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Sustainable consumption and third-party certified labels: Consumers' perceptions and reactions

Abstract

Compared with conventional products, sustainable products continue to attract relatively lower market shares. To increase customer acceptance, many sustainable products feature third-party certified labels (TPCL), yet it is unclear whether TPCL are effective and what processes and boundary conditions define their role in consumer decision making. Across three experimental studies, this research determines that sustainable products are characterized by credence qualities, associated with increased perceptions of risk, which negatively influence consumers' purchase intentions. Drawing on signaling theory, this study also shows that TPCL on sustainable products provide brand-like information cues that reduce the perceived risk of sustainable products. Finally, a third experimental study demonstrates that consumers must perceive TPCL as credible for them to reduce consumers' risk perceptions.

Keywords: information economics, mediation, moderation, perceived risk, sustainable products, third-party certified labels.

1. Introduction

Sustainability is a critical issue in management and marketing, and consumer responses to sustainable products—defined as products that have a positive environmental and/or social impact because they are produced with concern for human and natural resources, such as air, water, and land (Shrum et al., 1995; Szekely & Knirsch, 2005)—generally are positive. Yet these attitudes have not translated into corresponding behaviors (Boulstridge & Carrigan, 2000; Carrington et al., 2010; Luchs et al., 2010; Newholm & Shaw, 2007), potentially due to barriers such as price, performance/quality, availability, convenience, or time needed to source sustainable alternatives (e.g., Auger et al., 2003; Gleim et al., 2013; Gupta & Ogden, 2009; Johnstone & Tan, 2014; Papaoikonomou et al., 2011; Pickett-Baker & Ozaki, 2008; Shaw & Clarke, 1999). These barriers, reflective of financial, performance, or time risks (Liao et al., 2010; Mitchell, 1992), prevent consumers from purchasing sustainable product alternatives and remain unresolved across many product categories.

To alleviate these risks, many companies attach additional attributes to their products. Specifically, they adopt third-party certification labels (TPCL), submitting their products for certification by independent organizations. As a result, certified production across sustainable commodity sectors has increased by 41% (cf. 2% growth in conventional commodity markets; Potts et al., 2014). Pancer et al. (2015) argue that such cues enable consumers to categorize a product as sustainable and can increase the credibility of the products (Dando & Swift, 2003; Janssen & Hamm, 2012; Noblet & Teisl, 2015; Thøgersen, 2002), such that they can have important impacts on consumer decision making (De Chiara, 2015; Husted, Russo, Meza, & Tilleman, 2014). However, the lack of a single, well-defined, sustainable label (Castka & Corbett, 2014), and instead the presence of many differing labeling approaches, with multiple and assorted

criteria (Richards, 1994), creates challenges for consumers, in that the hundreds of TPCL may overwhelm their abilities to assess various sustainable product certifications. In other words, while TPCL are intended to reduce consumer risk, they may themselves function as a credence attribute which consumers struggle to evaluate. Indeed, it has been reported that most consumers are overwhelmed by product information and are critical of certain sustainability claims (e.g., Horne, 2009). Nonetheless, extant research evidences that certified labels promote the purchase of sustainable products and discourage the purchase of conventional products (Aprile, Caputo, & Nayga, 2012). Past research, however, largely neglects moderators of the links between product type and purchase intention or actual buying behavior (Povey et al., 2000). Moreover, previous studies often use fictitious sustainability labels (Bernard, Bertrandias, & Elgaaied-Gambier, 2015), thus, lacking insights into actual marketplace conditions. Accordingly, more research is needed to detail the effects of TPCLs in facilitating, or hindering, sustainable choice.

To define the role of TPCL, this research draws on signaling theory and argues that TPCL's represent relevant product attributes that function like signals, such that they reduce levels of perceived risk by decreasing consumers' screening efforts and information costs, making decision making easier (Erdem & Swait, 1998; Smith & Park, 1992). It is pertinent to highlight, however, that consumers may experience difficulty assessing the validity of TPCL claims (Richards, 1994). Therefore, this study empirically investigates the potential moderating effect of the perceived credibility of TPCL on both perceived risk and purchase intentions. This study in turn offers theoretical insights and practical recommendations, especially for companies that allocate resources to sustainable products and for legislators creating policy in this area. After detailing TPCL, risk, and credibility in sustainable consumption in the following section, hypotheses are derived and the data and methods outlined. The hypotheses are tested using data from three

experimental studies. Study 1 aims to establish a basic effect of product type (i.e., conventional vs. sustainable product without TPCL, sustainable product without TPCL vs. sustainable product with TPCL) on purchase intention and perceived risk in relation to food products. Study 2 differs from Study 1 in that an experimental condition was added and a non-food product considered to explore purchase intentions across different product categories. The purpose of Study 3 is to ascertain whether the effects found in Study 1 are contingent on the credibility of TPCL. Results are then presented and the implications of the findings considered, as well as some directions for future research.

2. Barriers to purchasing sustainably

The market for sustainable products has experienced growth for more than a decade, across the world (e.g., German Federal Environmental Agency, 2014; National Geographic Society/GlobeScan, 2014; The Cooperative Group, 2012), aided by efforts to move sustainability to the mainstream, by seeking to increase access and visibility (e.g., Dauvergne & Lister, 2012; Low & Davenport, 2005). Although sales of sustainable products have increased, as a proportion of overall consumer spending, they remain marginal relative to mainstream alternatives (The Cooperative Group, 2012). Surveys reveal that most consumers are concerned about sustainability, but this concern has not translated into sales of sustainable products (Auger et al., 2003); despite increased availability, sales of some sustainable products have even decreased (Clifford & Martin, 2011). Considering these trends, as well as increasing pressures on firms to move toward more sustainable approaches to business, companies need a better understanding of this gap and potential facilitators to sustainable product purchase to reduce the gap between positively expressed views regarding sustainable products and limited intention to purchase and purchase of such products (e.g., Cronin et al., 2010; Ganesan et al., 2009; Gleim et al., 2013).

Doing so also may have benefits, including improved employee commitment, performance, and profit margins (Menguc & Ozanne, 2005; Mon & Holland, 2006). Therefore, multiple prior studies have called for more insights into understanding sustainable product choice.

2.1 Information asymmetry and sustainable product choice

By their very nature, sustainable products increase decision making complexity. Consumers often lack the expertise and knowledge to evaluate the socio-ecological attributes of sustainable products (Gleim et al., 2013; Karstens & Belz, 2006; Rubik & Frankl, 2005). Complex scientific knowledge, language, and communication generally underlies sustainability issues, including climate change, deforestation, the extent of the global environmental crisis, and its causes. Such conditions make it nearly impossible for consumers to assess the sustainability of product attributes without assistance.

