The “solar wealth nexus”

Should we believe the hype?

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Victoria Energy Policy Centre

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

Why are we talking about rooftop solar today?

- Energy, and more specifically rooftop solar, has never been more topical or controversial in Australia.

- Rooftop solar & batteries
  - Uptake – differences across household cohorts, states and regions.
  - FTM vs BTM
  - Drivers of solar uptake
  - Policy design - subsidies and incentives

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Why are we talking about rooftop solar today?

- Technological developments and innovation
  - Virtual Power Plants (VPPs)
  - Neighborhood batteries (NB)
  - Community Choice Aggregation (CCA)
- Electric vehicles
- Climate change and move to net zero emissions target

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Why are we talking about rooftop solar today?

- Displacement of traditional generation
  - Network cost recovery – complicated by technological developments
  - FITs
  - Solar tax
  - Demand management – price incentives? Technology? Consumer inertia?

- Energy financial stress
  - Is energy “free for those who can afford it, and very expensive for those who cant”?

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Why are we talking about rooftop solar today?

- On any given day, there is an abundance of commentary, research, anecdotal evidence and policy debates surrounding rooftop solar in the media, industry and government.

- Today, we focus on the purported “solar wealth nexus”

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Outline of today's discussion

- What is the "solar wealth nexus"?
- Why are the implications of a solar wealth nexus?
- What evidence has been produced to support this claim?
- Does the evidence pass the pub test?
- What resources freely and readily available to critically evaluate these claims?
- Should we believe the hype?

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What is the “solar wealth nexus”?

- The solar wealth nexus refers to rooftop solar PV being disproportionately installed by more wealthy households.

- All else being equal, poorer households are less likely to have rooftop solar compared to their more wealthy counterparts.

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What are the implications of a solar wealth nexus?

- 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: A solar wealth nexus would exacerbate energy financial stress as less wealthy homes are less likely to have rooftop solar, energy efficient appliances and access to technology to easily enable demand shifting.
- Policy implications: Policy initiatives (eg. subsidies) would be targeted to least wealthy homes, and subsidies would be asset (rather than, for eg, income) based.

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What evidence exists to support the solar wealth nexus?

- Correlation analysis
  - Data grouped by income and wealth decile
- Econometric modelling
  - Household level survey data
  - Probit model to predict likelihood of solar uptake
- ABS Survey of Income and Housing

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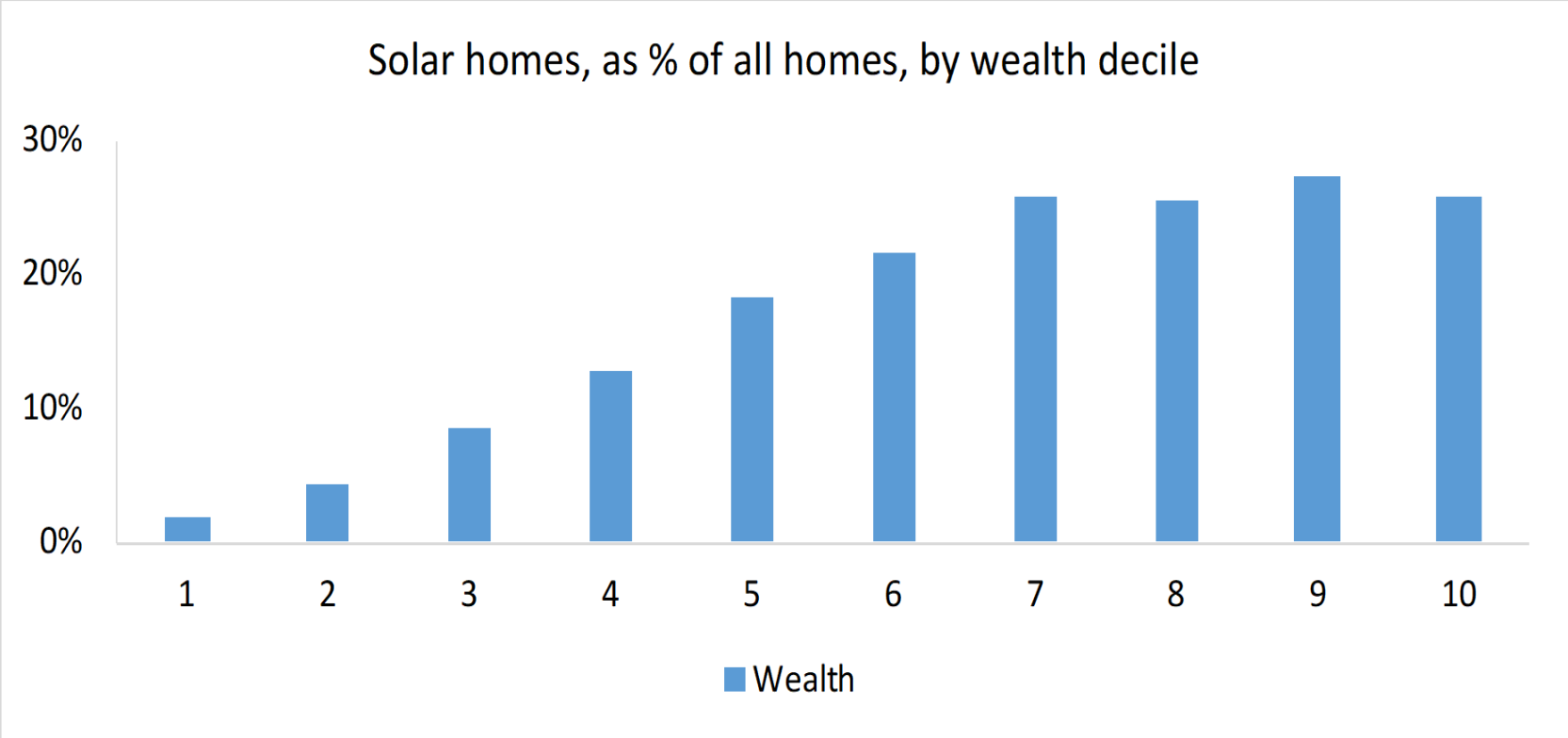
Correlation analysis of the solar wealth nexus



