

# The Long-Term Effects of Using the Energy Box on Energy Poor Households in the Private Rental Sector in the Netherlands

B. E. Weber, N. Vrieling, M. G. Rietbergen

**Abstract**—This paper explores the long-term effects of the Energy Box trajectory on households in the private rental sector, specifically households experiencing energy poverty. The concept of energy poverty has been getting increasing attention among policymakers over the past few years. In the Netherlands, as far as we know, there are no national policies on alleviating energy poverty, which negatively impacts energy-poor households. The Energy Box can help households experiencing energy poverty by stimulating them to improve the energy efficiency of their home by changing their energy-saving behavior. Important long-term effects are that respondents indicate that they live in a more environmentally friendly way and that they save money on their energy bills. Households feel engaged with the concept of energy-saving and can see the benefits of changing their energy-saving behavior. Respondents perceived the Energy Box as a means to live more environmentally friendly, instead of it solely being a means to save money on energy bills. The findings show that most respondents signed up for the Energy Box are interested in energy-saving as a lifestyle choice instead of a financial choice, which would likely be the case for households experiencing energy poverty.

**Keywords**—Energy-saving behavior, energy poverty, poverty, private rental sector.

## I. INTRODUCTION

THE European Union (EU) is increasingly acknowledging the significance of energy poverty for households within the EU, resulting in policies aimed at reducing energy poverty in its member states. Energy poverty is seen as “a widespread problem across Europe, as between 50 and 125 million people are unable to afford proper indoor thermal comfort” [4]. Especially now that gas prices are rising, the issue of energy poverty has become even more apparent. The European Commission defines households who experience energy poverty as “households that spend more than a predefined threshold share of their overall consumption expenditure on energy products” [4]. A threshold of 10% is frequently used in existing literature on the concept of energy poverty [1]-[7]. Furthermore, households experiencing energy poverty are often low-income households. It is difficult for these households to purchase energy-saving products, especially those requiring substantial investments, such as upgrading the home’s insulation. Additionally, because of their lower income, these households are more dependent upon housing corporations or

private landlords for making their homes more energy efficient.

Regardless of their income status, households in the private rental sector are encouraged to make their homes more energy efficient and, subsequently, reduce their energy bills. They can accomplish this by investing in home improvements, such as insulation or solar panels, which often involve higher costs and adjustments to the home. Another action households can take is to implement lower-cost energy-saving measures, such as investing in a water-saving shower head or LED lights. These measures are easier to implement and require fewer investments. Households can also improve their energy efficiency through changing their energy-saving behavior, examples of which can be taking shorter showers or lowering the thermostat at night.

The Energy Box is aimed at stimulating the energy-saving behavior of households through the implementation of affordable energy-saving measures. It consists of energy-saving products and tailored advice from an energy coach. With the help of an energy coach, households can make their homes more energy efficient without renovations and without investments. Energy-saving advice that households can implement are, for example, using LED lamps, placing weather strips around windowsills, or simply lowering the thermostat at night. However, it is difficult to estimate what the long-term effects are of stimulating energy-saving behavior. The success rate of projects aimed at changing energy-saving behavior, increasing energy efficiency, and combating energy poverty – such as the Energy Box – varies widely among households. Research has found that the success rate can be improved through systematic monitoring, thus making several home visits [7], since changing behavior takes time. Therefore, the data of two surveys conducted at two different moments in time among households using the Energy Box were analyzed and compared in order to answer the following research question: ‘What are the long-term effects of the Energy Box on the energy-saving behavior of households experiencing energy poverty in the private rental sector?’

## II. METHOD

For this research, the data of two surveys were analyzed. Both surveys were conducted among tenants who requested the

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Energy Box at their respective municipalities. The surveys followed along similar lines and provided participant opinions from different points in time. The first survey yielded evaluation results from 117 participants of the Energy Box directly after they had completed the Energy Box trajectory. The participants were tenants in the private renting sector and resided in Utrecht, Eindhoven, or Tilburg, with respectively 68, 40 and nine respondents. The data of the cities were analyzed collectively due to the number of participants from Eindhoven and Tilburg being smaller in size than the number of participants from Utrecht. The data from the survey were provided by JMA, the initiator of the Energy Box project.

