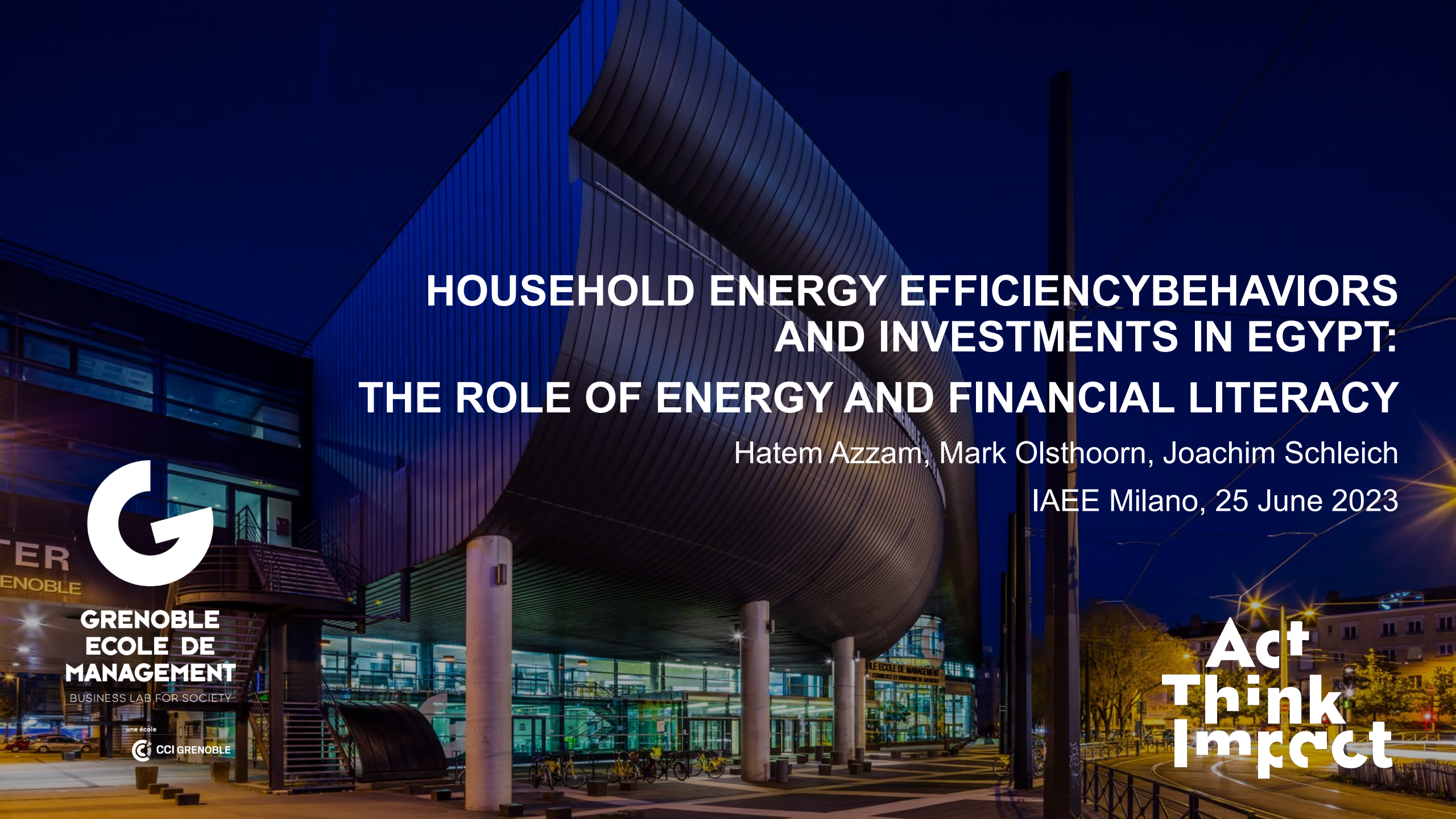

HOUSEHOLD ENERGY EFFICIENCYBEHAVIORS AND INVESTMENTS IN EGYPT: THE ROLE OF ENERGY AND FINANCIAL LITERACY

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MOTIVATION

- Bounded rationality and heuristic decision making prevent energy efficient household behavior (Gerarden et al. 2017).
- Energy and/or financial illiteracy may explain bounded rationality (Brent & Ward 2018).
- Energy literacy (DeWaters & Powers 2011), financial literacy (Lusardi & Mitchell 2011), and energy-related financial literacy (Blasch et al. 2021) as predictors of household energy efficiency behavior have been gained research attention (Brounen et al. 2013, Boogen et al. 2021, Blasch et al. 2021).
- The results are inconclusive or positive, depending on the literacy conceptualization and measurement and the type of EE behavior (van den Broek 2019).
- Literature focuses on developed (high & higher middle income) countries (except Filippini et al. 2020).
- In developing countries, (i) energy and financial literacy may be lower (Lusardi 2019), and (i) financial literacy may matter more. Growth of housing and appliance stock.
- We study the effect of energy literacy and financial literacy on energy efficient household behavior in a developing country: Egypt.

RESEARCH QUESTIONS

1 How do energy literacy and financial literacy affect household adoption of low-cost, medium-cost, and high-cost efficiency measures in developing countries?

2 What are socio-economic determinants of energy literacy and financial literacy in developing countries?

CONCEPTS

Energy literacy

Multifaceted concept (van den Broek 2019) capturing energy knowledge, attitudes, and behavior (DeWaters & Powers 2011), "which empowers individuals to make appropriate energy-related decisions" (He et al. 2022).

Here: Focus on knowledge dimension.

Financial literacy

Ability to process economic information and make informed financial decisions, as evident in the understanding of basic financial concepts, such as (i) compound interest, (ii) inflation, and (iii) risk diversification. (Lusardi & Mitchell 2014)

Energy-related financial literacy

"The combination of energy cost-specifc knowledge, fnancial literacy and cognitive abilities that are needed to take decisions with respect to the investment for the production of energy services and their consumption." (Blasch et al. 2021)

Predictors of **bounded rationality** in decision making regarding energy efficiency measures ?

