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Structural Equation Modeling Applied to a Study on the Background of Green Buying Behaviors

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ABSTRACT

Studies related to green buying behaviors, which indicate the relationship between the background and consequential behaviors remains complex and constitutes a challenge for academics and professionals in the marketing area. From this perspective, the aim of this study was to investigate the relationship between Ecological Knowledge (EK), Ecological Concern (EC), Ecological Affection (EA) and the green buying behavior of the consumer; while considering the cosmetics sector. In pursuit of the objectives proposed, a survey of 500 Brazilian women consumers was conducted. In the data analysis we applied the PLS structural equation modeling, noting that constructs EA, EK and EC have significant influence on buying behavior, with the Ecological Concern being the construct with the highest impact. Finally, it was observed that the consumers of the sample showed a favorable opinion and were homogeneous in relation to the ecological aspects, i.e. they were favorable to the consumption of green products.

KEYWORDS Consumer Behavior, Green Products, Cosmetics

1 Introduction

The environmental impacts seen in recent decades are the result of the current economic growth model, based on the maximization of production and consumption. This has occurred because this model has simultaneously resulted in huge imbalances in both the economic and social order, as well as in terms of the environment. In fact, according to Singh (2013), the huge population and economic growth around the world in the second half of the twentieth century has threatened the health of the planet - ozone depletion, climate change, depletion of forest cover, polluting of natural resources and the extensive loss of biodiversity and natural habitat.

This problem, in turn, was reflected in the increased concern for environmental issues (Paço, Alves, Chris, & Leal, 2013), especially from the 60s and 70s on, with the emergence of the ecological movement and environmental marketing in the academic studies, involving the related impact of such issues on the behavior and attitudes of consumers (D'Souza, Taghian, & Khosla, 2007; Straufhan & Roberts, 1999).

The concern with understanding who the consumer of environmentally friendly products is and what their characteristics are has been the main theme of marketing studies (Gonçalves-Dias, Teodósio, Carvalho, & Silva, 2009). Chalifour (2010) adds that several assessments related to environmental issues have been extensively reviewed and discussed in the literature as tools to help protect the environment.

Several researchers have sought to channel their efforts in search of answers that indicate the determinants of green purchases; which are understood as those that show concern for the physical environment, such as: water, air, and land (Shrum, McCarty, & Lowrey, 1995). Green or environmentally friendly products, according to the conception of Mishra and Sharma (2012), are those that are actually manufactured using green materials and technologies that do not cause risks to the environment.

In addition to this, we also observed a greater appeal for society to adopt environmentally friendly attitudes, since in the opinion of Elkington and Hailes (1989) and Green-Demers, Pelletier, and Menard (1997), people also contribute to environmental degradation, in many ways, for example, careless disposal of waste, poor consumer habits and so on. It has been a long time since Maloney and Ward (1973) warned about this; stating that the current environmental problems result from a crisis of bad behaviors. The solution to the problem, according to these authors, lies not only in the traditional technological approaches, but in altering human behavior. This joint effort to reduce environmental impacts and contribute to the preservation of the environment is defined by Lee, Jan, and Yang (2013) as an environmentally responsible behavior (ERB).

Understanding these aspects is evidenced as a key issue for the sustainability of marketing activities, whose challenge is the development and launching of new products that meet consumers' needs; bearing in mind that, in the opinion of Costa and Jongen (2006), this is considered to be the starting

point for the survival of businesses.

Based on the context presented here, this study is part of a debate on the relationship between environmental issues and the buying behavior of green or environmentally friendly products (Ottman, 1994), defined by Layrargues (2000) as that which, together with the power of choice covers, in addition to the price/quality issue, the environment. Therefore, the following research question has guided this study: **Do the constructs - ecological knowledge, ecological affection and ecological concern influence the ecological buying behavior of the consumer?** To answer such question, some findings inspired the development of the proposed research:

- The fact that environmental concern has been an increasingly important issue for the business community and academia (Paço et al., 2013).
- The finding that contemporary research on consumer behavior in relation to green brands have received considerable attention from the academic community (Meijers & Stapel, 2011; Papista & Krystallis, 2013).
- It should be noted that the propensity of consumers to buy green products is related to the fact that this variable may be a function of a set of factors (Pikturnienė & MacKelaité, 2013).
- It is also noteworthy the fact that the behavior of green buying is one of the recommended behaviors for helping to sustain the environment, being that the social influence and environmental concerns are considered predictors of the green buying behavior (Dagher & Itan, 2012).
- The selection of products related to the caring for the face, body and hair is justified because it is a sector whose products are used by most people, especially women (Pikturnienė & MacKelaité, 2013).

