



University of Vaasa



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The Role of Energy Literacy as a Component of Financial Literacy: Survey – based evidence from Finland

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1. Background of the study

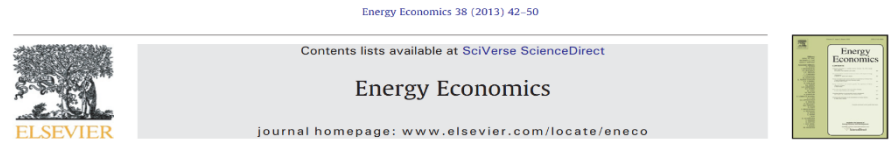
Our daily decisions on energy-related issues can be considered as one component of personal finance decisions → e.g., adjusting thermostat settings, energy efficiency investments, price comparisons.

Although energy-related decisions affect our daily life and our pockets, several studies (e.g., Brounen et al, 2013; Sovacool and Blyth, 2015) indicate that energy use and energy savings seem not to be important issues in our mind.

The difficulties to realize energy saving potentials have been traced by psychologist and economists on several sources such as lack of information to act in our best interest, lack of knowledge about energy costs, etc.

The understanding of how energy is used in everyday life or the awareness of the need of energy conservation are important, but the willingness to translate that knowledge into actual energy behaviours is even more crucial.

These considerations can be reflected also against the literature on financial literacy. Therefore, the two issues are assessed jointly.



Energy literacy, awareness, and conservation behavior of residential households[☆]

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2. Aim of the study

We collected survey data on energy and financial related issues in the residential sector of Finland in order to examine:

- The level of energy literacy, financial literacy, and energy awareness in Finnish households.
- The range of energy behaviours exhibited and attitudes towards energy consumption.
- The factors affecting energy literate households and whether financial literacy and energy literacy are correlated.

The goal of this study is to support the design of future energy policies targeting household energy efficiency and behaviour change. These interventions should include measures that guide consumer towards more responsible decisions - and not only focusing on energy-related savings.

Energy literacy is not energy knowledge or energy awareness.

Knowledge  Behaviour

3. Data

- The survey questionnaire was designed between 2016 and 2017 and it is based on an extensive literature review of survey methodology and households' energy and financial related surveys (e.g. Bowling, 2005; Brounen et al. 2013).
- Between April and May 2017 we collected data by using the survey tool Webropol 2.0.
- The survey consists of 57 energy and financial related questions, including information regarding the socio-economic and demographic characteristics of the respondents, environmental attitudes, dwelling characteristics, and respondents' willingness to get more information about energy consumption.
- The questionnaire was delivered in Finnish, Swedish, and English.
- The survey data has been combined with monthly electricity consumption data from April 2015 to March 2017 provided by Vaasan Sähkö (Finnish electricity provider) and Vaasan Sähköverkko (Finnish electricity distribution company).
- Among 244 adults who initially showed interest in participating to the survey, 184 completed the questionnaire - response rate of approximately 75%.

On the basis of the survey questionnaire and literature review, we formulate two hypothesis:

H1: Finnish households have a low level of energy literacy and energy awareness, while they have a high level of financial literacy.

H2: High levels of energy literacy are associated with high levels of financial literacy.

4. Methodology

We measured energy literacy by a binary variable that takes the value of one if the respondent correctly answered to two questions assessing the ability to choose between two different heating systems with the same lifespan but different retail price and monthly heating bills.

ENERGY LITERACY

Trade-off between two models of heating systems - lifespan of 15 years	Trade-off between two models of heating systems - lifespan of 5 years
Q1. Think about a hypothetical situation where you own your home, your heating system breaks down and is beyond repair. As a replacement, you can choose between two heating systems. Model A sells for €3750 and the heating is expected to cost €100 per month. Model B is more expensive, with a retail price of €5000, but the heating will cost €80 per month. You can assume that both models have an economic lifespan of 15 years. Which heating system would you choose?	Q2. What would happen if both models would have an economic lifespan of 5 years (instead of 15 years as assumed before)? Which heating system would you prefer?
<ul style="list-style-type: none">➤ Heating system A➤ Heating system B➤ Both models are equally adequate➤ Cannot say	<ul style="list-style-type: none">➤ Heating system A➤ Heating system B➤ Both models are equally adequate➤ Cannot say

The level of financial literacy is also measured by a binary variable that takes the value of one whether respondents correctly answered to three questions concerning the interest rate, compound interest, and stock options.