This is highlighted in the credence dimension of information economics theory (Darby & Karni, 1973; Nelson, 1970, 1974). Information economics theory established three qualities, namely, search, experience, or credence. Search qualities are those that consumers can readily inspect prior to purchase (e.g., price); experience qualities can only be evaluated through purchase and consumption (e.g., taste, functionality) (Nelson, 1970, 1974). However, for credence attributes, consumers cannot readily evaluate the level of quality either before or after purchase, because they lack expertise or would incur high costs to obtain sufficient, accurate information (Darby & Karni, 1973). In markets characterized by asymmetric, imperfect information, producers know more about their products than consumers, and consumers perceive high levels of credence qualities. For example, when considering the purchase of an organic apple, the consumer can readily ascertain the price and taste, but such search and experience qualities cannot verify that the farmer actually used organic farming methods. Similar challenges pertain to foods that claim to be

free of genetically modified organisms or products that claim to be made of organic cotton or high percentages of recycled waste. Consumers are unlikely to possess the knowledge needed to discriminate such contents and processes. The challenges related to credence qualities, thus, are particularly notable in sustainable markets, in which products might claim superior environmental performance, fair trade, no child labor, or cruelty-free manufacturing (Bonroy & Constantatos, 2008; Loureiro & Lotade, 2005), claims that are all challenging for the consumer to evaluate.

Gleim et al. (2013) report that consumers acknowledge their lack of knowledge about sustainable products. This lack of expertise represents a major barrier to the purchase of sustainable products—even among consumers who indicate that they actually purchase sustainably. Consumers appear cautious toward companies' sustainability claims, possibly due to the risk of "greenwashing" strategies, when firms only pretend to act sustainably to justify premium prices (Ellison, 2008; Kangun et al., 1991; Wagner et al., 2009). If consumers want to reduce knowledge gaps and skepticism about producers' sustainability claims (regarding, for example, farming, production, distribution methods, and lifecycle impacts), they would need to expend enormous efforts (e.g., visit a farm or factory) that likely exceed their involvement levels. Instead, consumers depend on other information sources, including mass media, to obtain information, which in itself is problematic due to, for example, bias in reporting and conflicting evidence. Indeed, after decades of mostly positive reports (Thøgersen, 2006), the sustainability sector has received increasing criticism, which can create substantial ambiguity for consumers (Källander, 2008). Journalists actively seek sustainability-related transgressions or greenwashing scandals, and the related reports undermine trust in companies' sustainability claims and products (Nyilasy et al., 2014; Thøgersen, 2006). In combination with consumers' subjective lack of knowledge, negative media coverage likely intensifies the information asymmetry in the market

for sustainable products. Therefore, in comparison with markets for conventional products, the market for sustainable products features more imperfect and asymmetric information. Because sustainability as a product attribute also resembles a credence quality, and products with high credence qualities and prices impede purchases (Darby & Karni, 1973; Kirmani & Rao, 2000), prior theory predicts:

H1. Consumers have lower purchase intentions toward sustainable versus conventional products.

2.2 Risk and sustainable product choice

In the case of credence products, consumers' uncertainty can persist beyond consumption. Consumers can also perceive greater risk, because "any action of a consumer will produce consequences which he[/she] cannot anticipate with anything approximating certainty, and some of which at least are likely to be unpleasant" (Robertson et al., 1984, p. 184). This suggests that sustainable products should be associated with higher perceived risk, compared with conventional products, because they have more credence qualities. The higher perceived risk associated with sustainable products may explain why positive attitudes do not always translate into buying intentions and actual behavior. For example, Kaiser and Gutscher (2003) find that behavioral intentions in relation to sustainable products only predict around 50% of sustainable behavior.

Stone and Grønhaug (1993) define risk as an expectation of loss (see also Mitchell, 1999; Sweeney, Soutar, & Johnson, 1999), and perceived risk types have been well established (e.g., Jacoby & Kaplan, 1972; Mitchell, 1992; Schiffman & Kanuk, 1994). In a sustainability context, the risks reflect the established barriers to consumption, including price, quality, convenience, availability, and time (Gleim et al., 2013; Gupta & Ogden, 2009; Johnstone & Tan, 2014; Luchs et al., 2010; Papaoikonomou et al., 2011; Pickett-Baker & Ozaki, 2008; Shaw & Clarke, 1999). Specifically, it is argued that these barriers constitute financial, performance, and time risks.

Financial risk pertains to the threat of losing money by purchasing the (wrong) product; performance risk is associated with concerns about its expected performance; and time risk involves the possible loss of time required to undertake a purchase of the product (Stone & Grønhaug, 1993). For example, in exploring barriers to adoption of natural gas vehicles, Wiedmann et al. (2011) find that financial, technological performance, and time risks (related to the time required to engage in the purchase) were main barriers to consumption. Exploring purchases of environmentally sustainable apparel, Kang and Kim (2013) identify perceived financial risk as a significant influence. Hamzaoui and Linton (2010) explain that both perceived financial and performance risk affect consumer decision making in relation to reused and recycled products. In line with these findings, and the supposition that sustainable products can be differentiated on the basis of their credence qualities, we suggest that experienced risks differ between sustainable and conventional products:

H2. Consumers experience higher levels of perceived risk for sustainable products than for conventional products.

Credence qualities result from imperfect and asymmetric information and increase risk perceptions (Mitra et al., 1999; Ostrom & Iacobucci, 1995), which in turn influence consumers' decision making (Pennings et al., 2002; Rao & Bergen, 1992). If a sustainable product is associated with higher levels of risk (compared to a conventional product), consumers cannot be certain if purchasing it will help them achieve their purchase goals, especially if uncertainty is inherent to the product, because it contains many credence qualities. Consumers tend to be risk averse (Shimp & Bearden, 1982), so greater risk associated with a product may negatively influence purchase intentions (Dowling & Staelin, 1994).

H3. Perceived risk in relation to a sustainable product is negatively associated with consumers' purchase intentions.

Combining the preceding arguments that consumers have lower purchase intentions for sustainable products, associate higher levels of risk with sustainable products, and exhibit a negative relationship between risk and purchase intentions, leads to the prediction that perceived risk ultimately explains differences in consumers' conventional versus sustainable product purchase intentions.

