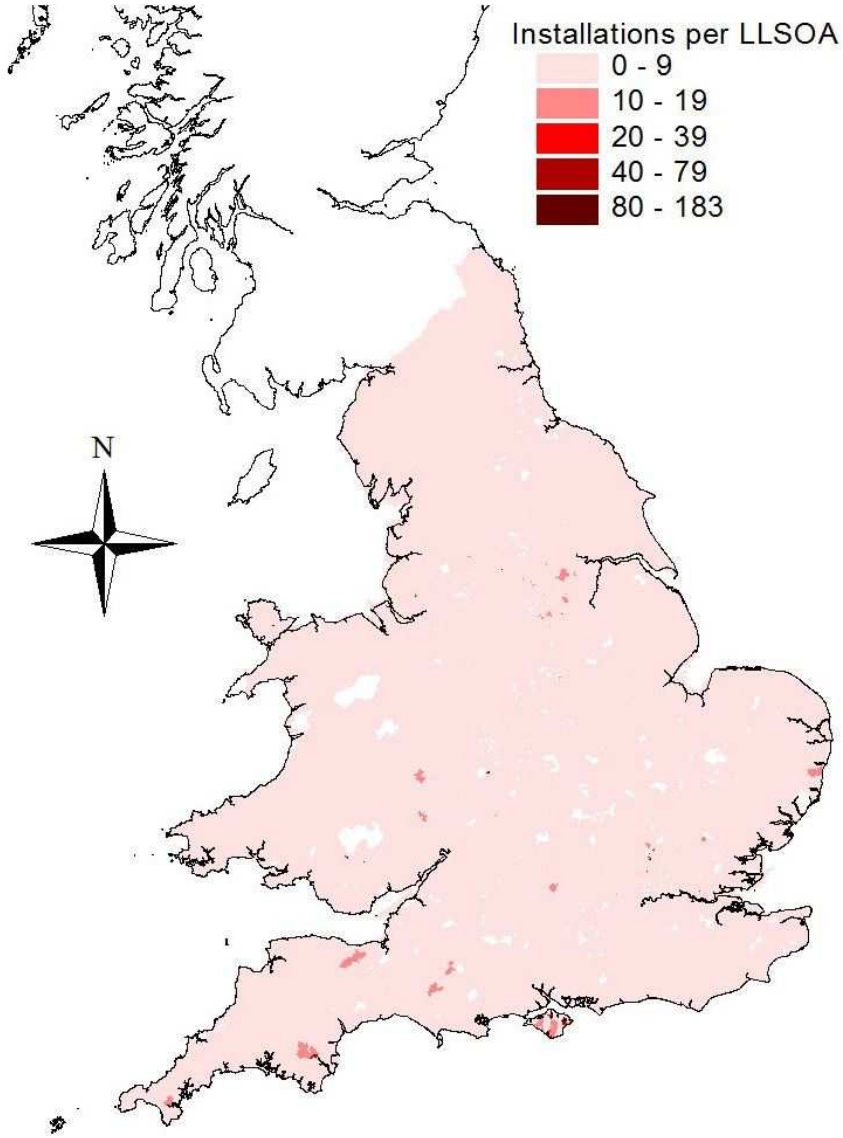
Distribution of benefits: installation uptake over time