The following section presents the background of the green behavior of the consumer.

2 Background of the Green Behavior of the Consumer

In the 1970s some investigations, demonstrated a concern for understanding these aspects related to the background of the green behavior of the consumer. Some researchers have sought to investigate possible determinants of the green behavior of the consumer, such as, ecological knowledge, ecological concern and ecological affection (Chan, Wong, & Leung, 2008; Dunlap & Van, 1978; Kassarijian, 1971; Kinnear & Taylor, 1973; Kinnear, Taylor, & Ahmed, 1974; Maloney & Ward, 1973). The descriptions of each of these constructs are presented below.

2.1 Ecological affection (EA)

The concept of affection is related to the emotions and feelings that an object arouses in someone. The affective component, according to Karsaklian (2008), corresponds to the assessment of the image formed. This summarizes the positive or negative feelings and the consequential emotions, which means that it is stimulated by the emotions utilized in advertising and marketing arguments. The emotional factor, according to Schouten (1991), is one of the most interesting components of human behavior and in particular, of the consumer.

In their research, Arnold and Reynolds (2009) reinforce the idea that conducting research on this subject has contributed to a better understanding of the effects of affection, showing that mood, feelings and emotions are related to almost all aspects of consumer behavior.

Some studies indicate that even with little knowledge about the environment, people have a strong emotional connection to it (Dispoto, 1977; Maloney & Ward, 1973), but consumers with high levels of ecological concern and affection are more likely to have positive attitudes toward the environment than those with a low level of concern and affection (Laskova, 2007). According to Zanoli and Naspetti (2001), although the relationship between affection and cognition is not yet fully understood, the cognitive interpretations (learned interpretations) of the consumers both influence and are influenced by affective reactions. Given the above, the first hypothesis of the investigation is assumed.

Hypothesis 1: Ecological affection influences environmentally friendly buying behavior.

From this perspective, Martin and Simintiras (1995) suggest that the influences of ecological knowledge and ecological affection on the green behavior of individuals constitute themselves as independent variables and therefore both influence the behavioral responses of the consumers.

2.2 Ecological knowledge (EK)

The **ecological knowledge**, referred to by Schahn and Holzer (1990) as **factual knowledge,** tends to affect people's actions even when the focus is not just about environmental issues. Byrne (2001) assumes that the individual's level of ecological knowledge, as well as the level of environmental orientation or commitment, can affect consumer behavior, leading them to environmentally friendly behaviors.

A research study carried out by Marchetti and Shelley (2009), involving 244 students in a fashion and clothing program at a Midwestern university, showed, however, that the willingness to pay more for counterfeit merchandise did not directly increase with the greater concern and knowledge in relation to the counterfeit merchandise. Contrary to previous findings, Kollmuss and Agyeman (2002) state that, in most cases, the increase in knowledge and awareness does not necessarily lead to a pro-environmental behavior. In this sense, Tanner and Kast (2003) suggest that although the ecological knowledge has been the subject of many studies, some empirical tests do not show a conclusive uniformity that indicate a direct relationship between ecological knowledge and ecological behavior.

The results of the studies by Dispoto (1977) showed that knowledge about ecology, environment and pollution was the main predictor of environmental behavior, but found a tenuous relationship between the two variables. Such results suggest that environmental education and planned conservation can serve as a basis for the changes related to the behavior of individuals. D'Souza et al. (2007) argue that consumers who are well informed about environmental problems are more likely to acquire green products.

In a recent study, with the aim to analyze the market segmentation, Barber, Taylor, and Strick (2010) revealed that the increase in information leads to greater knowledge about the environment and this is a precondition for changing attitudes. The results of a survey conducted by Xiao and Dunlap (2007) suggest that, in general, the attitudes of respondents are relatively related to the **concern for the environment**. These statements, in turn, led to the formulation of the second investigative hypothesis of this study.

Hypothesis 2: Ecological knowledge influences environmentally friendly buying behavior.

Focusing the efforts of this study is critical for this investigation, because, according to Chen and Chai (2010), the gap of knowledge on the uses and values of green products prevents consumers from committing to the purchase decision.

2.3 Ecological concern (EC)

The environmental concern, known as green or ecological concern (Ottman, 1992), has been the subject of several studies abroad (Chan et al., 2008; Chan & Lau, 2000; Chan, Leung, & Wong, 2006). Zimmer, Stafford, and Stafford (1994) point out that understanding the dimensions relating to the concern for the environment within the consumer market is the first step in the development of green marketing strategies.

