



Kyoto University
Institute of Advanced Energy

ELECTRIFICACIÓN RURAL Y CALIDAD DE VIDA: UNA VISIÓN DESDE EL SUDESTE ASIÁTICO

JORDI CRAVIOTO C.

UNIVERSIDAD TECNOLÓGICA DE LOS VALLES CENTRALES DE OAXACA
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Presentation flow

2

1. *Introduction*

- Why electrification?
- Rural electrification and QoL literature
- SE Asia as our case study

2. *Methods*

- Countries, survey
- Analysis methods

3. *Results*

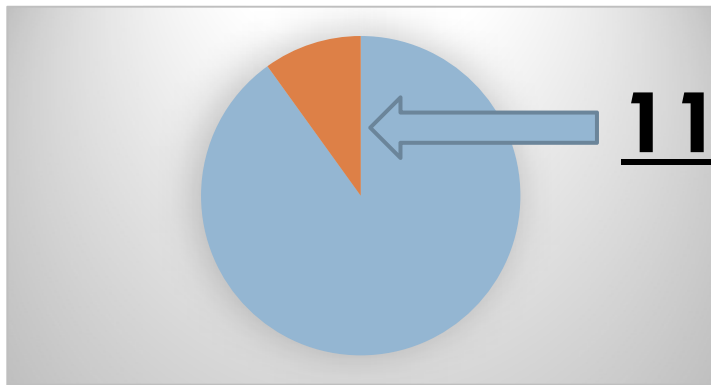
- Key findings, discussion

4. *Conclusions/future research*

How many people lack of electricity?

3

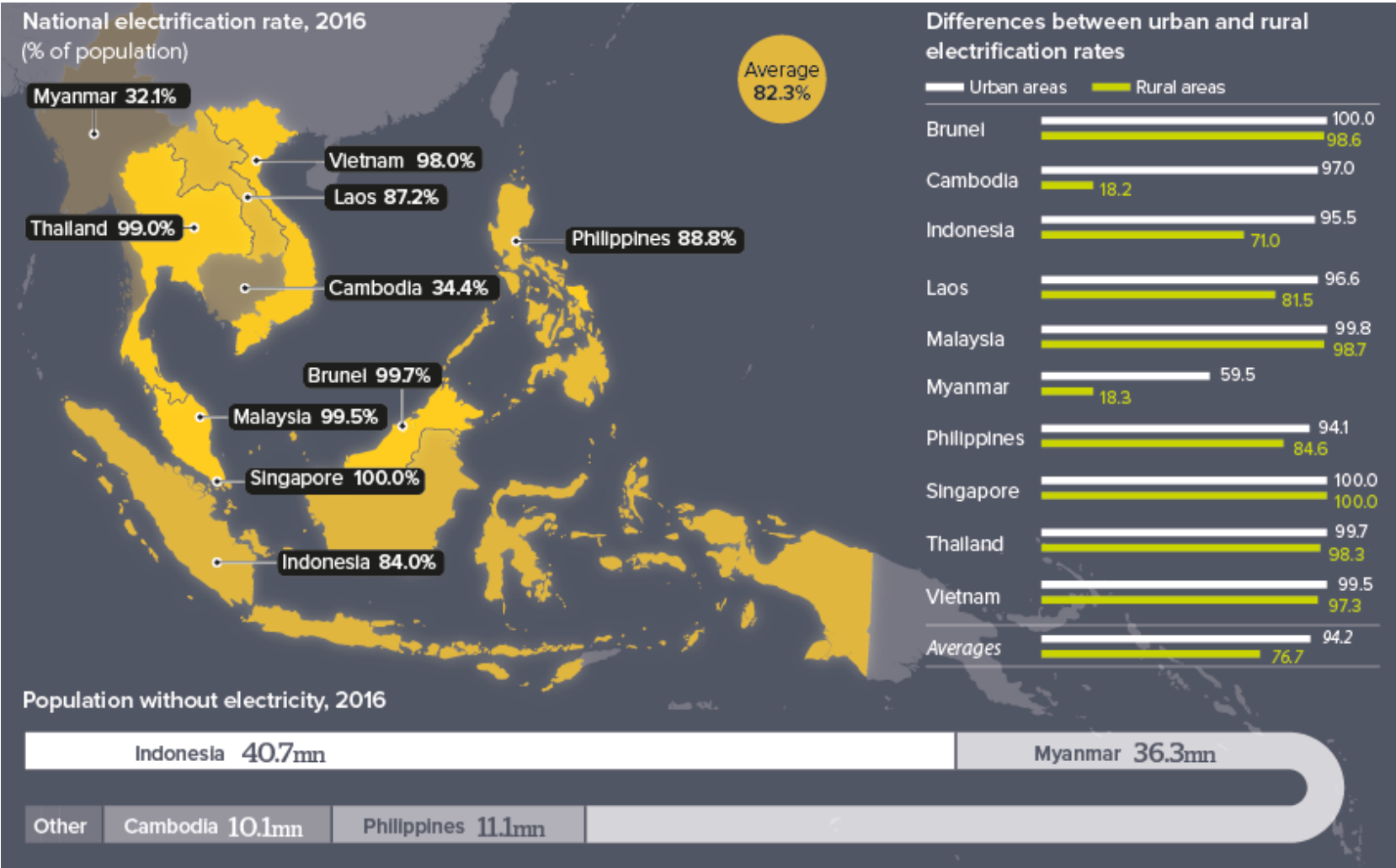
- Around 850 million people worldwide do NOT have access to electricity



11% of 7.7 billions (2019)

- Most live in rural areas of developing countries

What about South East Asia? (1)



<https://dailybrief.oxan.com/Analysis/GA220581/Uneven-electrification-will-affect-ASEAN-competition>

Is electrification important?

5

Electrification can:

- ❑ Improve children's education – **Lights** (SDG4)
- ❑ Improve sanitation and water access - **Pumps** (SDG6)
- ❑ Improve health – **Refrigeration, cooling, heating** (SDG3)
- ❑ Help use cleaner energy (SDG7)
- ❑ Better opportunities for women – **Time** (SDG5)
- ❑ Increase productivity, diversify activities, provide higher incomes (SDG8), reduce poverty (SDG1)

Electrification (rural areas) might also have negative impacts:

- ❑ Threaten local practices and culture
- ❑ Increase inequalities
- ❑ Create environmental and land rights controversies, etc.

