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Green … but at what cost? A typology and scale development of perceived green costs

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ABSTRACT

Despite people's growing interest in eco-friendly products, there are still hesitations in action. People perceive costs around the purchase of environmentally friendly alternatives. The present study aims first to conceptualize and organize these green costs in a typology and then operationalize them in a measurement scale. Following the literature on measurement theory, the authors report the results of five studies in developing, purifying and validating the perceived green costs scale (Perceived Green Costs Scale: PGCS). The authors follow Churchill's paradigm for developing a measurement scale and complement it with a nomological validity analysis using Structural Equation Modeling. The typology of perceived green costs incorporates nine types of costs. The operationalization of this typology of costs brought forth nine first-order constructs, eight of which amount to a second-order construct: one-time switching costs (Switching Costs) and the remaining one represents repeated purchase costs (Purchase Costs). The Perceived Green Costs Scale demonstrates reliability of the measure, internal consistency and convergent and divergent validity. Furthermore, the Switching Costs construct confirms the Perceived Green Costs Scale's predictive validity by significantly predicting actual green purchase behavior. Interestingly, the Switching Costs display a significant mediating effect between green attitude and green behavior, extending the theory of planned behavior in a sustainable consumption context. The findings advance knowledge on the green behavioral gap and behavioral frictions in sustainable consumption and help identify the root cause of unsustainable behavior in hopes of eliminating it and designing better customer journeys towards eco-friendly purchases Further implications for brand managers, customer experience architects, educators and consumers are discussed in hopes of catalyzing change toward a more sustainable future.

1. Introduction

Perceived green costs are behavioral barriers preventing consumers from accomplishing their sustainable goals, contributing greatly to the phenomenon of the green attitude-intention-behavior gap (ElHaffar et al., 2020). When individuals attempt to change their ways, replace their products and modify their consumption habits, they usually undergo a variety of psychological and monetary costs, including effort and time invested in accomplishing eco-friendly goals. Nevertheless, when the perceived costs are greater than the expected benefit or cause conflict with other priorities (Gifford and Chen, 2017), consumers get discouraged and either resist, reject, or procrastinate on the change (Dhar, 1997; Tversky and Shafir, 1992). Previous literature has been more interested in exploring the factors that positively correlate with the green purchase rather than those hindering the behavior; however, there is pragmatic value in casting the spotlight on the aspects *preventing* people from consuming responsibly (Lasarov et al., 2019), as it allows the diagnosis of the situation in a more comprehensive manner and identifies areas of intervention to facilitate the behavioral transition.

Perceived costs affect the overall customer experience (Zhang et al., 2014) and affect product value perception (Yang and Peterson, 2004). Specifically, when consumers are satisfied with the quality and performance of currently used products but decide to switch for ethical reasons, perceived costs become even more significant in the overall decision-making process (Z. Yang and Peterson, 2004). On the offer side, green companies struggle to present a competitive value

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proposition by emphasizing the green advantage (Chen and Chang, 2012); nevertheless, the associated effort, time and learning curve continue to be perceived by consumers as important barriers and tint the whole consumption experience with difficulties (Buenstorf and Cordes, 2008).

The green value proposition has been explored relatively well in green marketing literature (Chen and Chang, 2012; Papista et al., 2018). However, the customer experience and journey that lead to the purchase and consumption of the product have been somewhat left behind, let alone the behavioral frictions that hinder behavior throughout the journey.

Moreover, efforts to assemble and delineate the green purchase costs have mostly been conceptual (for example, Papista and Krystallis (2013)) and empirical endeavors to operationalize them have yet to be undertaken in a distinct approach of scale development and validation. Specifically, when measuring costs in the literature on sustainable consumption, researchers would borrow items from other contexts, such as the service marketing literature (Papista et al., 2018). Furthermore, when measuring green costs, there are conflicting approaches. Some researchers consider green costs unidimensional (X. Yang and Zhang, 2020), while others present them as multidimensional (Papista et al., 2018).[1] Consequently, defining the green costs as a construct and creating a scale to measure them is necessary and timely to resolve the inconsistencies and enhance the methods used in sustainable consumption research.

Thus, we present the current work by building on the existing literature and attempting to overcome the abovementioned limitations. We join the effort of Lasarov et al. (2019) in casting the spotlight on the aspects *preventing* people from consuming responsibly. The current research is motivated by two primary goals. First, we identify the perceived green costs encountered by the consumer and delineate them in a detailed typology based on relevant literature and qualitative data collection. This would serve as a roadmap for green companies to enhance the green customer journey. Second, we use empirical data to test the relevance and veracity of the actual role that perceived green costs play in hindering green behavior. In other words, we quantify the constructs in a measurement scale and statistically test their moderating role in aggravating the attitude-intention-behavior gap.

In what follows, we first conceptualize existing costs in the green marketing literature. Then we explore the different dimensions identified in past research. Later, following Churchill Jr (1979)'s paradigm for scale development, we report the results of five empirical studies and introduce the Perceived Green Costs Scale. Next, we demonstrate the Perceived Green Costs Scale's predictive validity by evaluating participants' actual green behavior. Further, through structural equation modeling, we model the scale within the theory of planned behavior to prove its nomological validity. Finally, we discuss the results and conclude the paper with research implications and future directions.

2. Conceptualizing a perceived green costs typology

Consumers usually endure several monetary and psychological costs when purchasing a green product. These costs, which we refer to as perceived green costs, can be defined as the cognitive and physical effort that consumers must consciously undertake to reach a green product or service, as well as the time these efforts entail. Specifically, when consumers *first* consider buying a green product, they learn and acquire information about the product, the available brands, the points of sale and so on (Papista and Krystallis, 2013). Furthermore, the *repeated* purchase of the green alternative comes with reoccurring costs, as the product is perceived as more expensive than the conventional one (Durif et al., 2012). These two facets, namely the one-time 'switching costs' and the repeated 'purchase costs', constitute the two categories of perceived green costs. A typology is defined in the next section as we define the underlying types of costs for each of these categories. Appendix 1 summarizes the conceptual delineation and definitions of each type of these costs.

2.1. Switching costs

Switching costs have been extensively tackled in the relational and service marketing literature, as they positively correlate with loyalty and discourage replacing service providers (Burnham et al., 2003; Jones et al., 2002). In the context of green products, switching from conventional to green products involves several costs. In the current project, we consider the following costs: seeking information about the product, evaluating the available options, managing uncertainty about product performance and environmental claims and losing an existing brand relationship with the habitual conventional product's brand.

2.1.1. Evaluation, search and learning costs

Contrary to routinely purchased goods, when buying a green product for the first time, consumers spend time and effort searching for the suitable alternative, evaluating the different offers and learning about them (Johnstone and Tan, 2015). This investment requires considerable 'thinking costs' (Shugan, 1980) that consumers usually avoid, especially in green purchases (Young et al., 2010). Generally, consumers seek additional information to conclude the sale when the product is more expensive or has related performance risks (Dholakia, 2001). In the case of green products, both these conditions apply. Add to that the lack of availability of green products in convenience stores intensifies the time and effort needed to turn intentions into action (Papista and Krystallis, 2013), resulting in intention behavior gaps (Weissmann and Hock, 2022). Moreover, considerable time is required to accommodate the new green product and compare it to its conventional counterpart (Papista and Krystallis, 2013). These perceived extra time and effort required before buying a green product discourage green purchasing behavior (Pham et al., 2019; X. Yang and Zhang, 2020).

In this case, we are tackling two types of costs: evaluation and learning costs. First, the search and evaluation costs represent the time and effort consumers spend evaluating and comparing the advantages and disadvantages of the newly adopted product to the old one. With consumers' busy lifestyles, the luxury of time is usually unavailable and finding it results in goal conflicts (Lacroix et al., 2019) which forestalls green behavior. Evaluation costs carry substantial cognitive effort and constitute a significant barrier that makes green behavior demanding (Young et al., 2010). Formally, evaluation costs are the perception of time and mental effort needed to gather, search, evaluate and analyze information about the new product prior to switching (Appendix 1).

Second, the learning costs include the time and effort needed to acquire enough knowledge about the target product, offers, prices, features and points of sale. Recently, lack of knowledge has been pointed out as one of the leading 'dragons of inaction' that deter consumers from consuming green (Lacroix et al., 2019). We define learning costs as the costs incurred to acquire information about the green offers, their prices and point of sale and the variety of brands available.

2.1.2. Performance loss costs

Often, the green alternative is associated with poor quality relative to its brown counterpart (Gleim and Lawson S, 2014; Wiederhold and Martinez, 2018; Young et al., 2010) and only recently has this assumption been challenged (Chernev and Blair, 2021). Compared to conventional products, which consumers usually use, green products are perceived as less performing (Durif et al., 2012). This perception of lesser quality generates a feeling of loss as if the consumer gives up the good quality when deciding to buy green (Durif et al., 2012; ElHaffar et al., 2020). We consider this subcategory of costs closely related to sunk costs. We adopt the following definition for performance loss costs: the perception of potential reduced utility and overall functionality of

[1] A detailed discussion of these approaches can be found in Appendix 4.

the product when switching brands.

2.1.3. Uncertainty costs

With green products, there are two kinds of uncertainty that consumers endure. The first one concerns green claims, also called green skepticism. This construct is amply present in green marketing literature. Green skepticism is a direct result of greenwashing, influencing information-seeking behavior and purchase intention (Leonidou and Skarmeas, 2017; Nguyen et al., 2019) and purchase behavior (Cheng et al., 2020). We do not include this construct in our scale development process, as it has already been operationalized in the literature (Mohr et al., 1998).