Ling-Yee (1997) adds that environmental concern has been

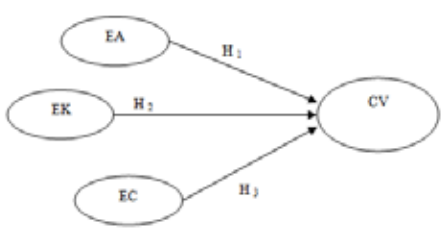
measured in different ways. Complementing this line of reasoning, Brehm, Eisenhauer, and Krannich (2006) suggest that some research-studies show low levels of environmental concern among U.S. consumers, but that such conclusions are inaccurate, since they have shown an environmentally conscious behavior when compared with the world population in general. The results of a survey conducted by Xiao and Dunlap (2007) suggest that, in general, the attitudes of respondents are relatively related to the **concern for the environment**.

Results of a study conducted in China by Chan and Lau (2000) show that there is a positive relationship between these variables, however despite this, the level of ecological knowledge of the Chinese people is low and this results in a minimum amount of green buying behavior. Based on these premises, it was possible to propose a third investigative hypothesis.

Hypothesis 3: Ecological concern influences environmentally friendly buying behavior.

A study by Chan (1996) pointed out that individuals who were more concerned with environmental issues were more likely to buy more green products. Kim and Choi (2005) consider environmental concern as something fundamental in research studies related to the green behavior of individuals, as this can be considered a predictive variable of environmentally friendly behavior. Based on the above, it was possible to formulate the hypotheses explained in this article and propose the following conceptual model in order to explain the green buying behavior of Brazilian consumers, as shown in Figure 1.

Figure 1 - The interrelationship between the investigative hypotheses



Source: the authors, from the literature review

Summers (2001) believes that the identification of hypotheses in a study is important because it provides the following advantages to the researcher: *i*) helps the researcher in developing the structure of the study; *ii*) facilitates the conceptual framework and parameters of the study; *iii*) allows the researcher to identify and choose the main articles in each area of interest. The methodological aspects adopted in the study to measure and correlate the constructs depicted in this research study are presented in the next section.

3 Methodological design of the field research

This section presents the design of the methodological procedures adopted in the study, as shown in the following sections.

3.1 Types of research

In the first phase of this study, also called the conceptual phase, exploratory research was adopted, since the purpose of the author, in this step, was to perform a survey of the existing literature on the subject, so that it could assist in defining the problem and in describing the behavior of the phenomena (Aaker, Kumar, & Day, 2001; Malhotra, 2001). According to Acevedo and Nohara (2013) this premise is corroborated, stating that the main objective of this type of research study is to broaden the understanding of the phenomenon being investigated, thereby enabling the researcher to more precisely define the research problem.

In the second phase of the research study, also known as the field research, the structured questionnaires were applied as data collection instruments, which are explained in more detail in the section regarding the data collection instrument. The role of the proposed research in describing a population analyzed from the viewpoint of the relationship between ecological knowledge, affection, concern and the green buying behavior, by way of the confirmation or lack there of, of the assumptions made, is characterized as a descriptive research study (Malhotra, 2001; Mattar, 1997).

The collection of data required for the description of the results was based on a survey, denominated by Malhotra (2001) as the simple cross-sectional method, because the collection of information takes into consideration a particular sample from the selected universe. The method used was the quantitative type, by allowing quantification throughout the collection and processing of the data, ensuring the accuracy of results, while avoiding distortions of analyses and interpretations (Richardson, Peres, Wanderley, Correia, & Peres, 2008).

3.2 Population and statistical sample

The universe of this study was composed of Brazilian consumers of cosmetics; women were the elements considered to be potential study respondents, as they represent the main consumer group of cosmetics globally, probably due to their greater concern (still) with the appearance. In this study, women consumers of cosmetics, over the age of 18 and who resided in the urban area of Ribeirão Preto - SP were considered potential respondents and thus formed the research population. The choice of this age group is justified by the fact that no precise data was found on the female population in other age groups. The data found in the Secretaria da Saúde do Município de Ribeirão Preto (SMS, 2009) concentrated the information in the following manner: less than 1 year; from 1-4; 5-9; 10-14 and 15-19. For this reason, we chose to consider women who were 18 years of age or older (with interpolation). The population selected is based on the fact that women over 18 represented about 34.9% of the city population.