In line with previous studies (e.g., Chaudhuri, 2000), we theorize that perceived risk is the intervening variable through which the independent variable (product type) impacts the dependent variable, namely, purchase intention. Specifically, product type (sustainable vs. conventional) is expected to directly influence purchase intention (as posited in H1) as well as indirectly affect purchase intention through perceived risk. The expected mediating effect is based on the notion that decision making in relation to sustainable products always involves some degree of perceived risk. This study, thus, tests perceived risk as a mediator that helps explain why consumers have lower purchase intentions toward sustainable products, using the following hypothesis:

H4. Perceived risk mediates the influence of sustainable (versus conventional) products on decreased purchase intentions.

2.3 Labeling sustainability

When imperfect and asymmetric information characterizes a market, companies often use signals to convey information about products (Mishra et al., 1998; Spence, 1974). Signaling theory implies that signals like brands or nutrition labels serve as cues of the quality of unobservable product attributes (Bauer, Heinrich, & Schäfer, 2013; Erdem & Swait, 1998; Montgomery & Wernerfelt, 1992) and, thereby, effectively reduce credence qualities and

consumers' perceived product risk (Drichoutis, Lazaridis, & Nayga, 2006; Kirmani & Rao, 2000). To reduce information asymmetry and consumer perceived risk with regard to sustainable products, companies may 'build' trust attributes such as labels into their products. Such trust attributes have been shown to be useful in consumer decision making in the context of sustainable products (Thøgersen et al., 2010). In sustainability contexts, certification labels cover a range of concerns, such as organic production, fair trade, and animal welfare. These labels gain more trust when they have been certified by a third party (Janssen & Hamm, 2012; Noblet & Teisl, 2015; Thøgersen, 2002). Therefore, TPCL can act as strong market signals to reduce information asymmetry in sustainable product markets (Thøgersen et al., 2010; Van Amstel et al., 2008). Similar to brands or nutrition labels, TPCL provide signals that may transform credence into search qualities (Erdem & Swait, 2004; Spence, 1976). Building on this reasoning, it is argued that TPCL mitigate the negative effects of credence qualities on consumer behavior:

H5. Consumers express higher purchase intentions toward sustainable products with TPCL versus those without TPCL.

Because labels can reduce credence qualities and consumers' perceived product risk (Drichoutis et al., 2006; Kirmani & Rao, 2000), there should be less risk associated with sustainable products that carry TPCL, compared with those that do not. The risk-reducing effect of certified labels is also reflected in the fact that consumers are willing to pay a price premium for products carrying such labels (Aprile et al., 2012; Wang, Mao, & Gale, 2008). As such, TPCL are an important decision making cue (Thøgersen et al., 2010).

This lower risk in turn should translate into higher purchase intentions for products carrying TPCL. In this sense, perceived risk may be an intermediate processing variable, so its role as a

mediator that explains differences in consumers' purchase intentions for sustainable products with versus without TPCL is tested:

H6. Consumers perceive less risk in relation to sustainable products with versus without TPCL.

H7. Perceived risk is a mediating variable that affects consumers' purchase intentions toward sustainable products with versus without TPCL.

Signals such as brands and TPCL are extrinsic information cues that convey information about unobservable product attributes, they may reduce consumers' risk perceptions, and guide their decision making (Teas & Agarwal, 2000). Branding research suggests that to reduce information asymmetries, signals must be credible (Tirole, 1990); a signal that is not credible from the consumer's perspective cannot decrease uncertainty about the product's unobservable qualities (Balasubramanian & Cole, 2002; Erdem & Swait, 1998). That is, less credible signals do not reduce consumers' perceived risk or increase their purchase intentions. The appeal of sustainable products, therefore, depends on the perceived credibility of their sustainable claims (Erdem & Swait, 1998). De Chiara (2015) highlights that claims from an independent organization, such as TPCL, are likely to appear more credible than those from a commercial source, and this perceived credibility should influence consumer decisions positively, compared with non-credible information.

Credibility refers to the extent to which a product or brand as a whole is seen as credible in terms of trustworthiness and expertise (Erdem & Swait, 2004). In general, TPCL evoke more trust among consumers (D'Souza et al., 2007; Janssen & Hamm, 2012; Noblet & Teisl, 2015), however, Balineau and Dufeu (2010) argue that they are only partial solutions, in that consumers remain reliant on the certification intermediaries. Without the technical expertise, time, or access to information to distinguish sustainable from non-sustainable components in product selection,

consumers have little choice but to trust certification labels to increase their awareness and reduce the potential for misleading claims and environmental impacts (Richards, 1994). Problematic, however, is that many certification labels on the market offer vague and varying criteria, which creates consumer confusion (Richards, 1994). For example, the Forest Stewardship Council and Sustainable Forestry Initiative both certify in the area of forest stewardship, yet different standards underlie their certifications, prompting questions of greenwashing (Alter, 2007). Moreover, certifiers may be independent in name, yet they cannot be operationally independent, because companies pay them to conduct the certification audit (Hatanaka & Busch, 2008). The uncertainty surrounding both sustainable products and TPCL likely leads to varying consumer judgments about the credibility of TPCL. For example, evidence indicates significant variation in consumers' trust in organic food labels (Daugbjerg & Sønderskov, 2012). The effects of TPCL on consumers' risk perceptions and purchase intentions, therefore, might not hold for all consumers. It is proposed that TPCL decrease the risk associated with a sustainable product more effectively the more the consumer considers these TPCL to be credible. Consequently, consumers' perception of a TPCL's credibility serves as a moderating variable of the association between product category and risk perception. As perceived risk also negatively affects consumers' purchase intentions, the moderating effect of a TPCL's perceived credibility should indirectly affect purchase intentions through perceived risk (i.e., moderated mediation):

H8. The perceived credibility of TPCL affects the amount of risk associated with sustainable products carrying TPCL.

H9. The perceived credibility of TPCL indirectly affects consumers' purchase intentions associated with sustainable products carrying TPCL, through perceived risk.

3. Method

3.1 Experiments

To test the hypotheses, three experimental studies across different product categories were conducted. In Study 1, H1–H4 were tested in the context of food products, to ascertain empirically that sustainable products are associated with higher levels of risk than conventional products. Study 2 focused on cleaning products and tested H5–H7, to determine if TPCL reduce the risk that consumers associate with sustainable products. To replicate the Study 1 findings, a condition with conventional products was also included in Study 2. To test H8–H9, in Study 3, sustainable cosmetic products with and without TPCL were investigated. Figure 1 depicts the overall conceptualization of these studies.

