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The Influence of Eco-Labelling on Consumer Behaviour – Results of a Discrete Choice Analysis for Washing Machines

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ABSTRACT
Eco-labelling is an important tool to overcome market failure due to information asymmetries for environmental products. While previous research has discussed the importance of labelling, this paper provides empirical data on the influence of eco-labels on consumer behaviour for household appliances. It reports on the results of a survey involving a total of 151 choice-based conjoint interviews conducted in Switzerland in Spring 2004. Choice-based conjoint analysis (also known as discrete choice) has been applied to reveal the relative importance of various product attributes for consumers. The EU energy label is used for the product category chosen in our survey, washing machines, and we investigate the relative importance of this eco-label compared with other product features (such as brand name) in consumers' purchasing decisions. We draw conclusions for sustainability marketing and policy. Copyright © 2006 John Wiley & Sons, Ltd and ERP Environment.

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Keywords: information asymmetry; consumer behaviour; eco-labelling; choice-based conjoint analysis; discrete choice; household appliances; EU energy label

Introduction

CONSUMERS ARE INTERESTED IN GOODS AS A BUNDLE OF DIFFERENT PRODUCT CHARACTERISTICS (Lancaster, 1966) that can be distinguished by search, experience and credence characteristics. While search characteristics can be identified by consumers prior to purchase, e.g. price, colour, size, etc., experience characteristics can only be determined after purchase (Nelson, 1970). Finally, credence characteristics cannot be checked before or after purchase (Darby and Karni, 1973). Knowledge about these product characteristics is asymmetrically allocated between buyers and

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sellers. This information asymmetry can be overcome in different ways. Markets for products with search attributes are able to produce this information relatively easily, while goods with credence attributes need reputable information to be credible for consumers. This study focuses on intangible product characteristics, which especially depend on appropriate product information (signals such as brands, labels). Brands and labels fulfil two main functions for consumers: they inform them about intangible product characteristics (information function, e.g. quality) and provide a value in themselves (value function, e.g. prestige). This paper addresses the relevance of the EU energy label as a buying decision criterion compared with other product characteristics such as brands. The EU energy label transforms the credence attribute 'energy consumption' into a search attribute by third-party certification, which guides consumers' buying decisions. Activities of firms and/or institutions to provide consumers with information about product characteristics are termed 'signalling' in new institutional economics, while the activity of consumers to search and check out the product characteristics of a product is called 'screening' (Göbel, 2002). After realizing that a problem exists in obtaining information about different product characteristics, the question is 'in which types of product characteristics is the consumer interested?'. On the basis of a discrete choice analysis with 151 interviews conducted in Switzerland in Spring 2004 this research question will be analysed, focussing on washing machines.

The European Energy Label

Previous literature on eco-labelling has often taken a conceptual or descriptive approach, discussing the relevance of eco-labels from marketers', consumers' and policymakers' perspectives (Gallastegui, 2002; de Boer, 2003; OECD, 1991). Another stream of literature has attempted to assess the market impact of eco-labelling schemes (OECD, 1997; Gallastegui, 2002; Imug, 1998; Banerjee and Solomon, 2003), while others have focussed on the policy process of implementing successful eco-labelling schemes (Karl and Orwat, 1999; Wiel and McMahon, 2003). Finally, some authors have tried to combine the different perspectives of eco-labelling in order to explain the dynamic incentives that this relatively new environmental policy instrument provides (e.g. Wüstenhagen, 2000, pp. 264 ff.; Truffer *et al.*, 2001).

The European energy label (see Figure 1) initiated by the European Commission is a compulsory label that is applied to all white goods, home appliances and light bulbs sold within the EU. It came into effect on 1 January 1995, based on the Directive For Mandatory Energy Labelling of Household Appliances. Application of the label will shortly be extended to cars (Energy Efficiency, 2004). Based on the EU directive, each country is responsible to establish national legislation for the program to be enforced and for aspects of implementation including compliance, label accuracy and educational and promotional activities (Harrington and Damnics, 2001). Switzerland introduced the EU energy label[1] on 1 January 2002 (Energie Schweiz, 2004). The purpose of this label is to allow consumers to compare appliances (comparative label). Appliances are rated on a scale of A to G, with 'A' being the most energy efficient and 'G' the least. The appliances that are subject to the labelling scheme account for 20% of electricity consumption in Switzerland (SAFE, 2001).

A series of studies within the EU has tried to evaluate the success of the energy label. In their report to the European Commission on the first three years of the EU energy labelling scheme, Winward *et al.* (1998) indicate that the label is used by consumers and they understand its message. They conclude that across the EU about a third of consumer purchases of cold appliances are influenced by the energy label. Three years after the implementation of the labelling scheme the energy label had little effect on purchasing patterns in the southern countries and much greater influence in northern countries, where

[1] To avoid mentioning the politically somewhat contentious term EU, the Swiss have invented a new name for the label, calling it 'Energieetikette'.