To estimate the size of the target population in the research study, which was the basis for the extraction of the sample to be studied, we used data from the Secretaria da Saúde do Município de Ribeirão Preto for the year 2000 (SMS, 2009). The formula for calculating the sample size for a reliable estimate by interval of a proportional population (*p*) is given by (Levine, Berenson, & Stephan, 2000):

$$n = \frac{Z^2_{\alpha/2} \cdot p.q}{E^2} \qquad (1)$$

Where: n = number of individuals in the sample; $Z_{\alpha/2}$ = critical amount that corresponds to the desired confidence level; p = proportional population of individuals belonging to the category of interest of the research study; q = proportional population of individuals who do not belong to the category of interest of the research study ($q = 1 - p$); and E = margin of error or maximum error of the estimate. This formula identifies the maximum difference between the sampling ratio ($\hat{p}$) and the true proportional population (p). The margin of error E needs to be specified by the researcher. In most cases, the value used is 0.05 or less (Malhotra, 2001). Choosing an E of 0.05 means that the researcher is tolerating a margin of error of 5% more or less around the result obtained in the estimation. This study will consider: E equal to 0.05; confidence level of 95% with $Z_{\alpha/2}$ equivalent to 1.96; sample proportion $\hat{p}$ equal to 0.5 (50%); sample proportion of individuals who do not belong to the category of interest of the research study $\hat{q}$ equal to 0.5 ($\hat{q} = 1 - \hat{p} = 50\%$); the values of 50% and 50% are the most unfavorable for the calculation of sample size (those which make it larger). Substituting these numerical values in the formula (2), we have:

$$n = \frac{1.96^2 \times (0.5) \times (0.5)}{0.05^2} = \frac{0.9604}{0.0025} = 384.16 \quad (2)$$

Thus, it was determined that the amount of elements that would constitute the sample n in this study would be at least

384 women over 18 living in the urban area of Ribeirão Preto - SP, the mathematically rounded value, according to Triola (1999).

3.3 Sample design and data collection techniques
This research was based on convenience sampling, as a lottery was not prepared to determine the participants in the sample. In addition, we used the districts of Ribeirão Preto as subdivisions. In this case, the recommendation of Richardson et al. (2008) is that the population is divided into mutually exclusive and exhaustive heterogeneous subsets, according to the variables that characterize the universe and approximately the same number of elements. Altogether 800 questionnaires were distributed, and of this total 500 questionnaires were included in the research study, which corresponds to a rate of 62.5%. The disposal of some of the questionnaires received was necessary for the following reasons: a) 21 questionnaires were incomplete; b) 68 were returned blank and c) 211 were not returned.

The process of data collection contemplated the personal application of self-administered questionnaires, as suggested by Cooper and Schindler (2003). In this mode, the respondents themselves read the questions and record the answers. One of the strategies adopted in this modality was the approach of using respondents in places of great circulation: promenades in the city center, beauty salons and shopping centers. The development of the data collection instrument is discussed below.

3.4 Data collection instrument
Scales based on previous research were used to measure the independent variables (ecological knowledge, ecological affection and ecological concern), and the dependent variable (green buying behavior), but they were duly adapted to the object of this research study. To this end, we prepared the research instrument from the adaptations of the scales proposed in models of Maloney, Ward, and Braucht (1975). In order to measure the dependent variable (green buying behavior), the questions were based on the model proposed by Kim and Choi (2005).

The metrics used were Likert scales, which consist of statements that express positive or negative attitudes towards the object of interest. The idea is that respondents agree or disagree with each statement (Cooper & Schindler, 2003). The operationalization of key constructs and measurement scales are detailed below.

3.5 Statistical treatment of data
Initially, the data were examined for the presence of outliers, by calculating the Mahalanobis distance, considering the significance level of 0.1%. Data normality was also checked by means of the non-parametric test of Kolmogorov-Smirnov, although the data analysis technique applied, PLS-SEM, does not require data normality as a requirement.

The PLS-SEM technique was applied in order to verify the consistency of the factor loads of the indicators of each construct, as well as the relationship between constructs: Ecological Concern, Ecological Knowledge and Ecological Affection as well as the Behavior of Buying Green Products. Table 1 presents the guidelines used to assess the adhesion of the structural model.