Recent rural electrification (RE) studies

6

Article	Focus point	Setting	Cited
Palit (2011)	Finance, institutions and governance	South Asia	239
Dinkelman (2011)	Employment, productivity, migration	South Africa	692
Schillebeeckx (2012)	Electrification business models	(Review)	74
Khandker et al. (2012)	Income, expenditure, poverty, schooling (infants)	India	114
Kooijman-van Dijk & Clancy (2014)	Production, financial capital	Tanzania	86
Winther (2015)	Gender (women's empowerment)	Africa	21
Winther (2015)	Impacts on living condition (household structures)	Mozambique, Tanzania, India	14
Riva et al. (2018)	Economic impacts	(Review)	31

- 72,800 hits in google scholar (Jan 2020)
- Investigations focus mostly on economic, technology, or institutional issues
- Less emphasis on living conditions and **quality of life (QoL)**

RE literature focused on SE Asia

7

Article	Focus point	Setting	Cited
Martin & Sustanto (2011)	RE and productive uses	Lao PDR	12
Bhattacharyya (2013)	RE experience and systems preferred	Indonesia, Philippines, Thailand, Vietnam	8
Van Gevelt et al (2017)	RE and productive uses, operation models	Malaysia	7
Al Faruq et al (2016)	Challenges to RE	Indonesia	3
Saing (2017)	RE, household consumption and children education	Cambodia	4

- Substantially fewer studies than S. Asia and Africa
- Focus remains on productive uses and frameworks (only one study related to social issues and **none to QoL**)

Findings and gaps

8

- Lit. concentrates on prod. uses, econ., tech. or institutions
 - ▣ RE can bring improvements, but are highly contextual
- Social effects are crucial but much less examined
- Fewer information about the SE Asian region
 - ▣ Myanmar and Cambodia are serious gaps

Research project objective:

- Analyse the effects of electrification on well-being in SE Asia, using a novel approach of measures in eight QoL domains.
- **This presentation will focus on Self-reported quality of life and some domains.**

Methods: analysis procedure

1. Villages selection:

- No electrification, similar conditions
- Community willingness to take part in the project

2. Electrification scheme: selection based on:

- Economic capacity in the project
- geographical features of location and proximity to grid

3. Field survey (QoL questionnaire):

- Prior (baseline) and after electrification (endpoint)

4. Post-processing analysis:

- Use statistical methods to reveal differences between stages.

1. Selected locations

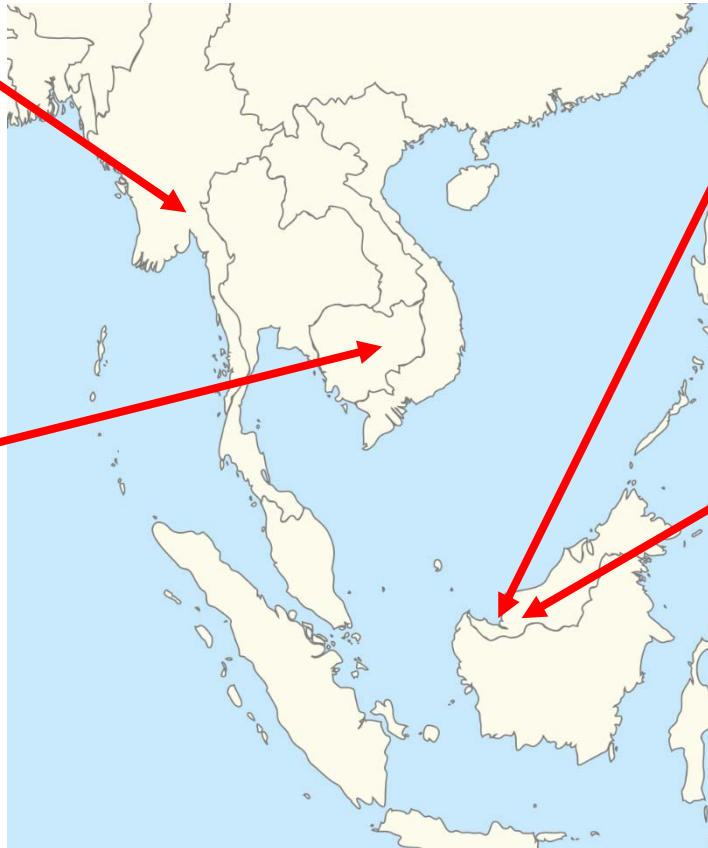
10



Oak Pho, Myanmar



Thmor Keo, Cambodia



**Kampung Sungai Merah,
Malaysia**



Menangkin, Malaysia

- Income levels below national average
- Similar economic activities (mostly farming and fishing)
- Similar climate (tropical typical of the South-east Asian region)

2. Schemes and surveys

11

Electrification schemes (3)

- Grid extension – centralised supply
- Hybrid systems (PV + diesel) - centralised supply
- Solar PV home systems – individual supply



Endpoint surveys ~ 1 year after electrification.

Electrification Scheme	Village	Country	Demographics	Cultural profile	Surveys	
					Baseline	Endpoint
Grid Extension	Menangkin	Malaysia	22 households (~100 inhab.)	Iban	n=19 (Apr 2016)	n=12 (18m after)
	Thmor Keo	Cambodia	215 households	Khmer	n=17 (Mar 2017)	n=21 (13m after)
Hybrid system	Oak Pho	Myanmar	400 households (~2000 inhab.)	Bamar	n= 19 (Nov 2017)	n=35 (15m after)
Solar Home System	Kampung Sungai Merah	Malaysia	5 households (~20 inhab.)	Iban	n=6 (Dec 2016)	n=7 (17m after)

Quality of life measures

12

Two categories:

- 1) Objective indicators (more common)
 - ▣ Infant mortality rate, life expectancy, mean years of schooling, gross domestic product, gross national income, water access, etc.
- 2) Subjective indicators
 - ▣ Self-reported quality of life, satisfaction levels, self-reported health, psychological well-being, social relations, aspirations, activities, etc.

Quality of life measurement

13

Elements used in the Wisconsin Quality of Life Index (Diamond, 1999):