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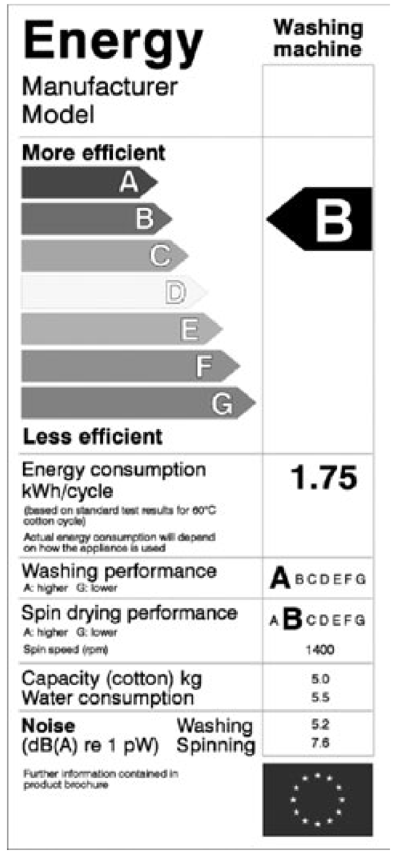

Figure 1. EU energy label

there is a longer history of concern about energy use. A limiting factor of the influence of the energy label on the buying decision can be seen in the limited range of models in some retail outlets, which reduces the consumer's choice to a few appliances or even a single model. However, the EU energy label provides both a carrot and a stick, labelling good as well as inefficient products, so manufacturers and retailers have a twofold incentive to offer more energy efficient products. Bertoldi (1999), based on the results of two market evaluations throughout the EU (Waide, 1998, 2001), concludes that average sales figures of energy efficient home appliances within the EU have increased by 29%.

Alec (2002, 2003) has evaluated the implementation of the energy label at typical points of sale on the Swiss market: About 6000 household appliances (refrigerators, washing machines, dryers, dishwashers) have been observed. About 56.5% of the household appliances had been labelled correctly and 26.5% were A labelled. One year later, both the share of properly labelled appliances as well as the percentage of A-rated products had slightly increased (58.9 and 28.9%, respectively).

While previous literature on eco-labelling in general and on the EU energy label in particular has provided good insights about the aggregate effects on the market level, knowledge about the influence of the energy label on consumer preferences and purchasing decisions remains an under-researched issue. Not only is previous empirical research largely supply-side and macro-level oriented, but the few consumer-focused studies that exist have used relatively unsophisticated methods of analysis. By applying discrete choice analysis and investigating consumers' purchasing decisions in a realistic setting, we contribute to closing this gap.

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Survey Design

Objectives and Hypothesis

The main objective of this study is to assess the relative importance of the energy label compared with other product attributes (such as brand, price, etc.) for consumers' buying decisions. The methodological approach that we chose, discrete choice analysis, is particularly powerful for this kind of analysis. Assuming that there will be a positive willingness to pay for energy efficient products, we aim at understanding how much of the utility of an A- or B-labelled product can be explained by the underlying willingness to pay for lower energy consumption, and how much is the residual value for the label itself. Corresponding to these objectives, our hypotheses were the following.

H1. The energy label positively influences consumers' buying decisions for household appliances.

H2. A-labelled energy efficient products cause a willingness to pay that is at least equal to the monetary value of reduced energy consumption over the lifetime of a product.

Survey

The universe of this survey comprises Swiss consumers of washing machines. We used a stated preference, not a revealed preference approach, i.e. we did not observe people's actual buying decisions, but confronted respondents with fictitious choice tasks. However, we sampled consumers who were actually in the process of making a buying decision or at least seriously interested in buying washing machines by conducting our survey at the point of sale, in the washing machine section of major Swiss retail stores (Fust, Media Markt). We surveyed a total of 151 customers. Two-thirds of the interviews were conducted in the German-speaking part of Switzerland (Zurich and Lucerne regions) and one-third in the French-speaking part (Lausanne). Given the size of our sample, we obviously did not aim at representativeness compared with all Swiss consumers. Looking at the socio-demographic characteristics of our sample, there may be deviations with regard to income, store location and sex. The average (self-declared) monthly net income in our sample was about 5000 CHF (3300 EUR), compared with 5601 CHF (3665 EUR) for Switzerland (BFS, 2004). For reasons of research efficiency, we conducted our survey in larger stores, which were in all but one cases located in suburban shopping areas rather than downtown locations. 37.1% of our washing machine customers were male. The average age of respondents was about 42 years.