Table 1 – Indexes of evaluation of the structural model

Indicator	Meaning	Decision
Average Variance Extracted (AVE)	Extent of convergent validity and adequacy of the model. The proportion of variability of the indicator explained by the latent construct (Hair et al., 1998)	AVE greater than or equal to 0.5
Composite Reliability	Internal consistency measure of the indicators of the construct (HAIR et al., 1998)	Minimum acceptable = 0.7
Cronbach's alpha	Measure of reliability, ranging from 0 to 1 (HAIR et al., 1998)	Minimum acceptable = 0.6
Factor Load	Correlation between the indicator and the construct (HAIR et al., 1998)	Minimum acceptable = 0.3 Recommended to be greater than or equal to 0.5
R-squared	Measures the proportion of the dependent variable explained by the independent variables (Hair et al., 1998)	The bigger, the better Cohen (1977) sets the guidelines for studies in the social sciences: - R-squared = 2% (weak effect) - R-squared = 13% (moderate effect) - R-squared = 26% (strong effect)

Source: data from the authors, based on Hair et al. (1998) and Cohen (1977)

The discussions related to the results found in the study are presented in the next section.

4 Presentation and Discussion of the Results
Initially, we sought to characterize the socioeconomic profile and buying habits of the respondents and, subsequently, the specific results of the object studied were presented.

4.1 Socioeconomic profile and buying habits of the sample investigated
The results concerning the age groups of the 500 women who constituted the sample studied presented the following socioeconomic characteristics: the majority of respondents were relatively young, between 21 and 30 years of age, followed by those between 31 and 50 years of age, with 47.2% stating that they were married, 32.4% single and 5.8% divorced. Another characteristic shown is that these women have a certain degree of education: 35.4% had a college degree, 50.0% reported having completed high school or having an incomplete college degree.

The characteristics that the respondents value the most are as follows: refillable products was the most cited (265 citations), followed by the best products (224 citations) and well-known product brands (213 citations). In fourth place, the characteristic of products with recyclable packaging appears, being cited by 179 respondents, followed by products that are manufactured by a company that does not harm the environment (161 citations) and biodegradable products (129 citations). Cheaper products (120 citations) and fashion trends (53 citations) were characteristics of a lesser value.

The perceptions of the respondents in relation to knowledge about green cosmetic products revealed that 75.6% of respondents strongly agree that green cosmetics are still poorly understood products. This becomes even more evident when one observes that, when asked about their knowledge of the ecological cosmetics, most respondents claimed to know little about these products (67.6% of respondents noted the values of 7, 8, 9 and 10 on the scale for Question 12). Table 2 shows the statistical summary of the responses to this set of variables.

Table 2 - Statistics on knowledge of green products

Statistical summary	Q11	Q12	Q13	Q14	Q15
N	500	500	500	500	500
Average	7.742	7.056	9.186	9.284	9.326
Median	8	8	10	10	10
Standard Deviation	2.455	2.711	1.527	1.407	1.384
Coef. Variation	31.7%	38.4%	16.6%	15.2%	14.8%

Source: data from field research

In general, a consensus is perceived on the fact that the cosmetic companies should disclose more about the environmentally friendly products they produce. The next section presents the characterization of the constructs analyzed in this research study.

4.2 Characterization of the constructs: ecological knowledge, ecological affection, ecological concern and the behavior of buying green cosmetics

The non-probability sample was tested for the presence of extreme cases, by using Mahalanobis Distance, with significance level of 0.1%, as recommended by Hair, Anderson, Tatham, and Black (1998) and Tabachnick and Fidel (2001) for detection of extreme cases, did not find the presence of any of these cases. The Kolmogorov-Smirnov test indicated a significance level of 1% that the study variables do not exhibit normal distribution. Thus, we applied the structural equations model SEM-PLS (Partial Least Square) to the data. This technique is suitable for the study, since it does not require data normality, as affirmed by Haenlein and Kaplan (2004).

Initially the factor loads of the indicators of each construct were examined, excluding those of the model with factor loads less than 0.3, a value considered as an acceptable minimum by Hair et al. (1998). Table 3 shows the final results for each construct. It required the exclusion of four variables, two from the ecological concern construct and two from the ecological knowledge construct, which had factor load less than 0.3.

