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The misleading effect of energy efficiency information on perceived energy friendliness of electric goods

Signe Waechter^{a,*}, Bernadette Sütterlin^b, Michael Siegrist^c

^a Institute for Environmental Decisions (IED), Consumer Behavior, ETH Zurich, Universitaetstrasse 22, CHN J 75.1, CH-8092, Zurich, Switzerland

^b Institute for Environmental Decisions (IED), Consumer Behavior, ETH Zurich, Universitaetstrasse 22, CHN J 75.3, CH-8092, Zurich, Switzerland

^c Institute for Environmental Decisions (IED), Consumer Behavior, ETH Zurich, Universitaetstrasse 22, CHN J 76.3, CH-8092, Zurich, Switzerland

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ABSTRACT

The European Union energy label informs consumers at the point of sale about the energy efficiency and electricity consumption of various electric goods. The label should enable consumers to purchase energy-friendly products (i.e., products with low energy consumption), thereby making a significant contribution to the reduction of overall energy consumption. This paper offers a systematic analysis of consumers' interpretation of the energy label. The results of a set of experimental studies revealed that consumers tend to base their estimates of a product's energy consumption mainly on the energy efficiency class (e.g., A) communicated on the energy label and largely ignore information about annual electricity consumption (e.g., 120 kWh/year). Thereby, consumers potentially overestimate the energy friendliness of a product assigned a high energy efficiency rating. This also holds true when consumers directly compare two products in terms of energy friendliness. Thus, participants chose a higher-consuming product because it had a high energy efficiency rating. High energy efficiency ratings (e.g., A⁺⁺⁺) can distort consumers' perceptions of product categories that consume excessively (e.g., freezers). Participants were seduced into thinking that a high energy efficiency rating (e.g., A⁺⁺) means the energy consumption of energy hogs is no longer problematic. This paper provides evidence that the energy label could have a contrary effect than the one intended due to people's susceptibility to an energy efficiency fallacy. This misinterpretation of the energy label could further explain why overall energy demand is increasing despite enhanced energy efficiency. Finally, implications for policy makers and further research for enhancement of the energy label are discussed.

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1. Introduction

Everyone uses electricity: To heat the coffee machine in the morning, to press the button for the elevator, and to turn the lights on in the evening. In short, electricity ensures the smooth functioning of modern society. Today, a life without electricity is unthinkable. Industries, transport systems, service providers, and the public depend on electricity. Since 2000, the demand of energy in Europe has been increasing (Eurostat, 2012). How to produce and how to use electricity have become an issue of interest internationally. Along with other European countries (e.g., Germany), Switzerland is seeking to decrease its electricity consumption, mostly through energy efficiency and voluntary curtailment

behavior (Bundesrat, 2013). In Europe, energy efficiency is viewed as essential to ensure future energy supplies (European Council, 2012).

Households roughly account for 30% of total energy demands (BFE, 2013; Eurostat, 2012), with home appliances, such as televisions, freezers, and washing machines, consuming large amounts of energy. For example, according to EnergieSchweiz (2013), 8.7 million freezers and refrigerators are in use in Switzerland, and they consume about 2.5 billion kilowatt-hours (kWh) in one year. Considering the energy consumption of consumer electronics (e.g., televisions, laptops) and household appliances (e.g., freezers, dishwashers) worldwide, the amount of energy needed for these products is enormous. Consumers' decisions about which products to purchase strongly influence overall energy consumption. The promotion of energy-efficient appliances has substantial potential to reduce overall energy consumption. An energy label that helps consumers to make energy friendly purchase decisions when

* Corresponding author. Tel.: +41 44 633 83 16.

E-mail address: siwaechter@ethz.ch (S. Waechter).