We used personal interviews with paper and pencil, which were done by experienced interviewers. The questionnaire was structured as follows: introductory question about ranking the most important societal issues, questions about the buying habits for washing machines, 21 choice tasks (combination sets of different product alternatives), washing behaviour, socio-demographic questions.

Methodological Considerations

Theoretical Framework

This research study is based on two theoretical concepts: first on economic theory, especially microeconomic theory (household, consumer theory), which says that humans make decisions that maximize their utility. Consumers face trade-offs, because 'there is no such thing as a free lunch'. Therefore making decisions (in this case a product choice) requires comparing the cost and benefits of alternative

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actions (Kreps, 1990). Lancaster (1966) advanced this theory for consumer theory by focussing on product characteristics rather than on products itself. For example, the assessment of a washing machine comprises many attributes, such as wash load capacity, water and energy consumption, price etc.

Second, our research builds on consumer theory based on behavioural science, which accounts for the subjective influence of individual behaviour (Hawkins *et al.*, 2001). Models based on behavioural science assume that what takes place in the 'black box' of the consumer's mind during the buying decision process can be inferred from a study of observed stimuli and responses (Kroeber-Riel and Weinberg, 1999). The input factors of the black box are personal factors (demographics), marketing-mix factors (product, price, place, promotion), psychological factors (motivation, attitudes, cognition, learning), sociocultural factors (culture, subculture, class), social factors (family, reference groups, opinion leaders, social roles) and situational factors (environment, present mood, time, buying purpose, . . .) (Diller, 2001). The output of the black box is the actual buying decision. Purchasing behaviour itself is characterized by problem recognition (by means of stimuli), information search (by means of internal and/or external sources of information), evaluation of alternatives from the evoked set, purchase decision and post-purchase evaluation (Kroeber-Riel and Weinberg, 1999).

Discrete Choice Analysis as Survey Instrument

The research method chosen within this study is a discrete choice analysis. The discrete choice approach is rooted in quantitative psychology. This econometric model is based on Quandt (1968), Theil (1970) and McFadden (1974) and has evolved into a family of techniques. A specific feature of this model is the possible inclusion of dependent variables with qualitative scaling attributes (e.g. buying decision). The limited response option of a discrete choice analysis results in analyses based on random utility models, akin to dichotomous-choice contingent valuation questions and random-utility travel cost models (Roe *et al.*, 1996). Discrete choice analyses are increasingly applied within various disciplines of the social sciences, including transportation studies (Hahn, 1997), energy-related issues (Rivers and Jaccard, 2005; Goett *et al.*, 2000) and health economics (Hall *et al.*, 2004). A detailed description of this methodology would go beyond the scope of this paper and can be found in Train (2003) and Louviere *et al.* (2000).

Briefly described, a stated preference discrete choice model considers a realistic buying situation, where consumers choose between one or more products from a restricted product set (evoked set). Products vary within their product attributes and are not dividable. The dependent variable that provides information about the buying decision is binary (0–1 decision). It is assumed that consumers choose the most beneficial product from the evoked set (see previous section). Personal attributes of every respondent are included within the model, which leads to individual sets of criteria. Other influencing factors of buying behaviour are taken into account by the use of a random utility function. Preferences can be directly derived from the stated buying decisions.

The utility function and decision rule can be described as (Hahn, 1997)

$$U_{jk} = U_{jk}(\nu_{jk}, \delta_{jk}) \rightarrow \max!$$

U_{jk} = utility of product k for consumer j
ν_{jk} = vector of deterministic relevant decision attributes which subumes feasible product attributes of product k for consumer $j(z_{jk})$ and known personal attributes of consumer $j(s_j)$
δ_{jk} = stochastic random variable which comprises unobservable product attributes z_{jk}*, unobservable personal attributes s_j* and measurement errors ε_{jk}.

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The response probability P_{jk} that a consumer j decides on alternative k from the evoked set X_t is equal to the probability that utility U_{jk} of product k is at least as high as the utility of other product alternatives U_{jn} from the evoked set.

$$P_{jk} = \mathrm{Prob}(U_{jk} \geq U_{jn}; \forall k \neq n; k, n \in X_t)$$

P_{jk} = probability that consumer j choose product k

The implementation of the discrete choice approach asks for further provisions, such as the functional form of the deterministic utility function $v(z_{jk}, s_j)$, as well as an appropriate distribution function for the stochastic utility function δ_{jk}. We have chosen the standard multinomial logit model (MNL) (McFadden, 1974). The MNL function assumes the 'independence of irrelevant alternatives' (IIA), which implies that the probability of choosing an alternative (a specific washing machine) is independent of whether the consumer chooses among all washing machines or only among selected alternatives (e.g. three alternatives). The estimation of the multinomial logit (MNL) model is based on a maximum likelihood estimation (Ben-Akiva and Lerman, 1985).