The second type of uncertainty is related to the functional aspect of the product, i.e., the perception of *the likelihood* that the green product will be less efficient in delivering upon its functional role (Jones et al., 2002). Conceptually, this construct differs from the *Performance loss costs* in that the first is likely and results from ambiguities and lack of sufficient information, while the latter is definite and is incurred when the product is examined and found to be poorly functional. With the lack of information, perception of poor quality and skepticism towards green brands (Cheng et al., 2020; Lacroix et al., 2019; Wiederhold and Martinez, 2018), uncertainty costs become a prevalent cause inhibiting green behavior. Empirical evidence further confirms that uncertainty leads to lower levels of sustainable consumer behavior (van der Wal et al., 2018).

2.1.4. Brand relationship loss costs

Replacing a conventional product with a green alternative requires familiarizing the new product and the new brand. It also means that the conventional brand is being left behind. Brand relationship loss has been tackled in service marketing, along with personal relationship loss, when consumers attempt to switch from one provider to another (Burnham et al., 2003; Jones et al., 2002). In the context of green products, personal relationship loss does not always apply since most routine products are purchased from large stores and do not necessarily happen through a human seller (online shopping). However, brand relationship loss could deter green consumption through locked-in behavior. This remark is confirmed by the results of past research, where conventional brand loyalty has been identified as one of the main barriers to purchasing green products (Cronin Jr, 2013). Formally, brand relationship loss costs are defined as the affective loss associated with breaking the bonds of identification that have been formed with the brand or company with which a customer has associated. It includes the loss of image and meaning associated with the consumers' sense of identity.

2.2. Purchase costs

The perception of green products is stigmatized; even when a green product is on sale, consumers turn away as they believe it will always be more expensive (Aschemann-Witzel and Niebuhr Aagaard, 2014). These misperceptions accompany the green product whenever people intend to buy it and they constitute the second part of perceived green costs: repeated purchase costs, encompassing monetary costs.

2.2.1. Monetary costs

In the context of the green purchase, the price has been frequently reported as the most significant barrier that prevents consumers from purchasing a green product (Buder et al., 2014; Davari and Strutton, 2014; Liobikienė and Bernatonienė, 2017; Weisstein et al., 2014). Empirically, Gleim and Lawson S, 2014 found that price is among the main reasons for the green attitude-intention gap. Similarly, Buder et al. (2014) showed that price was repeatedly stated among the three top reasons to buy the conventional instead of the green option regardless of the type of green product. Comparable results regarding the negative impact of green prices on the attitude as well as the intention to buy green products were recently reported by Fan et al. (2019); Mkhize and Ellis (2020) and Pham et al. (2019). Thus, price "puts off consumers" in their eco-friendly journey (Papista and Krystallis, 2013). In the current paper, we define monetary costs as the repeated financial costs of the green alternative.

3. Scale development

Aiming at developing a valid and reliable measurement scale of perceived green costs, we followed the scale development paradigm outlined by Churchill Jr (1979). After having defined the conceptual delineation above, we conducted a qualitative study to generate initial items. Items were then purified based on experts' examination. A scale refinement through quantitative data analysis followed and finally, scale validation and predictive and nomological validity were established.

3.1. Phase 1: qualitative study and item generation (study 1, $n = 13$)

We conducted a qualitative pilot study to confirm the existence of the costs reviewed in the literature and explore further costs in the context of green cosmetics and personal care products.

3.1.1. Procedure

This pilot study consisted of semi-directed interviews of approximately 24 min each, guided by an interview guide. The participants were all female residents of Montreal. The interviews took place in a university laboratory – a sustainable mock shop. However, three interviews took place remotely (via Zoom and Messenger). At the end of the interviews, participants were rewarded with an eco-friendly personal care product they picked from various choices (soaps, shampoos, sunscreen, lip balm, deodorant, insect repellent … etc).

3.1.2. Participants

Participants constituted a convenience sample of 13 female consumers between 23 and 44 years old who showed interest in the study by opting in and filling out a participation survey. We conducted the interviews while simultaneously recruiting participants until saturation was achieved.

3.1.3. Data analysis and results

The interviews were audio-recorded, transcribed and coded on the software NVivo. The principal researcher analyzed the data following thematic data analysis. Results confirmed the existence of the seven types of costs found in the literature on green perceived costs. Notably, we found two additional types of costs: sensory appeal loss costs and variety loss costs.

3.1.3.1. Sensory appeal loss costs. Participants mentioned their dislike of the packaging colors and the inferior perfume quality of specific green cosmetics. These aspects concern sensory appeal loss when switching to green alternatives. These costs relate to the sensory attributes of conventional products, which are hard to find in eco-friendly products, such as the visual appeal, the olfactory appeal and the tactile appeal.

3.1.3.2. Variety loss costs. Purchasing a cosmetic or personal care product is usually associated with a hedonic dimension (Apaolaza-Ibáñez et al., 2011) that applies to the beauty benefits but also extends to the choice aspect of the purchase; in our sample, consumers expect a wide range of brands and compositions for different skin types. They conveyed that the choice was limited when switching to the green alternative. This cost has been mentioned by M. R. Gleim et al. (2013) in their qualitative study on the barriers to green consumption. Hence, we include variety loss costs within the typology and we define it as 'the sacrifices associated with the loss of variety and options to choose from, whether intra-brand (line of products) or inter-brand (competitors)'.

3.1.4. Item generation

Our conceptual review and qualitative pilot study facilitated the generation of 73 items to measure perceived green costs. The principal investigator generated the items after conducting and analyzing the interviews and based on a thorough literature review. This creative exercise was based on participants' verbatims, as well as on the theory and other scholarly work on the subject matter.

3.2. Phase 2: item purification (study 2, n = 5)

We sent the generated items and the domain definitions to five marketing professors. This phase aimed at assessing each item's face validity and deleting or modifying problematic items. The rule followed was that items would be removed, modified, or replaced if at least one expert recommended so.

Based on the feedback, 31 items were deleted, leaving us with 42 items. The research group reviewed the remaining items in light of the available literature and several items were consequently reworded, rephrased and modified for the next phase.

3.3. Phase 3: scale refinement (study 3, n = 155)

In theory, items generated to measure a specific construct should relate to the core of this construct. When a construct is multidimensional, each dimension correlates with a specific set of items. In practice, only a sample of the generated items follows the expectations and shows acceptable reliability (Churchill Jr, 1979). For this reason, we collected quantitative data to assess the extent to which the items correlate with higher-order dimensions and construct core. To do that, we first assessed the Cronbach alpha of the measurement tool and then we conducted a factor analysis to assess the loading of each item to the corresponding dimension. This phase aimed at deleting the items that did not correlate highly on any dimension and those that correlated highly on several dimensions simultaneously.

3.3.1. Procedure

After obtaining permission from the FaceBook group admins and universities' ethical boards, an online survey was administered to university students through student Facebook groups. Participants accessed the survey online and responded to each item on a five-point Likert scale comprising the following points: Totally Disagree, Disagree, Neither agree nor disagree, Agree, Totally Agree. After the survey was done, participants were given the option to opt-in and provide their emails to enter a draw to win one of two 50$ gift cards.

3.3.2. Participants

The data collection yielded 254 responses, of which 155 were useable (a rate of 60%). The final sample comprised 155 participants: 77.4% female and 69.6% between 18 and 28.

3.3.3. Data analysis

3.3.3.1. Exploratory factor analysis. To have an overall assessment of our items and to allow for the complementarity of theory and data in constructing our measurement tool (Gerbing and Hamilton, 1996), we first conducted an exploratory factor analysis (EFA) with Promax rotation, allowing but not forcing our factors to correlate. Items were retained if 1) they loaded 0.4 or higher on one factor, 2) they did not present an alternative loading of 0.3 or higher, 3) and the difference between the principal loading and the alternative loading was 0.2 or above (Howard, 2016). The Kaiser–Meyer–Olkin (KMO) value of 0.843, as well as the significant value of Bartlett's test of sphericity (X^2 = 3621.982, p < 0.001), indicated that the sample was appropriate for an EFA. In total, ten factors presented an eigenvalue that is above 1. Three of those factors presented a single-item factor and were consequently disregarded, especially when this single item did not correlate with the items supposedly measuring the same construct. As expected, some items measuring constructs in the same category of costs (example: learning and evaluation costs) loaded on the same factor. Also, items measuring costs of lost performance and uncertainty costs loaded on the same factor. Items measuring learning costs loaded on two different factors. These results will be explored further in the confirmatory factor analysis for validation. Overall, 11 items were deleted and 31 remained for further analysis.

3.3.3.2. Confirmatory factor analysis, model modification and comparison. A seven-factor CFA (Model 1) was estimated by maximum likelihood (ML) using lavaan package (Rosseel, 2012) in R & Rstudio (RStudioTeam, 2020). This model presented poor fit with CFI = 0.881, TLI = 0.66, rmsea = 0.068 and X^2/df = 1.717. The model was purely empirical and concluded from the results of the EFA.