Table 3 - Description of the study constructs

Construct	Indicators	Factor Load	Cronbach's alpha	Composite Reliability	AVE (Average Variance Extracted)
Behavior of Buying Green Cosmetics (BBGC)	BBGC1 – Although they cost more, I buy cosmetics that are made from materials that do not harm the environment.	0.773	0.9097	0.9263	0.5623
	BBGC 2 - I prefer to buy green cosmetics because I'm concerned about environmental issues.	0.832			
	BBGC 3 - I do not buy cosmetics from companies that may be causing the extinction of plants and animals.	0.722			
	BBGC 4 - I have bought cosmetics that have biodegradable packaging because I believe that my behavior is important to reducing the level of environmental degradation.	0.847			
	BBGC 5 - Between two equal cosmetic products, I buy the one that is less harmful to the environment.	0.819			
	BBGC 6 - Between two equal cosmetic products, I buy the one that has reusable packaging (refill).	0.544			
	BBGC 7 - Between two equal cosmetic products, I buy the one that has recyclable packaging.	0.769			
	BBGC 8 - I avoid polluting the environment by buying only the cosmetic products I really need	0.562			
	BBGC 9 - I have purchased green cosmetic products because I feel responsible for the reduction of environmental pollution.	0.875			
	BBGC 10 - I have purchased environmentally friendly products because most of the people who are important to me are encouraging me to take this stance.	0.675			
Ecological Affection (EA)	EA25 - I am distressed about the large amount of garbage that life nowadays produces.	0.708	0.8845	0.9070	0.5017
	EA26- It irritates me when I see people throwing trash out the windows of moving cars.	0.667			
	EA27- Seeing streams, rivers and lakes polluted makes me upset.	0.728			
	EA28-The speed of current climate changes alarm me.	0.613			
	EA29- Knowing about leaks and oil spills that occur in the environment makes me upset.	0.824			
	EA30- I am sad when I learn that more species of animals and plants are at risk of extinction.	0.771			
	EA31- Seeing illegal dumps make me appalled.	0.786			
	EA32-Finding out that a company does not respect the environment makes me upset.	0.810			
	EA33- Wasting food makes me upset.	0.692			
	EA34- It annoys me when people take their pets to the beach.	0.373			
Ecological Concern (EC)	EC35-I put only what I will eat on my plate.	0.448	0.7644	0.8266	0.3808
	EC36- I buy medications in the amount that prevents me from having to discard expired products in to the sewage system or garbage.	0.506			
	EC37- I collect used oil from frying foods in order to send it for recycling.	0.657			
	EC38- I use roofing and water containers containing asbestos.	0.526			
	EC39- I try to buy goods and services from companies that are environmentally friendly.	0.798			
	EC40- I discard used batteries in places prepared especially for this.	0.718			
	EC43- I usually send the recyclable parts of my household waste for recycling.	0.630			
	EC44- I use a minimal number of plastic bags when grocery shopping.	0.576			

Ecological Knowledge (EK)	EK46-Most environmental scientists acknowledge that man's actions are an important cause of the current changes in the planet's climate.	0.405	0.7510	0.8206	0.3724
	EK47- The two countries that emit the most carbon dioxide (CO2) are China and the United States of America (USA).	0.623			
	EK48- Ozone (O3) at ground level is considered a pollutant.	0.438			
	EK50- A decrease in the amount of stratospheric ozone would increase the incidence of skin cancer.	0.554			
	EK51- Carbon dioxide is one of four main gases responsible for the "greenhouse effect" on Earth.	0.757			
	EK52- The main human activity that increases the level of carbon dioxide in the atmosphere is the burning of fossil fuels.	0.696			
	EK53- Since 2005, asbestos mining and the production and use of products containing asbestos are banned in the European Union countries.	0.642			
	EK54- The toxicity of mercury (silver colored metal, liquid at room temperature) is one of the causes for the decline of its use in thermometers and other medical instruments.	0.677			
Excluded Variables	EC41- I think my attitudes and actions in defense of the environment are valuable to the ecological cause.	0.172			
	EC42- I take long showers.	0.257			
	EK45- Cigarette "butts", after being thrown on roads, streets and sidewalks, degrade quickly without harming the environment.	0.146			
	EK49- Markets that allow the trading of permits to emit pollutants are a way to limit the emission of pollutants.	0.233			

Source: data from field research

It is important to highlight that, in Table 3, the values of Cronbach's Alpha and Composite Reliability above 0.7 indicate the adherence of the model, as suggested by Hair et al. (1998). The values of the Average Variance Extracted (AVE), however, proved to be below 0.5, a value recommended by Hair et al. (1998) for the Ecological Knowledge and Ecological Concern constructs.

Table 4 shows the descriptive statistics for the constructs studied. Initially, the score of each construct was obtained by the arithmetic average of the constructs that comprise it, then the mean, standard deviation and coefficient of variation were calculated for the scales added. As observed, the mean scores given by the participants in the research constructs can be considered high (buying behavior has the lowest mean BBGC = 6.93, the other constructs presented higher scores). Additionally, the values of the coefficient of variation (CV = standard deviation/mean*100) indicate relative homogeneity in the opinions, i.e. the consumers surveyed have similar and favorable opinions regarding the ecological aspects.