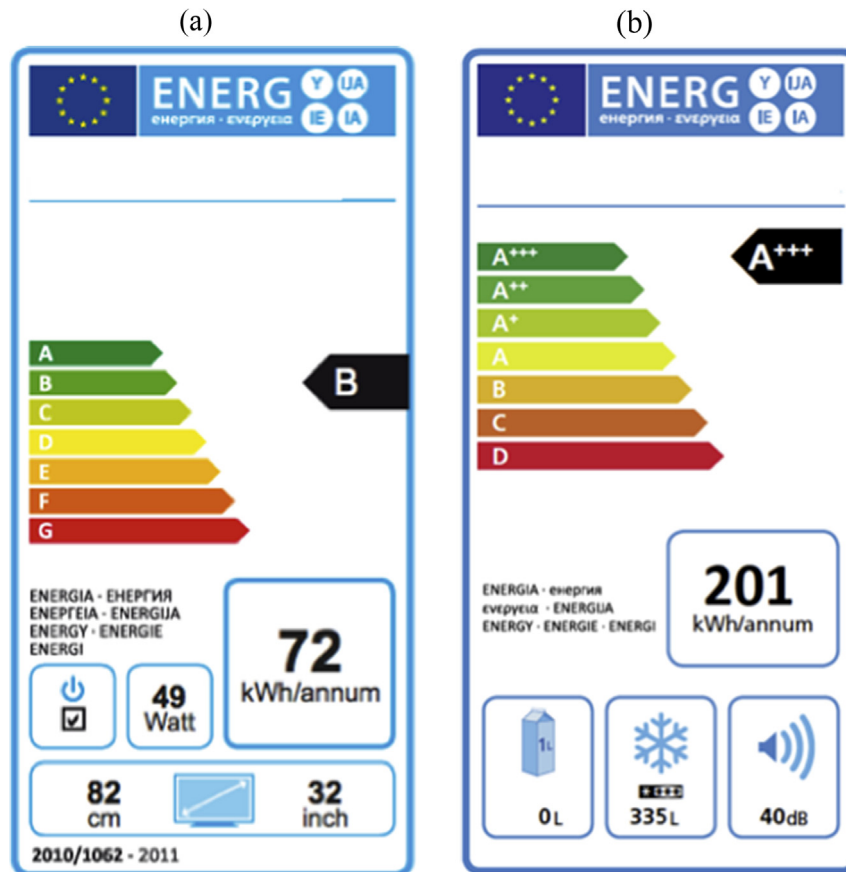


Fig. 1. These EU energy labels are used to inform consumers about the energy friendliness of electric goods. (a) EU energy label used for televisions with an energy efficiency scale ranging from A to G. (b) EU energy label used for freezers and refrigerators with the adopted energy efficiency scale ranging from A+++ to D.

buying electrical appliances seems a promising tool for enhancing energy savings. The Council of the European Communities introduced such an energy label for various electric goods in 1992 (Council of the European Communities, 1992). In 2010, a renewal of the guidelines by the European Union (EU) standardized the energy label for various products (European Council, 2010, 2012). The label is mandatory for more than 10 product categories, such as light bulbs, kitchen devices, and consumer electronics, in more than 27 countries in Europe (European Council, 2010). However, a precondition for the efficacy of the energy label helping consumers to make more energy friendly purchase decisions (and thus reduce energy consumption) is that consumers correctly interpret the information provided on the energy label. Little is known about whether consumers correctly use the information provided. This lack of evidence for the effectiveness and evaluation of the energy label is remarkable given the broad use of the label.

1.1. The European Union energy label

By introducing the energy label, the European Parliament aimed to inform consumers about a product's energy friendliness, more precisely, about a products' performance regarding energy use. The label must be visible to consumers, which means it has to be placed on the product at the point of sale. To estimate the energy friendliness of a product, two sources of information are provided on the label: information about its energy efficiency and electricity consumption (Fig. 1 a, b). Electricity consumption is communicated as annual energy consumption in kWh and as power consumption in watts (W). Annual electricity consumption refers to generic use of the product over one year. This number (kWh/year) is calculated

the same way for all products of the same type assuming the same generic use (e.g., televisions: use of 4 h per day over one year; freezers: plugged in over one year). Therefore, it can be classified as an absolute measure within one product category. Energy efficiency is expressed with the letters A to G (Fig. 1a). "A" indicates that a product is among the most energy efficient on the market, and "G" indicates that a product is among the least energy efficient. This schema communicates the energy efficiency performance of a product in a simple way. Energy efficiency is a measurement of how efficiently an electric product uses energy in relation to its size. For example, the energy efficiency of a television is calculated by the power consumption (W) per squared decimeter (dm^2) of the screen. Due to this calculation method, this classification system is not absolute, but relative. Thus, the energy efficiency class should only be used to compare products within the same product category (e.g., only for televisions that are the same size). This means both a small and big television can have the same energy efficiency rating (e.g., A), because they use the energy with equal efficiency per dm^2 of the screen. The actual energy consumption, however, is in this case different because they differ in size. That is, the smaller product would have lower energy consumption. Therefore, and this is the crucial point, two different-size televisions cannot be compared using the energy efficiency rating, but the actual electricity consumption should be used for a comparison. Unfortunately, this information is not clearly communicated on the energy label. The present research aims to test whether this might be a source of confusion for consumers.

Following the introduction of the energy label in 1992, the technology of electrical appliances soon outperformed the original energy efficiency rating on the energy label. More precisely, a

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