

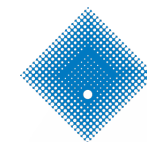
The relationship between household wealth and rooftop solar in Australia

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Research Talks, Episode 3 – Energy
19th November 2021



**Victoria
Energy Policy
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Overview of today's presentation

- ▶ Importance of rooftop solar and research into solar uptake
- ▶ Drivers of solar uptake
- ▶ Does wealth drive solar uptake?
 - ▶ Examine solar uptake by wealth, building form and ownership
 - ▶ What factors show the greatest association to solar uptake?
 - ▶ Can econometric modelling shed more light on drivers of solar uptake?
- ▶ Conclusions & Policy lessons

The important of rooftop solar uptake research

Rooftop solar uptake impacts many other energy markets and is relevant to broader policy debates:

- ▶ Climate change and move to net zero emissions target
- ▶ Batteries
 - ▶ FTM vs BTM, Drivers of uptake
- ▶ Technological developments and innovation
 - ▶ Electric vehicles, Virtual Power Plants, Neighborhood batteries
- ▶ Traditional generation
 - ▶ Network cost recovery, FITs, Solar tax, Demand management, Self consumption, Grid congestion
- ▶ Energy access and energy financial stress
 - ▶ Is energy “free for those who can afford it, and very expensive for those who cant”?

Drivers of residential solar uptake

- ▶ Understanding the drivers and barriers of solar uptake is important because policies are designed based on these factors.

Current understanding

- ▶ Positive wealth effect
 - ▶ Rooftop solar is disproportionately installed by more wealthy households

Other plausible explanations

- ▶ Barriers for renters
 - ▶ Transaction costs, building form and property rights.
- ▶ Split incentives
 - ▶ Landlords have a low incentive to bear system costs when the financial benefits accrue to renters in the form of lower electricity bills.

Implications of solar uptake being driven by wealth

▶ Inequity:

- ▶ More wealthy households have access to free solar energy, receive payments for excess energy generated and fed back into the grid, and hence incur lower electricity bills.

▶ Widens the gap:

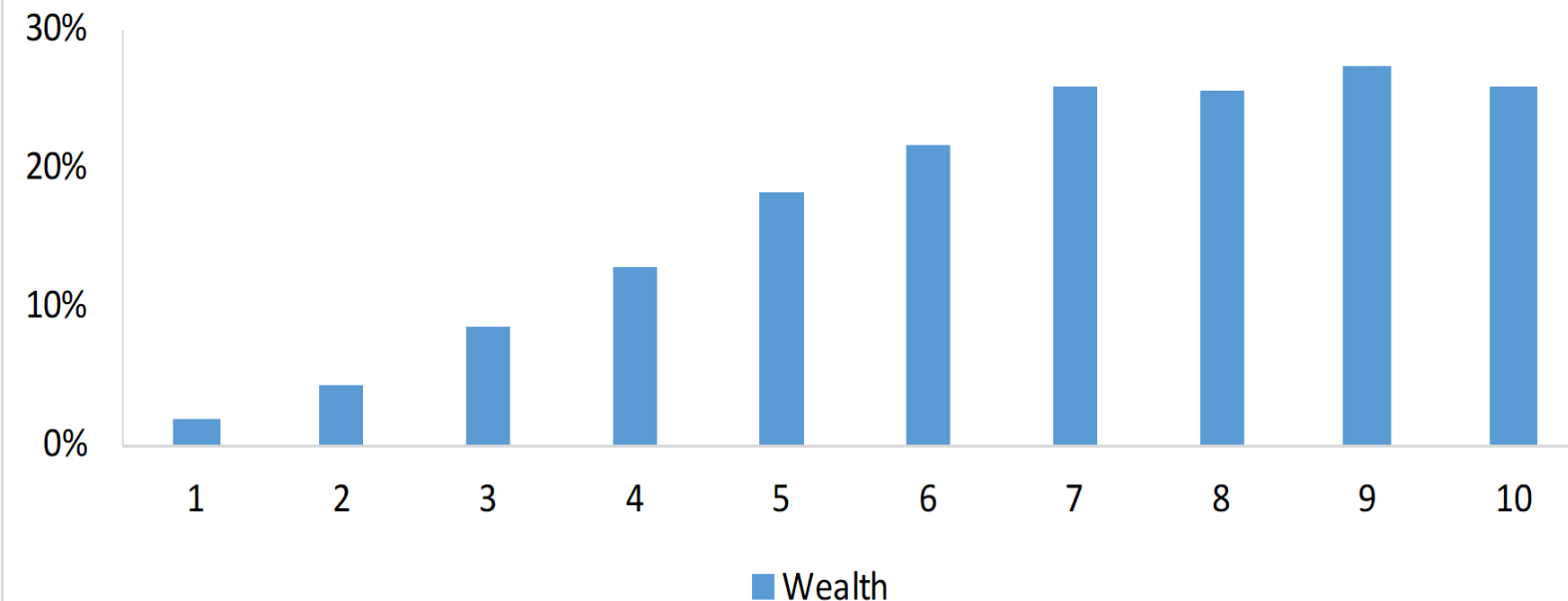
- ▶ Low uptake by poorer households could exacerbate energy financial stress and increase inequality.
- ▶ As rooftop solar uptake grows, the inequities between rich and poor will be exacerbated.

