GREEN ELECTRONICS – DO GERMAN CONSUMERS CARE?

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ABSTRACT

This paper analyzes, whether positioning an electronic brand as environmentally friendly and thus employing a high degree of environmental commitment influences the customer perception of that brand. A panel dataset consisting of 17 cross-sections and 8 periods is analyzed via panel regression. The results show that brands with a high environmental commitment are perceived better by customers.

INTRODUCTION

Addressing environmental issues is of growing importance for companies in our current society. In Germany, 67% of all participants in a study on environmental consciousness reported to prefer buying products with a low environmental impact and 53% stated to boycott firms which are proven environmental polluters (Borgstedt et al., 2010). In a recent editorial in the Journal of Marketing, Kotler (2011) proposes that today's consumers chose among brands not only on the basis of functional and emotional criteria but also based upon how the producing companies meet their social responsibilities. As industries differ in the ecological impact of their products, this topic is presumably more important for industries with a high environmental impact. Especially manufacturers of electronic devices have to consider environmental aspects, as the production and the disposal of those products have a large impact on the environment (First and Khetriwal, 2010) and thus are well-advised to cosider environmental issues when managing their brand.

In the course of this paper, I will analyze whether and to what extent electronic company brands which are comparably greener are also perceived in a more favorable manner by customers than their less green counterparts. My work can contribute to existing research by filling several research gaps. First, unlike most studies, which - due to lack of adequate data - limited their assessment of perception or attitude towards the company or the brand to one or a limited number of dimensions (for example: Sen and Bhattacharya (2001) and Luo and Bhattacharya, 2006), I employ a holistic, multidimensional operationalization of brand perception. It is based upon a series of aspects: the consumers' evaluation regarding the general impression of a brand, the quality and the value for money of the brand's products, the satisfaction with products and services provided by the brand, the willingness to recommend the brand and the attractiveness of the underlying company as an employer. Second, I use secondary data. Most studies in this area use primary data (for example: Castaldo et al. (2009) and Sen and Bhattacharya (2001)), resulting in problems of social desirability (Zerbe and Paulhus, 1987) and the so-called attitude-behavior-gap (Greenwald and Banaji, 1995). People often state an attitude which conforms to social norms (such as buying environmental friendly products), but actually exhibit a different behavior (Maison et al., 2004). The study at hand avoids these effects by merging two independent databases and by solely relying on secondary data. Consumers' perceptions of a brand were collected without any reference to environmental friendliness. Therefore, consumers are not put into a situation, where social desirability could play a role. By this, I contribute to the understanding of the effect of a company brand's "doing good" on the way customers think of them.

CONCEPTUAL FRAMEWORK AND HYPOTHESES

In the following sections, hypotheses are proposed for the analysis of the impact of electronic companies' environmental commitment on customer perception. The hypotheses are constructed from theory and previous empirical findings. Due to the fact that research on the impact of environmental commitment in the electronics sector is scant, the hypotheses are deducted from less specific research. However, the studies of Saphores et al. (2007) and First and Khetriwal (2010) provide evidence that general findings regarding the environmental commitment – customer perception link can be transferred to the electronics sector.

A Rationale on the Effect of Environmental Commitment

Theory proposes several reasons, why environmentally committed companies are generally perceived better by their customers. Most theories originate from psychology and social sciences. In the following, an overview on several rationales for the impact of environmental commitment on customer perception is provided.

Theory of environmental concern. The theory of environmental concern implies that many people "(…) intrinsically care about the well-being of the planet and its inhabitants (…)" (Griskevicius et al., 2010, p. 393). Research proposes several explanations for this phenomenon (Bamberg, 2003, Stern et al., 1995). Environmental degradation is perceived as threatening by the majority of Germans (Financial Times/Harris Poll, 2009, p. 2) and inhabitants of other industrialized countries. As concern for a topic is associated with the risk an individual attributes to it (Slovic, 1987), acting in an environmentally conscious way can therefore be part of a risk avoidance strategy. Another explanation for intrinsic environmental concern is its classification as a higher order need as proposed by Inglehart

(1977, 1995). Last but not least, one theoretical approach is based on the so-called Schwartz norm-activation model of altruism (Schwartz, 1977). It claims that individuals generally feel morally obliged to take action against certain things that could pose threats to other human beings.