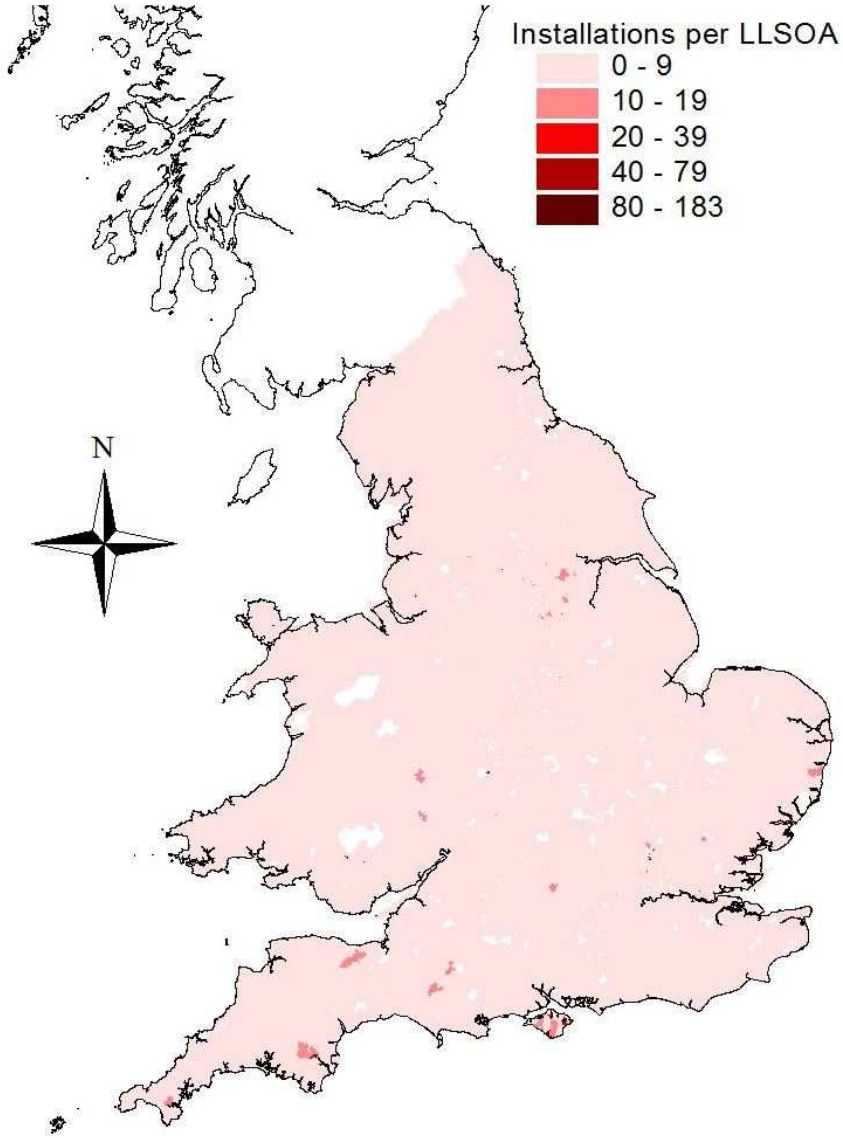




Distribution of benefits: installation uptake by technology

	Installations	Av. size (kW)
Anaerobic digestion	48	795.5
Hydroelectric	364	96.6
Micro CHP	441	1.0
Photovoltaic	374,031	4.2
Wind	4,647	28.7
All	379,531	4.72