▶ Policy implications:

- ▶ Policy design → reduce capital costs, asset/income based (home owners only).

Does wealth drive solar uptake?

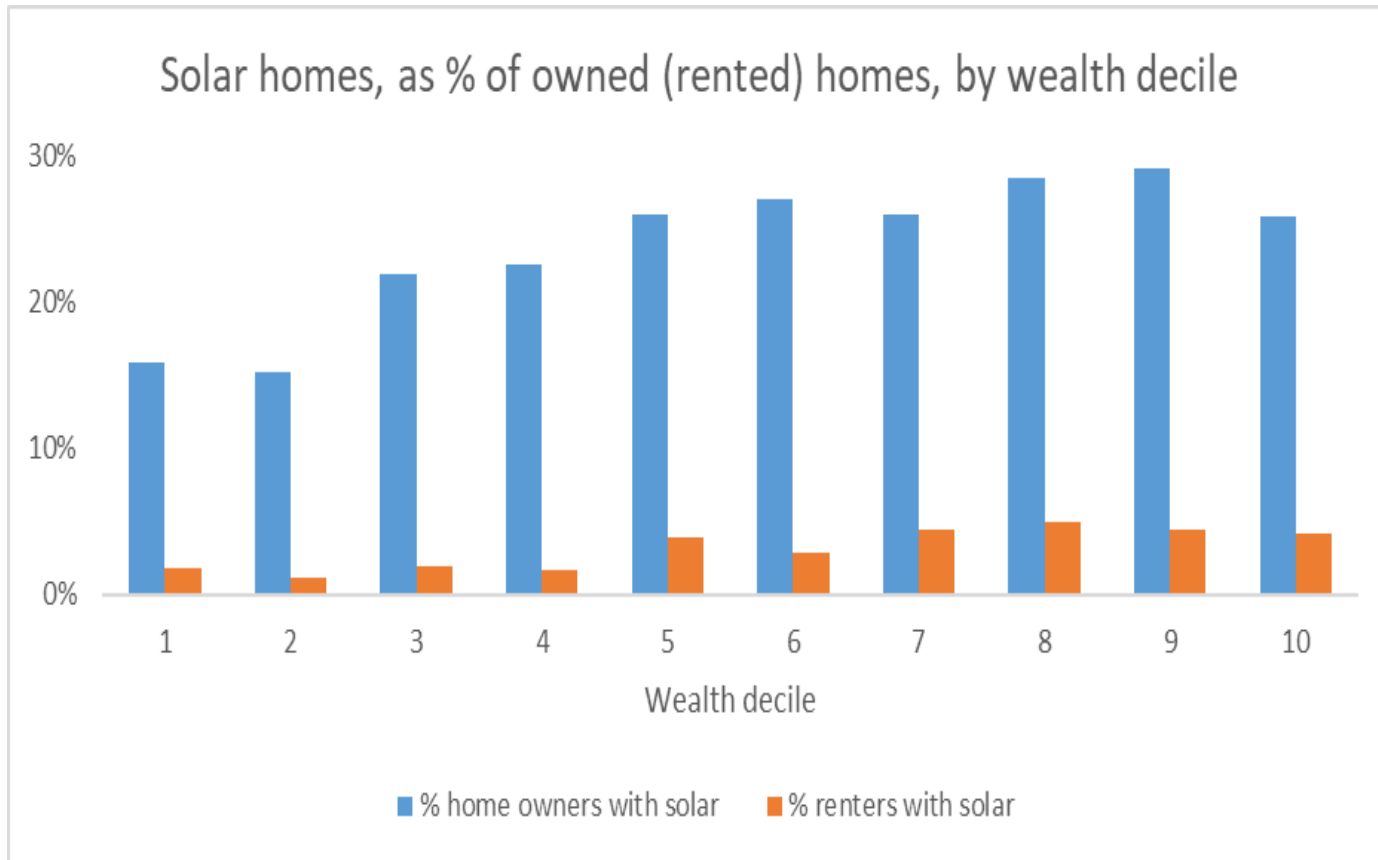
Solar homes, as % of all homes, by wealth decile