Social identity theory. Social identity theory is originally targeted towards the employee-employer relationship. This theory assumes that each individual's self-concept is influenced by its membership in various social organizations which includes the firm the individual works for (Ashforth and Mael, 1989). If an individual perceives an organization as a socially or environmentally responsible part of society, this may result in pride to be part of such a group by working for the respective firm or brand (Greening and Turban, 2000, Maignan and Ferrell, 2001). Bhattacharya and Sen (2003) transferred this theory to the customer-company relationship. They stated that the ability of environmentally conscious customers to buy products or services from brands which also exhibit a large amount of environmental responsibility can increase customers' self-identification with the brand and therefore their perception of the brand (Bhattacharya et al., 1995, Bhattacharya and Sen, 2003).

Consumer psychology. Psychology proposes that one major reason for consumers to act in an altruistic way, for example by deliberately buying environmentally and socially reconcilable products, is avoiding guilty feelings or triggering positive ones (Pickett-Baker and Ozaki, 2008, Strahilevitz, 1999). Furthermore, Holbrook (2006) lists several sources for customer value, namely efficiency and excellence, status and esteem, play and aesthetics, and ethics and spirituality. Buying environmentally friendly brands can influ-

ence at least two of the four dimensions – status and esteem and ethics and spirituality. Yoon et al. (2006) provide empirical evidence for this connection.

The Impact of Green Electronics on Customer Perception

There is broad evidence in literature that a firm's environmentally friendly behavior is important to the customers (see the German survey by Borgstedt et al., 2010). Hence, most perception- and attitude-based constructs such as reputation or image contain a CSR dimension which in turn includes one or several "environmental items". Examples for this are Schwaiger's model of Corporate Reputation (Schwaiger, 2004), the Fortune Corporate Reputation Index (Fombrun and Shanley, 1990) and corporate image (Keller, 2000). Based upon the theory (chapter 2.1) and previous empirical findings I hypothesize the following effects:

$H1_a$: Highly environmentally committed electronic company brands are systematically perceived better than less committed electronic company brands.

$H1_b$: The customers' perception of electronic company brands is sensitive to relative changes of the company brands' environmental commitment.

One further dimension of brand perception which I want to analyze in detail is customer satisfaction because of its great practical importance for a brand, as firms and brands with satisfied customers have a better financial and market performance (Fornell et al., 2006).

A positive effect of CSR on customer satisfaction was found by Carvalho et al. (2010) and Luo and Bhattacharya (2006). A further indicator for a positive effect of CSR on customer satisfaction is the positive effect of perceived value on customer satisfaction (Fornell et al., 1996, Mithas et al., 2005). As CSR enhances value (see the section on

consumer psychology in chapter 2.1 and – for empirical evidence – the following section), one can conclude that satisfaction can be likewise increased. Concluding, I propose the following hypotheses:

$H2_a$: Customers of highly environmentally committed electronic company brands are systematically more satisfied with the brand than customers of less committed electronic company brands.

$H2_b$: The customers' satisfaction with electronic company brands is sensitive to relative changes of the company brands' environmental commitment.

Perceived value for money is another very important aspect of brand perception which will be analyzed in detail in this work. The existence of a green or sustainable value for the customer has been analyzed in several studies. Consumers' willingness to pay for environmentally friendly products was proven to be systematically higher than for comparable not green products (see for example Laroche et al. (2001)). The same applies for the impact of CSR on perceived price fairness (Carvalho et al., 2010). Saphores et al. (2007), examined the California Households' willingness to pay for ecologically friendly electronics. They found an increased willingness to pay for green electronics - the maximum price premium that was accepted by most households was 1%. Comparably affluent households stated a willingness to pay mark-up prices of 5% and more. Concluding, in line with theoretical considerations regarding consumer psychology (chapter 2.1), I propose the following hypotheses:

$H3_a$: Highly environmentally committed electronic company brands are systematically perceived to have a higher value for money than less committed electronic company brands.

$H3_b$: The customers' perception of the value for money of electronic company brands is sensitive to relative changes of the company brands' environmental commitment.