In the light of theory, we modified the CFA structure and produced several models to better the model's fit. First, we deleted the items that were supposed to load on one construct but loaded on another instead, as well as factors with loadings <0.6. We further separated the items that loaded on a single factor in the EFA when in theory, they are supposed to load on two separate constructs (items related to Uncertainty costs and Lost performance costs, which correlated on a single construct, as well as items related to Learning costs and Evaluation costs). Learning costs' items correlated in Model 1 on two separate constructs, so we gathered them in a single construct. Our model (Model 2) improved from the first, but the fit indexes were still unacceptable. We noticed that learning costs presented two pairs of convergent items, mirroring two separate constructs. Indeed, each pair of items represented a distinct learning cost: learning about the place of sale and learning about the available offers. We then separated the two constructs again in an SEM model and regrouped them in a second-order factor such as Learning costs = Learning offers + Learning place. This decision is based on an iterative process informed by theory and a respecification of the analysis to fit the model (Hurley et al., 1997). The resulting model (Model 3) offered significantly enhanced results, with CFI = 0.955, TLI = 0.942, rmsea = 0.054 and srmr = 0.055, mirroring a good model fit. A final CFA model, which splits the learning costs in two but does not include second-order learning costs, was also computed (Model 4) and presented slightly improved fit indexes compared to the previous model (Model 3). The Root Mean Square correlations are presented in Table 1, and the results discussed above are featured in Table 2.

3.3.3.3. Reliability, convergent and discriminant validity. Internal reliability was confirmed with Cronbach's alpha >0.6 for all the constructs. Similarly, the values of Mcdonald's omega mirrored the alpha values, validating the composite reliability of the items retained.

Factor loadings were all above 0.6 or very adjacent to it (lowest loading = 0.597) and the average variance extracted was larger than 0.5 for each construct/dimension but one (Sensory appeal). This meant that factors were unidimensional, and it further confirmed convergent validity. As for the Sensory appeal construct, we kept it for further investigation in the next data collection.

Discriminant validity was also satisfied as all inter-construct covariances were lower than the root square of the average variance extracted (AVE) for each construct (Table 3). The final model, consisting of 9 factors and 22 items, is presented along its psychometric properties in Appendix 2.

3.4. Phase 4: scale validity (study 4, n = 104)

We replicated the CFA, validity and reliability analysis of phase 3 on a fresh data set. Our purpose in this section was to confirm the robustness of our scale.

Table 1
Constructs' correlation, root squares of AVE of study 3, n = 155.

	Monetary	Evaluation	LearningOffers	LearningPlace	Performance	Uncertainty	Brand	Variety	Sensory
Monetary	(0,849)	0,350	0456	0,394	0171	0,391	0223	0,226	0099
Evaluation		(0,736)	0,529	0380	0,250	0496	0,366	0246	0,221
LearningOffers			(0,863)	0,622	0183	0,479	0392	0,205	0299
LearningPlace				(0,886)	0,111	0285	0,327	0348	0,261
Performance					(0,826)	0,551	0425	0,201	0100
Uncertainty						(0,771)	0,671	0255	0,203
Brand							(0,903)	0,405	0236
Variety								(0,752)	0,157
Sensory									(0,696)

The rtsq of AVE are the numbers figuring in parathesis.

Table 2
Fit indexes of the models computed in phases 3, 4 and 5.

	Model	Estimator	chisq	df	chisq/df	p-value	rmsea	srmr	CFI	TLI
Study 3 (n = 155)	Model 1	ML	709.476	413	1.718	0.000	0.068	0.080	0.881	0.866
	Model 2	ML	350.383	181	1.935	0.000	0.078	0.059	0.905	0.879
	Model 3	ML	259.736	179	1.451	0.000	0.054	0.055	0.955	0.942
	Model 4	ML	248.505	173	1.436	0.000	0.053	0.050	0.958	0.943
Study 4 (n = 104)	Model 4′	ML	222.141	173	1.284	0.007	0.052	0.068	0.957	0.943
	Model 5	ML	1138.790	721	1.579	0.000	0.075	0.116	0.851	0.838
	Model 6	ML	952.200	612	1.555	0.000	0.073	0.115	0.869	0.857
	Model 7	ULS	1001.750	612	1.636	NA	0.079	0.098	0.963	0.960
Study 5 (n = 341)	Model 4″	ML	297.032	173	1.716	0.000	0.046	0.043	0.967	0.956
	Model 6′	ML	1382.136	612	2.258	0.000	0.061	0.086	0.900	0.891
	Model 7′	ULS	1650.511	612	2.696	NA	0.071	0.070	0.970	0.967

The following table shows the model iterations' fit indexes, with the evolution of model fit across iterations.

Table 3
Constructs correlation, root squares of AVE of study 4, n = 104.

	Monetary	Evaluation	LearningOffers	LearningPlace	Performance	Uncertainty	Brand	Variety	Sensory
Monetary	(0,744)	0,201	0211	0,151	0091	0,167	0042	0,071	0023
Evaluation		(0,827)	0,788	0505	0,317	0461	0,374	0123	0,061
LearningOffers			(0,905)	0,644	0372	0,400	0449	0,150	0074
LearningPlace				(0,825)	0,218	0285	0,276	0064	0,036
Performance					(0,847)	0,397	0268	0,135	0061
Uncertainty						(0,789)	0,347	0232	0,088
Brand							(0,719)	0,144	0046
Variety								(0,716)	0,080
Sensory									(0,697)

The rtsq of AVE are the numbers figuring in parathesis diagonally in the table.

3.4.1. Procedure

We designed a new survey integrating the 22 items remaining after the analysis and we added items measuring the five variables of the theory of planned behavior (Appendix 3). Items were reworded to mirror costs related to the purchase of hand moisturizers. A filter question at the beginning of the survey allowed those with experience in this type of product to continue to the rest of the survey; otherwise, participants were redirected to end the survey. The survey was administered via Amazon MTurk and only participants who finished the survey were rewarded 1.5 dollars for their participation.

3.4.2. Participants

The data collection resulted in 157 returned questionnaires. We made sure participants did not return to take the survey after acknowledging the existence of a filter question through IP address verification. We also included attention questions and those who failed these questions were removed from the sample. The final sample consisted of 104 participants, 45% female and 77.8% between 18 and 39.

3.4.3. Data analysis

3.4.3.1. Confirmatory factor analysis. A nine-factor CFA (Model 4 from phase 3) was estimated by maximum likelihood (ML) using lavaan package (Rosseel, 2012) in R & Rstudio (RStudioTeam, 2020). The specified model offered significant improvement from the baseline model at $p = 0.007$. It also confirmed our previous results and mirrored a good fit with CFI = 0.957, TLI = 0.943, rmsea = 0.052 and X^2/df = 1.284 (Table 3).

3.4.3.2. Reliability, convergent and discriminant validity. Cronbach's alpha was computed for the scale as well as for each separate construct. The scale's alpha of 0.89 is assumed plausible. The alpha of each separate construct passed the cut-off of 0.65, except for one (sensory appeal loss costs). McDonald's omega values mirrored alpha values, which meant further evidence for the internal reliability of the scale. The composite reliability index was computed manually and yielded a value of 0.97, reflecting the reliability and internal consistency of the scale.

Factor loadings were all above 0.6 or adjacent to it (lowest loading = 0.556) and the average variance extracted was larger than 0.5 for each construct/dimension, but one (Sensory appeal). This meant that factors were unidimensional, further confirming the scale's convergent validity.

Discriminant validity was satisfied as all inter-construct covariances were lower than the root square of the AVE of each construct (Table 3). The psychometric properties of the items were reported in Appendix 2.

The *sensory appeal loss costs* construct did not meet alpha's cut-off with an alpha = 0.40, omega = 0.59 and AVE = 0.48. After carefully examining the two items measuring the latent variable, we slightly modified the wording of the items to converge towards a unique dimension in the next data collection.

3.4.4. Pre-test for nomological validity

To make sense of our construct in a nomological network, we performed an SEM of the two categories of costs (Purchase costs and Switching Costs) within the model of the theory of planned behavior. We presumed the perceived costs would mediate attitude and behavior, as the literature implies their role in green purchase behavior. Also, we wanted to bring quantitative evidence on the role of perceived green costs in the green gap phenomenon. We computed the model using ML as an estimator. The model (Model 5) consisted of the five constructs of the theory of planned behavior, purchase costs and switching costs as a mediator between attitude and behavior.

The model presented poor fit indexes (CFI = 0.851, TFI = 0.838, rmsea = 0.075 and srmr = 0.116). We were nevertheless interested in the viability of the regressions within the sem model. Two regressions were not significant: perceived behavioral control did not influence attitude and attitude did not influence purchase costs. While unanticipated, these results are considered in the following analysis.

We computed another model (Model 6), which abandons the insignificant regressions. The fit indexes did not improve significantly. Considering the small sample size, we decided to compute the model with an estimator other than ML. Model 7 consisted of Unweighted least squares as an estimator. The model fit improved, with CFI = 0.963, TFI = 0.96 and rmsea = 0.079. The srmr of 0.098 was, however, high. Nevertheless, the regression coefficients were all significant at a *p-value*<0.005. Despite the poor fit of this model, it offered primary evidence of the nomological validity of the Perceived Green Costs Scale (PGCS) within the network of the theory of planned behavior.

3.5. Phase 5: finalization (study 5, n = 341)

A final larger-scale data collection was undertaken to replicate the reliability and validity analysis of the previous phases.

3.5.1. Procedure

The same survey of phase 4 was used in this data collection; however, the sensory appeal scale was slightly modified to converge on a unique dimension (See Appendix 2). Items were reworded to fit the context of buying eco-friendly deodorants. Participants were recruited via the platform Prolific Academic and only participants who finished the survey were rewarded 1 euro (the equivalent of 1.5 CAD).

3.5.2. Participants

A total of 360 participants were requested via the platform. Only 341 questionnaires were deemed useable after checking attention questions. Therefore, the final sample consisted of 341 participants, 52% female and an average age of 29 years old, all residents of Canada.