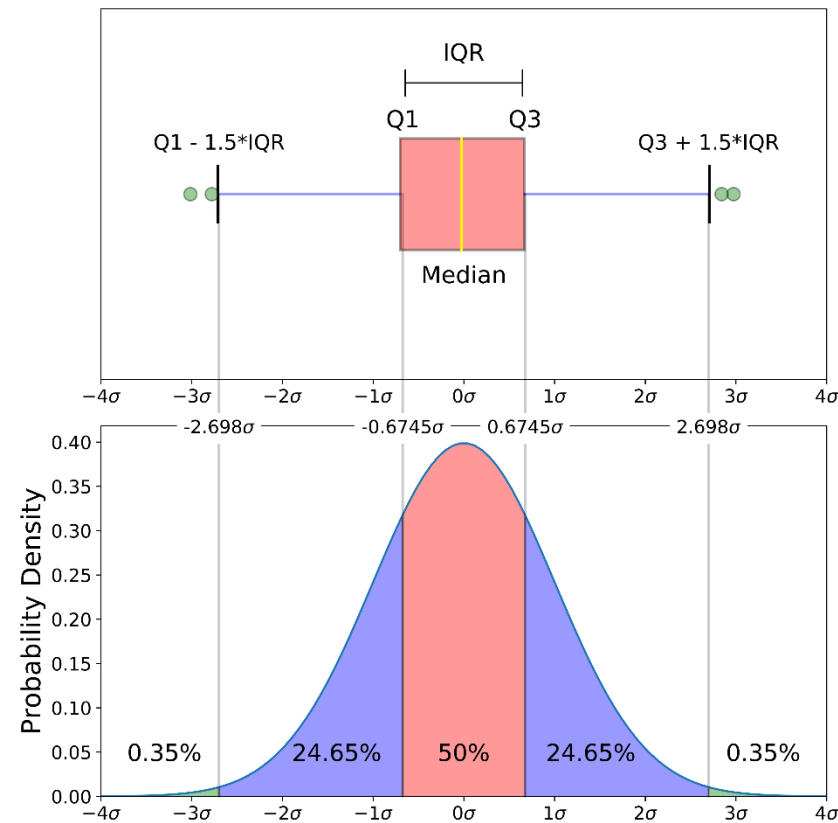
No.	Category	Domains	Concepts	Items	Type of variable
I	Demographics	-	(1) Gender, (2) age, (3) education, (4) family type, and (5) occupation	5	Nominal
II	Quality of Life	Quality of Life (General)	(1) Self-reported quality of life	1	Ordinal (10p scale)
		Quality of Life (Domains)	Satisfaction with: (1) way of spending time, (2) housing, (3) food	4	Ordinal (5p-likert scale)
		Psychological well-being	Self-reported mental health	1	Ordinal (5p-likert scale)
		Health well-being	Self-reported physical health	1	Ordinal (5p-likert scale)
		Social well-being	Perception on social support from family and friends	1	Ordinal (5p-likert scale)
		Economic well-being	(1) Feelings about money owned, (2) Regularity of lack of money preventing activities, (3) Income	3	Ordinal (5/4p scale) / Scale
III.	Occupations	-	Satisfaction with (1) main activity, (2) hrs of work	2	Ordinal (5p-likert scale) / Scale
IV.	Time of activities	-	(1) Wake up, (2) breakfast, (3) lunch, (4) dinner and (5) sleep time	5	Time scale

5p likert Scale: very unsatisfied (1) – very satisfied (5)

Post processing analysis methods

14

a. Boxplot analysis



b. ANOVA plots

(*statistical tests verify if difference is significant)

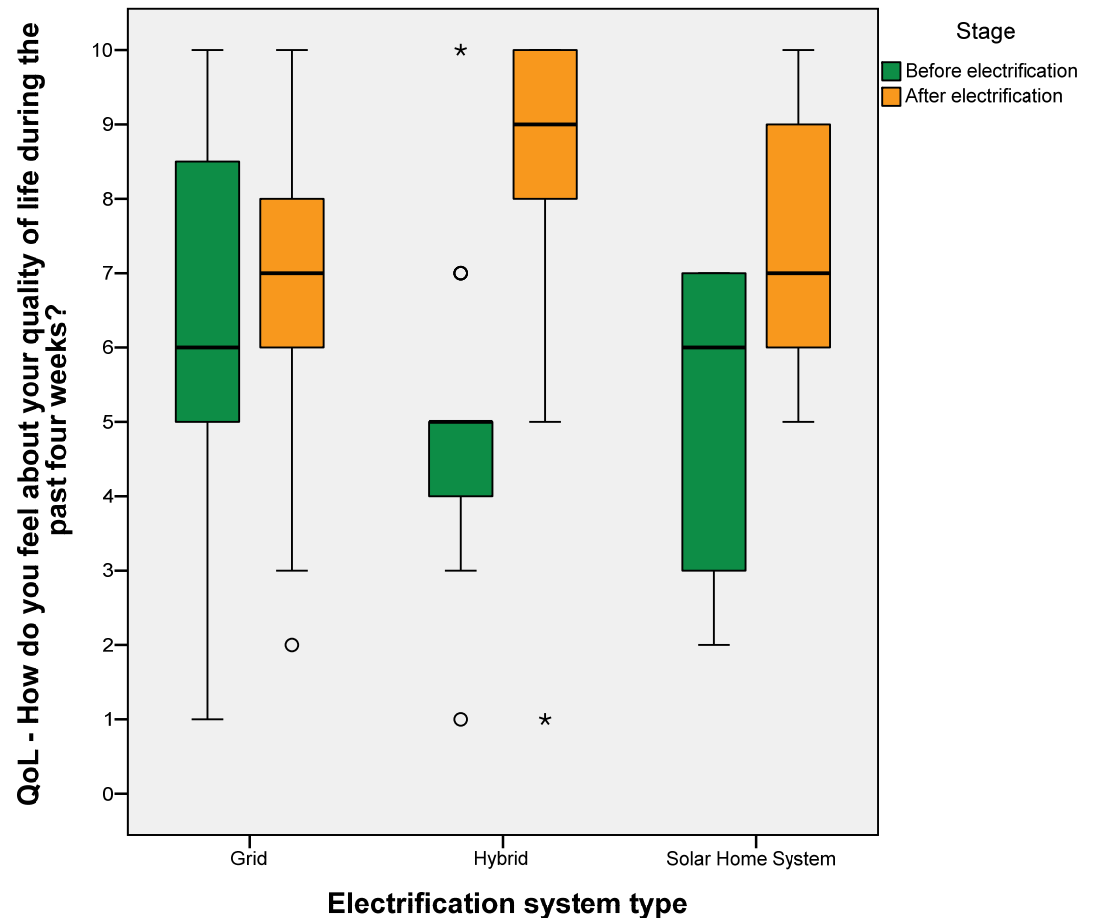
Results: Self-reported QoL

15

We find a similar tendency:

- *Increase of QoL levels from electrification*
- *Greater for hybrid system*

❖ Confirms the hypothesis that electrification is positive for well-being with a more direct measure