Insert Fig. 1 about here

3.2 Study 1

Study design

Study 1 tested for differences in consumers' purchase intentions (H1) and perceived risk (H2) across conventional and sustainable products. The sustainable product used in the experiment was sustainable in the sense that it claimed environmental friendliness as well as economic and social quality (Li et al. 2014). In addition, the effect of risk on purchase intentions (H3) and the proposed mediating effect (H4) were investigated. Trained graduate students helped recruit participants for the online experiment. Participants consisted of 101 consumers (58.1% women, M_{Age} = 25.5 years) recruited from different Internet forums, social networks, and newsgroups unrelated to sustainable food or other products. The participants accessed the online experiment via a banner link posted on the sites. This was a between subjects study with two experimental conditions (conventional product vs. sustainable product). Participants were

assigned to the experimental condition in a randomized fashion to rule out selection bias (Steiner et al., 2010). As a participation incentive, in all three experimental studies, several Amazon vouchers were offered in a raffle.

On beginning the experiment, participants were randomly assigned to a condition and read that they would be asked to answer questions about grocery items. Depending on the experimental condition, participants were instructed to think about the purchase of either conventional or organic milk. Next, they completed a questionnaire pertaining to their perceptions of risk and purchase intentions toward the product. Before leaving the study website, all participants provided some demographic information, received thanks and a debriefing (to explain the purpose of the experiment), and had the option of leaving their e-mail address if they wished to take part in the raffle.

Risk measure

The risk measure captures three types of perceived risk, in line with prior research into the main barriers to sustainable consumption (Gleim et al., 2013; Gupta & Ogden, 2009; Johnstone & Tan, 2014; Luchs et al., 2010; Pickett-Baker & Ozaki, 2008). An exploratory study tested the argument that the risk dimensions consumers associate with sustainable products include performance, financial, and time risks. That is, 17 consumers were asked to ascertain which risk dimensions were most representative of barriers to sustainable consumption. The results aligned with this study's reasoning and reflected the previously established definitions of financial risk as the risk of losing money in purchasing the product, performance risk as concerns about the product's expected performance, and time risk as the possible loss of time while purchasing (Stone & Grønhaug, 1993). Three items measured each risk dimension (Stone & Grønhaug, 1993; Sweeney et al., 1999), measured on seven-point Likert scales, ranging from 1 ("strongly

disagree”) to 7 (“strongly agree”). The items matched the product categories, such as “I am concerned that the purchase of [organic] milk is a bad way to spend money.”

Following Sweeney and colleagues (1999), an exploratory factor analysis (EFA) was conducted with non-orthogonal rotation on the items measuring the different types of perceived risk. The Kaiser-Meyer-Olkin measure of sample adequacy was .83, indicating that the sample size (n= 101) was adequate (Kaiser, 1974). The EFA revealed three factors with eigenvalues greater than 1, but the third factor was dropped, because it contained only one item with a loading of -.40. The remaining two factors explained 69.35% of the variance. In line with Sweeney et al. (1999), one factor comprised items that measured financial and performance risk; it served as the mediator (perceived risk) in the model. The other factor included time risk items, related to the process of purchasing. Accordingly, the two factors were named “financial and performance risk” and “time risk.” Their Cronbach’s alphas values were greater than .7 (Nunnally, 1978).

Dependent variable

To measure purchase intention, three items ($\alpha = .86$) adapted from Taylor and Baker (1994) were used, after adjusting the wording to fit the experimental condition: “The probability that I would consider buying organic milk is …”, “The probability that I buy organic milk is …”, and “My willingness to buy organic milk is …”.

Covariates

Prior research has demonstrated that socio-economic status and education affect consumer purchases of sustainable products (Gleim et al., 2013; Shrum et al., 1995), so these categorical variables were incorporated as dummy-coded control variables. This study also controlled for people’s experience with sustainable food and the amount of sustainable food in their everyday purchases.

Hypotheses tests

A regression-based analysis implemented in the SPSS macro by Hayes (2013), with a bootstrapping procedure was applied to test for indirect effects. The table in the Appendix contains the descriptive statistics and zero-order correlations. The regression model is significant, $F(19, 81) = 3.24$, $p \leq .001$, explaining 43% of the variance in purchase intentions. None of the control variables yield significance, thus, they are not discussed further. The experimental condition indicates a significant, negative effect on the dependent variable; consumers' intentions to buy sustainable rather than conventional products are lower ($b = -1.98$, $p \leq .01$), in support of H1. Compared with a conventional food product, a sustainable food product also is associated with greater financial and performance ($b = 1.28$, $p \leq .001$) and time ($b = .43$, $p \leq .05$) risks, in support of H2. Financial and performance risk ($b = -.37$, $p \leq .001$) and time risk ($b = -.63$, $p \leq .001$) both negatively affect consumers' purchase intentions, in line with H3. As indicated by the bootstrap confidence intervals (5000 samples) that do not include zero, the indirect effect of the experimental manipulation on the dependent variable is significant for both risk factors. This finding supports the prediction in H4 that the lower purchase intentions for sustainable products reflect their higher levels of financial and performance risk ($b = -.51$; lower-level bootstrap confidence interval [BootLLCI] -.97, upper-level bootstrap confidence interval [BootULCI] -.12) and time risk ($b = -.19$; BootLLCI -.58, BootULCI -.02).

Discussion

Consumers express lower purchase intentions for sustainable than for conventional products. The finding that sustainable products are associated with higher levels of risk also supports the argument that sustainable products tend to be characterized by credence qualities. Moreover, the mediation analysis sheds light on the processes underlying differences in purchase

intentions between sustainable and conventional products; the difference in consumers' risk perceptions translates to lower levels of purchase intentions for sustainable products. These results provide a foundation for investigating the effects of TPCL on consumers' purchase intentions and risk perceptions toward sustainable products.

3.3 Study 2

Study design

Study 2 tested differences in consumers' purchase intentions (H5), associated risk (H6), and the mediating effect of risk on different purchase intentions (H7) for sustainable products with and without TPCL. Participants consisted of 157 consumers (54.1% women, M_{Age} = 27.6 years) recruited from different Internet forums, social networks, and newsgroups unrelated to sustainable food or other products. The participants accessed the online between-subjects study with three experimental conditions (conventional product vs. sustainable product without a TPCL vs. sustainable product with a TPCL) through a banner link posted on the sites. Participants were randomly assigned to the experimental condition.