It is important to mention that the answer options of the surveys differed between Utrecht, Eindhoven, and Tilburg. For example, for some questions of the Tilburg and Eindhoven surveys, participants were able to select multiple answers, whereas participants of the Utrecht survey were only able to select one answer. In such a case, for the Eindhoven and Tilburg surveys, it was decided to use the first answer the participants had selected. In addition, due to not all surveys containing the same questions, namely the Tilburg survey differentiated between a first and a second consultation, not all research findings of this survey could be implied.

The second survey was set out by researchers of the ENPOR project in consultation with JMA. A total of 88 tenants in the private rental sector participated in the second survey. The participants resided in the municipality Utrecht. At the time of this survey, the participants had already had a consultation with an energy coach and had been using the Energy Box for one year. After the first survey question, all respondents who stated that they were not a renter were excluded from the survey. For the remainder of the survey, there were a total of 79 respondents, thereby removing non-renters from the survey.

### III. RESULTS

#### A. First Survey

The respondents resided in either Utrecht (58%, N = 68), Eindhoven (34%, N = 40) or Tilburg (8%, N = 9). The vast majority (86%) of respondents rented their homes from a private landlord, and the second largest group of respondents (9%) rented from a housing cooperation called Bouwinvest.

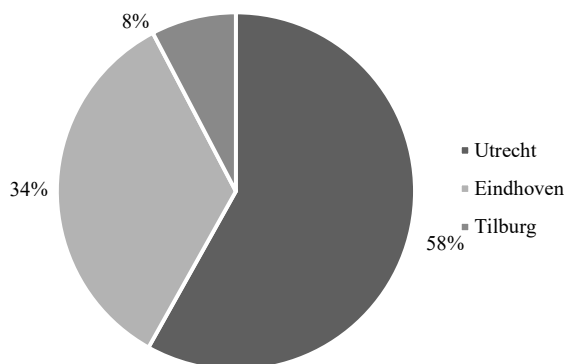


Fig. 1 In which municipality do you live?

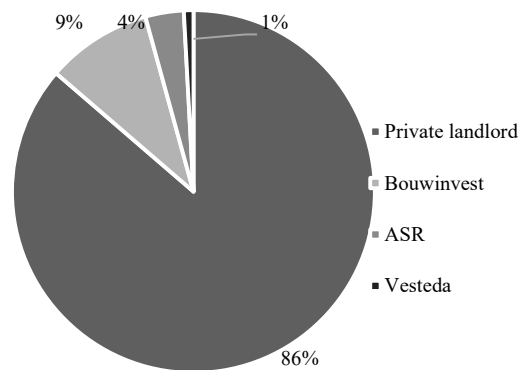


Fig. 2 From whom do you rent your home?

Most households participating in the survey were two-person households (48%) or one-person households (30%). When asked how the respondents came across the Energy Box, the main modes they opted for were: the website of the Energy Box (43%), a letter or email from their landlord, housing cooperation or municipality (20%), or through friends, acquaintances, or neighbors (13%). Respondents note differing reasons for signing up for the Energy Box. The most often named reasons were live more environmentally friendly (53%), gain knowledge regarding energy consumption (25%), or save money on energy bills (16%).

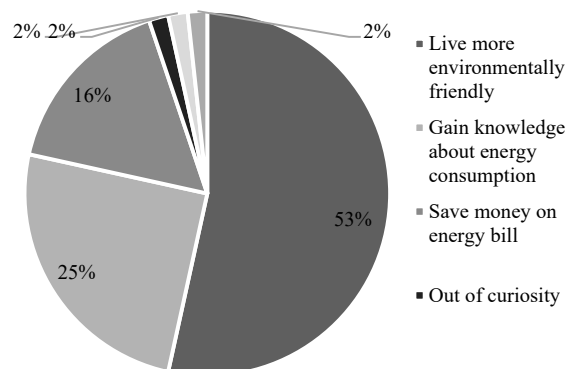


Fig. 3 Why did you sign up for energy advice?