3.5.3. Data analysis

3.5.3.1. CFA, reliability and validity. We computed the same Model 4 within the new dataset (Model 4″). The model presented good model fit, with CFI = 0.967, TFI = 0.956, rmsea = 0.046 and srmr = 0.043. Within this model, the sensory appeal cost construct was not problematic; hence our modification performed the intended enhancements to the model.

The scale was deemed reliable, with a Cronbach alpha of 0.89. Manually computed composite reliability of the scale yielded an index of 0.97. Factor loadings were all above 0.6 and the average variance extracted was larger than 0.5 for all constructs. Also, the square root of the AVE of each of the constructs was larger than the correlations between the latent factors of the scale, except for one (Table 4). In fact, the two constructs of learning costs (those concerning the offers and those concerning the place of sale) had a higher correlation than the root square of the AVE of Learning Costs (Place). Since we established that these two constructs converge to a second-order higher construct of learning costs (in phase 3), we considered this high correlation reasonable. Thus, our Perceived Green Costs Scale (PGCS) 's reliability, convergent and discriminant validity were confirmed.

3.5.3.2. Post-hoc analysis: nomological validity (N = 341) and predictive validity (N = 126). Verifying reliability, internal consistency, discriminant and convergent validity is necessary to establish a measurement scale. However, they are not sufficient. A scale should further demonstrate its theoretical credibility, i.e., its operational fit within a theoretical model in the field of green marketing and its empirical relevance to managers and decision-makers. For these reasons, we advanced our work to confirm the predictive and nomological validity of the PGCS.

3.6. Nomological validity

To establish the theoretical relevance of the PGCS, the following nomological validity analysis was conducted. We analyzed the data of study 5 (N = 341) through structural equation modeling. Model 6 of the previous study was applied to the new dataset (Model 6′). Model 6' displayed acceptable model fit indexes with CFI = 0.9 and TFI = 0.891. Rmsea = 0.061 was also acceptable, but the srmr = 0.086 was too high. The model confirmed the existing relationships between the second-order construct switching costs (which is the result of the sum of the values of the eight switching costs: Evaluation costs, Uncertainty costs, Brand relationship loss costs, Performance loss costs, Learning (place) costs, Learning (offer) costs, Sensory appeal loss costs, Variety loss costs), the monetary costs (purchase costs) and the rest of the variables of the theory of planned behavior (TPB).

We modified the estimator (replacing ML with ULS) as ordinal data allows this iteration. Model 7' showed significant improvement in the fit indexes and the regression coefficients remained significant.

Attitude significantly and negatively correlated with the second-order construct of switching costs ($\beta = -0.576$, p-value<0.001). This means that when consumers have higher attitudes towards eco-friendly alternatives, they perceive lower switching costs. Moreover, lower perceived switching costs were associated with higher purchase behavior as the relationship between the two constructs was negative ($\beta = -0.323$, p-value<0.001). Furthermore, purchase costs represented by the green purchase's repeated monetary costs negatively influenced behavior ($\beta = -0.310$, p-value<0.001). The results are presented in Table 5 and the nomological network is displayed in Fig. 1.

Essentially, the switching costs moderate the relationship between attitude and behavior. Moreover, the monetary costs significantly and negatively affect green purchase behavior. This means that the scale developed and validated within this work quantifies a significant underlying cause for the green attitude-behavior gap. The scale was thus nomologically validated within the literature on green consumption, specifically within the theory of planned behavior. It brings insights into costs as underlying mechanisms to the green gap phenomenon. We discuss the theoretical and practical implications of our work in what follows.

3.7. Predictive validity

3.7.1. Procedure

We replicated the seventh's study of Wilson and Bellezza (2021). Of the 341 participants who completed the survey in Study 5, we randomly recruited 165 participants. We asked them to take a picture of their current deodorant and upload it to the survey. Participants were rewarded 0.3 euros via Prolific Academic for their participation. The

Table 4
Constructs' correlation, root squares of AVE of study 5, n = 341.

	Monetary	Evaluation	LearningOffers	LearningPlace	Performance	Uncertainty	Brand	Variety	Sensory
Monetary	(0,762)	0,117	0077	0,109	0124	0,124	0137	0,163	0065
Evaluation		(0,800)	0,444	0484	0,234	0328	0,374	0248	0,298
LearningOffers			(0,883)	0,833	0223	0,330	0329	0,192	0315
LearningPlace				(0,826)	0,184	0317	0,395	0232	0,308
Performance					(0,877)	0,476	0379	0,250	0316
Uncertainty						(0,753)	0,408	0269	0,417
Brand							(0,830)	0,368	0505
Variety								(0,690)	0,307
Sensory									(0,770)

The rtsq of AVE are the numbers figuring in parathesis diagonally in the table.

Table 5
Regression coefficients, standard errors, z-value, p-value and starndard estimates.

	Estimate	stderror	z-value	P(>|z|)	Std estimates
TPB					
Attitude→ Intention	0.937	0.092	10.131	0.000	0.580
Subjective Norm → Intention	0.247	0.056	4.428	0.000	0.220
Intention→ Behavior	0.654	0.056	11.732	0.000	0.594
Perceived Green Costs					
Attitude → Switching costs	−0.576	0.071	−8.064	0.000	−0.564
Switching costs→ behavior	−0.323	0.089	−3.610	0.000	−0.185
Monetary Costs → Behavior	−0.310	0.096	−3.238	0.001	−0.146

All relationships tested within this model were significant with p-value<0.001.

photo downloaded by each participant was coded in a new binary variable called Green Behavior, based on the claims appearing on the product.

3.7.2. Participants

128 surveys were returned and 126 were deemed useable for further analysis. The sample consisted of 61% female, with average age = 29.86, all residents of Canada. Participants' data were matched with their previous responses on the PGCS from study 5 following their identification code on prolific. Overall, 91 participants in our sample used conventional non-green deodorants, while 35 used deodorants with green attributes (green certification, green ingredients, non-toxic ingredients …).

3.7.3. Data analysis

A logistic regression (Model ML1) was computed in RStudio, with Green Behavior being the dependent variable and both switching costs and purchase costs being the independent variables. The results showed that the switching costs index significantly predicted Green Behavior ($\beta = -1.2$, p-value<0.0005). However, the effect of purchase costs (monetary costs) on the model was not significant ($\beta = -027$, p-value<0.39).

We then computed another logistic regression model (Model ML2) to compare the switching costs index's predictive power with that of intention. In this Model ML2, intention served as an independent variable, while Green behavior was the dependent variable. Results showed that intention was a significant predictor of Green Behavior, with $\beta = 0.83$, p-value<0.0001. Examining the two models showed that both constructs (SC and intention) were significant and comparable predictors of Green Behavior and that SC had a larger effect size than intention. Though the PGCS did not surmount intention in its statistical significance, it nevertheless represented a powerful tool to predict green behavior. These findings prove our scale's predictive validity in empirical settings.

Notably, the PGCS captured important marketing metrics and could inform strategy through its forecasting power for actual green purchasing behavior.

4. Discussion

This present research brings a behavioral perspective to the green

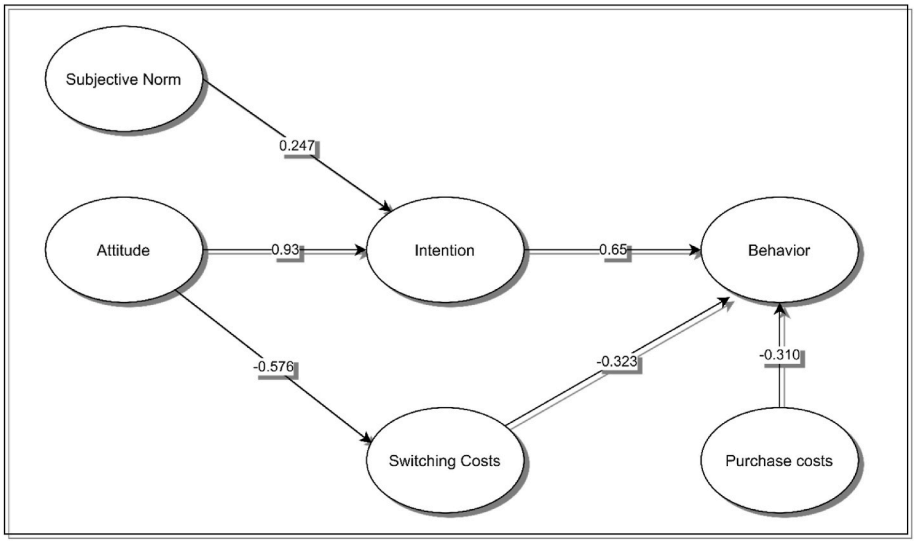

Fig. 1. Nomological network of the perceived green costs scale within the model of the theory of planned behavior (Model 6′). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

purchase experience by conceptualizing and developing a scale to quantify the perceived green costs that consumers confront when switching from conventional to eco-friendly alternatives.

Our work shows that perceived green costs are manifested in a range of nine first-order dimensions, some of which are related to actively engaging in learning about the products, brands, points of sale and other mentally consuming activities that require evaluating the performance of the new product, comparing alternatives and managing the uncertainty that comes along switching to an unfamiliar green brand. The burden of learning that we highlight in this paper coincides with recent research on green information avoidance that consumers practice to minimize cognitive effort in green consumption episodes (Momsen and Ohndorf, 2022), which links out findings to the green gap. Additionally, consumers might have to give up on certain preferences when switching to green alternatives, such as the variety of options to choose from and sensory appeal, specifically when the green products have a more rustic look and less industrialized scents. This is a novel contribution that the paper brings about to the green consumption literature, that has not been discussed otherwise in the literature.