Discrete Choice Design

Discrete choice analysis applications based on choice experiments typically involve the following steps: determination of product attributes, specification of attribute levels, experimental design, visual presentation of choice alternatives to respondents and estimation of the choice model (Verma *et al.*, 2004). The first stage in the design of this study involved the identification of relevant product attributes and their levels for washing machines. By means of marketing documents (e.g. catalogues, websites), a former study about washing machines (Bauer *et al.*, 1996) and expert interviews (e.g. retailers, industry associations, energy consultants), the final set of attributes and their levels were determined (Table 1). It is very important to identify those attributes and attribute levels that are meaningful and realistic from a consumer's perspective, while keeping the number of attributes low. The chosen brands represent a spectrum of the Swiss market for washing machines. V-Zug is a Swiss premium brand, and Miele, too, is positioned on the high end of the market. AEG is in the medium price segment and the 'no-name' brand Iberna represents a low-price product. For the attribute levels of the energy label, we chose to include only three of the seven possible rating classes (A, B and C), which cover 96% of the products on the market. 80% of washing machines sold in Switzerland in 2002 are A labelled, about 10% are B labelled and 6% are C labelled (FEA, 2002).

We made sure that some particularly unrealistic combinations of unrealistic attribute levels did not appear in the questionnaire (e.g. the Miele premium brand for a washing machine with the lowest price of 980 CHF). The experimental design (Choice Tasks) was calculated randomly with Sawtooth, which provides minimal overlap (each attribute level is shown as few times as possible in a single task), level balance (each level of an attribute is shown approximately an equal number of times) and orthogonality (Sawtooth, 1999). The choice tasks were presented visually (picture of the product) and verbally (see example in the appendix). The respondents had to choose between three product alternatives (concepts) plus a 'None' option in each choice task. Sawtooth provided eight versions of the questionnaire including 21 choice tasks. Half of the choice tasks included the energy efficiency label as an attribute.[2]

[2] Our analysis in this paper is based on those 11 choice tasks that included the energy label.

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Attribute	Attribute levels
1. Brand	AEG
	V-Zug
	Miele
	Iberna ('no name')
2. Equipment version	Simple*
	Medium*
	De luxe*
3. Water consumption (l/wash cycle)	39 l/wash cycle
	47 l/wash cycle
	58 l/wash cycle
4. Energy consumption (kW h/wash cycle)	0.85 kW h/wash cycle
	1.0 kW h/wash cycle
	1.3 kW h/wash cycle
5. Energy efficiency rating (energy label)	A
	B
	C
6. Price	980 CHF
	1890 CHF
	2650 CHF
	3780 CHF

Table 1. Discrete choice design for washing machines: attributes and attribute levels
*The three different levels of the equipment version are described in more detail within the choice tasks.

Results

Descriptive Results: Buying Criteria, Knowledge of Label, Relevance of Energy

When asked a prompted question, providing them with a list of product features (Table 2), 31.8% of respondents said price was the most important criterion in buying a washing machine, followed by the machine's configuration (extra equipment) and energy consumption. Interestingly, when they named their second priority, energy consumption moved up to the top of the list, with price ranking second and water consumption third, a picture that remained unchanged for their third priority.

Customers have a high level of awareness of the energy label. Prompted recall rates are around 70% among washing machine customers. To probe their knowledge, we gave them a list of products, some of which are indeed labelled while others (such as hairdryers and PCs) are not (italic in Table 3). The label was best known on refrigerators (79.5%), while it was less known for other household appliances such as dishwashers (51.8%). The lower recall value in the case of cars (27.7%) is likely a consequence of the recent introduction of the label for this product category. Only 19.6% of washing machine customers recalled the label from light bulbs. On the other hand, a very large majority (correctly) said they had not seen the label on TV sets, hairdryers and PCs, highlighting a good level of knowledge.