Installations per LLSOA
0 - 9
10 - 19
20 - 39
40 - 79
80 - 183
N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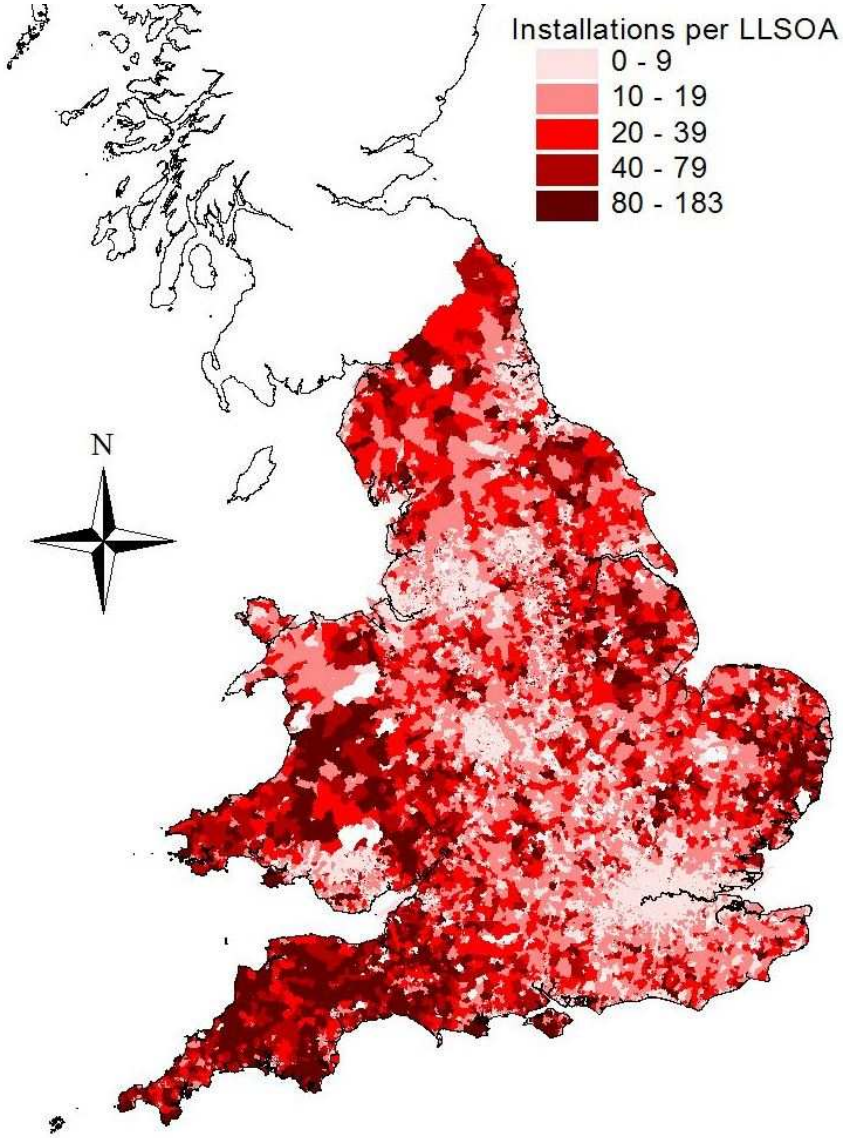
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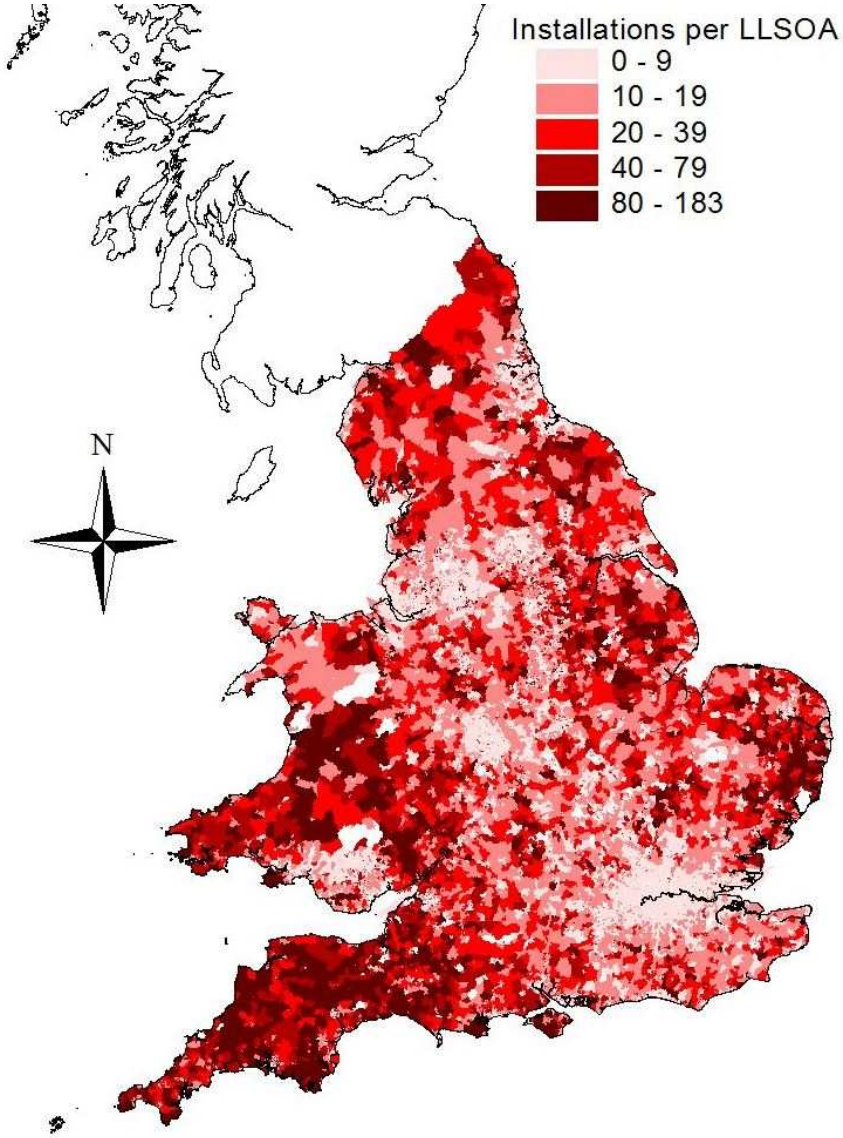
Installation uptake across space