The nine dimensions are then regrouped into 2 s-order constructs: one-time switching costs and repeated purchase costs. Our analysis shows that switching costs play a significant mediating role between attitude and behavior, while purchase costs have a direct impact on behavior. Consequently, our PGCS contributes to explaining the phenomenon of the green attitude-behavior gap. It puts forward perceived behavioral and psychological costs as reasons preventing the transition from positive attitudes into actual purchase behavior. Our results confirm that even if consumers have positive attitudes towards the green alternative, the perceived green costs tint the whole consumption experience with difficulties and hinder behavioral change. In the following, we present in more detail both the theoretical and practical implications of this paper, as we discuss the findings in the light of existing literature.

4.1. Theoretical implications

The present research makes four main contributions to the literature. To begin with, our work contributes to the extension of the theory of planned behavior by further exploring the linearity between attitudes, intentions and behaviors and introducing perceived green costs, specifically switching costs, as a mediating construct between attitude and behavior. In his recent paper, Ajzen (2020) mentioned that although the TPB is intuitively reasonable, there is evidence that behavior does not necessarily follow attitudes and intentions, specifically when individuals lack time, money and resources. Our current work coincides with these claims. Additionally, while the TPB is theoretically sufficient to predict behavior, it does not consider behavioral variables, such as context and frictions. Our research adopts the bounded rationality paradigm (Simon, 2000). It confirms that consumers do not rationally make consumption choices and do not always conform to their values, attitudes and intentions, especially in sustainable consumption contexts.

Second, this research advances the behavioral change literature, specifically on sludge defined as 'frictions that make it harder for people to do what they want to do' (Shahab and Lades, 2020). This construct was born in governmental organizations and the service literature and the current work extends it to the sustainable consumption universe and advocates for its mediating role between attitude and behavior, expressly as it impedes individuals' green behavior. Depicting a clear portrait of the behavioral disablers of green consumption (i.e., perceived green costs) throughout the consumption journey pinpoints opportunities for action, specifically to better design the experience. Previous work has put a lot of emphasize on the role of internal factors such as attitude (Litvine and Wüstenhagen, 2011), personal norms (Tung et al., 2012) and environmental values (Mishal et al., 2017) in driving green consumption. However, external factors, such as perceived green costs, cannot be overseen in this context, as they draw a holistic and comprehensive picture of the situation (Ali et al., 2020). Attributing the behavioral constraints to external factors further redeems individual consumers from a fair share of the responsibility and attributes it to marketers, businesses and governmental decision-makers. More generally, the present work contributes to the literature on green marketing as it tackles switching and purchase costs as procedural barriers to buying eco-friendly products. Our study thus adds to the discussion on the role of external and situational factors in hindering green behavior (Cleveland et al., 2020). While green costs are not new to the marketing literature, a comprehensive and holistic approach to congregate the dispersed costs in the context of green purchase behavior has not been undertaken previously. We build on existing research and bring forward a conceptual framework and measurement scale of costs involved in switching from conventional to green products.

Third, through a rigorous scale development methodology and robust results from our reliability and validity analysis, we build a scale that is theoretically relevant and practically useful for quantifying switching costs in a purchase context. Specifically, our scale can be integrated into behavioral change interventions to measure their effect on the perception of costs. It also allows market researchers to compare the cost dimensions and address the most salient ones. As such, our work extends and complements the work of Papista et al. (2018) and Cleveland et al. (2020) in developing a green costs scale to evaluate and quantify the factors hindering green behavior.

Moreover, our work taps into the literature on the green attitude-intention-behavior gap in sustainable consumption (ElHaffar et al., 2020). While consumers communicate their willingness to engage in sustainable behaviors, there is a discrepancy between what they say and what they do. Our results embrace the existence of the green gap and offer an empirically applicable and theoretically pertinent explanation. We further the discussion on the behavioral biases preventing consumers from translating their intentions into actions (van der Linden and Weber, 2021) and we confirm that behavioral frictions contribute to the existence and the persistence of inaction. This insight can be better understood in the light of the behavioral change wheel, where the person's capabilities and motivations need to co-exist with external facilitator and opportunities to enable a transition from one behavior to another (Michie et al., 2011).

On similar note, the current study touches on the intangibility issue of green alternatives. Green consumption is often considered abstract and intangible for consumers (Reczek et al., 2018) and, more substantially, for managers and decision-makers, resulting in green myopia (Ottman et al., 2008; Stafford and Graul, 2020). Consequently, breaking down the perceived green costs into distinct blocks addresses this bias as it facilitates surmounting the costs and resolves the intangibility issue for decision-makers and the end consumer. Therefore, our contribution extends the discussion on the responsibilities of researchers and marketers in offering clear steps to facilitate ethical behavior (White et al., 2019).

4.2. Practical implications

4.2.1. For managers

Several managerial implications follow from our work. First, part of the costs covered in this paper is informational by nature, learning costs, uncertainty costs and evaluation costs. Information can hinder the decision-making process when it is not available in the right amount, but it can also cause confusion when uncertain or overwhelming (Sunstein, 2020). The sweet spot is somewhere in the middle. Brand managers must integrate this understanding into their green communication strategies to clarify the ambiguities, differentiate their brand positioning and provide the information consumers need to surmount the perceived green costs. Our work offers a roadmap to delineate these costs and paves the way to addressing them meticulously.

Information is an important and necessary condition for the accomplishment of a sale, specifically in the context of experimental

goods such as cosmetics and personal care products (Lu and Chen, 2017). Specifically, information asymmetry is prominent in the market and consumers often have to purchase based on incomplete information (Chen and Chang, 2012). Eco-friendly brands must therefore put upfront product performance in their communication strategy and, more importantly, work on overcoming the information gap by culminating on actual performance through free sample distribution, social influencers reviews and word of mouth. These strategies would address the procedural frictions and behavioral costs related to performance loss and uncertainty costs and play a role in overcoming green skepticism and gaining customers' trust.

Our scale offers a roadmap for business through detailed delineation of the perceived green costs. It thus offers valuable insights for marketers to better design their communication strategies and promotion campaigns around eco-friendly products. First, to make the green purchase a viable choice, marketers would eliminate frictions and sludge that would otherwise impede the green choice. By eliminating and minimizing the effects of these costs, marketers have a better chance of reaching interested consumers. For instance, marketers would eliminate the evaluation, performance and uncertainty costs by offering free samples in conventional stores for consumers to try. Variety loss and sensory appeal costs would be addressed by widening the range of fragrances of the green cosmetic and by personalizing the uses for different skin or hair types. Adopting therefore a win-win communication strategy (Goldsmith et al., 2022) which includes personal consumer benefit along with environmental benefit (Delmas and Colgan, 2018).

In order to boost the sales of eco-friendly products within the retail environment, retailers need to address the availability issue of these products. As eco-friendly alternatives become trendier and more requested by consumers, eco-friendly cosmetics brands are seen more often in conventional. However, the next step would be to offer various brands, fragrances and uses. These steps address behavioral costs and create an encouraging context for the consumption of such products.

Another way to inspire eco-friendly consumption is to provide information at the point of sale. This type of nudge answers consumers' needs for information about the products, the brand, the benefits and instructions for use. As in the case of soap bar shampoos, the consumer might feel intimidated to ask or intentionally avoid information to minimize cognitive effort (Momsen and Ohndorf, 2022) and this kind of information would boost her purchase intentions into action.

4.2.2. For designers and manufacturers

Understanding the perceived costs that revolve around purchasing and consuming eco-friendly alternatives paves the way toward a new customer experience design leading to product consumption. Specifically, following the process model for the customer journey and experience (Lemon and Verhoef, 2016), each step of the customer experience would be influenced by specific types of costs that should be accounted for in the design of the customer journey and the touchpoints with the brand/product (See Fig. 2. Perceived Costs at Each Stage of the Customer Journey). Green brand awareness is mostly influenced by conventional brand relationship loss costs and the more notorious the brand, the easier the switch (Hidayat et al., 2021). Further in the journey, choosing and ordering the product would be affected by how much information is provided regarding the point of sale, delivery and handling options and, hence, learning costs. Designer and customer

