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Letters, signs, and colors: How the display of energy-efficiency information influences consumer assessments of products

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ABSTRACT

The increase of energy efficiency is a major goal of many countries throughout the world. For the successful achievement, consumers must choose energy-efficient household appliances. The European Union (EU) has introduced an energy label for energy-related durables to empower consumers to make energy-friendly choices. Due to the great progress in energy efficiency and the ban of inefficient products on the market, only products in the top efficiency classes are available for many categories, while products in lower classes are no longer manufactured. However, the energy-efficiency scale on the label still displays a range of seven classes (e.g., A^{++}–E). This paper presents a systematic analysis of the influence of the presentation format of energy-efficiency information on consumers' assessments of products' energy friendliness. A series of experimental studies reveals that the display of a rating scale that includes only the energy-efficiency classes of products still available in the market (i.e., a shorter scale) enhances consumers' perceptions of the differences in energy friendliness between the classes. Consequently, the findings suggest that the format of the energy-efficiency scale significantly influences consumers' perceptions of the energy-efficiency gains of products in higher efficiency classes, positively affecting their motivation to choose the most energy-efficient products.

1. Introduction

The use of energy has become a fundamental element of global civilization. Most people do not care about the science behind technology, for example, why the lights turn on when they flip a switch. For consumers, at least in western countries, energy is always available and accessible. For many, energy scarcity is at most a childhood memory. However, political strategies to reduce energy consumption rely on consumers playing an active role, especially in the purchase of energy-related products [14]. In 1992, the European Union (EU) introduced an energy label for household appliances, such as freezers and refrigerators, to empower consumers to make informed decisions. With the help of the label, consumers can choose the most energy-friendly products [10]. Since 1992, mandatory energy labeling has been extended to various other products, such as televisions [16]. In 2010, after 18 years of implementation, the label was revised and standardized for different product types [16]. In 2012, the importance of the labeling framework to the achievement of EU energy goals was once again emphasized, and labeling was extended to more energy-related products [17].

Fig. 1 shows the energy labels used for household refrigerating appliances (i.e., freezers and refrigerators) and televisions. The EU energy label is mandatory for various products in all EU member countries. In addition, Switzerland voluntarily adopted the label and has made its application mandatory. The EU energy label is also used as a prototype in other countries, such as China [65].

Consumers are provided with two types of information on energy labels to assess the energy friendliness (i.e., energy-related performance) of a product: information about its energy efficiency and information about its actual energy consumption. Energy efficiency is communicated with a letter ranking and color code. The color code ranges from green to yellow to red, with different colors indicating energy-efficiency performance. Highly energy-efficient products are in the green-colored ranking and less energy-efficient products are in the red-colored ranking.

The letter ranking originally ranged from A to G, with A assigned to the most energy-efficient products and G assigned to the least energy-efficient products. Some products (e.g., freezers, dryers) were made very energy efficient in a short period of time. This necessitated an extension of the energy-efficiency scale to