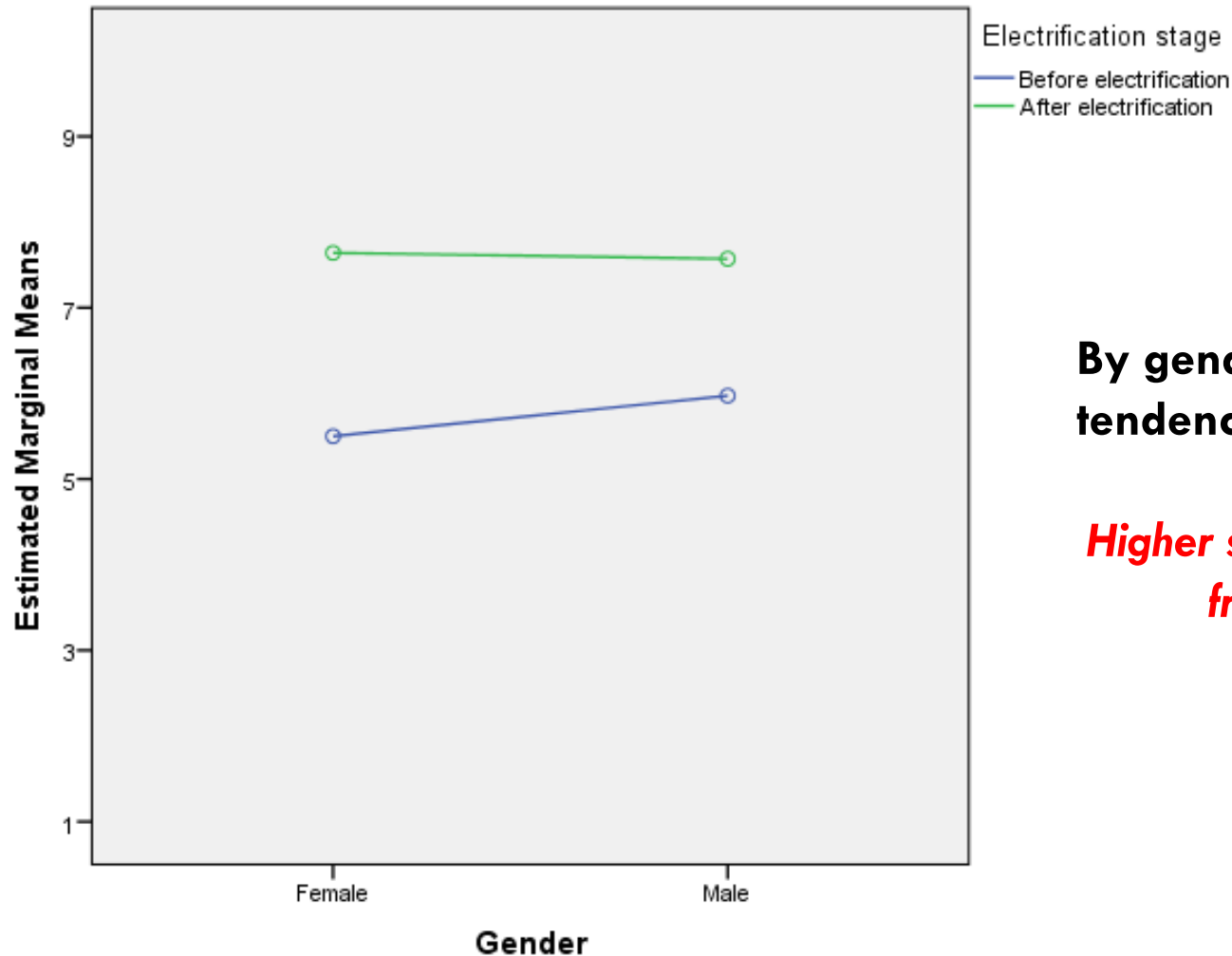


Median test: $X^2 = 13.1, p < .05$

Self-reported QoL by gender

16

Estimated Marginal Means of QoL self-reported

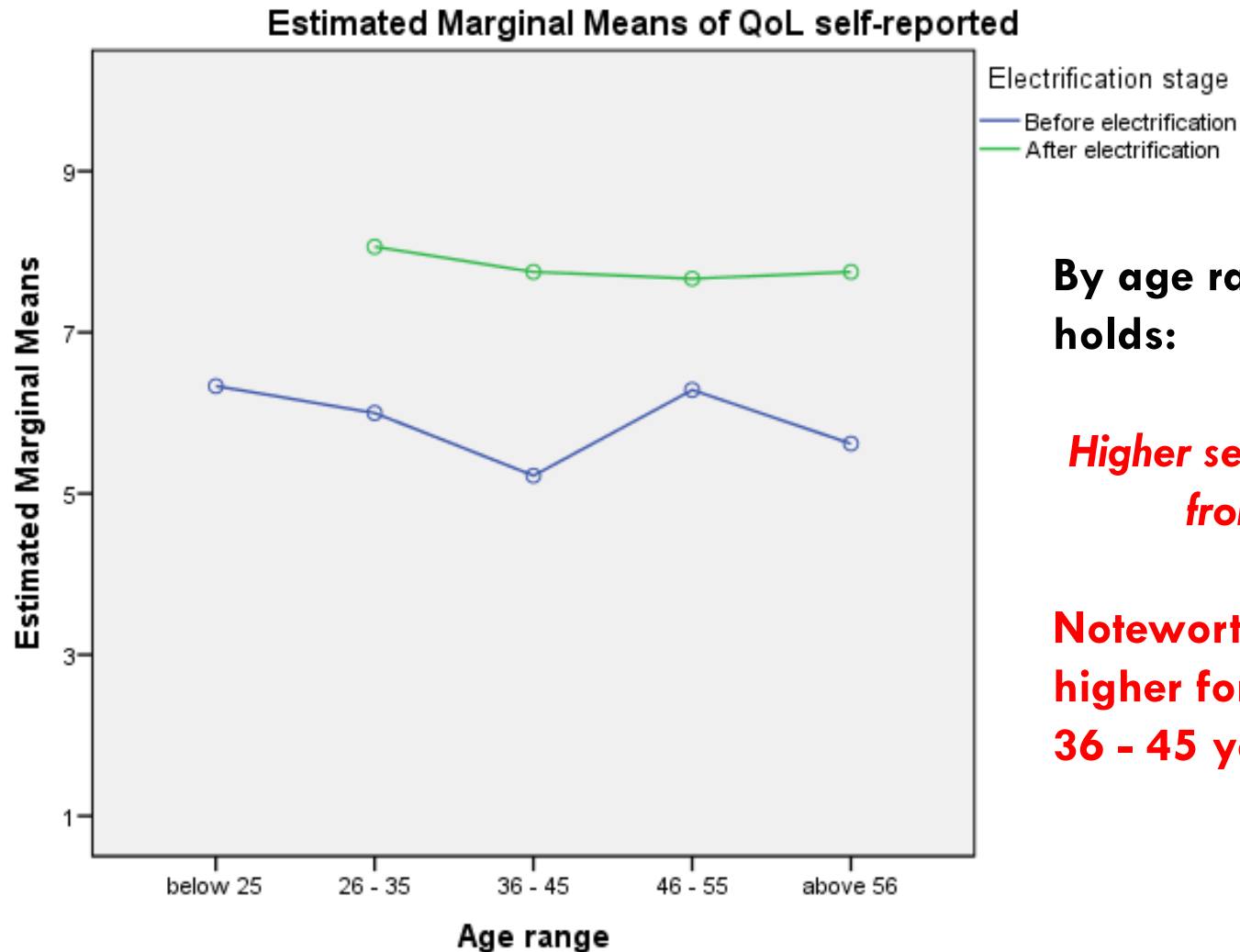


By gender, we find a similar tendency:

Higher self-reported QoL levels from electrification

Self-reported QoL by age

17



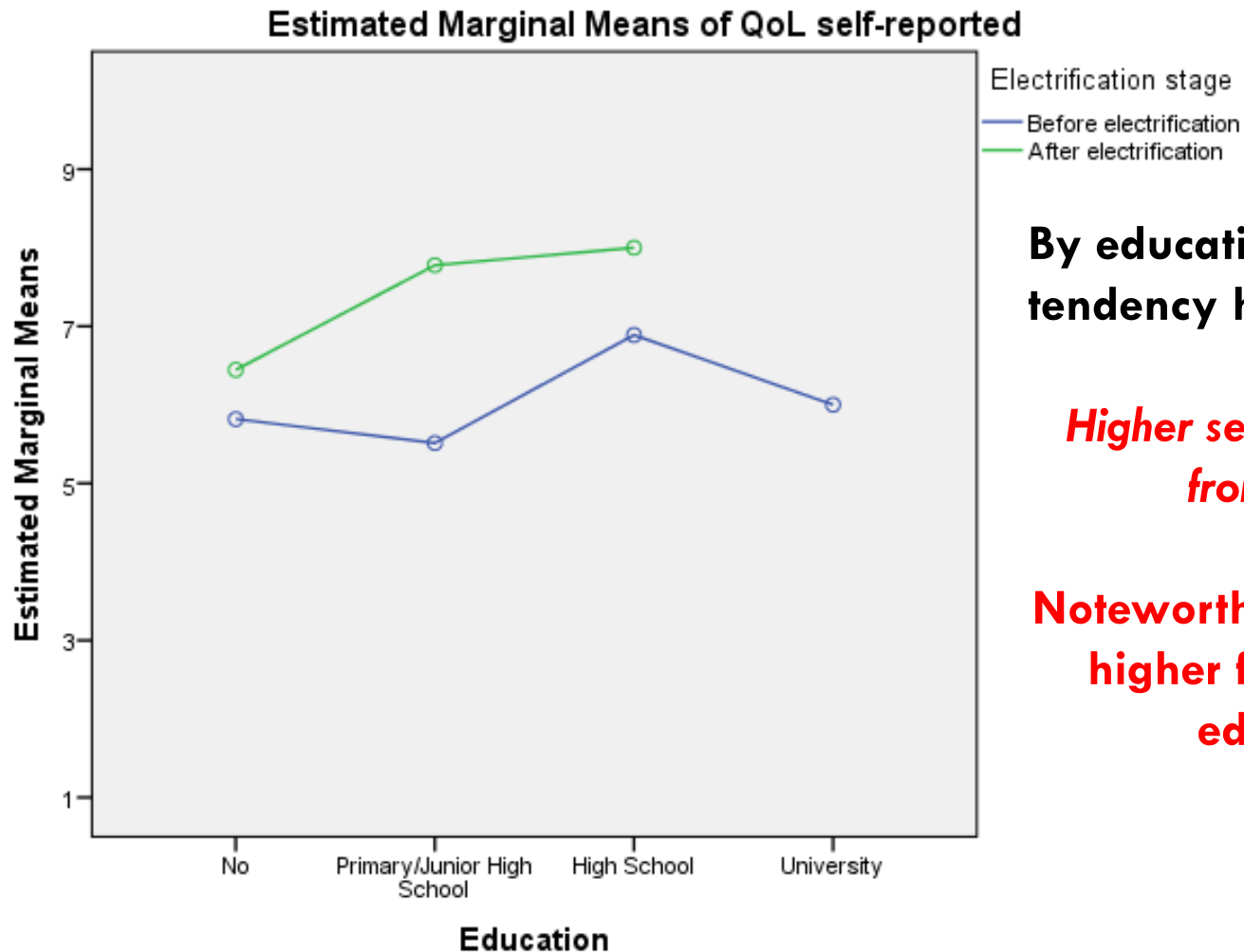
By age ranges, the tendency holds:

Higher self-reported QoL levels from electrification

Noteworthy, differences are higher for those in the 36 - 45 year old range

Self-reported QoL by education level

18



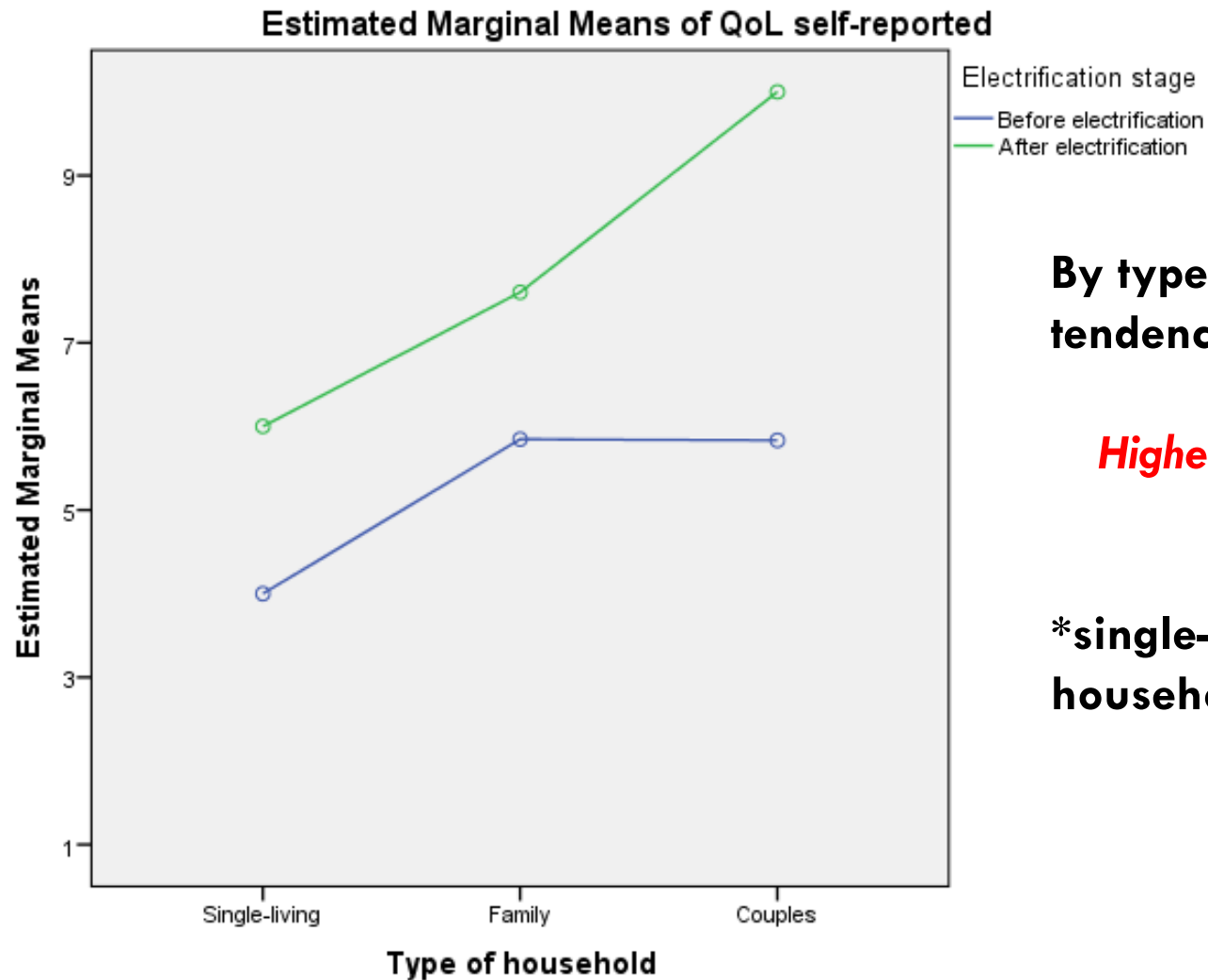
By education level, the tendency holds:

Higher self-reported QoL levels from electrification

Noteworthy that differences are higher for those with basic education levels

Self-reported QoL by type of household

19



By type of household, the tendency holds:

Higher self-reported QoL levels from electrification

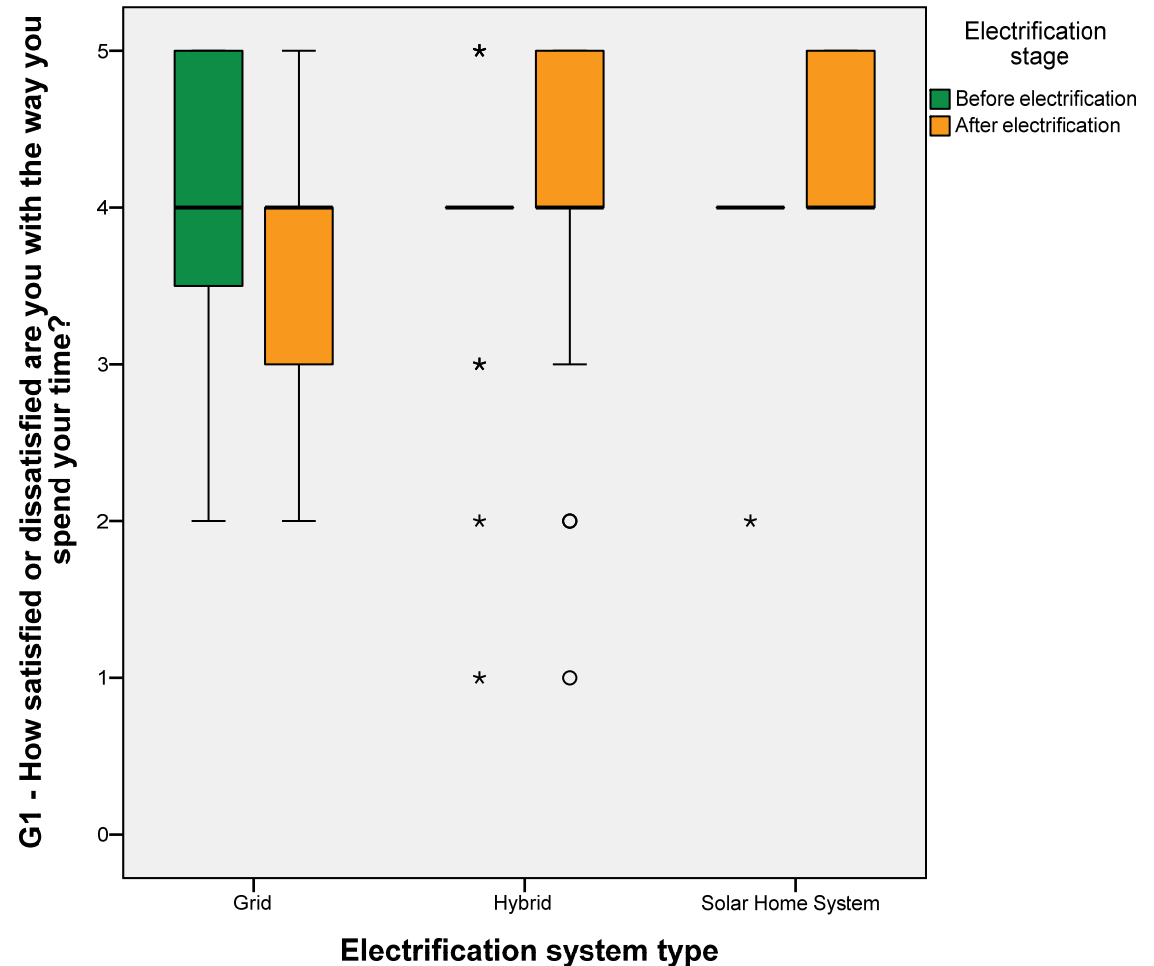
***single-living individual household is rare**

Results: QoL domains (way of spending time)

20

Time spent
No effect

- ❖ QoL gains might not be fully related to the way that people spend time
- ❖ Electrification might not have a strong impact on this type of human need
- ❖ In SE Asia time is spent similar regardless of electrification