ABS SIH survey 2017-18

- Prima facie, wealth affects rooftop solar uptake.
- On this basis, most conclude there is a solar wealth effect Australia: Best, Chareunsy, & Li (2021), Best, Burke, & Nishitateno (2019), Phillips, B., (2018)

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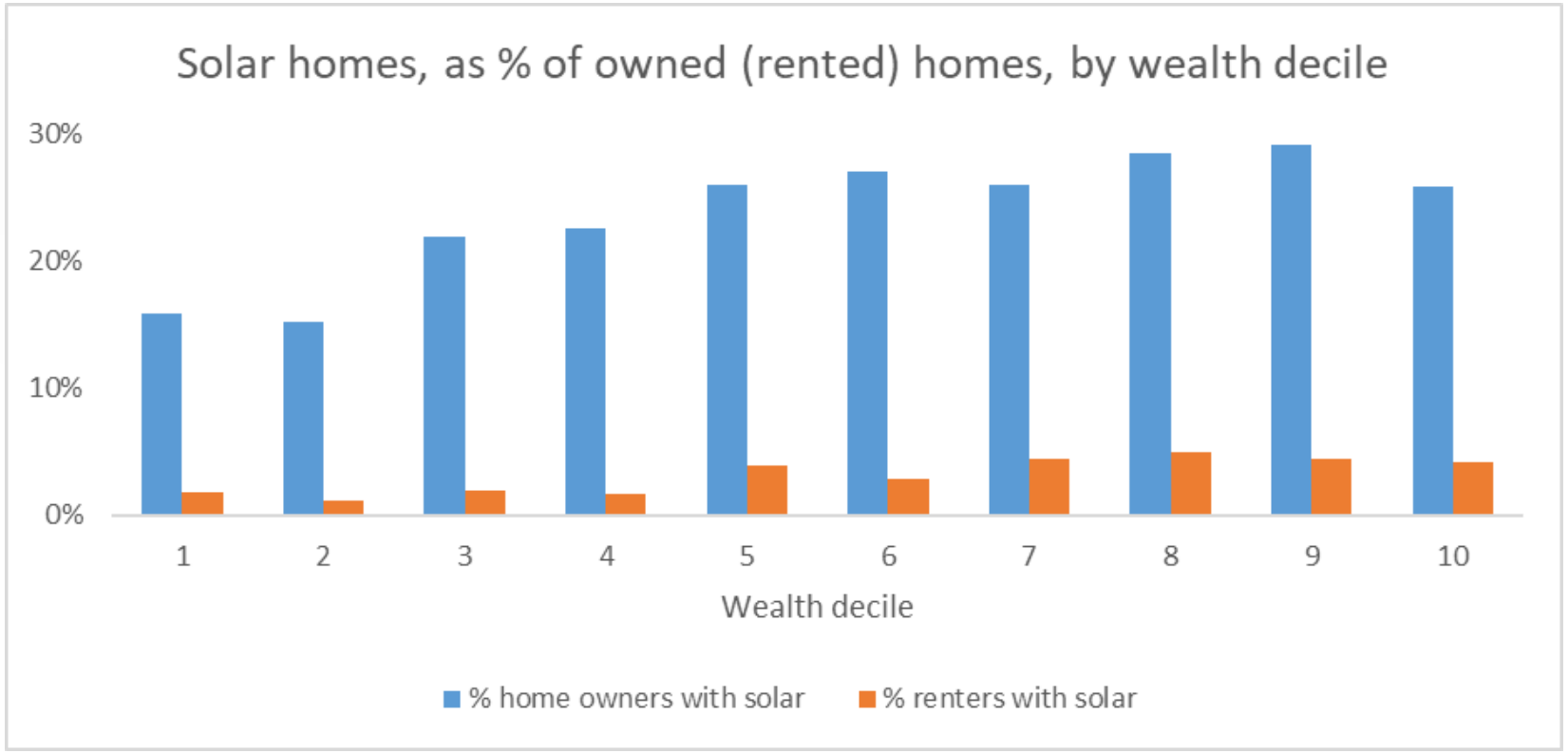
Correlation analysis by renters vs owners