RESEARCH MODEL

Energy literacy
(Knowledge, DeWaters & Powers 2011)

Financial literacy
("Big three", Lusardi & Mitchell 2011)

Covariates:
Household characteristics, attitudes, preferences

Uptake of:

1. **Energy saving habits**

2. **Efficient lighting (LED)**

3. **Efficient appliances**

DATA COLLECTION

Survey

- *N* = 1002
- **Cairo, Egypt**
- May-June 2021
- Face-to-face

Population

Inhabitants of Cairo involved in household purchasing and expenditures decisions.

Sampling

Stratified random sampling

Questionnaire

- Strata: Age, gender, district of living
- EE habits
- EET adoption (LED, appliances)
- Energy Literacy
- Financial Literacy
- Household characteristics
  - Environmental identity
  - Social norms
  - Time and risk preferences
  - Income
  - Education
  - Household size

ENERGY EFFICIENCY MEASURES

Habits

1. I turn off the lights when leaving a room (64.9%)
2. I turn down the air conditioning/ventilation when leaving the dwelling (and nobody else is in the dwelling) (73.1%)
3. I wait for a full load before using the washing machine (54.6%)
4. I switch off the T.V. (or use a power strip) rather than leaving the T.V. on stand-by (63.1%)
5. I turn off the screen of my computer when I take a break for more than 10 minutes (53.5%)
6. I unplug the charger after charging the phone (53.4%)

Mean habits = 3.42

LED adoption

Did you buy a new light bulb (all types) in the past two years?

If yes, which type did you buy? *[LED/CFL/Halogen/ICL/Other/Don't know]*

LED = 1 if LED only (59,6% of sample)

Efficient appliance adoption

IF new appliance bought within past 5 years:

To the best of your knowledge, was this appliance a top-rated energy-efficient appliance? *[Yes/No/Don't know]*

Top = 1 if Yes (39.1% of sample)

LITERACY MEASUREMENT

Energy literacy (DeWaters & Powers, 2011)

1. **The amount of electrical energy (electricicty) we use is measured in units called** *[Kilowatthour (kWh)]*
2. **The amount of energy consumed by an electrical appliance is equal to the power rating of this appliance (Watts or Kilowatts)** *[Multiplied by the time it is used]*
3. **Which of the following appliances typically causes the highest electricity consumption through its use?** *[Refrigerator]*
4. **Which of the following options typically causes the lowest electricity consumption [to bring one liter of water to a boil]?** *[Electric kettle]*

EL index = number correct [0, 1, 2, 3, 4]