Study 2 is identical to Study 1, with three exceptions. First, the product category was changed from food products to detergent, to increase the generalizability of the findings. Second, an experimental condition was added that described sustainable products with TPCL, so participants were randomly assigned to one of three experimental conditions (conventional product vs. sustainable product without TPCL vs. sustainable product with TPCL). As in Study 1, the manipulation varied the short text that participants read; depending on their assigned experimental condition, participants were instructed to think about the purchase of conventional dishwashing liquid, sustainable dishwashing liquid, or sustainable dishwashing liquid carrying a TPCL (which also was depicted under the text paragraph). Third, the wording of the variables

used to measure the amount of sustainable consumption changed to match the context of this study. The factor analysis for the risk measures yielded the same results as in Study 1, so again financial and performance risk and time risk dimensions were used (see Table 1 for α values). The purchase intentions dependent variable (α = .97) and demographic information were the same as in Study 1. Again, the covariates had no significant effect and are not discussed.

Choice of TPCL

Two frequently used current marketplace TPCL that were deemed likely to be known by most German consumers were selected and pretested, one issued by the EU and the other by the German government. A sample of 62 consumers recruited over the Internet rated the familiarity of the two TPCL on a seven-point scale (1 = “not at all familiar”; 7 = “very familiar”); note that consumers did not rate the familiarity of the product. The labels appeared in randomized order to avoid order effects. Although both labels are issued by official organizations and used frequently, a repeated measures analysis of variance revealed clear differences in the familiarity ratings, $F(1, 61) = 252.12$, $p \leq .001$. Consumers were less familiar with the EU version ($M = 1.44$, $SD = 1.24$) than with the label issued by the German government ($M = 5.82$, $SD = 1.77$), so the latter TPCL was chosen for this study.

Hypotheses tests

The data were analyzed with a regression-based analysis in the SPSS macro developed by Hayes and Preacher (2014). This allowed the testing of the mediating processes of several variables in experiments with a multicategorical, independent variable for significance and explicit quantification; as well as testing the indirect effects using bootstrap confidence intervals. To handle the categorical independent variable, the macro creates two dummy variables, comprising the three experimental conditions. Sequential coding was applied, because the relative

effects of sequentially coded independent variables can be interpreted as the effect of one experimental condition on a condition sequentially lower in the ordered system (Darlington, 1990). The condition with the conventional product served as a control condition; dummy variables were set to 0. In the condition with the sustainable product without TPCL, the first dummy variable equaled 1, and the second was 0 and, finally, in the condition with the sustainable product with TPCL, both dummy variables were set to 1. Thus, the analysis provides two comparisons. First, the conventional product is compared against the sustainable product without TPCL, which replicates Study 1. Second, the sustainable product without TPCL is compared against the sustainable product with TPCL, as a test of H5–H7. The comparisons reveal relative effects.

The descriptive statistics and zero-order correlations are in the table in the Appendix. The overall regression model is significant, $F(19, 137) = 3.28$, $p \leq .001$, explaining 33% of the variance in the dependent variable. The effects of the experimental conditions largely can be derived from their relative effects, thus, in the following analyses, the contrasting effects of the sequentially coded dummy variables are addressed.

Insert Table 1 about here

Regarding the relative total effects of the experimental conditions on purchase intentions, in Table 1, participants in the condition with the sustainable product without TPCL indicated lower purchase intentions than participants in the conventional product condition, replicating the Study 1 findings. Furthermore, among participants in the sustainable product conditions, those who saw TPCL indicated higher purchase intentions than those without TPCL, in support of H5.

In terms of the relative direct effects of the experimental conditions on perceived risk, the same patterns for both financial and performance risk and time risk is found in the relative direct

effects of the sequentially coded dummy variables on the mediating variables (Table 1). Compared with a conventional product, a sustainable product without TPCL evokes higher financial and performance and time risks, replicating the Study 1 findings. A sustainable product with TPCL is also associated with lower levels of financial and performance and time risk than a sustainable product without TPCL, which supports H6.

Both mediating variables yield significant negative influences on purchase intentions (Table 1). That is, higher levels of financial and performance risk and time risk directly reduce consumers' intention to buy a product. To test their indirect effects, a bootstrapping procedure recommended by Preacher and Hayes (2004, 2008) was used and considered the mediating influences across the three experimental conditions (Hayes & Preacher, 2014). All indirect or mediated effects are significant, because none of the 95% confidence intervals contained zero (Table 2). As found in Study 1, differences in purchase intentions between conventional and sustainable products without TPCL are mediated by perceived financial and performance risk and time risk. Comparing sustainable products, the risk-reducing function of TPCL is responsible for higher purchase intentions toward certified sustainable products (Table 2), in support of H7.

Insert Table 2 about here

Discussion

Thus, the Study 1 results were replicated in a non-food product category. More important, Study 2 shows that TPCL on a sustainable product reduces the risk associated with that product. This lower risk translates into higher purchase intentions for sustainable products with TPCL compared with sustainable products without TPCL. Therefore, producers and retailers can use these labels to reduce the barriers to sustainable consumption. To test whether TPCL actually function as signaling instruments, such that their effect on risk and purchase intentions would

depend on their credibility from consumers' perspective (Erdem & Swait, 1998; Erdem et al., 2006), Study 3 was conducted.

3.4 Study 3

Study design

Study 3 investigated if the perceived credibility of TPCL affects the consumers' ability to reduce the risk that they associate with a product. Erdem and colleagues (2006) suggest that a signal's effect depends on the level of credibility consumers associate with it. The higher the signal's credibility, the more effectively it should guide consumers' decision making (Tirole, 1990). In turn, the signaling effect of TPCL on consumers' decision making should hold only if consumers perceive TPCL as credible. The TPCL in Study 3 were the same as those in Study 2. Participants consisted of 109 consumers (52.7% women, M_{Age} = 26.1 years) recruited from different Internet forums, social networks, and newsgroups unrelated to sustainable food or other products. The participants accessed the online between-subjects study with two experimental conditions (sustainable product without a CTPL vs. sustainable product with a CTPL) through a banner link posted on the sites. Participants were randomly assigned to the experimental condition.

Two changes were made in Study 3 relative to Study 2. First, the product category was changed to a cosmetic product (shower gel), to strengthen the generalizability of the findings further. Second, the experimental condition with a conventional product was removed, because the study focus was on comparing sustainable products and the boundary conditions of the TPCL functions. Participants were randomly assigned to one of two experimental conditions (without TPCL vs. with TPCL), and the manipulation again involved a short text provided to participants. Depending on the experimental condition, participants were instructed to think about the purchase

of a sustainable shower gel or a sustainable shower gel carrying the TPCL. The EFA for the risk measure yielded results similar to those in Studies 1 and 2, so again the risk dimensions financial and performance risk ($\alpha = .88$) and time risk ($\alpha = .89$) were used. After completing the risk ratings, participants viewed the TPCL and indicated their perceptions of its credibility, with one item adapted from Roe et al. (2007),[1]; that is, credibility was treated as a continuous moderating variable. The dependent variable (purchase intention, $\alpha = .97$) and demographic information were the same as in Study 1. Again the covariates had no significant effect and are not discussed.