ABS SIH survey 2017-18

- Australian Bureau of Statistics survey data (N = 14,060)
- Prima facie, wealth affects rooftop solar uptake.
- On this basis, most conclude there is a solar wealth effect Australia: Best et al. (2019), Best et al. (2021).

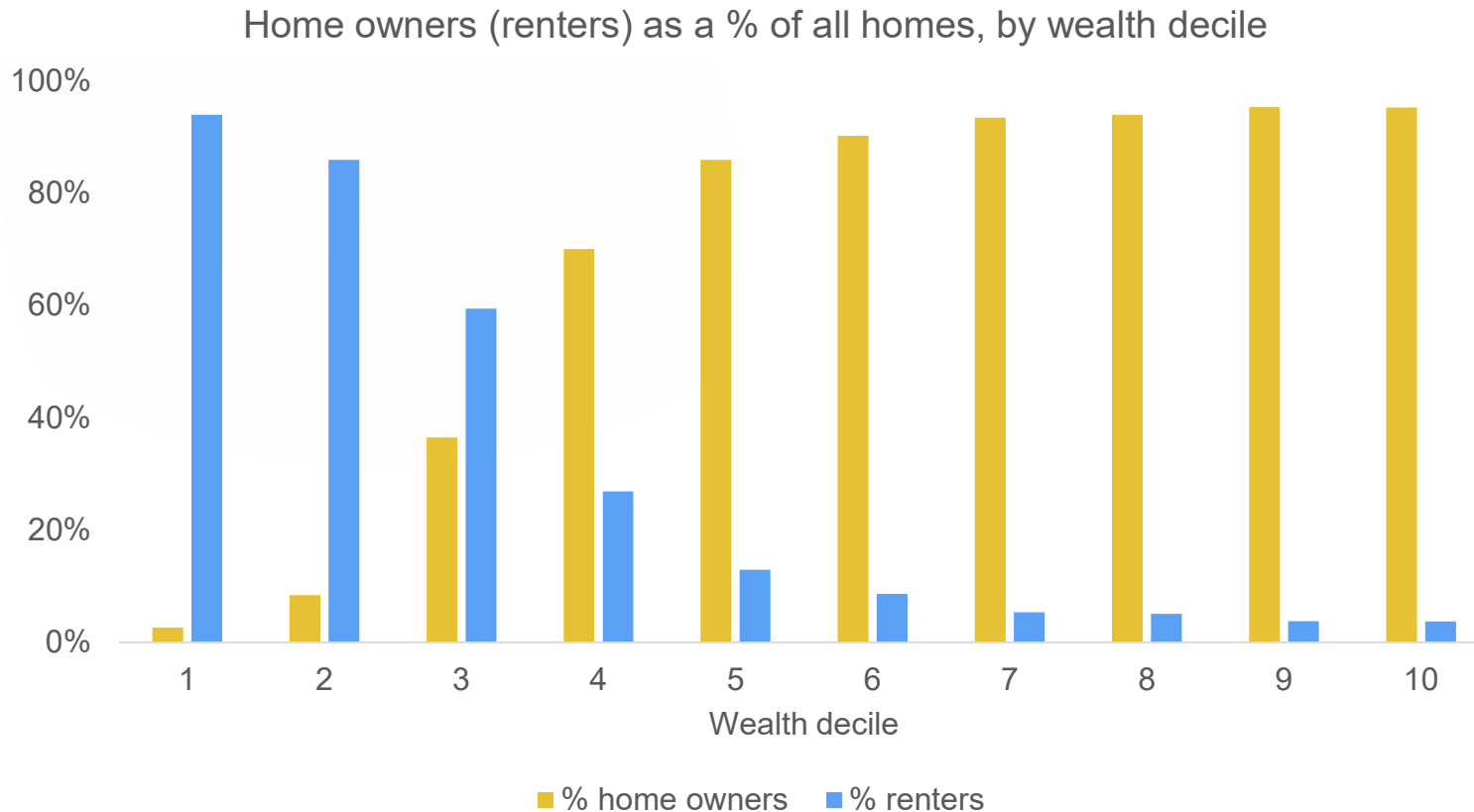
Segmenting the data by ownership



- What if we segment the data by home owners and renters?
- Home owners are almost 8 times more likely to have solar than renters.
 - 3% of renters have solar and 24% of home owners have solar.
- When segmented by ownership, the **wealth effect largely evaporates** for home-owners.
- Solar uptake amongst renters is inconsequential.

ABS SIH survey 2017-18. (Owners = 9,444, Renters = 4,297)