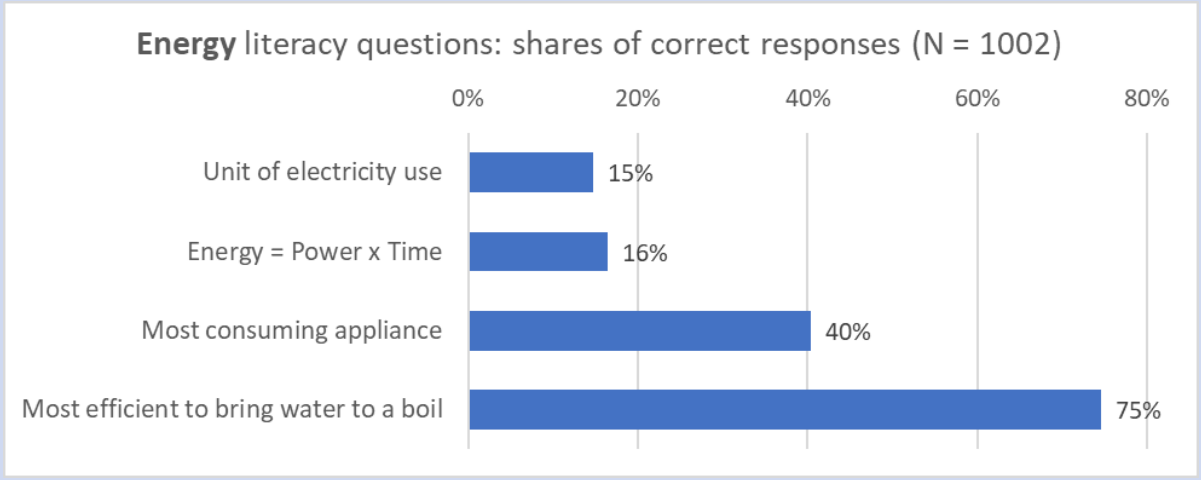
Financial literacy (Lusardi & Mitchell, 2011: "Big Three")

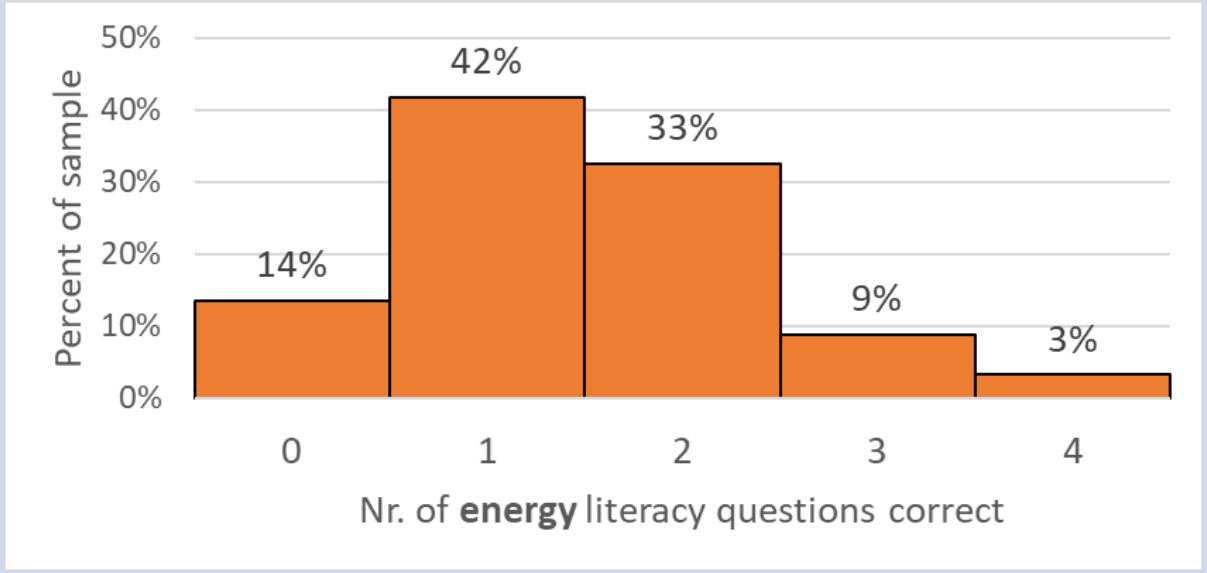
1. **Suppose you had $100 in a savings account, and the interest rate was 2% per year. After one year, how much do you think you would have in the account if you left the money to grow?** *[More than / Exactly/ Less than $102 / Don't know]*
2. **Imagine that your savings account's interest rate was 1% per year, and inflation was 2% per year. After one year, how much would you be able to buy with the money in this account?** *[More than today / Exactly the same / Less than today / Don't know]*
3. **In your mind, is the following statement true: "Purchasing a single company share typically involves a more secure rate of return than investing in a fund."** *[True / False / Don't know]*