Hypotheses tests

To test whether TPCL reduce risk perceptions only if consumers perceive them as credible, a SPSS macro developed by Hayes (2013) was employed. As Aiken and West (1991) recommend, TPCL credibility was mean-centered prior to computing the interaction term. The overall regression model for the moderated mediation is significant, $F(5, 103) = 20.65$, $p \leq .001$, explaining 50% of the variance in purchase intentions. The moderation analysis is discussed first, followed by the conditional indirect effects of the mediating risk dimension, which indicates moderated mediation. A dummy for the experimental conditions (0 = sustainable product without TPCL; 1 = sustainable product with TPCL) served as the independent variable; financial and performance risk and time risk were mediating variables; the TPCL's credibility was the moderating variable; and purchase intention provided the dependent variable. The descriptive statistics and zero-order correlations are in the table in the Appendix.

Insert Table 3 about here

H8 predicts that the perceived credibility of TPCL affect the amount of risk associated with sustainable products carrying these labels. The dummy variable indicates significant main effects

[1] Technical aspects of the planned moderation analysis required the participants in the condition without TPCL to indicate their perception of a TPCL's credibility as well, although they did not see it during the manipulation.

on both mediating variables; a sustainable product with TPCL is associated with lower levels of financial and performance risk (b = -.50, $p \leq .05$) and time risk (b = -.68, $p \leq .05$) than a sustainable product without TPCL, consistent with the results from Study 2. However, TPCL credibility has no significant main effect on financial and performance risk (b = .01, *ns*) or time risk (b = -.14, *ns*). These results are qualified by a significant interaction between the dummy variable and TPCL credibility for financial and performance risk (b = -30, $p \leq .05$), although not for time risk (b = .09, *ns*). To investigate the significant interaction with financial and performance risk further, a simple slope analysis (Aiken & West, 1991) was conducted, which shows that financial and performance risk for a sustainable product with TPCL is lower when TPCL credibility is high (1 SD above the mean) rather than low (1 SD below the mean; b = -.29, $p \leq .05$). If TPCL are not perceived as credible, the risk associated with a sustainable product carrying a TPCL does not differ from one without a TPCL (b = .01, *ns*). These findings support H8 for financial and performance risk. To facilitate the interpretation of the moderating effect, Figure 2 illustrates the relationships of products with financial and performance risk at low and high levels of TPCL credibility.

To test the prediction that perceived TPCL credibility indirectly affects consumers' purchase intentions, this study also tested for mediated moderation. The interaction of the independent variable and the TPCL credibility rating has a significant effect on the dependent variable for financial and performance risk (b = .16; BootLLCI .05, BootULCI .35) but not for time risk (b = -.07; BootLLCI -.23, BootULCI .10). The simple slope analysis reveals that higher levels of TPCL credibility positively affect consumers' purchase intentions through perceived financial and performance risk (b = .15; BootLLCI .04, BootULCI .28), supporting H9 for this dimension.

Insert Fig. 2 about here

Discussion

The results of Study 3 suggest that TPCL function like brands in that they reduce consumers' perceived financial and performance risk when consumers perceive them as credible. For time risk, the results fail to support the moderation hypothesis. Moreover, TPCL credibility appears positively associated with consumers' purchase intentions.

4. General discussion

4.1 Theoretical implications

This study examined sustainable products, from an information economics and signaling theory perspective, to identify barriers to sustainable consumption and ways to reduce them. As such, the present research contributes to the broader literature on consumers' attitude-intention gap in relation to sustainable products (e.g., Miniero et al., 2014). The theoretical assumption that sustainable products are characterized by credence qualities that negatively influence consumers' purchasing behavior due to increased levels of risk was confirmed in Study 1. Thus, Study 1 reveals that the risk of sustainable versus conventional products impedes consumers' sustainable purchase decisions. Expected financial losses and the threat of poorer performance by sustainable products constitute barriers and negatively affect choice behavior. In addition, risk associated with losing time when buying sustainable products is perceived as higher than that for conventional products, further impeding purchases.

The results from Study 2 also support hypotheses derived from signaling theory and show that TPCL as signaling instruments effectively reduce these risks and positively affect consumers' purchase intentions for sustainable products. Thus, TPCL are an effective means for overcoming information asymmetries between producers and consumers in this market, as well as for reducing

barriers to sustainable purchasing. In Study 3, some boundary conditions regarding the effects of TPCL were established, revealing that TPCL positively influence consumers' purchase behavior only when they are credible. This finding is in line with signaling theory (Erdem & Swait, 2004; Tirole, 1990). That is, TPCL decrease consumers' (financial and performance) risk perceptions and increase their purchase intentions only if those consumers perceive the TPCL as credible. The reduction in the time risk associated with purchasing sustainable products when a product carries TPCL instead is independent of perceived TPCL credibility. It could be that products carrying TPCL signal at least some minimum quality level or firm trustworthiness to consumers (Jahn et al., 2005), which saves their search time.

4.2 Managerial implications

This research is premised on parallel notions that retailers are interested in selling more sustainable products because they generate higher profit margins (Mon & Holland, 2006), and companies that offer sustainable products enjoy higher employee commitment, more satisfied customers, and improved firm performance (Lash & Wellington, 2007; Luo & Bhattacharya, 2006). The three studies identify credence qualities and perceived risk as potential barriers to consumer purchase of sustainable products and also show that TPCL offer effective tools that producers and retailers can use to reduce the risk associated with sustainable products and, thereby, increase consumers' purchase intentions. Managers should be careful in their choice of TPCL as the process of certification and application of TPCL is expensive for producers and retailers, and their effectiveness depends on consumers' perception of labels' credibility.

Insights based on signaling theory suggest some additional possibilities for reducing consumer perceived risk. For example, warranties and money-back guarantees inform consumers about unobservable product qualities and can address elements of performance and financial risk.

These are relatively straightforward to implement without high investments. In addition, product demonstrations that show that sustainable products are as effective and reliable as conventional products could help reduce such consumers' risk perceptions. Retailers' reputations can serve as signals too and also reduce consumers' risk perceptions (Walsh et al., 2014) saving search and point of purchase time. Thus, producers of sustainable products should aim to place their products on the shelves of well-reputed retailers. This can be observed in the mainstreaming of fair trade tea, coffee and chocolate products.