Most of the consultations for energy advice were held either over the phone (64%) or at the home of the respondents (32%). The respondents were highly positive about the personal consultation. They mentioned that the consultation was clear (98%), and the duration was just right (83%). Additionally, the coach listened to their wishes and needs (89%), explained everything well (80%) and the consultation met their expectations (83%). Moreover, the given analysis of the financial statements (the energy bills) was a useful addition to the advice (63%), and the energy box was a useful addition to the consultation (84%). Therefore, the overall experience of the consultations can be deemed as rather positive. The respondents were also positive about the advisory report that was given after the consultation. They agree that the measures were clearly described (90%), the measures were useful for their living situation (71%), and the respondents saw the advisory report as a useful addition to the consultation (86%). Hence, the advisory

report was seen as a helpful addition to the consultation.

The Energy Box differs per household since each household has distinctive energy-saving needs. The three energy-saving products that most respondents use are: power strip with on/off switch (78%), freezer/refrigerator thermometer (63%), and feed-through plug with on/off switch (54%).

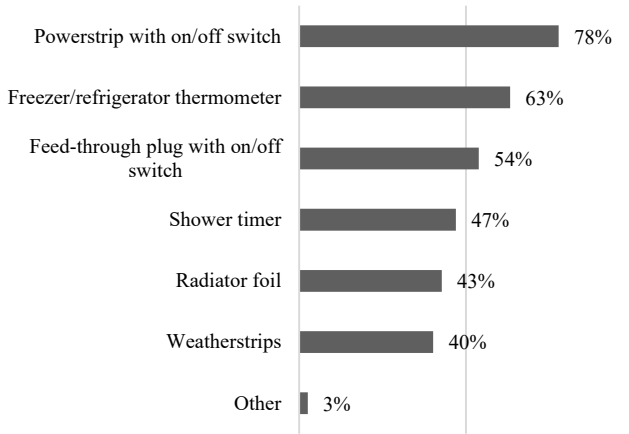


Fig. 4 Which Energy Box products do you use?

Furthermore, the energy advice that was followed the most by respondents was: preventing undetected power consumption of electrical appliances (62%), set refrigerator and/or freezer to correct temperature (49%), and take shorter showers (42%).

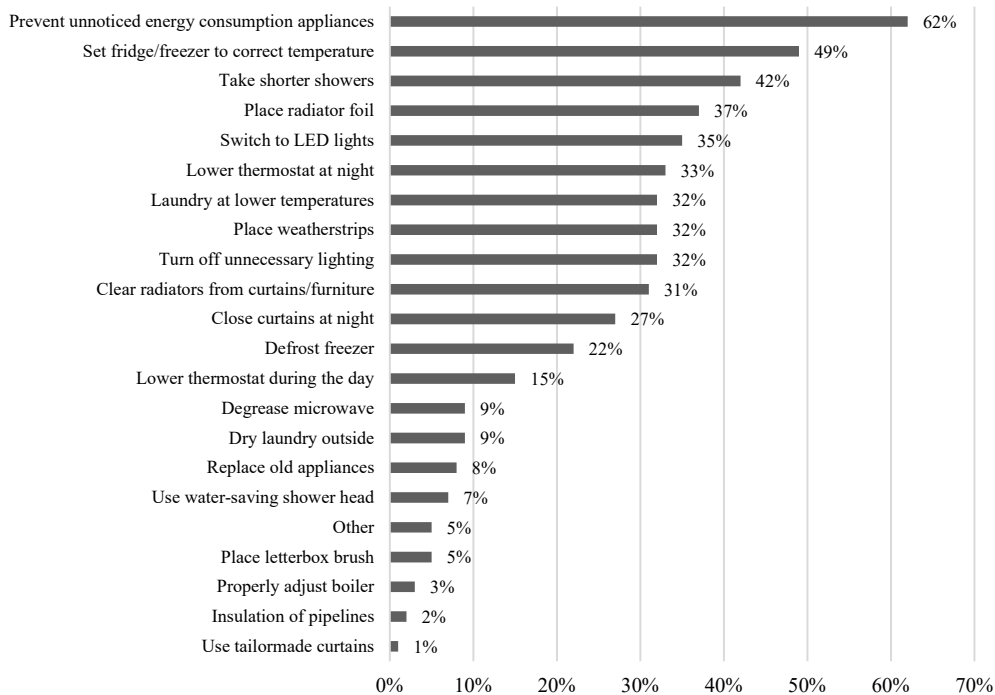


Fig. 5 Which energy advice have you implemented?