More installations in south than north

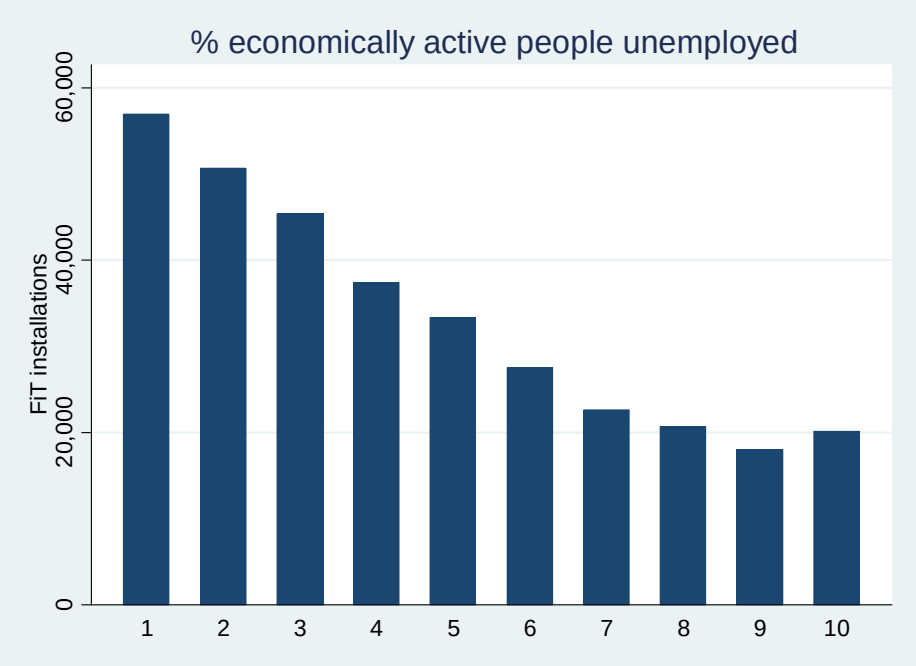
More installations in non-urban than urban areas

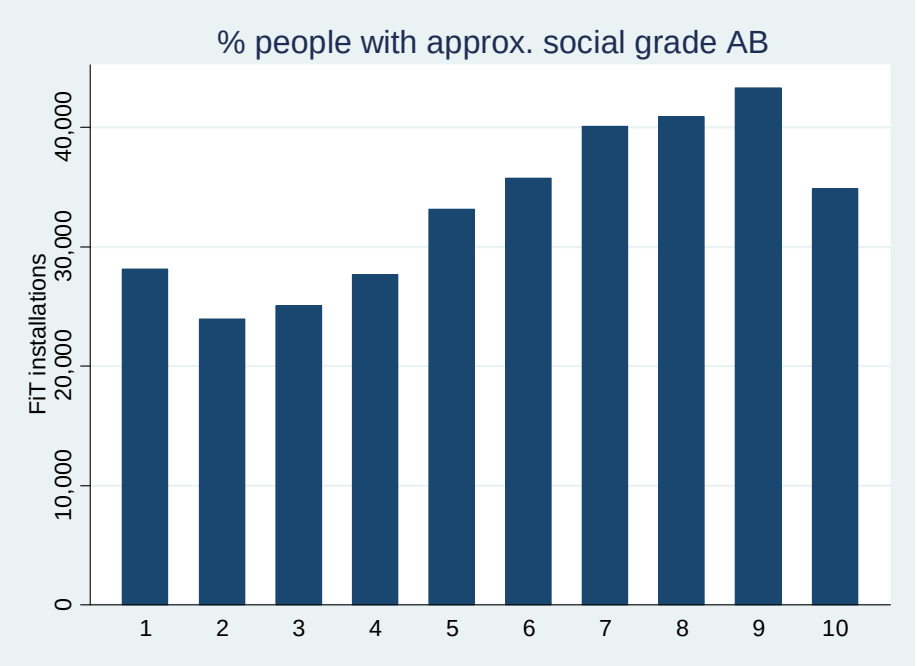


Distribution of benefits: uptake and socioeconomic characteristics

	Zero installation areas	1+ installation areas
Index of multiple deprivation	0.369	0.198
Perc. people unemployed	0.067	0.041
Perc. people of social grade AB	0.180	0.232
Perc. HHs owning property	0.181	0.331