Table 4 - Descriptive statistics of the constructs

BBGC	Mean	6.93
	Standard deviation	2.15
	CV	31%
EA	Mean	9.04
	Standard deviation	1.09
	CV	12%
EC	Mean	7.11
	Standard deviation	1.51
	CV	21%
EK	Mean	7.47
	Standard deviation	1.51
	CV	20%

Source: data from field research

The discussion concerning the relationship between the independent variables and the dependent variable is presented below.

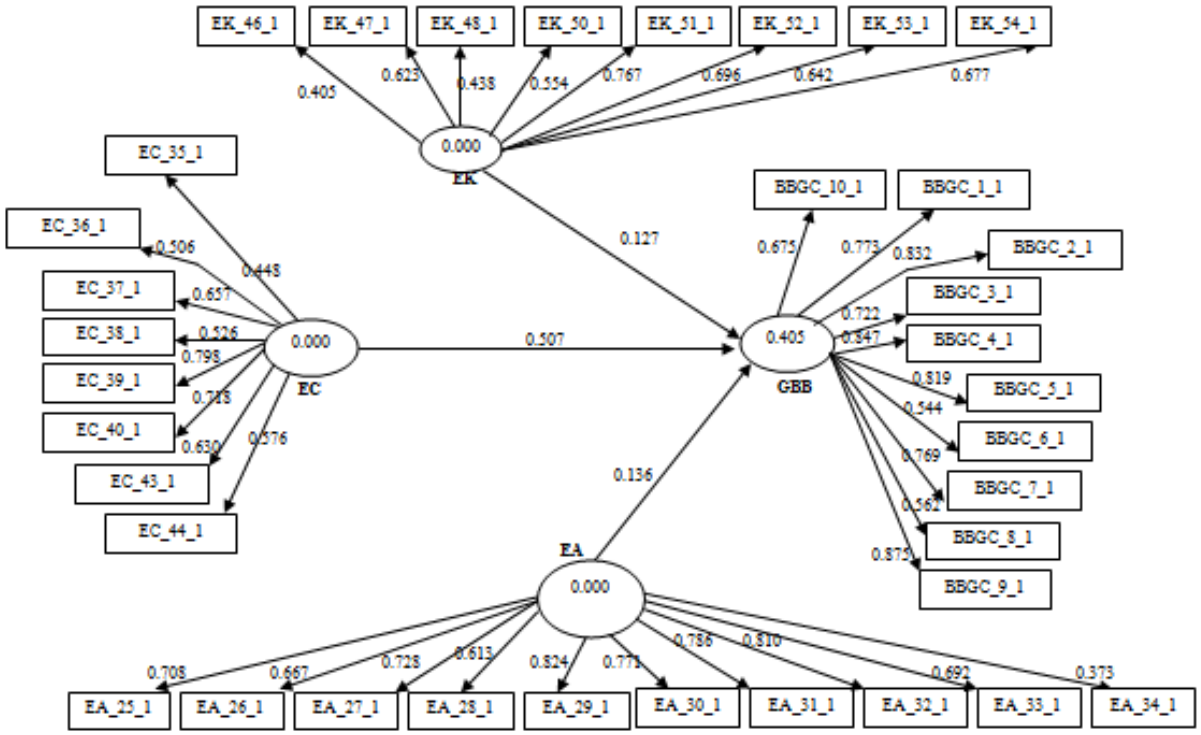
4.3 Relationship between ecological knowledge, ecological affection, ecological concern and the behavior of buying green cosmetics

The structural model obtained indicates that the Behavior of Buying Green Cosmetics is positively influenced by the constructs: Ecological Concern (Beta = 0.507), Ecological Affection (Beta = 0.138) and Ecological Knowledge (Beta = 0.127), significant at 5%. This suggests that consumers who are more concerned with the environment, with a higher level of affection and greater ecological knowledge tend to exhibit a more favorable consumer behavior to buying green cosmetics. These results are consistent with the results of the research study of Chan (1996) and confirm the hypotheses 1, 2 and 3 of this study.

The R-square value is 40.5%, which indicates a strong effect, as suggested by Cohen (1977). Thus, it was observed that 40.5% of the variance of the Buying Behavior is explained by the independent variables: Ecological Concern, Ecological Af-

fection and Ecological Knowledge. Additionally, the Ecological Concern presents a higher influence on the Buying Behavior than other constructs. Figure 2 shows the structural model obtained.