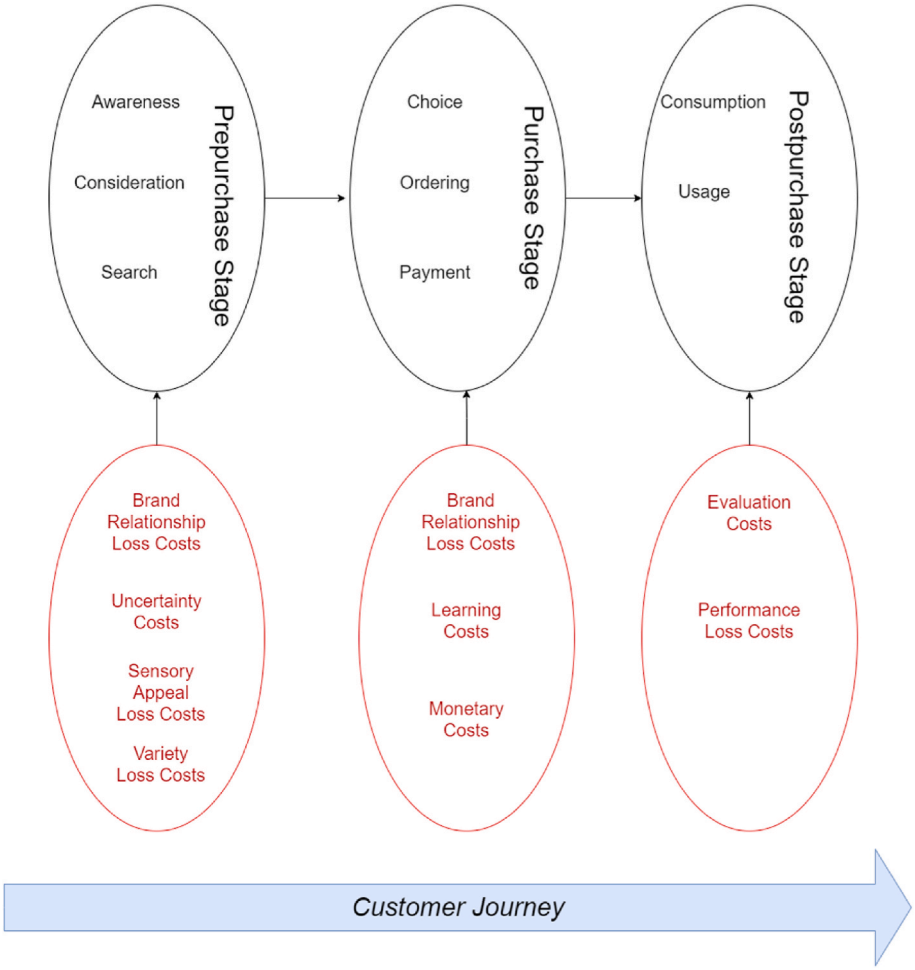

Fig. 2. Perceived costs at each stage of the customer journey.

experience managers need to ensure the experience is seamless and minimal effort is required to move from one step to another while focusing on purchase repeat and customer loyalty as the overarching goal.

4.2.3. For governments

The concept of sludge, which was born in governmental institutions, needs to be addressed in the context of sustainable consumption. Incentives are usually effective in driving sustainable behavior but present several perceived costs for specific product categories. For instance, reusable diapers are encouraged by municipalities in Canada and citizens who decide to opt for these products get a refund on these products (de Montréal Ville, 2023). However, the process is not evident and needs lots of effort from the side of the individual. Institutions could benefit from the insights on green costs presented in this thesis to make the switch to sustainable diapers easier. Free samples of reusable diapers and informative pamphlets for pregnant women can eliminate the behavioral friction around this kind of green behavior.

4.2.4. For consumers

This paper offers an exciting implication for consumers: the list of perceived costs that hinder sustainable behavior and cause the green gap. We believe that unraveling the root cause of a behavioral bias helps approach it more consistently and resolve it more efficiently through the detection and identification of the problem as a first step (Moser and Ekstrom, 2010). While consumers might experience these perceived costs frequently, they have yet to think about them consciously with a problem-solving mindset. Thus, pointing out these costs would facilitate controlling and overcoming them when encountered. For instance, understanding that the green decision takes time and effort to be successfully completed (evaluation and learning costs) would motivate the consumer to keep striving towards their green goals instead of abandoning it, getting overwhelmed with inaction and losing faith in themselves.

4.2.5. For educators

Moreover, educators in environmental psychology, marketing, consumer studies and other social science fields would find a rich source of educational material for their students. Teachers in colleges and universities can spread awareness of the existence of behavioral biases and behavioral frictions in the sustainability journey and our work contributes to stimulating discussions on the role of perceived green costs within this journey and the shared responsibility to alleviate them.

5. Limitations and future work

The present research sheds a spotlight on consumers' perceived green costs when they intend to purchase an eco-friendly alternative to replace their conventional product. In the light of theory and practice, we pinpoint several limitations and opportunities to extend this line of work in future endeavors. First, our paper focuses on a specific context: personal care products. This focus brings in-depth knowledge and resonates with the call for accuracy in conceptualization and measurement in consumer research (Luchs et al., 2021). However, it introduces an apparent generalization issue; the scale would have to be carefully reviewed before being adopted in other contexts.

Furthermore, the product choice, personal care products, limits the generalizability to other consumption contexts, specifically when the consumption context involves a social dimension such as buying clothes or a shared purchase decision such as dining out. Future research on perceived green costs could replicate and adapt the study to other consumption contexts and other steps within the consumption journey, such as behaviors related to post-consumption and the products' disposal.

Moreover, our approach to developing a measurement item is reflective, which means that each construct is reflected by a series of items, each of which is a manifestation of the construct itself. However, our analysis aggregates the different switching costs (which are reflective) into a higher-order factor. This aggregation is formative by nature. The use of reflective and formative items together is tolerated in some scientific studies and analyses, such as the Multiple Indicator and Multiple Causes Model (Coltman et al., 2008). However, we are unaware of the application and the co-existence of these approaches in two different hierarchical levels of the model: Level one: items are reflective and Level two: Aggregation of the dimensions into a second-order construct is formative. While we believe that it is pragmatically acceptable within the context of our current research, we present this as one of our work's limitations. Future research in scale development theory could investigate this further by providing a comparative analysis of using those approaches separately and combined. This would give empirical evidence for whether such an approach is viable.

Furthermore, our nomological network assesses the relationships of the second-order construct, switching costs, instead of considering each type of switching costs as first-order factors individually. While this aggregation benefits the parsimonious and practical aspects of the model, it weakens the richness of the complete model and hinders the uniqueness of each type of cost. While we disregard performing this detailed analysis within this work, as it falls outside the scope of the scale development procedure, further investigation can be conducted to assess the theoretical network of each cost type individually.

In our initial TPB model, perceived behavioral control did not significantly affect intention as anticipated. While this result is indeed surprising and contradicts the results of previous research on the subject (such as Han and Stoel (2017) and Heath and Gifford (2002) as mentioned by White et al. (2019)), we did not discuss it earlier, as we consider it outside the scope of this research. Nevertheless, the strength of the prediction of perceived behavioral control is not comparable to other variables in the context of the green purchase. This interpretation deserves further investigation in future endeavors.

An additional limitation is the sign of the relationship between the switching costs and the behavior. While this relationship appeared negative, as expected in Study 5, it was counterintuitively positive in a preliminary analysis of Study 4's sample. This might be due to the small sample size of Study 4 or the heterogeneity of samples (Study 4 vs. Study 5). It could also be due to another moderator indirectly affecting the relationship between the two variables. Barber et al. (2009) found that subjective knowledge is negatively associated with the attitude toward green products. This means the more one knows about a green product and the more they are familiar with it (and naturally, the more they buy it), the less positive their attitude towards it. While unexpected, this could be why in Study 4, there was a positive correlation between switching costs and behavior. Further research is needed to investigate this relationship.

Our scale features sensory appeal loss costs, which emerged from the field. While we initially envisioned this cost as encompassing several sensory aspects of the green product: the scent, the visuals and the product's texture, we only succeeded in validating the first aspect in the final version of the scale. Hence, future research might consider investigating and validating items to measure the other sensory aspects of personal care products (i.e., visual appeal of packaging for cosmetics) and those applying for other product types (i.e., taste for food, sound for cars, etc.)

Moreover, the learning costs validated in our work present two distinct types of costs and therefore are considered two distinct types of costs. Our approach to justify this step derives from our initial reflective approach in item development, which requires items manifesting the construct itself rather than a series of items describing different aspects of it. We also confirmed that the two first-order constructs correlate to a higher second-order factor, alleviating some awkwardness around this issue.

Another issue we would like to discuss is the use of the same dataset for EFA and CFA. Our rationale for following this process resides in our

awareness of its associated risks. In other words, the risk of using EFA and CFA on the same data set resides in constructing the scale based solely on the data. If the scale is purely empirical, it will lack theoretical validity (Fokkema and Greiff, 2017). Our process considers this risk and attempts to overcome it by putting theory at the heart of the scale development process. We first perform an EFA and delete items accordingly. However, we do not conduct the CFA on the same model that resulted from the EFA. As stated in the manuscript, we rearranged the resulting items based on theory before conducting the CFA. In that, we followed a reflective approach, where items were rearranged based on the initial item generation and domain specification (each set of items belonged to a construct/factor to which they should load). Please note that constructing the CFA model based on the results of the EFA model (as mentioned in the best practices paper of Worthington and Whittaker (2006)) is the mainstream case where the risk of overfitting arises when using the same dataset for EFA and CFA. To our point, other scholars have pointed out the importance of bringing theory in these critical first stages of scale development, as having items load on the same factor does not necessarily mean they measure the same construct (Hinkin, 1995; Nunally and Bernstein, 1978). Our approach ensures the mitigation of the risk; however, we mention this as a limitation of our work and we recommend that future research digs deeper into comparing the two methods in scale development to reach a consensus.

Finally, we would like to acknowledge that the samples we recruited did not represent the whole population. On the one hand, studies 1, 3 and 4 were dominated by female participants precisely because the recruitment happens through opt-in, not allowing much control on our part towards the sample's characteristics. On the other hand, Study 3 is mainly composed of students. Moreover, while in studies 4 and 5, we made sure we used Amazon Mturk and Prolific Academic to test the model on another type of sample and to balance participants based on gender, we state the lack of population generalizability as a limitation of our study. Future efforts can extend this line of research by testing the scale on other populations, such as young professionals, older adults and parents while accounting for the representativity of genders within the sample.