The last dimension of brand perception which I will look at in detail is the attractiveness of a company brand as an employer. The positive impact of CSR on employer attractiveness was proven in several empirical studies (see for example: Backhaus et al. (2002), Greening and Turban (2000)). Furthermore, Rupp et al. (2006) find that employees of companies with a high CSR are more satisfied with and more committed to their job than employees of companies which are less committed towards social and environmental issues. Based upon those empirical findings and social identity theory (see chapter 2.1), I draw up the following hypotheses:

$H4_a$: Highly environmentally committed electronic company brands are systematically more attractive as employers than less committed electronic company brands.

$H4_b$: The attractiveness of electronic company brands as employers is sensitive to relative changes of the company brands' environmental commitment.

EMPIRICAL ANALYSIS

Data

The main sources of the data this analysis is based on are the BrandIndex as a measure of customer perception and the Guide to Greener Electronics by Greenpeace as a measure of

environmental commitment. The BrandIndex is an operationalization of customer perception by the YouGov Psychonomics AG (YouGov, 2011). The data is derived by daily surveys. As the data in this study is analyzed on a monthly basis, the daily data is transformed by calculating average values. The Guide to Greener Electronics was launched by Greenpeace in August 2006 and ranks the 18 main actors in the consumer electronics segment in terms of ecological criteria of their electronic products, namely chemicals management, the handling of electronic waste and use of energy in fabrication and usage of the electronic devices. Between 2006 and 2010, Greenpeace released 16 versions of the guide. On average, two to three editions are published every year. A committee of five Greenpeace employees rates the companies in terms of several pre-specified criteria and aggregates the results on a 0 to 10 scale. Due to the subjectivity this expert judgment can bring about and the fact that the criteria were not used consistently through every version of the guide[1] means that the total score is based upon different criteria in different periods making it impossible to compare them without bias. Hence, I decided to rank the brands based on their attained score in each wave and assigned the corresponding number as a figure for relative environmental commitment instead of absolute figures. In case of equal scores, all affected brands were assigned the highest possible rank. The control variables used in the panel regression models – size and firm profitability (more specifically, the return on assets (RoA)) – were derived from Datastream. By including these variables, I account for the assumption that more profitable and greater firms, which stand behind the examined brands, might be perceived in a better way. For example, large and profitable firms were found to exhibit a higher attractiveness as an employer (Turban and

[1] One example for such inconsistencies is the amendment of the precautionary principle criterion in the 14th edition of the Guide to Greener Electronics (Greenpeace, 2010).

Greening, 1997, Turban and Keon, 1993). Regarding the firm size, big companies are typically perceived by the public to be better which manifests itself in a systematically higher reputation (Fombrun, 2008). As research suggests that total assets, number of employees and total sales are all equally valid figures for firm size (Harrison et al., 1988), I chose sales, as this also measures the brand's product dispersion and therefore is probably the most relevant figure in a consumer context. In order to account for possible structural breaks, the BrandIndex and Datastream data were z-standardized by period before included in the analysis. The variables and the sources of the data are displayed in table 1. The asterisks identify the items which were analyzed separately (H2-H4).

Insert table 1 about here

The final dataset used in this analysis is a balanced panel dataset including 8 different waves (periods) of the Greenpeace Guide to Greener Electronics between September 2008 and October 2010[2] and 17 different electronic companies (cross-sections).

Model Development

In order to be able to include control variables and to account for the panel nature of the dataset, a specific form of regression which is adapted to the panel character of the data – namely panel regression – is used. In each model, I include the dependent variable (the z-standardized BrandIndex variable and the variables for value-for-money, satisfaction and employer attractiveness respectively), the key variable (each wave's green rank of the respective brands, $GRANK_{it}$) and two control variables, namely the z-standardized values

[2] BrandIndex data was available from 2008 to 2011. Therefore, the earlier versions of the Guide to Greener Electronics could not be included in the analysis.

of the RoA (RoA_{it}) as a performance variable and the natural logarithm of total sales ($SIZE_{it}$) as an indicator for the firm's size. The resulting level model is the following:

$$BI_{it} = \alpha + \beta_1 * GRANK_{it} + \beta_2 * SIZE_{it} + \beta_3 * RoA_{it} + \mu_i + \epsilon_{it}$$