Half of the respondents (50%) estimated that they would be able to save between 1 and 50 Euros per year, based on the energy advice. The second largest group of respondents (28%) estimated to save between 50 and 100 Euros on a yearly basis.

In order to save money on their energy bills, a small group of respondents (18%) mentioned that they had spent money in order to implement the measures of the advisory report. This finding shows that, in some cases, the contents of the Energy Box were not sufficient and respondents had to purchase energy-saving products in order to implement the energy advice. The respondents had spent between 5 and 240 Euros on energy-saving products, with the most expensive item being a new freezer of said 240 Euros. The most often bought energy-saving product was a LED lamp (20% of respondents bought one or more). Other items that were bought by respondents were: power strip with on/off switch (6%), water-saving showerhead (5%), or a letterbox brush (4%). After taking these actions, most respondents (83%) mentioned that they had not taken additional measures to save more energy.

Nearly all respondents (94%) stated that they would recommend the Energy Box to other residents. A little over one third (35%) of the respondents gave the Energy Box trajectory a mark of 9 out of 10, with 10 being the highest possible score. The mean mark given by respondents was an 8.4. Therefore, it can be concluded that the respondents were remarkably positive about the Energy Box.

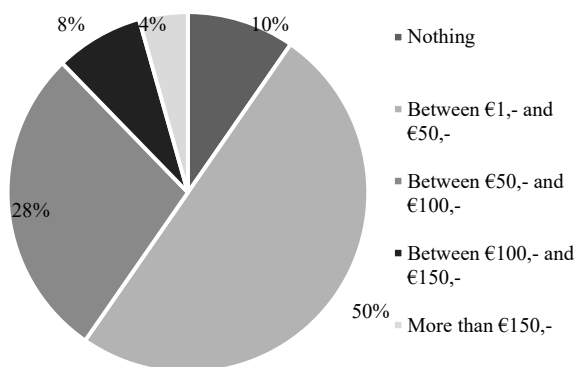


Fig. 6 How much do you expect to save on a yearly basis?

**B. Second Survey**

Most respondents (65%) do rent their home from a private landlord instead of a housing cooperation. Furthermore, most respondents belong to a one-person household (42%), or a two-person household (39%). When asked why the respondents signed up for energy advice, they stated that the main reason was either to live more environmentally friendly (51%) or to save money on their energy bills (37%). This reasoning remains the same when looking more closely at the difference between distinct households.

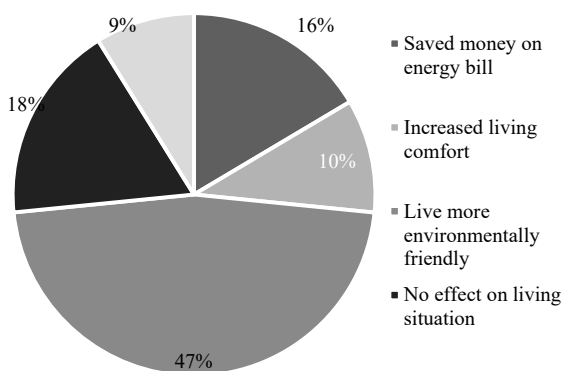


Fig. 7 What has been the most significant effect of using the Energy Box and energy advice?

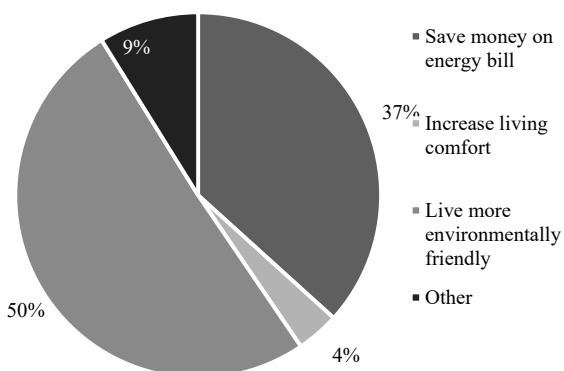


Fig. 8 Why did you sign up for energy advice?