FL index = share correct [0, 1, 2, 3]

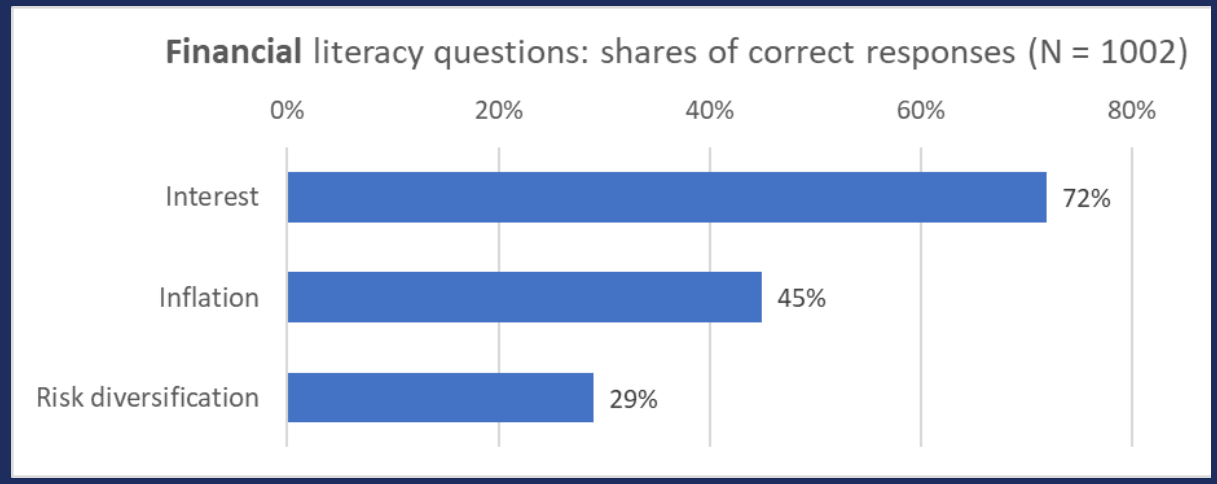
DESCRIPTIVE STATISTICS

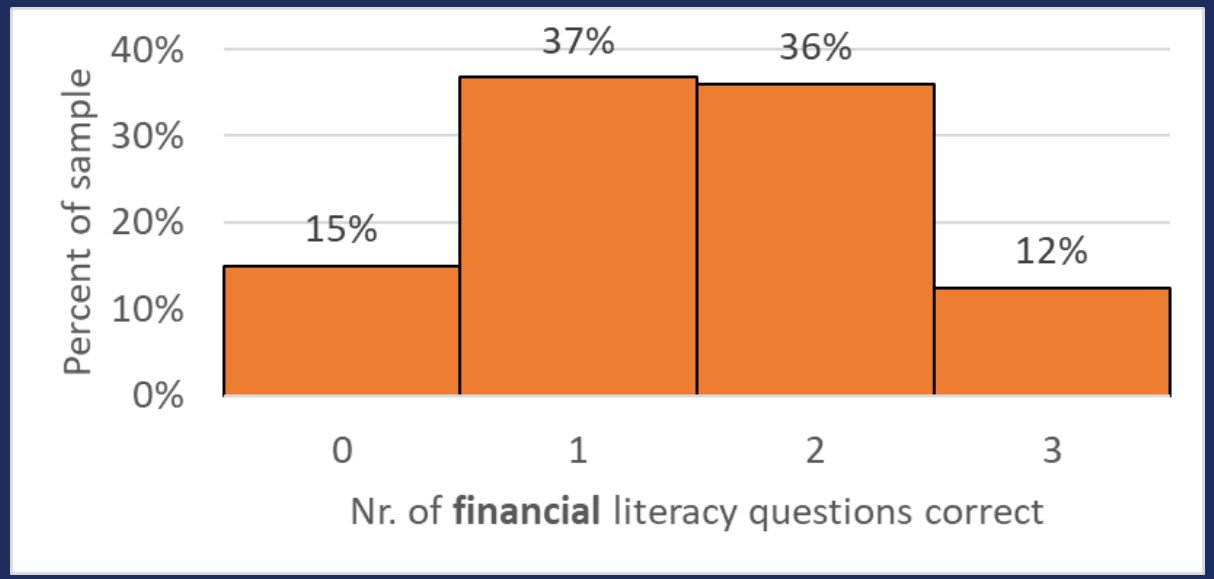