α is the constant whereas the βs stand for the variables' coefficients. Furthermore, I include cross-section fixed effects[3] (μ_i) to account for unobserved heterogeneity between the brands. ϵ_{it} represents the remaining disturbance (Baltagi, 2008, p. 13). The models for the value-for-money, the satisfaction and the employer attractiveness are set up analogously. The decision to include fixed effects rather than random effects in these models is based on the fact that the random effects model assumes that individual effects are uncorrelated with other regressors (Greene, 2008, p. 208) – an assumption which has to be doubted in the dataset and the variables at hand.[4] The resulting inconsistency in estimation (Hausman and Taylor, 1981) seems a high price to pay for smaller variances (Wooldridge, 2010, p. 326) and a smaller loss of degrees of freedom (Greene, 2008, p. 208). From a purely statistical point of view, the Hausman specification test for the random effects model (Hausman, 1978) shows that the random effects model is generally applicable for the models where the BrandIndex, satisfaction and value-for-money are specified as the dependent variables. The coefficients of the fixed effects and the random effects estimates do not differ significantly. However, in case of the attractiveness as employer, the applicability of the random effects model is rejected. Due to the above stated

[3] Period fixed effects were not included as the coefficients for the particular effects were mainly insignificant. To avoid disadvantages stemming from overparameterization of the model – for example an enormous loss of degrees of freedom (Baltagi, 2008, p. 35) - I decided to not include period fixed effects and therefore estimate so-called one-way fixed effects models.

[4] One - at least - has to assume correlations between individual effects and the control variables size and profitability.

theoretical considerations and due to the fact that random effects are not applicable for one of the four models tested, I decided to use fixed effects in all models.

A modified Wald-test detected heteroskedasticity in all models and a test for serial correlation (Wooldridge, 2010, p. 319-320) uncovered the existence of autocorrelation in three of the four models at hand, namely the models where the BrandIndex, the value-for-money and satisfaction were specified as dependent variables. To account for the heteroskedasticity, I applied so-called panel-corrected standard errors (PCSE) in my estimation procedure (Beck and Katz, 1995). In the models where autocorrelation had been detected, a Prais-Winsten regression (Kmenta, 1997, p. 121) was carried out instead of the ordinary least squares (OLS) estimation procedure for panels. The variance inflation factors (VIF) for the simple OLS model are 1.184, 1.376 and 1.235 respectively. As these values are far below the stipulated thresholds of 5 to 10 (Hair, 2010), one can assume that despite the significant correlations, there is no multicollinearity present between the independent model variables. Regarding the differences model, the following is estimated:

$$\Delta BI_{it} = \alpha + \beta_1 * \Delta GRANK_{it} + \beta_2 * \Delta SIZE_{it} + \beta_3 * \Delta RoA_{it} + \mu_i + \epsilon_{it}$$

The variables are the same as in the level model but in differences to gather the effect of changes in the relative green performance on the change in the consumer perception. I also control for changes in sales and profitability. Again, cross-section fixed effects are included. The Hausman specification test shows that a random effects model is possible for all four models from a statistical point of view. However, for the same reasons as in the level models, I decided to use the fixed effects estimation procedure instead. The modified Wald-test detected heteroskedasticity in all four models which again indicates

the need for using PCSE in my estimations. Autocorrelation was present in the attractiveness as an employer model. This model therefore was estimated using a Prais-Winsten regression. With VIFs of 1.004, 1.142 and 1.138, multicollinearity is no problem in the differences models.

Descriptive analyses revealed some kind of anomaly regarding Nokia – compared to all other dimensions of the BrandIndex, this company brand performed very badly in terms of employer attractiveness. This is clearly due to Nokia's factory closing in 2008, which caused a sustainable damage in terms of employer attractiveness (Sarstedt and Schwaiger, 2008). As this event primarily affected the employer attractiveness dimension, Nokia is excluded from further analysis regarding this component of brand perception[5] when analyzing level values.

Panel Data Analysis

The results from the level models discussed in chapter 3.2 are displayed in table 2.