- When solar uptake for home owners and renters is analysed, the wealth effect evaporates.
- In reality, wealth does not affect solar uptake….so what does?

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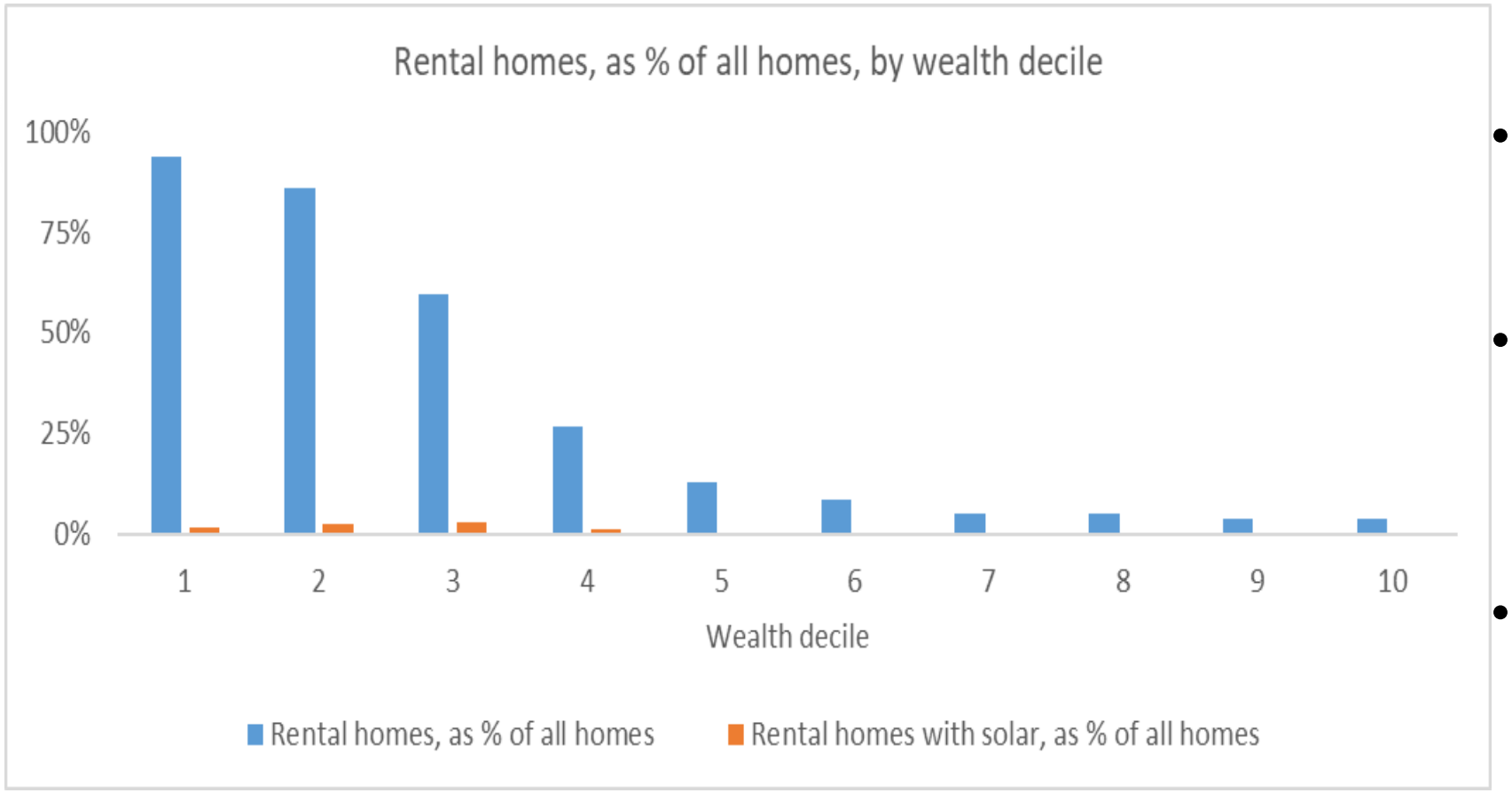
Property ownership, wealth and solar uptake



- Least wealthy are more likely to be renters.
- Solar uptake amongst renters is inconsequential.
- This, in part, is driving the perception of a solar wealth nexus.