This ties in with what the respondents deem to be the most significant effect of the Energy Box and energy advice. Nearly half of the respondents (47%) mentioned that they had started

living more environmentally friendly/sustainably after implementing the measures following the energy advice. A much smaller part of the respondents (18%) stated that implementing the energy advice had not had any effect, while few (17%) expressed that they had saved on their energy bills by using the Energy Box. How much the respondents had saved on their energy bills differed per respondent. Most respondents' energy bills had decreased, but they were unsure by how much exactly (30%), or their energy bills had not decreased, but instead remained about the same (29%). The latter is certainly not the anticipated outcome of using the Energy Box. However, the vast majority of the respondents (82%) stated that they never struggle with being able to afford their energy bills every month, which ties in with their estimated expenses on energy. Most respondents (67%) estimated their energy bills to cover around 5% of their total income. A much smaller part (24%) estimated it to be around 10% of their income. Knowing that the percentage of Dutch households in energy poverty is about 7% [8], these figures suggest that the energy box has not been very successful in reaching substantially more energy poor households than average.

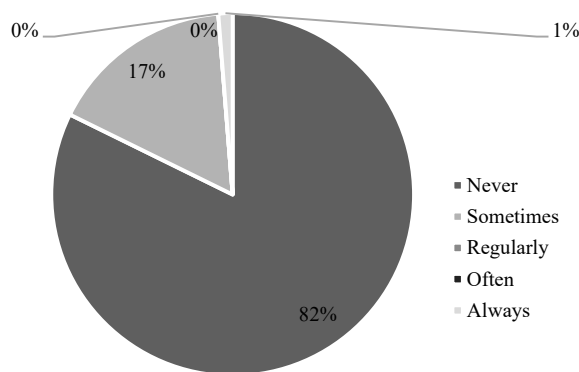


Fig. 9 Do you struggle with being able to afford your energy bills every month?

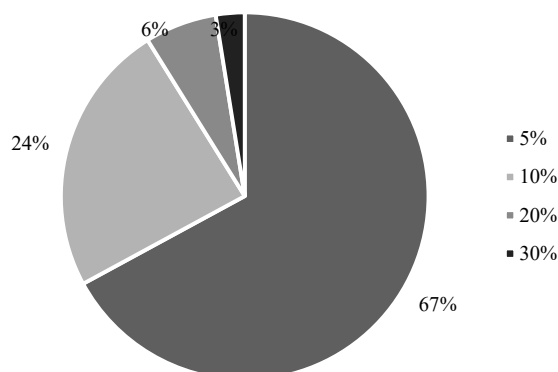


Fig. 10 How much of your income (in %) do you spend on energy?

During the consultation with an energy coach, the respondents were given energy advice which they then had to implement in their homes. The energy advice that was implemented most often was: preventing unnoticed energy consumption in electrical appliances (68%), turning off unnecessary lighting (52%), and lowering the thermostat at

night (46%). Moreover, when asked which products of the Energy Box the respondents still used, the most often named products were the power strip with on/off switch (78%), LED lamp (67%), and feed-through plug with on/off switch (52%). Furthermore, some respondents decided to invest in additional energy-saving products, besides the energy-saving products provided by the Energy Box. The products on which most respondents had spent money to implement the energy advice were LED lamps (39%), water-saving shower head (23%), and power strip with on/off switch (22%).

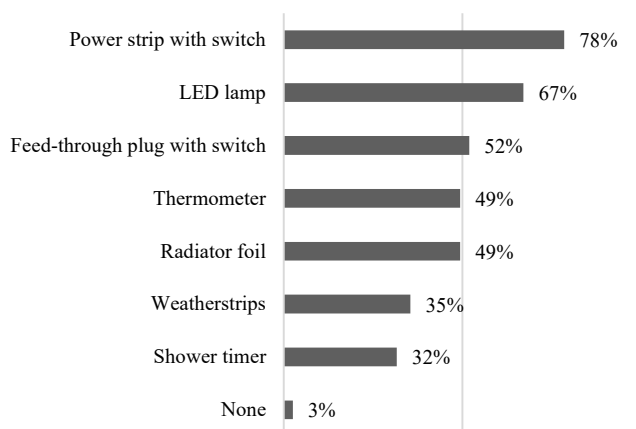


Fig. 11 Which Energy Box products do you still use?