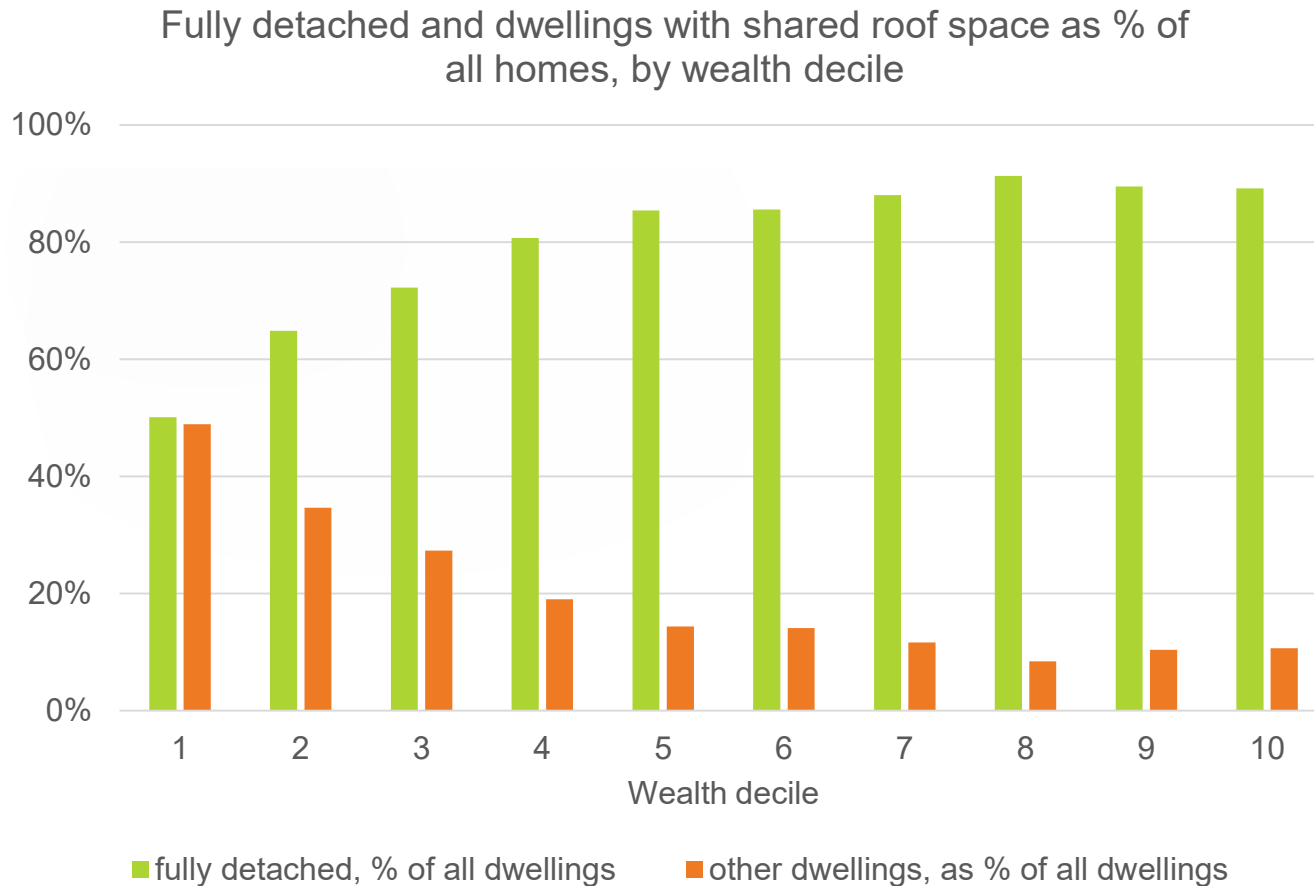
Segmenting the data by ownership



ABS SIH survey 2017-18

- Ownership is one reason why wealth appears to drive solar uptake:
 - Least wealthy more likely to be renters.
 - Most wealthy more likely to be home owners.
 - As per previous slide, home owners more likely to have solar.

Segmenting the data by building form

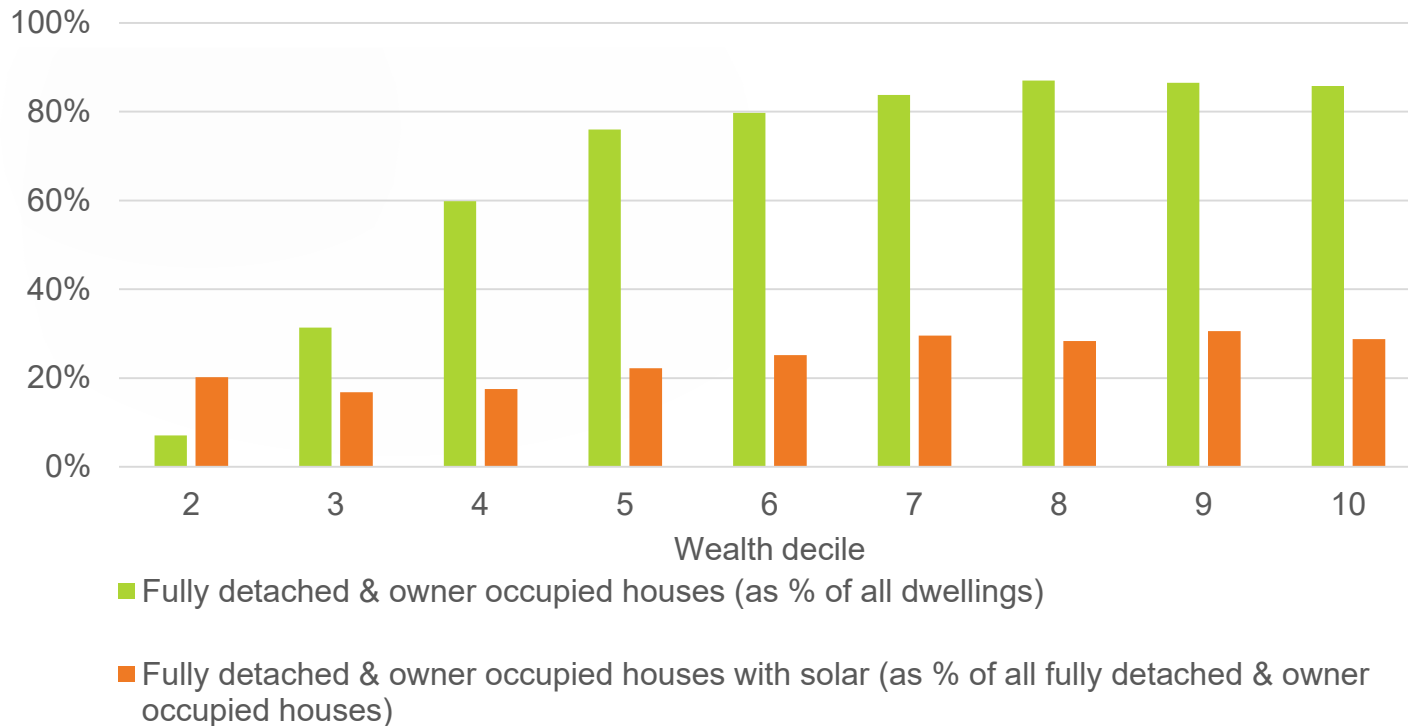


ABS SIH survey 2017-18

- Fully detached houses are 7 times more likely to have solar than other dwellings:
 - 21% of fully detached homes have solar, compared to 3% of other dwellings.
- Building form is one reason why wealth appears to drive solar uptake:
 - Less wealthy more likely to share roof space.
 - Most wealthy more likely to occupy fully detached house.
 - Fully detached houses more likely to have solar.