Installations by prosperity decile

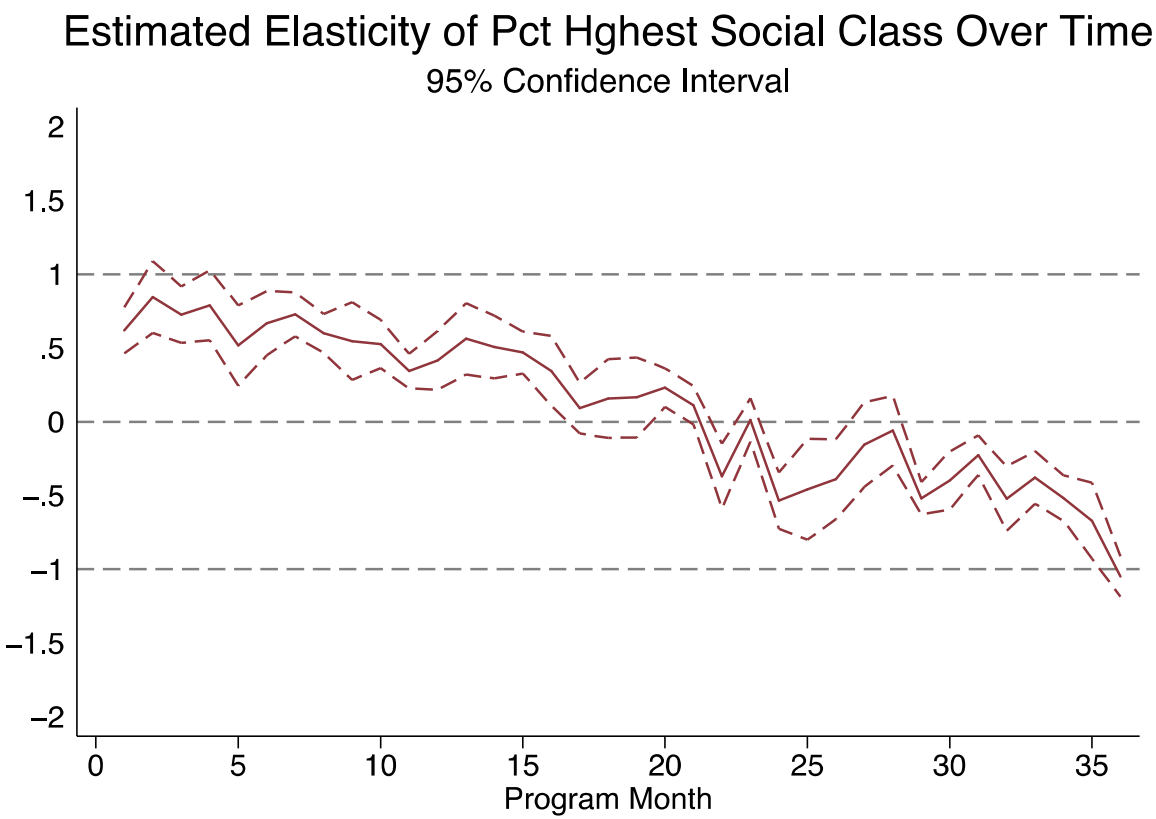




Summary of model results

- Data: PV installations matched to 2011 census data
- Question: are PV installations less likely to locate in poor areas after controlling for other factors?
- Answer: evidence suggests yes
  - Richer areas made larger investments in generating capacity on average
  - Richer areas secured higher tariff rates on average because they adopted earlier

- Relationship between PV adoption and high social class started positive but became negative
- Early adopting households were richer



Conclusions

- Assuming cost is equally distributed, we estimate scheme transfers between £14.2 and £26.6 million from least prosperous half to most prosperous half of households each year (£284 – £532 million over 20 years)
- FiT scheme is expanding: aim to deploy 750,000 installations by 2020
- Social leadership / followership aspect of technology diffusion process is key to understanding unequal uptake
- Cautionary tale for renewable heat installations, electric vehicles, other FiT schemes