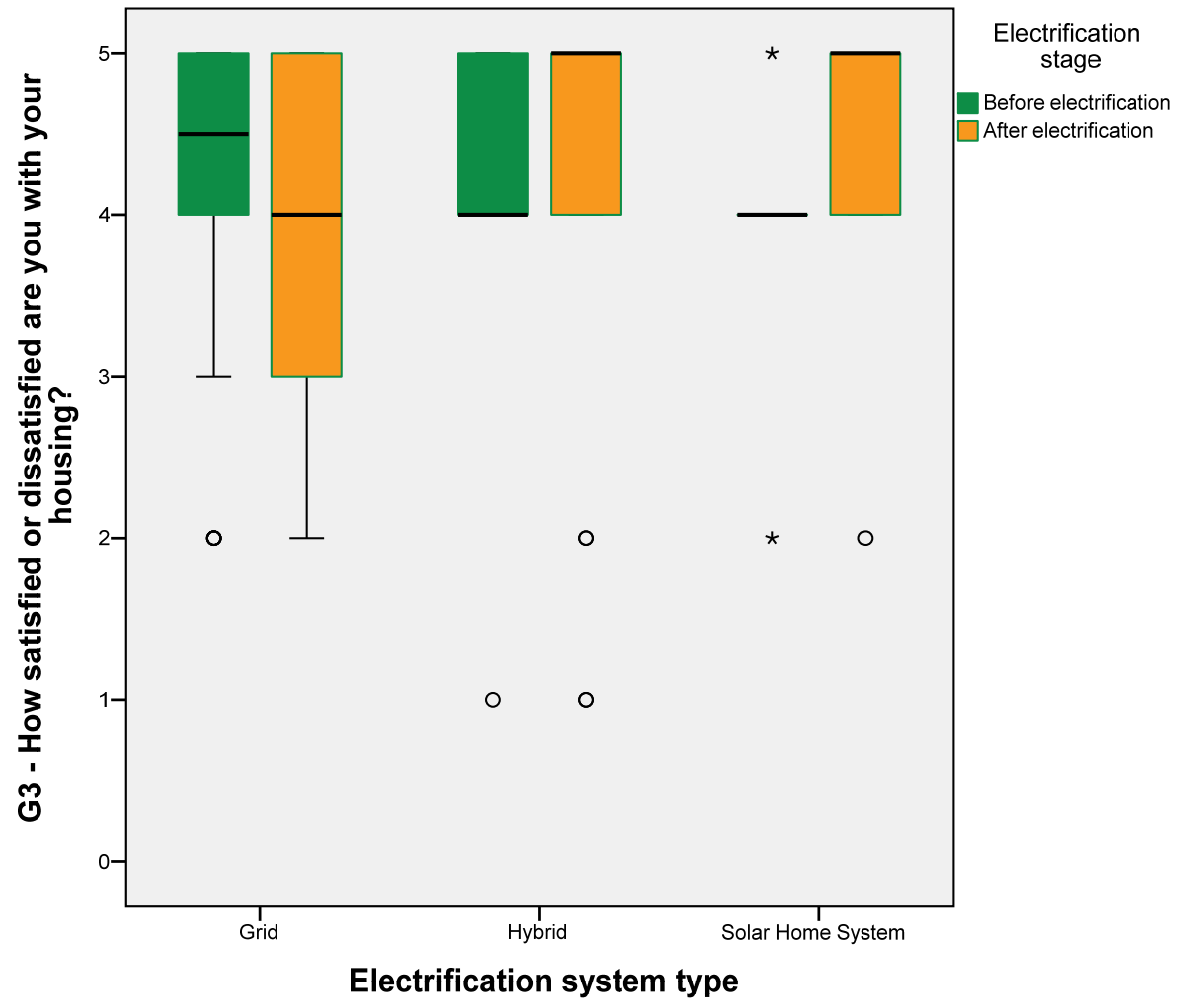


Results: QoL domains (Housing)

21

Housing
No effect

- ❖ Probably because measure relates to house construction not energy services
- ❖ Longer span view might give different outcomes

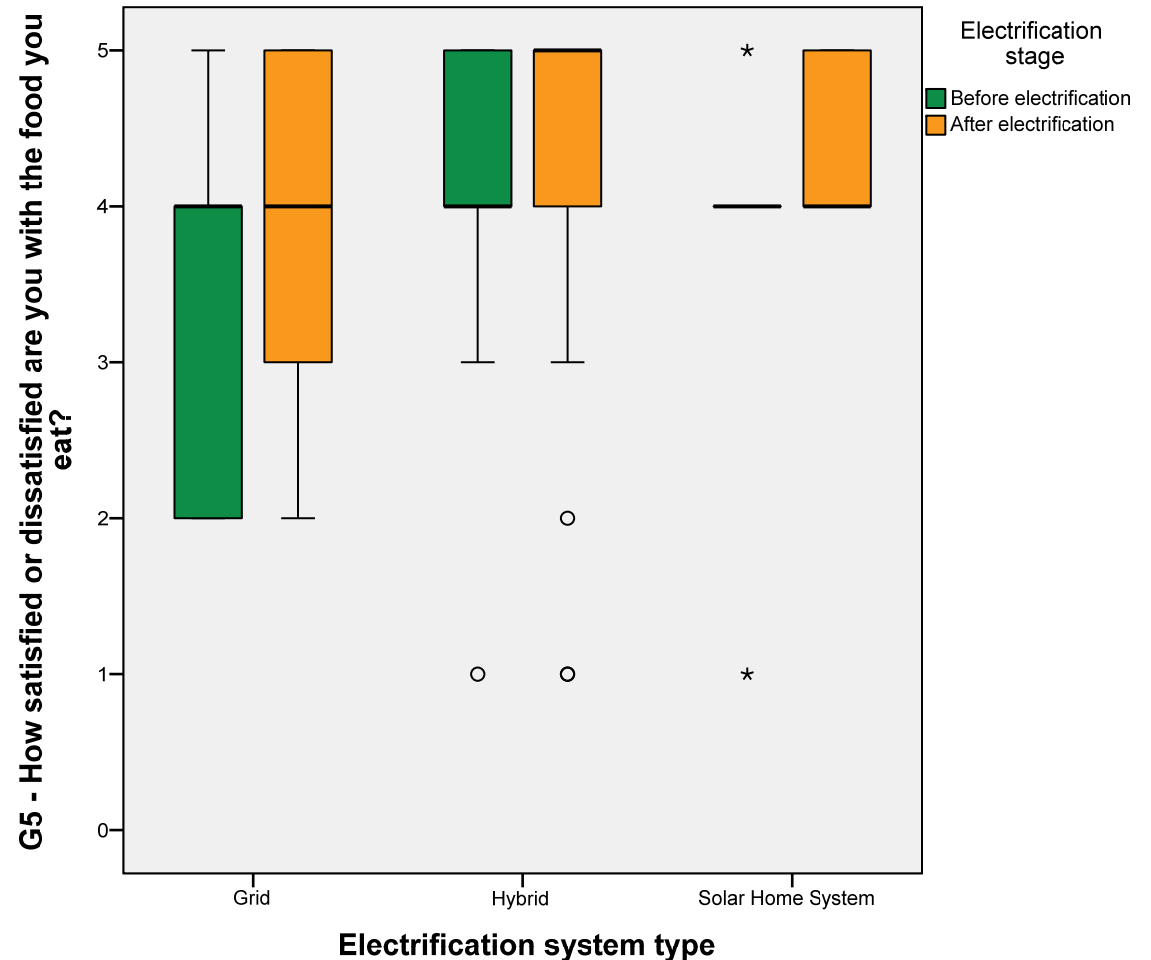


Results: QoL domains (Cooking)