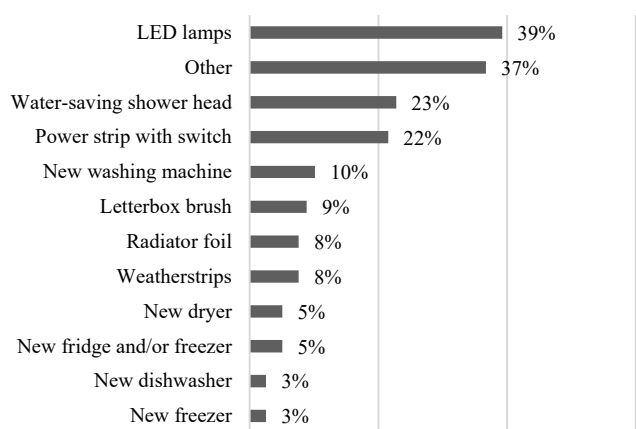


Fig. 12 Which of the following products have you spent money on to implement the energy advice?

After the energy advice, respondents might have chosen not to implement some of the given measures. The most often mentioned reasons why the respondents did not implement the measures were that it was too difficult to implement the measures (14%), too expensive to implement the measures (10%), or that implementing the measures was at the expense of the living comfort of the respondents. Additionally, when asked whether the respondents had been in contact with their landlord about energy-saving investments in their home or complex, most respondents (61%) stated that they had not been in contact with their landlord and do not intend to do so either. Fewer respondents (23%) stated that they had contacted their

landlord, but their landlord had not made any energy-saving investments yet.

Towards the end of the survey, the respondents were asked how they would describe their experience with the Energy Box. Nearly all respondents described the Energy Box as useful, handy, or helpful. Additionally, they mentioned that the energy advice was informative. Some respondents even described the experience as an eye-opener which increased their awareness regarding their energy usage. By and large, the respondents found it to be an overall pleasant experience.

#### IV. DISCUSSION, CONCLUSION AND LIMITATIONS

This research was conducted to answer the research question: ‘What are the long-term effects of the Energy Box on the energy-saving behavior of households experiencing energy poverty in the private rental sector?’ Important long-term effects are after one year, that respondents stated that they are living more environmentally friendly, and stated that they had saved money on their energy bills. This finding ties in with the objective of the Energy Box, which is to help households reduce their energy bills through becoming more conscious of their energy consumption. When comparing the results of both surveys, it became clear that one of the Energy Box’s long-term effects is the use of energy-saving products, specifically power strips, fridge/freezer thermometers and feed-through plugs were seen by the participants as helpful to become more energy efficient.

The results are in line with a report by ECN, which also stated that projects such as the Energy Box influence the energy consumption of the household, resulting in energy savings and a lower energy bill, however, a reduction of CO<sub>2</sub> was not mentioned by the respondents in this study [7]. In addition, this study showed a high user satisfaction rate for the Energy Box. This can be linked to the success factors as stated in the ECN report, which are the quality of the advice, giving good calculation examples, having an experienced coach visit, finding the intrinsic motivation, and providing clear information about the advice after the home visits. For future research, these aspects could be further explored to research whether Energy Box is adequately using these success factors.

The results from the second survey suggest that the energy box program has not been very successful in reaching more energy poor people than average. Only a few respondents indicated that they always have trouble paying their energy bills and only 9% of respondents said they spend 10% or more of their income on energy and therefore experience energy poverty.

Limitations to the research were that it was uncertain whether both surveys had the same participant group. The initial population was identical for each survey, however, due to privacy reasons, we could not trace whether the participants had partaken in both surveys or just one for the two. Consequently, it was not possible to directly compare the surveys. Additionally, the participants were asked to self-report on the percentage of their income they spend on energy and whether on they ever struggle with the payment of their energy bills. Since these answers were self-reported, it is difficult to know

whether the answers were honest, or whether participants were providing wrong estimations. Moreover, the majority of respondents were positive about the Energy Box survey and perhaps only satisfied users participated in the surveys, which could also limit the usefulness of the results.

#### ACKNOWLEDGMENT

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