While many people know the energy label, this does not necessarily mean that it plays a major role in their buying decision. To find out about the importance of the energy label, but also of a product's energy consumption, in customers' purchasing decisions, we used two approaches. First, we asked them two prompted questions: 'how important is energy consumption (the energy label) when you buy a washing machine?'. Second, we answered this question indirectly through our discrete choice analysis discussed below. In the prompted question, people were asked to indicate the importance of a product's

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Criteria	1st priority	2nd priority	3rd priority
Price	**31.8%**	**21.2%**	**15.9%**
Equipment	**19.2%**	7.3%	8.6%
Energy consumption	**11.9%**	**25.2%**	**17.2%**
Brand	9.3%	8.6%	8.6%
Water consumption	7.9%	**11.9%**	**13.9%**
Wash load capacity	5.3%	10.6%	6.0%
Dimensions	4.6%	6.0%	4.0%
Design	1.3%	1.3%	3.3%
Short wash time	0.7%	3.3%	9.3%
Low noise	0.7%	2.0%	7.3%
Dryer integrated	0.0%	0.7%	0.7%
Other	7.3%	1.3%	4.0%
Total	100.0	99.3%	98.7%
N	151	150	149

Table 2. Most important criteria in buying a washing machine

	Washing machine customers
	N = 151
Recall seeing the energy label	74.2%
of those:	
Recall the energy label from other products, namely . . .	*N* = 112
Refrigerator	79.5%
Washing machine	N/A
Dishwasher	51.8%
Car	27.7%
Light bulb	19.6%
TV set	*3.6%*
Hairdryer	*0.0%*
PC	*0.9%*
Other	2.7%
Don't know any particular product that is labelled	2.7%

Table 3. Prompted recall of the energy label

energy consumption and of the label on a scale from 1 (not important) to 6 (very important). Results are shown in Figure 2.

Figure 2 shows that more customers state that the energy label is important in their purchasing decision than they do for energy consumption, which indicates that there is a positive effect of the label in making the energy issue meaningful for them. The fact that this effect is particularly pronounced in the case of high, but not very high, importance of energy issues leads us to believe that the label is particularly meaningful for consumers outside the niche of highly energy-aware customers.

Results: Discrete Choice Analysis

Table 4 shows the results of the discrete choice model for washing machines. It contains 1396 observations, based on the responses of 151 individuals performing 11 choice tasks each (= 1661 total choices),

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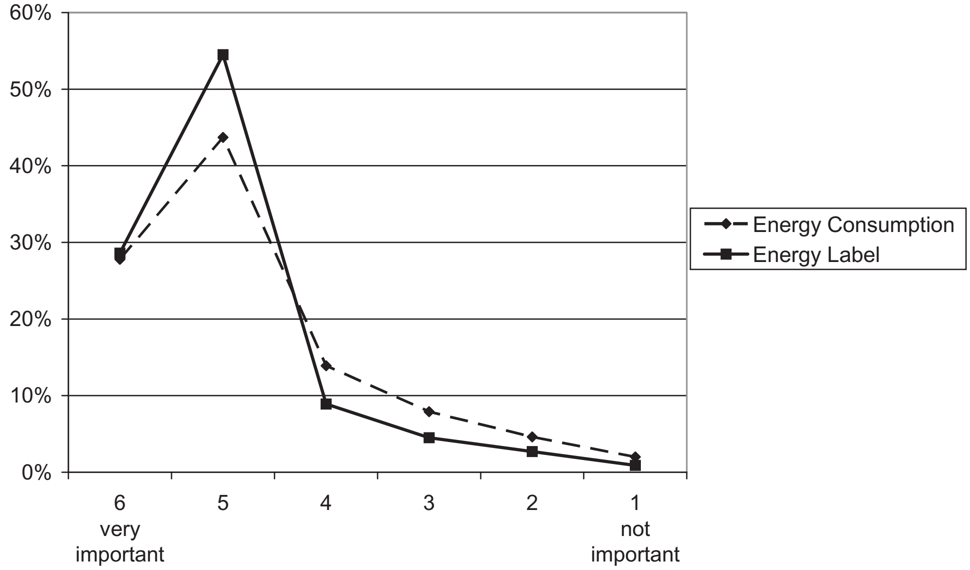

Figure 2. Importance of energy consumption and energy label for washing machine customers

Variable	Coefficient (*b*)	Standard error (SE)	Ratio of coefficient to standard error (*t*-value)
Constant, Eo	0.1152*	0.0621	1.853
Brand: AEG (dummy), em1	0.3136***	0.0875	3.583
Brand: VZug (dummy), em2	0.8785***	0.0992	8.859
Brand: Miele (dummy), em3	0.8610***	0.1014	8.489
Brand: Iberna (no name)	0	–	–
Equipment version: simple (dummy), ea1	−0.5308***	0.0851	−6.236
Equipment version: middle (dummy), ea2	−0.1164*	0.0775	−1.502
Equipment version: de luxe	0	–	–
Water consumption: l/wash cycle, ewv	−0.0090**	0.0037	−2.410
Energy consumption: kW h/wash cycle, eev	−0.2648*	0.1970	−1.344
Energy efficiency rating A (dummy), eeka	0.4874***	0.0918	5.306
Energy efficiency rating B (dummy), eekb	0.2434***	0.0828	2.941
Energy efficiency rating C	0	–	–
Price: Swiss francs, e_pr	−0.0007***	-4.87×10^{-5}	−15.039