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Why do we observe a solar wealth nexus at all?

- Property ownership, wealth and solar uptake nexus:
  - Least wealthy are more likely renters
  - Most wealthy are more likely home owners
  - Ownership structure impacts solar uptake due to transaction costs, legal rights, cost recovery and other limitations faced by renters.

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Why do we observe a solar wealth nexus at all?

- Dwelling type is also important (however, there are insufficient observations to do comparable analysis).

- Dwelling, wealth and solar uptake nexus:
  - Least wealthy tend to live in apartments.
  - Most wealth tend to live in detached or semi-detached houses
  - Shared roof space is a major barrier to solar uptake

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Why do we observe a solar wealth nexus at all?

- Dwelling type, property ownership, wealth and solar uptake nexus:
  - Least wealthy tend to live in rented apartments.
  - Most wealth tend to live in their own detached or semi-detached house.
  - Apartments are largely unsuitable for solar due to shared roof space.

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Why do we observe a solar wealth nexus at all?

- Wealth, per se, is not the driver of solar uptake.

- Wealth is a driver of home ownership and the type of dwelling occupied
- Home ownership and dwelling structure are the drivers of solar uptake.

- Once we account for home owners vs renters, we find no evidence of a wealth effect

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Econometric modelling of the solar wealth nexus

- Best et al. (2019) estimate the probability a household has rooftop solar using five difference probit models and drawing on ABS SIH data.

Table 2 Probit results 2015-16 SIH N=17,437	1	2	3	4	5
Net wealth (log)	3.663***	1.507***	1.485***	1.521***	0.201***
Net wealth (log, squared)	-0.123***	-0.052***	-0.048***	-0.050***	
Income (log)	0.008	-0.014	-0.02	0.002	-0.01
Private pension div.. By income	0.577***	0.737***	0.791***	0.604***	0.570***
Long property tenure	-0.134**	-0.213***	-0.172***	-0.216***	-0.208***
Rent		-1.441***	-1.396***	-1.421***	-1.573***
Apartment		-1.889***	-1.753***	-1.756***	-1.793***
Bedrooms		0.260***	0.222***	0.220***	0.212***
Persons		0.044**	0.075***	0.189***	0.192***
Employed persons				-0.134***	-0.133***
Dependent children				-0.138***	-0.141***
Mortgage				-0.038	-0.017
Credit cards				0.085***	0.082***
Region	No	No	Yes	Yes	Yes
Pseudo	0.07	0.107	0.145	0.148	0.146

Econometric modelling of the solar wealth nexus

- On the basis of these results, Best et al. (2019) conclude that wealth is the largest driver of rooftop solar uptake in Australia.
- Other significant drivers are: pension income, age of dwelling, rental status, number of bedrooms, number of occupients, number of employed people, number of dependent children and number of credit cards.
- Income and whether the home is mortgaged do not drive solar uptake.

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Econometric modelling of the solar wealth nexus

Are these results reliable and rigorous?

- What theoretical foundation underlies the explanatory variables?
  - Would the explanatory variables really have an influence on solar uptake?
  - How could the number of dependent children drive solar uptake?
  - Why would pension income, but not income be significant?
  - “Stir-fry” regression
- Model diagnostics and robustness
  - Multi-collinearity:
    - income (log) and income (log, squared)
    - Number of occupants, employed persons, dependents.

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Does the evidence meet the pub test?

- Correlation is not causation
- Data not appropriately segmented
- Econometric modelling does not seem robust theoretically or empirically.

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What resources freely and readily available to critically evaluate these claims?

- ABS have amazing resources that your tax dollars help fund – use them
- Look beyond the standard publications
- ABS TableBuilder
  - Predefined summaries and tables
  - Capacity to customise
  - Census and other datasets, such as SIH
  - https://tablebuilder.abs.gov.au/webapi/jsf/login.xhtml
- Microdata download
  - CURF data downloads available
  - https://microdatadownload.abs.gov.au/MicrodataDownload/login.xhtml

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Should we believe the hype?

- Claims of a solar wealth nexus are based on precursory understanding of the drivers and barriers to rooftop solar uptake across Australia, and an insufficient interrogation of the available data using standard econometric and statistical techniques.

- Don’t just believe the hype!...no matter where its published or by whom

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Should we believe the hype?

- Think critically and apply the pub test
- Use all available resources to critique the evidence and arguments
- Don’t forget your basic training –
  - Is there a theoretical foundation? Are the data, statistics and modelling rigorous? What has been overlooked?

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Thank you.

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Questions
&
Discussion

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