Figure 2 - Model of behavior of buying green cosmetics



Source: data from field research

The adherence of the model, in addition to the Composite Reliability indicators, AVE and Cronbach's Alpha mentioned also consider the correlation between the latent variables and their relationship with the square root of the AVE, as seen in Table 5.

Table 5 - Correlation matrix for the latent variables

	EA	BBGC	EK	EC
EA	0.7083			
BBGC	0.3969	0.7499		
EK	0.2799	0.3278	0.6102	
EC	0.4439	0.6086	0.3201	0.6171

*** The values presented in the diagonal of the table indicate the square root of the AVE**
Source: data from field research

Taking as a basis the fact that the root of the AVE, presented by the diagonal of Table 5, has a higher value than the correlations between the latent variables; as it can be considered that the model has satisfactory discriminant validity. The discussion of the results is presented in the next section.

5 Discussion of the Results

At the conclusion of this research study, it was possible to evaluate the range of propositions postulated, which sought to verify the influence of the constructs: Ecological Knowledge (EK), Ecological Concern (EC) and Ecological Affection (EA) on the Behavior of Buying Green Cosmetics in the sample studied.

In regards to the relationship between EK and BBGC, for example, it is emphasized that, despite the fact that Kollmuss and Agyeman (2002) and Tanner and Kast (2003) have suggested that empirical tests have not shown a conclusive uniformity showing a direct relationship between ecological knowledge issues and pro-environmental behavior, the findings of this study contradict these assumptions, to reveal the relationship between them. A study conducted in China by Chan and Lau (2000) also demonstrated that there is a positive relationship between these variables, but despite this, the level of ecological knowledge of the Chinese population is low and indicates a minimum green buying behavior, but still, the belief of Chan (1999) is that knowledge positively influences people's behavior.

A relationship was found between ecological affection (EA) and the behavior of buying green cosmetics (PBGC). These results were consistent with the assumptions of Dispoto (1977), Maloney and Ward (1973), as explained in the theoretical framework. According to these authors, even with little knowledge about the environment, people have a strong emotional connection with it. The congruence of this study also extends to the premises of Schouten (1991), which conceives the emotional factor as one of the most interesting components of consumer behavior.

It should be noted, however, that in accordance with Laskova (2007), consumers who have high levels of ecological concern and affection are more prone to having positive attitudes toward the environment than those with a low level of concern and affection. Within the same approach, the results of Martin and Simintiras (1995) suggest that the influences of ecological knowledge and affection on the ecological behavior of individuals are the behavioral responses of the consumers.

The results reported here allowed us to infer that, although people are increasingly aware of environmental threats, they still choose to buy products for mere necessities, making choices in this way that may directly affect the quality of the environment where they live (Elkington & Hailes, 1989). These assumptions are consistent with Tanner (1999), whose study concluded that, although in recent decades there has been an

increased awareness in relation to environmental threats, environmental degradation persists.

Another noteworthy aspect is that, although the sample studied stated that they knew little about green products, over 95% had a high degree of ecological affection and also a high degree of ecological concern. It is believed that this may have influenced the fact that 52% have demonstrated a high degree of environmentally friendly buying behavior. The next section presents the final considerations and limitations found in this study.

6 Final Considerations and Limitations of the Study

An important contribution envisioned in this study refers to the framework of reference that might serve as inspiration for future research in the area of marketing, more specifically, strategic planning, consumer behavior, management of the marketing mix, among others. Despite this, some limitations were identified, which could be overcome in future studies: a) although the indicators used were based on the literature and properly adapted to the specific object of this study, the scales used with 11 points, ranging from 0 to 10, were grounds for complaint by some respondents that felt it was a bit large; b) the values obtained for the AVE, EC and EK may indicate that for the sample in question, the indicators proposed by the theory may not properly measure the constructs that they purport to measure, thus the need arises for future studies to adapt and validate the instrument used, considering the Brazilian context and cultural specificities.

Thus, some hypotheses could be postulated as a proposal for future studies, in order to broaden academic knowledge and possibly provide different results from those found here: a) establish an analysis that also considers men as consumers, as the literature provides evidence that the male audience has a proven potential as a cosmetic consumer group; b) research issues related to the level of environmental awareness of consumers who participate in the production process of ecological goods and services; c) verify the production of green products and provide environmentally friendly services for businesses in the city of Ribeirão Preto or even in other cities in the state of São Paulo.

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