Table 4. Results of the discrete choice (multinomial logit) model for washing machines
* Coefficient significant at 80% confidence level.
** Coefficient significant at 95% confidence level.
*** Coefficient significant at 99% confidence level.

minus 265 observations that have been skipped because the respondent decided to choose none of the three products. *R*-square is 0.103; predictive quality is 40%.[3] The results table includes three indicators. The coefficient (*b*) indicates the influence of a change of the respective variable on the customer's likelihood to buy the product. Positive values indicate that an increase of the variable results in increasing utility for the consumer, while negative values indicate decreasing utility, as in the case of energy con-

[3] Predictive quality is an indicator that shows how well the model is able to forecast whether a respondent in a specific choice task would choose alternative 1, 2 or 3.

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sumption (in kW h/wash cycle) or price. For nominal or ordinal variables, such as brand or energy label, one attribute level has been set as a dummy variable (e.g. energy efficiency rating C = 0), so that the coefficient indicates the relative increase in utility of the respective attribute level over the base case (e.g. A compared with C). The following two columns provide different measures for the goodness of fit. The standard error is an indicator for the exactness of estimating the coefficient. The ratio of coefficient to standard error (*t*-value) provides a standardized value for the exactness of the coefficient, enabling comparison across attributes. The higher these values, the better the estimate. Based on the respective value of the standard normal distribution, *t*-values greater than two indicate a reliable estimate (within the 95% confidence interval) of the coefficient. In our model, most coefficients are significant at the 95% or even 99% levels, except for the variables 'medium equipment version' and 'energy consumption', which are only significant at the 80% confidence level, indicating a higher random error. A possible explanation is that a 'medium' level of equipment is less meaningful for people than the two alternative levels of this attribute (simple versus de luxe), and that energy consumption in kW h/wash cycle is not something that people can routinely assess with high accuracy.

A comparison of results across different attributes is facilitated by converting the utility coefficients to monetary units, which can be interpreted as the average consumer's willingness to pay for a change from one attribute level to another. This is done by dividing the coefficient (*b*) of each attribute level by the absolute value of the coefficient of price. Figure 3 shows the results of this analysis.

As we can see, the value of brands is very high when it comes to buying a washing machine. For the two most popular brands, VZug and Miele, customers are willing to pay a premium of more than 1220 CHF (800 EUR) compared with a no-name product. The other interesting result is the influence of energy labels: an A-rated washing machine increases customer utility by 696 CHF (455 EUR) compared with a C-rated machine, and going from B to A increases willingness to pay by 347 CHF (227 EUR). Interestingly, this is a substantially higher amount than the willingness to pay for the underlying difference in electricity consumption. Since the difference between categories is 0.2 kW h/wash cycle (assuming 5 kg wash load), we can easily combine figures 3(d) and 3(e) (see Figure 4).

The third line in Figure 4 represents the actual cost savings that a customer realizes over the 15-year lifetime of a washing machine.[4] When judging their utility increase based on kW h differences, people tend to underestimate the energy cost. This is an indication that people are not well informed about the energy consumption of washing machines, and that the label plays an important role in 'translating' energy efficiency into something more meaningful for them. In fact, the meaning that consumers attach to the label seems to go beyond energy efficiency. The steeper utility function for the energy label suggests that consumers perceive it as a signal for other features of a high-quality product, too, similar to other signals, such as the brand name.

Conclusions

Our results provide important insights for marketing and policy, as well as opportunities for further research.

Implications for Sustainability Marketing

With regard to sustainability marketing, the most important result of our analysis is the significant willingness to pay for A-labelled energy efficient products, confirming our first hypothesis (H1). The

[4] This has been calculated using typical Swiss retail electricity prices of 0.20 CHF/kW h (0.13 EUR/kW h), assuming four standard wash cycles per week (208 per year) and a discount rate of zero.