The results also offer implications for governments and bodies that issue TPCL to promote sustainable consumption. To be effective, TPCL must be perceived as credible; otherwise, they are less likely to influence consumers' behaviors. The vast number and different criteria of different TPCL (Szolnoki, 2013) create doubt about their ability to provide decision guidance, so this study recommends establishing credible TPCL to mitigate consumers' risk perceptions and guide their decision making. As signaling theory details, the credibility of a signal, such as brands, nutrition labels, or TPCL, depends on the expertise (i.e., ability to deliver what is promised) and trustworthiness (i.e., willingness to deliver what is promised) of the organization behind that signal (Erdem & Swait, 2004). Consumers feel they lack knowledge about sustainable products and are uncertain about TPCL and their sponsoring bodies and organizations. This study suggests that a single set of criteria underpinning specific certification categories would assist in increasing perceptions of credibility and contribute to information manageability among consumers. This would in turn contribute to addressing challenges related to lack of knowledge.

4.3 Limitations and further research

Some limitations of this study offer guidance for further research. Although the underlying experimental approach provides important initial insights into the effects of perceived risk on

purchase intentions in the context of sustainable products, confirming the external validity of the results would require additional field research. This study investigates low involvement products; other regular purchases, such as clothing, involve more complex supply chains and regular exposures of poor factory conditions, which may affect risk and credibility perceptions. Research should examine risk perceptions for high involvement products (e.g., electronic goods) and sustainable services (e.g., car sharing), settings in which consumers' perceived risks may be higher. Consumer risk perceptions may also vary depending on whether a TPCL is used on national or private brands. Indeed, Bauer et al. (2013) report that organic labels are more effective on private than national brands in terms of influencing consumer purchasing motives.

Another limitation of this study is that only one TPCL was used. An array of regional, national, and international third-party labels exist, with different criteria for certification (e.g., some food labels do not exclude genetically manipulated fodder for cattle, whereas others do). Thus, further research should systematically investigate differences among TPCL in terms of their effects on consumers' decision making. Similarly, other instruments used to signal unobservable product qualities (e.g., warranties, money-back guarantees, low introductory prices, coupons) should be investigated with regard to their effect on consumers' perceptions and purchase behaviors in sustainable markets. The different reputations of retailers also may spill over to sustainable products and affect consumers' perceptions or choices.

A further limitation concerns the use of purchase intention as final outcome variable. While we recognize that product type and perceived risk likely predict other outcomes, we would note that purchase intention is a widely used measure in consumer-related sustainability research. As for the measure of purchase intention, we used a three-item scale. Future studies, could use other, more parsimonious measures in addition to the exploration of actual behavioral choices.

All the data for these studies came from single sources and self-reported surveys. The online experiments may have triggered socially desirable answers, but continued studies could investigate the reasonable possibility of capturing real behavior, which is particularly important considering the attitude–behavior gap noted in this context (e.g., Carrington et al., 2010; Carrington et al., 2016). Finally, this study only includes German consumers. Germany is the most populous country in the EU, with a large retail market, but it is not clear whether the findings generalize to other countries. Further investigation of the effect of TPCL in other countries would be desirable. Overall, however, the present study provides evidence of the importance of TPCL as means to increase purchase intentions for sustainable products, by reducing perceived risk.

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Table 1
Estimated coefficients and standard errors, Study 2.

		Mediator Variables		Outcome Variable
		Financial and Performance Risk	Time Risk	Purchase Intention
	Cronbach's α	Coeff. (s.e.)	Coeff. (s.e.)	Coeff. (s.e.)
Dummy Variable 1		1.28** (.24)	1.14** (.21)	-2.25** (.31)
Dummy Variable 2		-.50* (.24)	-.69* (.21)	.68* (.31)
Financial and Performance Risk	.88			-.34** (.09)
Time Risk	.90			-.63** (.11)

Notes: Sequential coding was used. Dummy variable 1 represents the comparison of the conventional product and the sustainable product without TPCL. Dummy variable 2 represents the comparison of the sustainable product without TPCL and the sustainable product with TPCL. s.e. = standard error
* Statistically significant at α ≤ .05.
** Statistically significant at α ≤ .01.

Table 2
Indirect effects of the experimental conditions, Study 2.

	Relative Indirect Effects on Purchase Intention					
Mediator Variable	Financial and Performance Risk			Time Risk		
	Coeff. (s.e.)	BootLLCI	BootULCI	Coeff. (s.e.)	BootLLCI	BootULCI
Dummy 1	-.44 (.16)	-0.775	-0.142	-.72 (.20)	-1.151	-0.381
Dummy 2	.17 (.10)	0.001	0.403	.44 (.15)	0.185	0.756

Notes: Sequential coding was used. Dummy variable 1 represents the comparison of the conventional product and the sustainable product without TPCL. Dummy variable 2 represents the comparison of the sustainable product without TPCL and the sustainable product with TPCL. s.e. = standard error. BootLLCI = Lower-level bootstrap confidence interval. BootULCI = Upper-level bootstrap confidence interval. The 95% confidence intervals were created using 5000 bootstrap samples.

Table 3
Estimated coefficients and standard errors, Study 3.

	Mediator Variables		Outcome Variable
	Financial and Performance Risk Coeff. (s.e.)	Time Risk Coeff. (s.e.)	Purchase Intention Coeff. (s.e.)
Dummy	-.50*	-.68**	-.06
	(.24)	(.22)	(.26)
Credibility of TPCL	.01	-.14	.10
	(.08)	(.08)	(.09)
Interaction Term	-.30*	.10	-.05
	(.15)	(.13)	(.16)

Notes: The dummy variable represents the comparison of a sustainable product without TPCL and one with TPCL. s.e. = standard error.
* Statistically significant at $\alpha \leq .05$.
** Statistically significant at $\alpha \leq .01$.