22

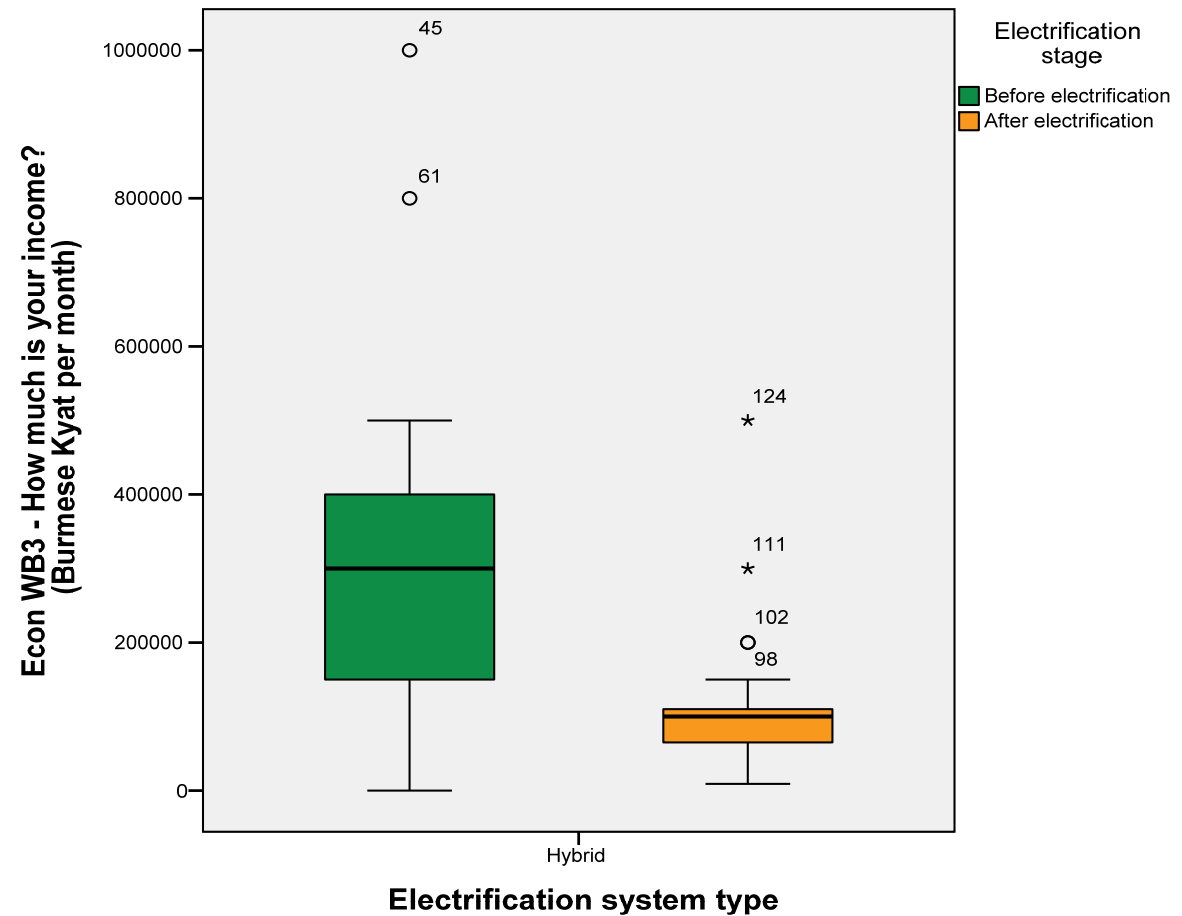
Cooking
Slight increase
(less evident)

- ❖ **Use of rice cookers and fridge might explain this difference, particularly in grid extensions (not so much for Solar Home)**



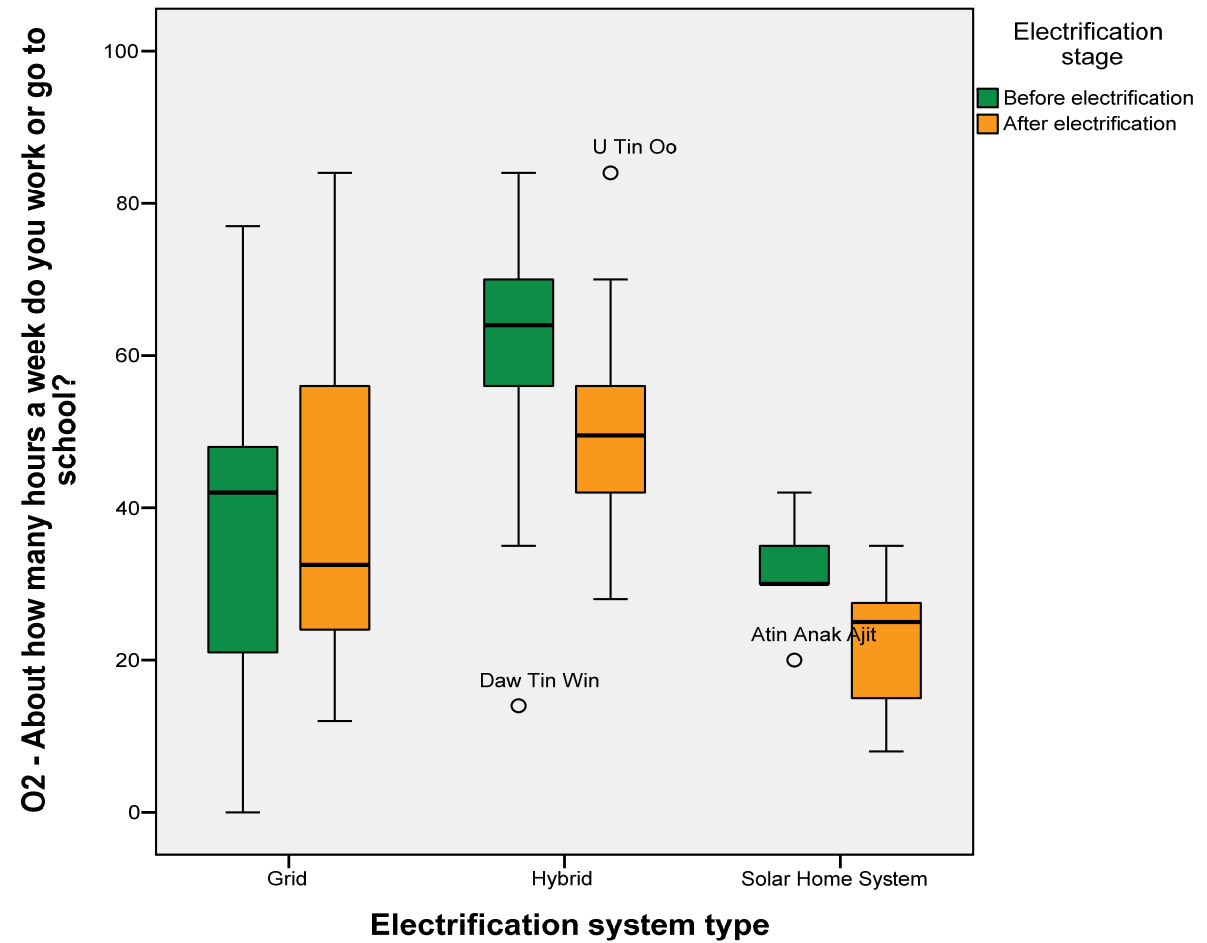
Results: Economic well-being

23



Results: Occupations

24



Conclusions

25

- Observed a positive effect of electrification on QoL in SE Asia using on a more direct measure.
- Through the demographic lenses, QoL increase is greater among the middle-aged, and people with basic education completed, as well as families without children.
- Through different QoL domains, we observed positive and neutral effects.
 - ▣ Notably, for ways of spending time and housing, there was no visible effect
- Overall, the results reflect short-term effects, further examination is needed for longer spans results and more conclusive findings.

Future research

26

- Comprehensive understanding of domains
 - ▣ Examine what has changed in daily life
- Explore cultural meanings in more detail
 - ▣ Follow-up local interviews/observations to understand community values that explain outcomes
- Observe the dynamics and change in longer spans

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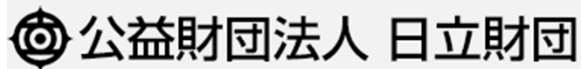
Indonesia



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Thank you
for your attention



Jordi Cravioto

jordi.cravioto@gmail.com



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