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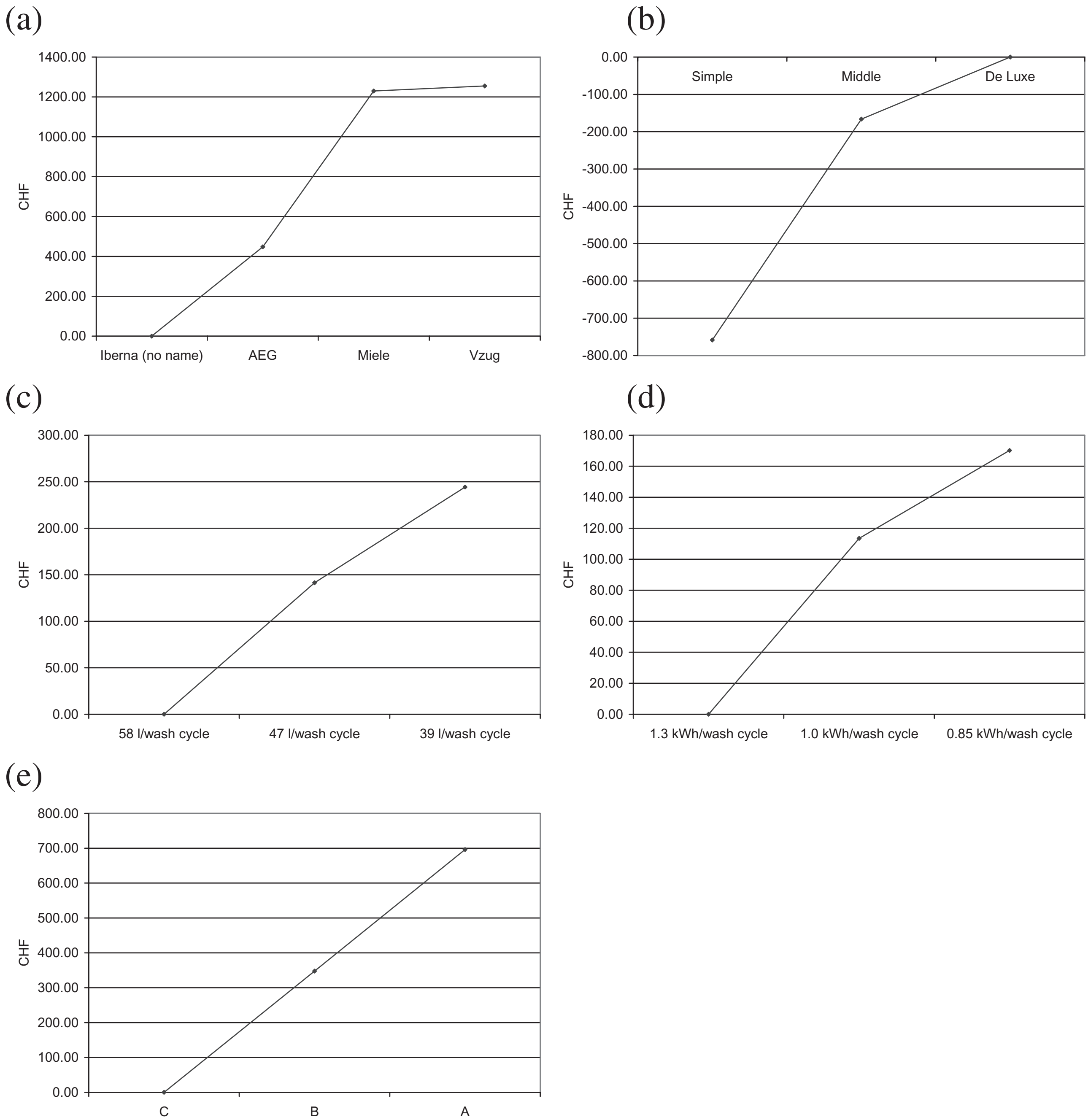

Figure 3. Willingness to pay for product attributes and attribute levels (washing machines): (a) brand; (b) equipment version; (c) water consumption; (d) electricity consumption; (e) energy efficiency rating

premium for an A- versus a C-labelled product was 696 CHF (455 EUR) for washing machines. Compared with the average price of products in our sample, this represents about a 30% premium. This strong willingness to pay for a labelled product is encouraging for marketers who want to differentiate themselves based on energy-efficient product attributes. We could also demonstrate that consumers'

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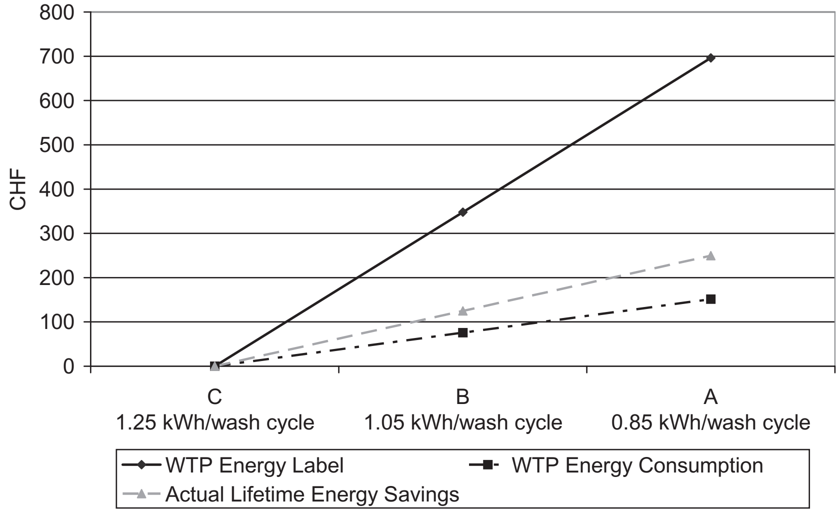

Figure 4. Willingness to pay for energy label exceeds underlying willingness to pay for energy efficiency

willingness to pay for A-labelled products exceeds the cost savings that can be expected over the lifetime of the product, confirming our second hypothesis (H2).