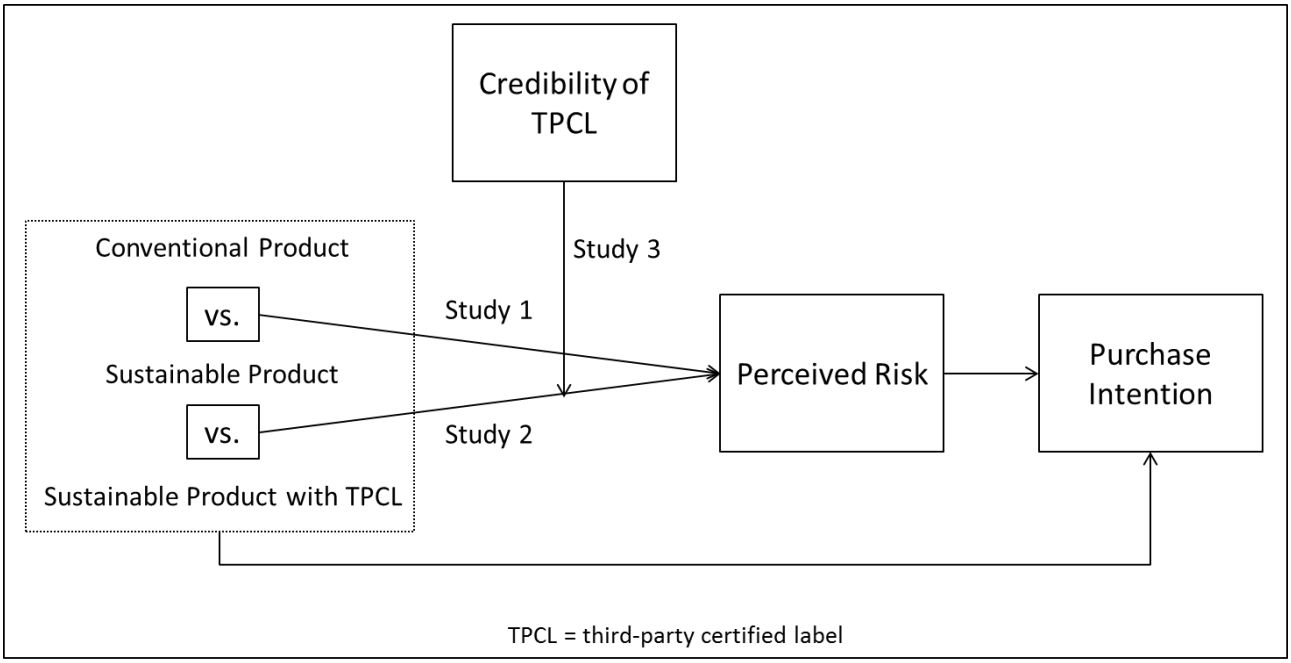

Fig. 1. Conceptual model.

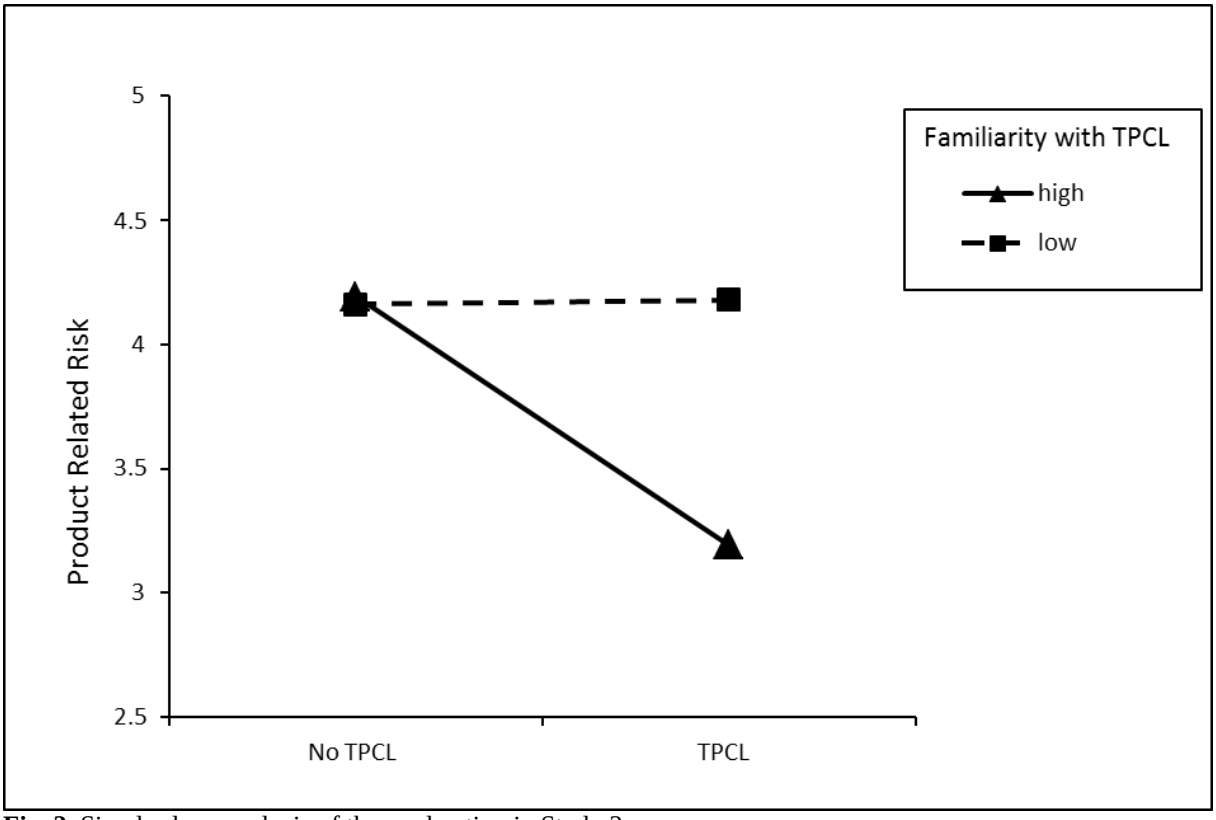

Fig. 2. Simple slope analysis of the moderation in Study 3.

APPENDIX. Means, standard deviations, and zero-order correlations of items used in the studies.

Study 1 (N = 101)	M	SD	1.	2.	
1. Financial and Performance Risk	2.72	1.27			
2. Time Risk	1.94	.85	.42**		
3. Purchase Intention	5.12	1.78	-.56**	-.45**	
Study 2 (N = 157)	**M**	**SD**	**1.**	**2.**	
1. Financial and Performance Risk	3.58	1.36			
2. Time Risk	2.38	1.16	.50**		
3. Purchase Intention	4.41	1.85	-.56**	-.62**	
Study 3 (N = 109)	**M**	**SD**	**1.**	**2.**	**3.**
1. Financial and Performance Risk	3.88	1.35			
2. Time Risk	2.62	1.18	.43**		
3. Purchase Intention	3.86	1.83	-.60**	-.63**	
4. Credibility of TPCL	5.54	1.71	-.14**	-.17**	.21*

* Significant at $p < .05$ (two-sided).
** Significant at $p < .01$ (two-sided).