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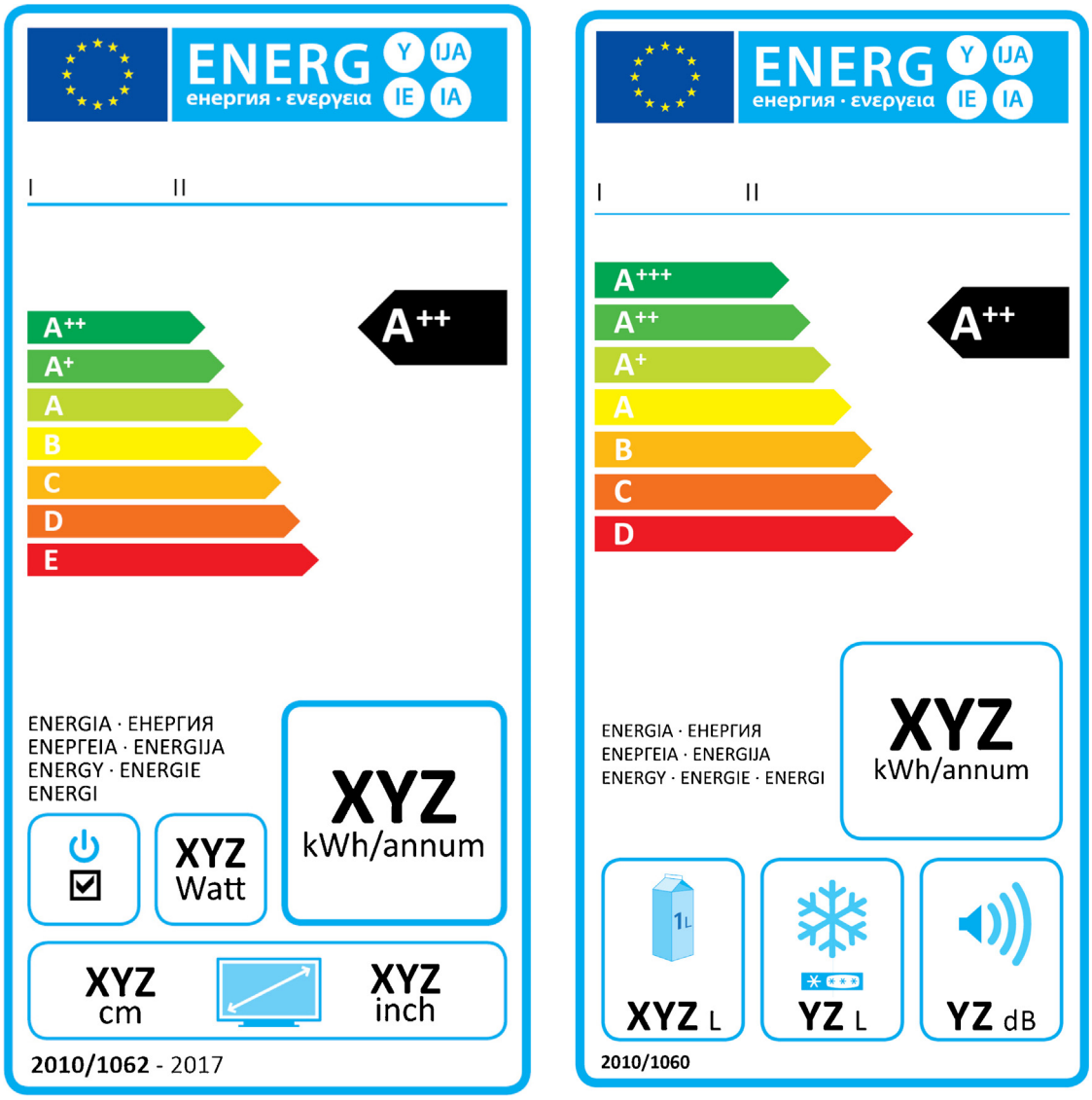

Fig. 1. EU energy label used for televisions (left) and household refrigerating appliances (right).

differentiate among products with the best energy-efficiency rating of A. The letter ranking, therefore, was extended with plus signs indicating different classes (i.e., A^{+}–A^{+++}) for these product rankings. This means that, in addition to the original scale from A to G, there are other energy-efficiency scales with different letter ranges (e.g., A^{+++}–D). The actual energy consumption of products is measured in kilowatt-hours per year (i.e., XY kWh/annum).

These two types of information differ, however, in their ability to compare the energy friendliness of products. More precisely, energy efficiency tells how efficiently a product uses energy and is relative to the size of the product, whereas actual energy consumption is an absolute value. The energy-efficiency rating does not tell whether the product's total energy consumption is high or low. The product's actual energy consumption indicated in kWh/annum is numerical and provides an absolute basis to compare the energy-friendly performance of different products.

Political programs strongly connect energy savings with innovative technology and increased energy efficiency [1,20]. For example, the EU's plans to cut energy consumption 20% by 2020 rely on increasing energy efficiency [18]. This approach depends on consumers to select the most energy-efficient products [51]. However, as recent research has shown, the way energy-related information is depicted on labels might result in misperceptions of products' energy friendliness. Consumers' accurate evaluation of products' energy efficiency and consequent motivation to choose the most energy-efficient product are crucial for the effectiveness of political programs to increase energy efficiency. Non-optimal consumer behavior could add to the observed energy-efficiency gap, that is, the gap between estimated potential energy savings based on technical, economic, and social factors compared to the amount of energy actually saved [30]. For example, household electricity consumption in the EU rose by 10% from 2002 to 2012 even though energy efficiency increased [18].

Therefore, the influence of communication and persuasive measures on consumers is a highly relevant research topic in energy and social sciences [50]. It has been demonstrated that the provision of information alone is insufficient to initiate energy-friendly behavior for several reasons. One, consumers sometimes simply ignore information because it is not designed in an optimal way [34]. Second reason, communication might have unwanted consequences, such as negative spill-over effects [55,56] and rebound effects [23,29]. In these scenarios, final energy demand actually increases after an energy-friendly action has been performed. For example, consumers' purchase of an energy-efficient household