FINANCIAL LITERACY		
Interest rate	Compound interest	Stock options
Q1. Suppose you put €1000 into a savings account with a guaranteed interest rate of 1% per year. The inflation is 2% annually. You do not make any further payments into this account and you don't withdraw any money. In one year's time will you be able to buy:	Q2. Suppose you put €100 into a savings account with a guaranteed interest rate of 2% per year. You do not make any further payments into this account and you don't withdraw any money. Assume that there is no tax on interest paid. How much would be in the account at the end of five years?	Q3. When you buy a wide range of stocks, it usually means a higher risk of decrease in value, than in investing in one stock only.
<ul style="list-style-type: none"> ➤ The same amount as today ➤ Less than you could buy today ➤ More than you could buy today ➤ Cannot say 	<ul style="list-style-type: none"> ➤ More than €102 ➤ Exactly €102 ➤ Less than €102 ➤ Cannot say 	<ul style="list-style-type: none"> ➤ True ➤ False ➤ Cannot say

ENERGY AWARENESS

➤ Awareness of electricity prices → Reported estimation are compared to actual energy costs and distribution charges

Electrical energy cost

Electrical distribution charge

Q1. How many Cents per Kilowatthour do you pay for the electrical energy cost on average? *Please provide the exact amount or an estimate.*

Q2. How many Cents per Kilowatthour do you pay for the electrical distribution charge on average including all taxes and levies? *Please provide the exact amount or an estimate.*

- Cents per Kilowatthour [.....]
- Cannot say

- Cents per Kilowatthour [.....]
- Cannot say

➤ Awareness of different operating costs → Correct answers to at least two of the following questions

Dishwasher

Oven

Heating bill

Q1. How much does it cost (Cents) to run an ordinary dishwasher for two hours? *Please provide an estimate.*

Q2. How much does it cost (Cents) to use an ordinary oven for two hours (at 200°C)? *Please provide an estimate.*

Q3. What is the percentage (%) your heating bill goes up on average if you increase the temperature of your house by two degrees in a month? *Please provide an estimate.*

- Cents [.....]
- Cannot say

- Cents [.....]
- Cannot say

- My heating bill goes up by (per cent) [.....]
- Cannot say

➤ Awareness of monthly electricity consumption → Reported estimation are compared to actual electricity consumption

Winter electricity bill

Summer electricity bill

Q1. How much did you pay for your monthly electricity bill (basic charge, energy charge, distribution charge and taxes) during the last winter (December 2016-February 2017)? *Please give the monthly average amount.*

Q2. How much did you pay for your monthly electricity bill (basic charge, energy charge, distribution charge and taxes) during the last summer (June 2016-August 2016)? *Please give the monthly average amount.*

- 30-59 euros
- 60-89 euros
- 90-119 euros
- ...
- 500 euros or more
- Cannot say

- 30-59 euros
- 60-89 euros
- 90-119 euros
- ...
- 500 euros or more
- Cannot say

Energy-saving behaviours ➡ “never”, “occasionally”, “often”, “always”.

Energy efficiency investments ➡ “my household has already done this investment”....
“my household is not planning to do this investment”.

We then turn the analysis to the factors influencing the likelihood of Finnish households to be energy literate within a standard discrete choice logit model framework. Thus, in order to explore the determinants of energy literacy, we estimate the following equation:

$$\Pr(En)_i = \alpha_i + \beta_i S_i + \delta_i D_i + \varepsilon_i$$

En_i = binary dummy representing whether respondent i is “energy literate”

S_i = vectors of explanatory variables with household i socio-demographic factors.

D_i = vectors of explanatory variables with household i dwelling factors.

β_i and δ_i = parameter vectors to be estimated.