Insert table 2 about here

All models are highly significant as the Wald χ^2 statistic shows. Regarding the effect of the relative degree of environmental commitment on the overall perception of a brand by its consumers (first column), my results show that there is a significant coherence. The coefficient of the key variable, Green rank, is significantly negative. This implicates that the better (that means the lower) a brand is ranked in terms of environmental commitment, the better it is perceived by the consumers. This confirms hypothesis $H1_a$ which proposed that green brands are systematically perceived better by consumers than their

[5] Since the factory closing has nothing to do with environmental commitment but does influence the consumers' perception of employer attractiveness to a degree which dwarfs all other effects, an exclusion of this brand is not only acceptable but absolutely necessary to prevent biases caused by this single event.

less green counterparts. The absolute effect, however, is relatively small with -0.011, considering that the values for the BrandIndex range between -2.058 and 2.580. Being the worst rated brand only causes an average drop of (16-1) * 0.011 = 0.165 points from the overall perception measure compared to the best-rated brand. Nevertheless, despite being small, the significance of the figure shows that it is non-random and therefore systematic. Concluding, our hypothesis $H1_a$ is supported. From the three dimensions of the BrandIndex I analyzed in this study, two are significantly influenced by environmental commitment. The coefficient of the key variable in the satisfaction and the value-for-money model (second and third column) is significantly negative, which indicates that a better ranking in the Greenpeace index comes along with both a smaller penalty in customer satisfaction and a higher perception of value-for-money. Again, the absolute effects are relatively small, which is not surprising as one can assume that there are several brand and product related attributes which contribute a great deal more to customer satisfaction and value-for-money perception than the brand's environmental commitment (for example quality of the products and services, the price of the products and the additional value, such as status, a brand conveys). Nevertheless, the effects are – in a statistical sense – not random. Therefore, the hypotheses $H2_a$ and $H3_a$ can be supported. Last but not least, I analyze the attractiveness as an employer. When looking at the fourth column of table 2, one can see that the key variable's coefficient (0.001) is not significant. $H4_a$ can therefore not be supported.

All in all, in three of the four models I could find the effects proposed in the hypotheses. Environmental commitment does have an effect on the customers' perception of a brand as literature suggests; however, this effect is only very low in absolute terms. I could not

find any coherence between the attractiveness as an employer and the relative environmental commitment of the regarding brand. The question remains why, opposed to rather product-related features such as satisfaction and value-for-money, the attractiveness as an employer is not affected by the electronic brand's environmental commitment. An explanation for that could be that the decision where to work is completely different from the one which product to buy. When thinking of simple potential or real buying decisions or consumption experiences as is the case when rating a brand in terms of satisfaction or value-for-money, "doing the right thing" is not that "costly" as it is when deciding on a potential employer. The latter decision is much more important, therefore factors such as security of employment and salary dwarf potential effects coming from the brand's high performance in ecological issues. This is confirmed by the significant coefficient for the size variable, as larger companies typically pay higher wages. Furthermore, firm size is a proxy for a firm's economic stability and therefore conveys security of employment. These assumptions are confirmed by the results of a study by Turban and Greening (1997). As is the case in this study, employer attractiveness was linked to firm size but not to environmental commitment.

Table 3 shows the outcomes from the four differences models.

Insert table 3 about here

Neither regarding the overall customer perception, nor the three dimensions, I could find any significant effect of the key variables' first difference on the changes in the dependent variable from one period to the next. The coefficients of all variables except employee attractiveness are negative and therefore point into the direction proposed in the b-hypotheses claiming that customers and employees are sensitive to changes in the relative

environmental commitment. However, these effects are far from being statistically significant. Hypotheses $H1_b$- $H4_b$ can therefore not be supported.

IMPLICATIONS

Contribution to research. This study's strength and point of difference from past studies coming to similar results is certainly the data. Instead of single dimensions of customer perception, such as satisfaction or perceived value, and outcomes or consequences of high perceptions, such as purchase intentions and brand loyalty, customer perception in this study is a holistic measure which comprises of six different dimensions. This enables a much more accurate portraiture of perception than in the studies before. Furthermore, by merging two independent datasets regarding customers' perception and environmental commitment, my results are not biased by social desirability. This is – as discussed in the introduction – a major problem when using primary data in this kind of context. Last but not least, in this study I use with panel regression a comparatively advanced technique of data analysis. With this method, chronological development as well as cross-sectional differences of customer perception can be taken into account, thus further increasing the accuracy of the results. Therefore, this study can contribute to existing research on the impact of CSR and environmental commitment on customer perception.