6. Conclusion

In 2023, managers are striving to include sustainability into the DNA of their companies and consumers seem to be the only entity 'out of sync' in this environmental vogue (Stafford and Graul, 2020). To comprehend the reasons behind this peculiarity, we investigate consumers' perceived green costs and present a conceptual framework and measurement scale to assess these costs quantitively within the context of the green purchase. We bring evidence to the relevance of our work by confirming its predictive power in a real consumption context. We also establish the construct's nomological validity within the theory of planned behavior and we accentuate the significance of perceived green costs within the phenomenon of the green attitude-behavior gap. We hope our perceived green costs scale will benefit managers, researchers and policymakers in evaluating and overcoming frictions in consumers' greening process and facilitating market penetration, branding and communication of green alternatives.

CRediT authorship contribution statement

Ghina ElHaffar: has made significant contributions to the conception and design of the study, Data curation, data, collection and, Formal analysis, analysis, interpretation of results, and manuscript drafting, Moreover, this manuscript is an integral part of Dr. ElHaffar's doctoral dissertation, and thus she has invested extensive efforts in its development. **Fabien Durif:** has been the Ph.D, supervisor, of the first author during her doctoral studies, He has made substantial contributions by supervising, guiding, funding the, Data curation, data, collection, and providing constant feedback throughout the research process. **Dilip Soman:** serves as the external examiner of the first author's doctoral dissertation, He has provided valuable feedback, guidance, and assistance in transforming the research into a publishable work. **Laurette Dubé:** has been part of the doctoral jury of the first author and has provided continuous support during her doctoral thesis, including the development of the current manuscript, She has dedicated significant time to revising the manuscript, offering feedback, guidance, and expertise.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix 1. Domain Specification and Definitions for each type of costs

Category of costs	Type of costs/dimensions of costs	Domain specification	References	Status for the current study
Perceived Green Costs	-	**The cognitive and physical effort that consumers must consciously undertake in order to reach a green product or service, as well as the time that these efforts entail.**	-	
Purchase Costs		**The repeated costs that consumers must endergo everytime they need to purchase/access a green products or service.**	-	
Switching Costs		**The one time cognitive and physical costs that consumers must endure when first deciding to switch from a conventional to a green product/ service.**		
Purchase Costs	Monetary loss costs (CM)	The repeated financial costs of the green alternative.	Burnham et al. (2003)	
Switching costs	Pre-switching Search (CS) and Evaluation Costs (CE)	The perception of time and mental effort needed to gather, search, evaluate and analyze information about the new product prior to switching.	Burnham et al. (2003); Jones et al. (2002); Shugan (1980)	
Switching costs	Learning costs (CL)	The costs incurred to acquire information about the green offers, their prices and point of sale and the variety of brands available	Burnham et al. (2003); Jones et al. (2002)	
Switching costs	Uncertainty Costs (CU)	The uncertainty costs extend to both the uncertainty of product performance (not being as efficient as it is supposed to be) and the uncertainty about the	Burnham et al. (2003); Jones et al. (2002)	

(*continued on next page*)

(*continued*)

Category of costs	Type of costs/dimensions of costs	Domain specification	References	Status for the current study
		claims that the green brands are communicating (green skepticism). We adopt this double-dimensional perspective on uncertainty costs in our study. However, we only develop items for the first part, as the second part is already operationalized.		
Switching costs	Performance loss costs (CLP)	The perception of potential reduced utility and overall functionality of the product when switching brands.	Aqueveque (2006); Jones et al. (2002)	
Switching costs	Brand relationship loss costs (BC)	The affective loss is associated with breaking the bonds of identification that have been formed with the brand or company with which a customer has associated. It includes the loss of image and meaning associated to the sense of identity of the consumers.	Burnham et al. (2003)	
Switching costs	Sensory appeal loss costs (PSC)	The costs related to the sensory attributes of the conventional products and that are hard to find in eco-friendly products, such as the visual appeal, the olfactory appeal, the gustatory appeal and the tactile appeal.	NA	Newly added
Switching costs	Variety loss costs (PVC)	The costs associated with the loss of variety and options to choose from, whether it is inter-brand (line) or intra-brand (competitors)	NA	Newly added

These definitions of costs are adopted in the manuscript. The first row presents the overarching construct of perceived green costs. The second and third represent the two categories of perceived green costs. Then the remaining costs are the types of costs identified within this work.
The acronyms in parentheses represent the symbols used in the measurement items for each on the constructs. Therefore, they can serve as a reference for other tables such as Appendix 2.

Appendix 2 Perceived Green Costs Scale across Studies

Perceived Green Costs Scale Measurement Items

	Items	Study 3 (n = 155)				Study 4 (n = 104)				Study 5 (n = 341)			
		Std Loading	**α**	**AVE**	**CR**	Std Loading	**α**	**AVE**	**CR**	Std Loading	**α**	**AVE**	**CR**
Monetary Costs rowhead		**0.880**	**0.720**	**0.884**		**0.787**	**0.553**	**0.970**		**0.787**	**0.581**	**0.98**	
CM1	Switching to eco-friendly shampoo would involve paying more money than usual	0.901				0.845				0.735			
CM2N	Eco-friendly shampoos have a similar price to the shampoo I currently use	0.766				0.588				0.613			
CM4	I think eco-friendly shampoos are more expensive than the shampoo I currently use	0.861				0.849				0.924			
Evaluation Costs rowhead		**0.693**	**0.542**	**0.701**		**0.809**	**0.684**	**0.970**		**0.760**	**0.640**	**0.970**	
CE1	I cannot afford the time to get the information to fully evaluate if an alternative eco-friendly shampoo suits me	0.675				0.813				0.690			
CE2	Comparing the efficiency of my current shampoo with an alternative eco-friendly shampoo takes too much time and effort	0.788				0.838				0.890			
Learning Costs (Learning about the offers) rowhead		**0.853**	**0.744**	**0.853**		**0.893**	**0.819**	**0.980**		**0.875**	**0.780**	**0.990**	
CL1	It will take me a lot of time and effort to learn about the available options in the market	0.865				0.844				0.858			
CL2	Learning about the features of the eco-friendly shampoo would take a lot of time and effort	0.859				0.958				0.907			
Learning Costs (Learning about the point of sale) rowhead		**0.879**	**0.785**	**0.879**		**0.724**	**0.680**	**0.950**		**0.804**	**0.683**	**0.980**	
CL4	I will have to spend time and effort to learn about the place where eco-friendly shampoos are sold	0.859				0.556				0.926			
CL5	Learning about the points of sale that have eco-friendly	0.913				1.021				0.728			

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	Items	Study 3 (n = 155)				Study 4 (n = 104)				Study 5 (n = 341)			
		Std Loading	**α**	**AVE**	**CR**	Std Loading	**α**	**AVE**	**CR**	Std Loading	**α**	**AVE**	**CR**
	shampoos will take a lot of time and effort												
Performance Loss Costs rowhead		**0.824**	**0.682**	**0.857**		**0.841**	**0.718**	**0.980**		**0.886**	**0.770**	**0.990**	
CLP1	The shampoo I currently use gives me effective results I would not receive using another eco-friendly product	0.597				0.597				0.682			
CLP3	I worry that the new eco-friendly shampoo won't work as well as expected	0.885				0.926				0.935			
CLP4	I fear that I will be compromising the performance when switching to an eco-friendly shampoo	0.878				0.909				0.946			
Uncertainty Costs rowhead		**0.810**	**0.594**	**0.814**		**0.831**	**0.623**	**0.980**		**0.790**	**0.567**	**0.980**	
CU1	I am not sure what is the level of performance that I would have with an eco-friendly shampoo	0.805				0.760				0.728			
CU2	The efficacy of an eco-friendly shampoo could be worse than the shampoo I currently use	0.759				0.833				0.709			
CU5	I don't know what I'll end up having to deal with when switching to an eco-friendly shampoo	0.747				0.775				0.807			
Brand Relationship Costs rowhead		**0.891**	**0.816**	**0.898**		**0.667**	**0.517**	**0.920**		**0.786**	**0.689**	**0.970**	
BC3	I like the brand of my regular shampoo and if I am to switch, I have to give up a product of a brand that I like	0.941				0.775				0.962			
BC4	I care about the brand of my regular shampoo and if I am to switch, I have to give up a product of a brand that I care about	0.857				0.649				0.675			
Variety Loss Costs rowhead		**0.797**	**0.565**	**0.796**		**0.748**	**0.512**	**0.960**		**0.718**	**0.476**	**0.970**	
PVC1	If I switch to eco-friendly shampoos, my brand options will be reduced	0.754				0.512				0.736			
PVC2N	I think there is a broad range of eco-friendly shampoos on the market, from which I can freely choose	0.782				0.696				0.735			
PVC3N	When switching to eco-friendly shampoos, I think I will find the same variety for different hair types as that I find in regular shampoos	0.719				0.900				0.574			
Sensory Appeal Loss Costs rowhead		**0.650**	**0.485**	**0.652**		**0.405**	**0.486**	**0.800**		**0.739**	**0.593**	**0.970**	
PSC3N	I think it's very likely that the scent of the eco-friendly shampoo will appeal to me *(as much as that of regular deodorant)**	0.670				0.248				0.733			
PSC4	I believe that the smell of the eco-friendly shampoo will not be as appealing as that of the current shampoo that I use	0.719				1.036				0.802			