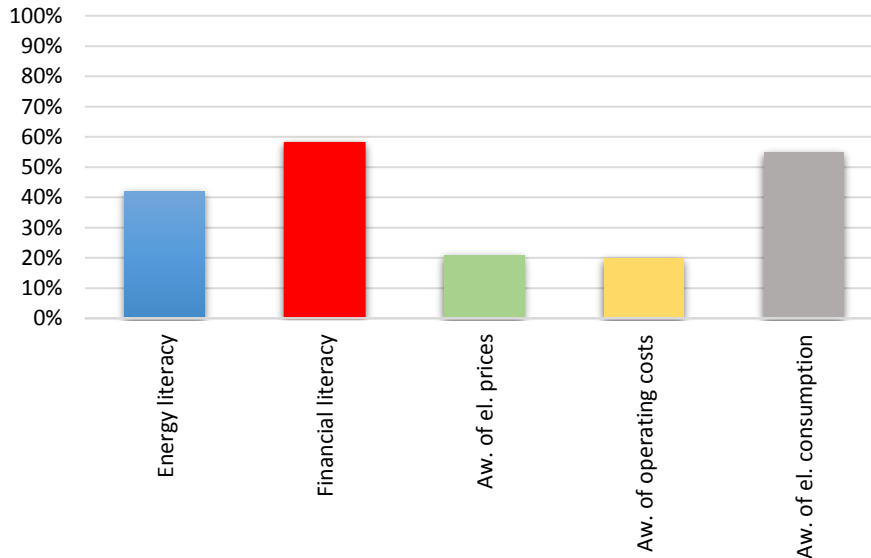
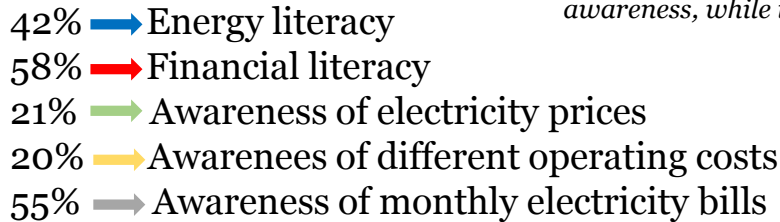
ε_i = error term.

Socio-demographic and dwelling factors included in the analysis: the household respondent’s age, gender, educational level, level of household income, dwelling by type and period of construction, housing tenure, whether young or elderly persons are present in the household, the responsible of the electricity bill, and the financial literacy proxy.

5. Discussion and Empirical Results

5.1 Energy literacy, financial literacy, and energy awareness

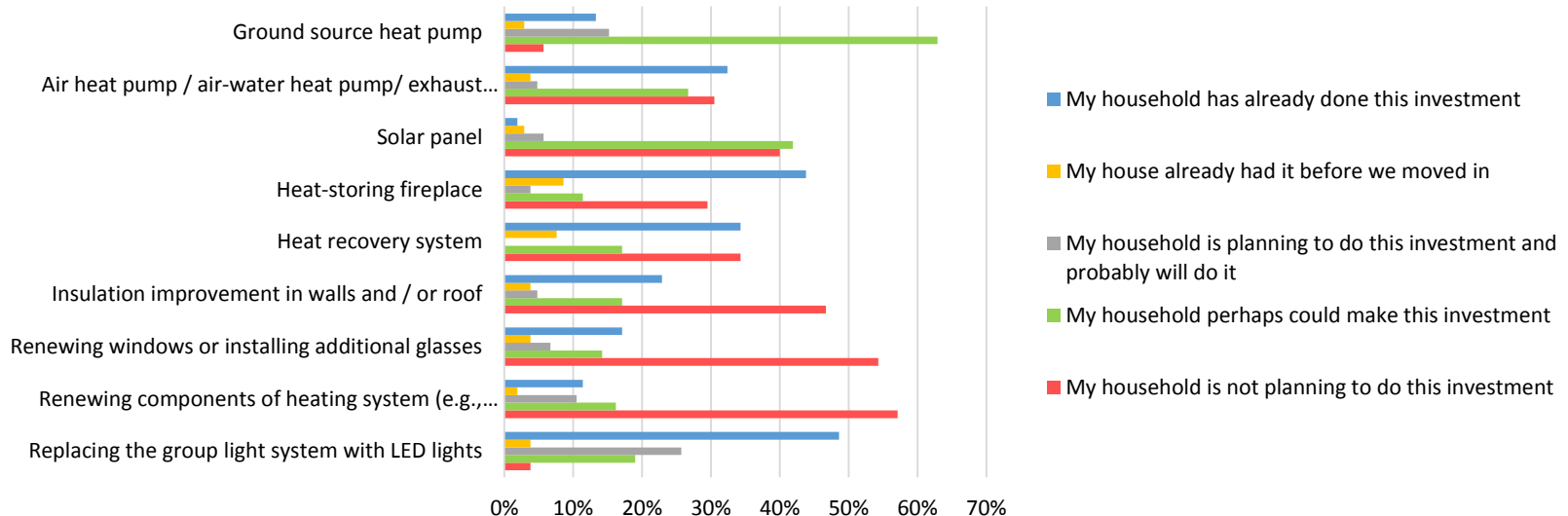
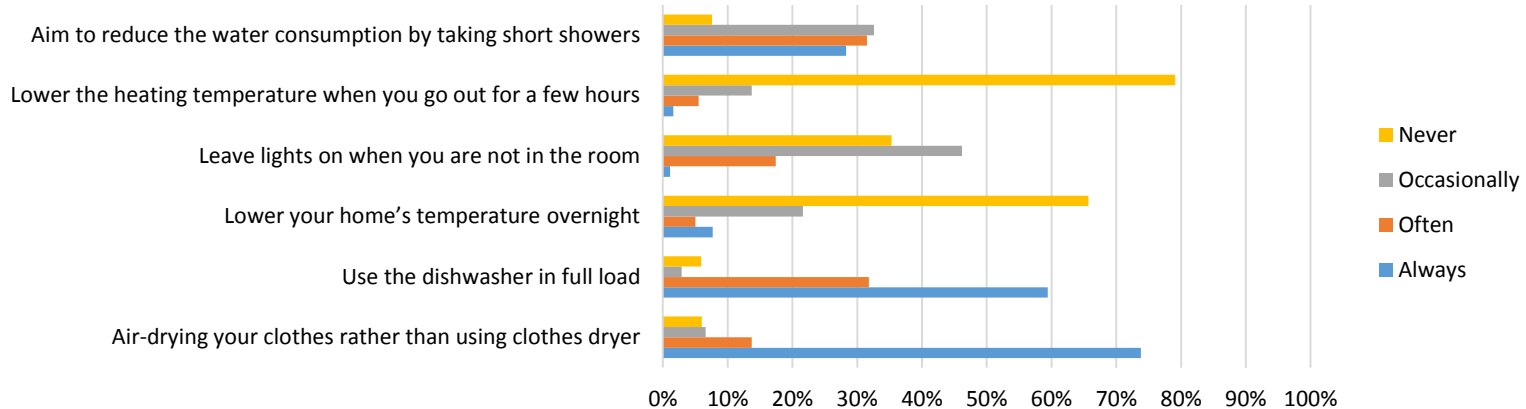
H1: Finnish households have a low level of energy literacy and energy awareness, while they have a high level of financial literacy. ✓