Segmenting the data into owner-occupied houses

Fully detached & owner occupied houses (total and with solar), by wealth decile



- ▶ Ownership & building form are related:
 - ▶ 75% houses are owner occupied
 - ▶ 62% other dwellings are rented
- ▶ Wealth & ownership & building form are related:
 - ▶ Wealthy are more likely to be owner occupier in fully detached house.
- ▶ When we segment the data into owner occupied fully detached houses, **solar uptake shows no association to household wealth.**

ABS SIH survey 2017-18. Owners of fully detached houses (n=8,429).
Note: 1st decile is excluded as low number of observations render the result unreliable.

Explaining the association between solar & wealth

- ▶ Wealth, per se, is not the primary driver of solar uptake.
- ▶ Home ownership and dwelling structure are major drivers of solar uptake.
- ▶ Wealth is a major driver of home ownership and building form.
- ▶ Once we account for home owners vs renters, and building form, there is no evidence of a wealth effect for owner occupied houses.

Can econometrics assist?

- ▶ Studies that estimate the likelihood of solar uptake by Australian households as a function of wealth, income, building form and ownership:
 - ▶ Best et al. (2019) and Best et al. (2021) use ABS survey data and conclude wealth is positively associated with solar uptake.
- ▶ However, these models suffer from multicollinearity, do not perform well when the data is appropriately segmented into owners and renters and suffer from omitted variable bias (Mountain et al., 2021).

Can econometrics assist?

▶ VEPC:

- ▶ Bills (CHOICE): accurate prices & consumption; wealth proxy.
- ▶ Data segmented: fully detached houses (mostly owner-occupied).
- ▶ Evidence suggests solar uptake is *negatively* related to wealth.

▶ Caveat:

- ▶ Findings may be not fully reliable due to data limitations.
- ▶ Can't confidentially isolate any solar wealth effect (holding ownership and building form constant) using ABS or CHOICE data: Mountain et al., 2021.

Conclusions

- ▶ Interrelationship between solar uptake & building form & ownership.
- ▶ Interrelationship between wealth & building form & ownership.
- ▶ Relationship between solar uptake and wealth is not well understood.
 - ▶ Evidence of positive wealth effect not robust.
 - ▶ Evidence of negative wealth effect based on proxy measure.

Policy lessons

- ▶ Building form & ownership are significant barriers to solar uptake
 - ▶ *All* of these factors should be better taken into account in policy design.
 - ▶ Overcoming barriers faced by renters and landlord split incentives.
 - ▶ Technology to better enable solar for shared roof space.
- ▶ Not saying wealth isn't important....but building form & ownership have been overlooked.
- ▶ Solely focusing on financial incentives may exacerbate socio-economic inequities, particularly as solar uptake grows.
- ▶ Ultimately, data limitations must be overcome.

Thank you.

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Questions & Discussion

References

- ▶ Best, R., Burke, P. J., & Nishitateno, S. (2019). Understanding the determinants of rooftop solar installation: evidence from household surveys in Australia. *Australian Journal of Agricultural and Resource Economics*, 63(4), 922–939. <https://doi.org/10.1111/1467-8489.12319>
- ▶ Best, R., Chareunsy, A., & Li, H. (2021). Equity and effectiveness of Australian small-scale solar schemes. *Ecological Economics*, 180. <https://doi.org/10.1016/j.ecolecon.2020.106890>
- ▶ Mountain, B., Burns, K., & Willey, B. (2021). What is the relationship between household wealth and rooftop solar in Australia?. VEPC Working Paper, November 2021 (*forthcoming*)

Case studies

- ▶ *Mountain, B.R. (2021) “I chose the electricity retailer offering the best deal for my home. That's not what I got”. The Conversation, 15 November 2021. Available at: <https://theconversation.com/i-chose-the-electricity-retailer-offering-the-best-deal-for-my-home-thats-not-what-i-got-171676>*
- ▶ *Victorian Energy Compare: <https://compare.energy.vic.gov.au/>*
- ▶ *Case study: <https://www.energyaustralia.com.au/about-us/media/news/energyaustralia-revolutionises-residential-solar-and-battery-ownership>*