Energy literacy



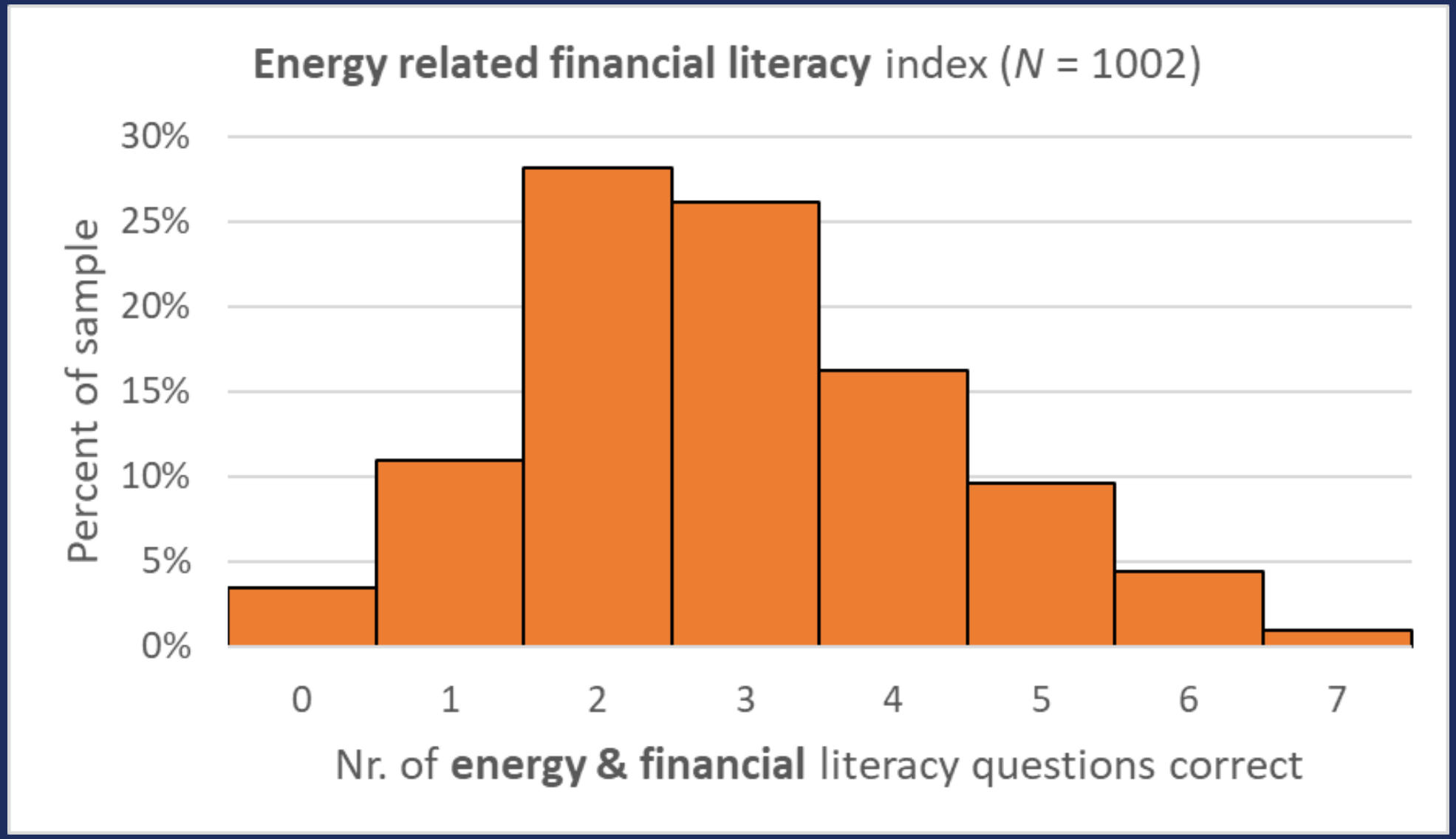


Financial literacy





ENERGY RELATED FINANCIAL LITERACY



RESULTS:

HOW ENERGY LITERACY AND FINANCIAL LITERACY AFFECT EEM UPTAKE

VARIABLES	(OLS) EE habits	(Probit) EE bulb	(Probit) EE appliance
High energy literacy	0.019	0.375***	-0.022
	(0.022)	(0.096)	(0.141)
High financial literacy	0.011	0.193*	-0.014
	(0.023)	(0.102)	(0.148)
Male	-0.045**	0.040	0.184
	(0.021)	(0.095)	(0.139)
Age	0.005***	0.009*	0.011
	(0.001)	(0.005)	(0.007)
Income quartile 1	0.077***		0.033
	(0.024)		(0.172)
Income quartile 4	-0.002		0.331*
	(0.029)		(0.172)
Income (x1000 EGP/month)		0.036**	
		(0.018)	
Household size	-0.017***	-0.068***	0.016
	(0.004)	(0.026)	(0.023)
Low educ. (<= 9y)	0.164***	-0.310	-0.183
	(0.039)	(0.232)	(0.460)
High educ. (> 12y)	-0.001	-0.235**	0.115
	(0.022)	(0.109)	(0.169)
Environmental identity	0.125***	-0.155**	0.313***
	(0.017)	(0.077)	(0.118)
Social norm	-0.001	0.126***	0.033
	(0.010)	(0.046)	(0.062)
Constant	-0.017	0.028	-2.265***
	(0.081)	(0.373)	(0.576)
Observations	905	795	378
(Pseudo) *R*-squared	0.170	0.0526	0.046

RESULTS:

DETERMINANTS OF ENERGY LITERACY AND FINANCIAL LITERACY

VARIABLES	(1, probit) EL dummy	(2, probit) FL dummy	(3, probit) ERFL dummy	(4, OLS) ERFL index
Male	-0.150*	-0.252***	-0.432***	-0.181*
	(0.086)	(0.088)	(0.095)	(0.093)
Age	0.002	-0.004	0.003	-0.001
	(0.004)	(0.004)	(0.005)	(0.005)
Income quartile 1	0.071	-0.413***	-0.304**	-0.274**
	(0.106)	(0.114)	(0.123)	(0.115)
Income quartile 4	-0.245**	-0.079	-0.195	-0.378***
	(0.112)	(0.114)	(0.120)	(0.121)
Household size	0.022	-0.002	0.013	-0.010
	(0.020)	(0.021)	(0.020)	(0.017)
Low educ. (<= 9y)	-0.465**	-0.224	-0.297	-0.516**
	(0.228)	(0.233)	(0.266)	(0.242)
High educ. (> 12y)	-0.176*	-0.278***	-0.267**	-0.299***
	(0.099)	(0.104)	(0.107)	(0.110)
Environmental identity	0.304***	0.718***	0.565***	0.680***
	(0.068)	(0.077)	(0.081)	(0.069)
Constant	-1.302***	-2.337***	-2.592***	0.755**
	(0.342)	(0.368)	(0.396)	(0.348)
Observations	905	905	905	905
(Pseudo) R-squared	0.0339	0.117	0.100	0.127
Log likelihood	-599.5	-553.8	-473.8	
p-val.	3.02e-06	0.000	0.000	0.000

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

CONCLUSIONS

- Energy literacy and Financial literacy (relatively) low in Cairo.
- Energy literacy and Financial literacy are associated with higher adoption of efficient light bulbs, but not with adoption of top-rated appliances or energy efficient habits.
- Men are less energy and financially literate than women, contrary to literature
- Age does not significantly correlate with energy or financial literacy (relatively young demographic)
- Low-income households are less financially literate, but not less energy literate
- Surprisingly, people with higher education are less energy and financially literate
- Strongest determinant: Environmental identity

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DESCRIPTIVE STATISTICS

Variable	Obs	Mean	Std. dev.	Min	Max
male	1,002	.4870259	.5000812	0	1
age	1,002	34.28244	10.19731	20	72
income_1000	911	5.62404	2.894004	.5	25
hh_size	1,002	4.305389	2.313266	0	30
low_ed	995	.0452261	.2079042	0	1
voc_ed	995	.1517588	.3589674	0	1
secondary_ed	995	.1517588	.3589674	0	1
high_ed	995	.6512563	.4768124	0	1
Environmen~D	1,002	4.042914	.6744996	1.75	5
social_nor~2	1,002	3.884232	1.12397	1	5