Finally, our analysis showed that brands are important. In our washing machine sample, the willingness to pay for a premium brand compared with a no-name product was more than 1220 CHF (800 EUR), which is about a 50% premium and almost twice as much as the difference between A- and C-labels. These results are relevant to manufacturers of energy-efficient products since it provides them with quantitative information for comparing investments in brand value versus in research and development (R&D) for energy-efficient products. Taking AEG for example, it appears that catching up with the two most preferred brands in Switzerland, Miele and VZug, would require substantial marketing investments. On the other hand, consumers are willing to pay a premium for A-labelled energy efficient products, and AEG has a strong track record in designing such products. Therefore, the company may get a better return on investment by doing R&D to further enhance the environmental performance of their products.

For retailers, our results imply that they can increase sales and profit by offering a range of products that includes a significant share of A-labelled products. To realize these benefits, however, careful training of their sales staff is key in order to successfully communicate the added value of an energy efficient product to the consumer at the point of sale.

We should point out that we looked at the EU energy label, which is a mandatory scheme. Many other eco-labels are voluntary schemes. In these cases, doing research along the lines that we have presented here will provide marketers with the necessary information to decide whether or not the added customer value of an eco-label exceeds the certification cost to get that label. It should be noted though that such an analysis will only provide valid results if the label is already well known among consumers, which was the case in our study and may also be true for some well established labelling schemes such as the Blauer Engel in Germany or Brå Miljöval in Sweden.

Implications for Policy Makers

For policy makers, our analysis shows that the energy label is well known and respected among Swiss consumers, which also led to our conclusion above that a label could be very useful for marketers to dif-

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ferentiate themselves. However, in a market where 80% of the products are A rated – as in the case of the Swiss market for washing machines – there is little left to differentiate. Therefore, policy makers should make sure that criteria provide enough incentive for continuous improvement and are therefore regularly reviewed. A currently discussed solution to include a new rating class such as AA or A+ at the top end of the spectrum will probably not do an equally good job to reduce information cost for consumers.

Implications for Research

Our discrete choice analysis turned out to be a fruitful approach to investigating consumer preferences for energy labels. For the first time, we presented a comprehensive quantitative analysis of consumer behaviour with regard to eco-labels in the appliance sector. This provides much richer results than simple willingness-to-pay studies or direct inquiries into people's environmental attitudes, since we get less socially desired answers by taking an indirect approach to revealing consumer preferences.

Therefore, applying discrete choice modelling to analyzing the influence of the EU energy label on consumer behaviour in other product categories (e.g. refrigerators, dryers) provides substantial research opportunities. Also, comparing across different European countries will be fruitful, especially given the differences in customer awareness about the EU energy label between Northern and Southern European countries described in earlier research (Winward *et al.*, 1998). As another angle, customer segmentation should be extended.

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Appendix. Sample for Choice Task Part of the Questionnaire

If you bought a washing machine today, which product would you choose (assuming 5 kg wash load capacity)?

Miele	V-Zug	V-Zug
Equipment version: simple*	Equipment version: middle*	Equipment version: middle*
Water consumption 39 l/wash cycle	Water consumption 39 l/wash cycle	Water consumption 58 l/wash cycle
Electricity consumption 0.85 kw h/wash cycle	Electricity consumption 1.3 kw h/wash cycle	Electricity consumption 1.3 kw h/wash cycle
'C' class energy efficiency	'A' class energy efficiency	'B' class energy efficiency
1890 CHF	3780 CHF	2650 CHF
		

* **Equipment Version:**

- **Simple:** spin speed up to 1000 rpm, basic wash programmes
- **Middle:** spin speed up to 1400 rpm, basic wash programmes, energy saving programmes, 'easy iron' programme, handwash programme for wool, quickwash programme
- **Luxus:** spin speed up to 1600 rpm, basic wash programmes, energy saving programmes, 'easy iron' programme, handwash programme for wool, quickwash programme, prewash programme

Which of these three models would you buy?

Please mark with a cross!

☐ 1	☐ 2	☐ 3

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