Appendix 3. Measurment Scales

Construct	Items	Reference
Attitude	- Buying a natural moisturizer is an idea that i Dislike ————Like -Buying a natural moisturizer is A bad idea————A good idea -Buying a natural moisturizer is Unpleasant ——— Pleasant -Buying a natural moisturizer is A stupid idea ——A smart idea -Buying a natural moisturizer is Pointless ——Significant	(Y. J. Kim et al., 2013; Mostafa, 2007)
Intention	-I think I will buy a natural moisturizer soon -I plan to buy an organic moisturizer -An organic moisturizer is on my list for my next shopping trip	Insipred by (Y. J. Kim et al., 2013)
Behavior	-I pay attention that a moisturizer has an environmental label when I buy it -I encourage my family to buy moisturizers that are made from natural ingredients -I buy natural or organic moisturizers -I pay attention if the producer highlights environmental protection when I buy a moisturizer	
Subjective norm	-My family and close friends would prefer that I purchase natural moisturizers rather than petroleum-based moisturizers. -My family and close friends want me to use natural personal care products such as moisturizers -People whose opinion I value recommend that I use natural personal care products, such as moisturizers	(Chin et al., 2018; Kazukauskaitė, 2020)
Perceived behavioral control	-Whether or not I buy natural personal care products such as natural moisturizers, is completely up to me -I am confident that if I want to, I can pay for an environmentally friendly moisturizer instead of a conventional moisturizer -I have the resources, time and opportunities to buy an environmentally friendly moisturizer	(Y. Kim and Han, 2010; Yadav and Pathak, 2017)

Appendix 4. Elaborating on the dimensionality of costs

Unidimensional vs. Multidimensional Perceived Costs

In green marketing literature, the operationalization of perceived costs has taken several forms. We distinguish between unidimensional and multidimensional conceptualization. Research assuming the one-dimensionality of green purchase costs translates the construct into its general, more abstract sense. A case in point is the recent study of X. Yang and Zhang (2020), in which perceived costs are referred to as "switching costs" and are defined as the perceived "time, money, psychology, emotion and efforts associated with shifting from non-green to green alternatives". The authors operationalize this construct by administering three items that revolve around this definition (i.e., "It costs me too much to switch to green products).

On the other hand, research admitting the multidimensionality of perceived costs acknowledges various facets of this same construct. To illustrate, consider the study of Papista et al. (2018). The costs associated with green products are divided into 2 s-order constructs: purchase costs and switching costs, each of which is associated with two first-order factors: price and effort (purchase costs) and evaluation and performance costs (switching costs). The measurement of each type of cost is performed through multiple reflective items.

While the two approaches are plausible, multidimensionality is favored for several reasons. We first consider the abstractness vs. the concreteness of the measurement items. Employing a unidimensional scale entails using general item leaving behind the construct's essential aspects: aspects that can only be captured with specific and particular items. Moreover, we perceive multidimensional scales as strategically more helpful in marketing. For instance, comprehending that "*the time spent on learning about the point of sale* is an important cost for consumers" is more informative than "*time* is an important cost for consumers". Hence a multidimensional scale aids in preserving more information of the measured construct and pours more specificity into the process (Van der Gaag and Snijders (2004) as mentioned by Van Der Gaag and Snijders (2005)). Our current work endorses this view and attempts to regroup the different facets of a multidimensional measuring scale.

Appendix 5. Items generated, modified and retained throughout the scale development process

Cost		Item generated & retained after expert input	Status after EFA	Status after CFA and theoretical input	Modifications
Pre-switching search costs	**CS1**	Finding an alternative shampoo that is organic would take a lot of time and effort	Deleted	–	
	CS2	It is difficult to find an eco-friendly shampoo that fits my budget	Kept	Deleted	
	CS3	Switching to eco-friendly shampoo is not difficult since there is enough information about eco-friendly shampoos everywhere	Deleted	–	
Learning costs	**CL1**	It will take me a lot of time and effort to learn about the available options in the market	Kept	Kept	
	CL2	Learning about the features of the eco-friendly shampoo would take a lot of time and effort	Kept	Kept	
	CL3	It will take time and effort to learn about the offers and the prices of eco-friendly shampoos available in the market	Kept	Deleted	

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Cost		Item generated & retained after expert input	Status after EFA	Status after CFA and theoretical input	Modifications
	CL4	I will have to spend time and effort to learn about the place where eco-friendly shampoos are sold	Kept	Kept	
	CL5	Learning about the points of sale that have eco-friendly shampoos will take a lot of time and effort	Kept	Kept	
	CL6	For validation purposes, please choose 'somewhat disagree' for this item	Validation	Validation	
Pre-switching evaluation costs	**CE1**	I cannot afford the time to get the information to fully evaluate if an alternative eco-friendly shampoo suits me	Kept	Kept	
	CE2	Comparing the efficiency of my current shampoo with an alternative eco-friendly shampoo takes too much time and effort	Kept	Kept	
	CE3	It is tough to compare the eco-friendly alternatives of shampoos available in the market	Deleted	–	
	CE4	I would not spend time to test and evaluate an eco-friendly shampoo	Deleted	–	
	CE5	If I am to replace my shampoo with an eco-friendly one, I would have to personally try this alternative, to be able to decide on using it	Deleted	–	
	CE6	It takes a significant amount of time for me to test, evaluate and switch to an eco-friendly shampoo	Deleted	–	
Uncertainty Costs	**CU1**	I am not sure what is the level of performance that I would have with an eco-friendly shampoo	Kept	Kept	
	CU2	The efficacy of an eco-friendly shampoo could be worse than the shampoo I currently use	Kept	Kept	
	CU3	I am likely to end up with lousy shampoo if I switch to an eco-friendly shampoo	Kept	Deleted	
	CU4	Switching to an eco-friendly shampoo will probably result in some unexpected hassle	Kept	Deleted	
	CU5	I don't know what I'll end up having to deal with when switching to an eco-friendly shampoo	Kept	Kept	
Performance Loss Costs	**CLP1**	The shampoo I currently use gives me effective results I would not receive using another eco-friendly product	Kept	Kept	
	CLP2	There are certain benefits I would not retain if I were to replace my current shampoo with an eco-friendly option	kept	Deleted	
	CLP3	I worry that the new eco-friendly shampoo won't work as well as expected	Kept	Kept	
	CLP4	I fear that I will be compromising the performance when switching to an eco-friendly shampoo	Kept	Kept	
	CLP5	I feel that eco-friendly shampoos won't foam as much as my current shampoo	Kept	Deleted	
Brand Relationship Costs	**BC1**	Switching to eco-friendly shampoo means buying a brand that I don't know	Kept	Deleted	
	BC2	I think I must give up the "brand" name if I am to switch to an eco-friendly shampoo	Kept	Deleted	
	BC3	I like the brand of my regular shampoo and if I am to switch, I have to give up a product of a brand that I like	Kept	Kept	
	BC4	I care about the brand of my regular shampoo and if I am to switch, I have to give up a product of a brand that I care about	Kept	Kept	
Peripheral advantages loss costs: Sensory appeal lost	**PSC1**	If I decide to buy an eco-friendly shampoo, I will probably end up with a bottle that is not as pretty as the current bottle of shampoo I use	Deleted	–	
	PSC2	I think the packaging of eco-friendly shampoos are as attractive as other regular shampoos	Deleted	–	
	PSC3	I think it's very likely that the scent of the eco-friendly shampoo will appeal to me	Kept	Modified	I think it's very likely that the scent of the eco-friendly shampoo will appeal to me *(as much as that of regular deodorant)**
	PSC4	I believe that the smell of the eco-friendly shampoo will not be as appealing as that of the current shampoo that I use	Kept	Kept	
Peripheral advantages loss costs: Variety loss costs	**PVC1**	If I switch to eco-friendly shampoos, my brand options will be reduced	Kept	Kept	
	PVC2	I think there is a broad range of eco-friendly shampoos on the market, from which I can freely choose	Kept	Kept	
	PVC3	When switching to eco-friendly shampoos, I think I will find the same variety for different hair types as that I find in regular shampoos	Kept	Kept	

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Cost		Item generated & retained after expert input	Status after EFA	Status after CFA and theoretical input	Modifications
	PVC4	When switching to eco-friendly shampoos, a wide range of different shampoo scents will be available for me to choose from	Kept	Deleted	
Monetary Loss Costs	**CM1**	Switching to eco-friendly shampoo would involve paying more money than usual	Kept	Kept	
	CM2	Eco-friendly shampoos have a similar price to the shampoo I currently use	Kept	Kept	
	CM3	The supplementary cost of eco-friendly shampoos might keep me from trying it out	Kept	Kept	

Appendix 6. Factor loading for the EFA in study 3

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
CU1	0.75										
CU2	0.73										
CU4	0.57										
CU5	0.74										
CLP1	0.65										
CLP2	0.54										
CLP3	0.93										
CLP4	1.07										
CE2		0.62									
CL1		0.96									
CL2		0.96									
CL3		0.60									
CM1			0.98								
CM2N			0.81								
CM3			0.56								
CM4			0.85								
PVC1				0.68							
PVC2N				0.60							
PVC3N				1.05							
PVC$N				0.56							
BC3					0.71						
BC4					1.05						
PSC3N						0.59					
PSC4						0.87					
CL4							0.83				
CL5		0.30					0.74				
PSC2								1.00			
BC2									0.81		
CM5	0.95										
CS1		0.39									
CS2			0.48								
CS3N		0.37									
CE1		0.48									
CE3		0.48									
CE4		0.36									
CE5											
CE6		0.46									
CU3	0.47										
CLP5	0.48										
BC1	0.40										
PSC1						0.43					

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