Management implications. The results of this study show that German consumers do only very marginally care whether the brand they buy their electronic products from acts in an environmentally friendly way. A segment of consumers seems to be both informed about the environmental commitment of the different electronic brands and reward such attitudes by an increased benevolence towards these brands. However, this effect is very

small. Therefore one has to be careful when thinking of employing a green branding strategy. It must not be considered as a universal remedy which alone guarantees consumers' goodwill and market success. Furthermore, short-term environmentally friendly actions did not prove to translate into a better customer perception. This suggests that a green image has to be grown and cultivated carefully before being perceived as credible by the consumers (Saha and Darnton, 2005). Greenwashing or purely short-term investments in ecological issues might therefore have no effect on how customers perceive the brand. Nevertheless, a certain degree of environmental commitment seems to be expected by consumers. Brands which cannot cope with these expectations or are even involved in environmental scandals may sooner or later get into trouble with consumers who do not approve of that.

Research opportunities. In this study, the BrandIndex data has proven its aptitude in these kinds of settings and should be utilized to extend the rather narrow scope of this study from electronic articles to more industries and from environmental commitment to CSR or sustainability. Using daily perception data could prove to be very helpful to, for example, identify differences in the effectiveness of CSR in improving customers' perception of a brand across different industries. The question, whether being environmentally committed matters more in, for example, the automobile or the textile industry is a very interesting topic for researchers and practitioners. Furthermore, this research area would expand the paper Strahilevitz (1999) which analyzed the influence of CSR initiatives on customers in different product categories.

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TABLES

Construct	Items	Source of data
Brand Index (Cronbach's Alpha: 0,95)	Impression Quality Value* Reputation* Satisfaction* Recommandation	YouGov Psychonomics AG
Green rank (ranking data)		Greenpeace Guide to Greener Electronics
Sales		Datastream
Return on Assets		Datastream

Table 1: Model variables

Dependent / **Independent**	BrandIndex[1]	Satisfaction[1]	Value[1]	Reputation[2]
Green rank	-0.011***	-0.015***	-0.015**	0.001
	(0.003)	(0.005)	(0.006)	(0.003)
RoA	0.128	0.098	0.051	0.049
	(0.084)	(0.141)	(0.099)	(0.064)
Ln_Sales	0.156	0.234	0.301	0.142*
	(0.162)	(0.297)	(0.204)	(0.083)
Intercept	-0.469*	-0.540	-0.331	-0.570***
	(0.273)	(0.571)	(0.293)	(0.116)
Model characteristics				
Number of observations	128	136	136	128
Number of cross-sections	16	17	17	16
Number of periods	8	8	8	8
R^2	0.906	0.7612	0.783	0.967
Wald χ^2	1859386.57***	426816.06***	210038.86***	4573.95***

Note: Significance at the level of * 10%, ** 5%, *** 1%.

[1]: Prais-Winsten regression model (therefore controlled for first order autocorrelation) with cross-section fixed effects and panel corrected standard errors

[2]: Panel regression model with cross-section fixed effects and panel corrected standard errors

Table 2: Panel data analysis (level model)

Dependent / Independent	Δ BrandIndex	Δ Satisfaction	Δ Value	Δ Reputation
Δ Green rank	-0.006	-0.011	-0.007	0.000
	(0.005)	(0.007)	(0.006)	(0.005)
Δ RoA	0.211***	0 .283***	0.208***	0.137***
	(0.049)	(0.074)	(0.064)	(0.039)
Δ Ln_Sales	-0.034	-0.107	0.058	-0.068
	(0.177)	(0.314)	(0.184)	(0.101)
Δ Intercept	0.092**	0.169**	0.070*	0.067
	(0.046)	(0.080)	(0.039)	(0.038)
Model characteristics				
Number of observations	119	119	119	119
Number of cross-sections	17	17	17	17
Number of periods	7	7	7	7
R^2	0.303	0.222	0.256	0.361
Wald χ^2	307029.73***	392728.41***	86831.96***	461056.56***

Note: Significance at the level of * 10%, ** 5%, *** 1%.

Table 3: Panel data analysis (differences model)