More than two-thirds of the respondents would like to have **more information** on:

- How to save energy at home;
- Their energy consumption compared with the energy consumption of similar households;
- Their current energy consumption compared with past energy consumption;
- The operating cost of all the electric appliances.

5.2 Energy saving-behaviours and energy efficiency investments



5.3 Determinants of Energy Literacy

- No statistically significant positive correlation between high levels of energy literacy and financial literacy has been found. *H2: High levels of energy literacy are associated with high levels of financial literacy.* ✖
- Women are found 18% more likely to be energy literate than men.
- The household composition seems to play an important role in influencing higher levels of energy literacy (number of persons, no young).
- Respondents belonging to a household in which elderly persons are not present seem 29% less likely to be energy literate.
- There appear to be a positive relationship between some households' characteristics that led to higher electricity consumption and the probability of being energy literate.
- A direct involvement in the payment of the bills might increase the level of information for responsible decisions and actions.
- Households with a high level of income and living in a modern house seem more likely to be energy literate.

Average Marginal Effects (AMEs) for Logit Estimations of Energy Literate Respondents

Variables	Energy Literate (AMEs-Logit)
Financial literate	0.05 (0.09)
Age	-0.1 (0.02)
Agesq	-0.00 (0.00)
Npeople	0.17* (0.08)
Female	0.18* (0.09)
BA degree or higher	-0.18 (0.09)
No young	0.53** (0.17)
No old	-0.29* (0.14)
High income household	0.33* (0.14)
Electricity bill payment: Myself	0.22* (0.09)
Single house / Detached	0.02 (0.1)
Year dwelling: >2000	0.41*** (0.08)
Owner dwelling	-0.11 (0.15)
Number of observations	126
McFadden Pseudo R ²	0.1805
Hosmer-Lemeshow test	0.6932
% of correct prediction	74.6%

6. Conclusions and Implications for Energy Policy

- ❖ Results show that Finnish households have a low level of energy literacy and energy awareness, while they possess a high level of financial literacy.
- ❖ While lowering the heating system when out for few hours or during the night are not common energy habits, more attention is paid to the use of lights, shower water, dishwasher, and also clothes dryer. The heat-storing fireplace is the most common energy efficiency investment made, followed by the replacement of the group lighting system with led lights.
- ❖ Logistic regression allows us to trace a profile with specific characteristics of Finnish households in respect to energy literacy (e.g, household composition, gender, income levels).
- ❖ Despite energy-related issues can be regarded a component of personal finance decisions, no statistically significant positive correlation between high levels of energy literacy and financial literacy has been found.
- ❖ By providing more reliable and transparent information, behavioural issues leading to higher electricity consumption could be lessened.
- ❖ In this setting, an important part of the future energy policy agenda on behavioral and efficiency interventions is to give people a tangible sense of their energy consumption and helping them to make optimal investment choices.



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Thank you for your attention

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