



PHD PROGRAMME IN
MANAGERIAL AND ACTUARIAL SCIENCES
XXIV CICLE

STUDENTS' BEHAVIOR AS A WAY TO REACH
SUSTAINABILITY WITHIN UNIVERSITIES
THE ROLE OF PLANNING A STRATEGY, AND OF STUDENTS'
PERCEPTIONS AND PERSONAL GOALS

Ph.D. candidate:

Alberto Bertossi

Supervisor:

Prof. Francesco Marangon

DISCUSSION YEAR 2022

TABLE OF CONTENTS

Introduction to the research	4
Chapter 1 – A literature review on the strategies implemented by Higher Education Institutions from 2010 to 2020 to foster pro-environmental behavior of students	
1.1 – Abstract	7
1.2 – Introduction	7
1.3 – Methodology	9
1.4 – Results	12
1.5 – Discussion	17
1.6 – Conclusions	19
Chapter 2 – What makes hot beverage vending machine cups eco-friendly? A research into university students’ views and preferences	
2.1 – Abstract	24
2.2 – Introduction	24
2.3 – Theoretical background	27
2.4 – Methods	30
2.5 – Results	34
2.6 – Discussion	38
2.7 – Conclusions	42
Chapter 3 – Analysis of the role of personal goals, product attributes and perceptions in influencing the purchase of products with eco-friendly packaging	
3.1. – Abstract	50
3.2. – Introduction	50
3.3. – Theoretical background	53
3.4. – Methods	57
3.5. – Results	61
3.6. – Discussion	65
3.7. – Conclusions	66
Final considerations and future developments	72

A mio padre

INTRODUCTION TO THE RESEARCH

According to the recent Intergovernmental Panel on Climate Change report (IPCC, 2021), the Earth is facing an unprecedented warming period. The main drivers seem to be the Green House Gases emissions (especially CO₂) caused by human activities, unsustainable behaviors and consumption patterns (Gardner and Stern, 1996; Vlek and Steg, 2007) driven by the advancing economic system. The (wrong) idea that has dominated the society since the last 50 years is that, just as yin cannot exist without yang, the current system based on infinite growth cannot exist without greedy and rational individuals, who rely only on purchasing and possessing goods for their happiness (Jackson, 2017) and vice versa. Consequently, this vicious cycle has exceeded some ecological boundaries of the Earth (Rockström et al., 2009), thereby resulting in a serious environmental and social crisis (Raworth, 2018).

The current scenario is frightening, but even the worst crisis can create an opportunity to be happy in a prosperous society. Tim Jackson defined a society as “prosperous” as the one that has learned to thrive within ecological and social limits (Jackson, 2017), as identified by Kate Raworth, living in a “doughnut” (Raworth, 2018). To attain this condition, a sustainable transition (Markard et al., 2012), that is, a process of changing a particular aspect of society (Markard et al., 2012; Rotmans et al., 2001), is required. A transition of our behavior, habits, and choices towards a more respectful and sustainable perception of the environment and society can be a good initiative. In other words, our present and unsustainable behavior must transition towards a pro-environmental behavior (PEB).

However, changing the behavior of individuals is complex, since there are many factors and barriers that influence and hinder our sustainable intentions and actions (Gifford and Nilsson, 2014; Steg and Vlek, 2009; Tripathi and Singh, 2016; Truelove and Gillis, 2018). Understanding which human behaviors to focus on, which are the driver and barriers of PEB, and identifying a coordination of institutions able to support the transition are the key ingredients of a sustainable strategy. In this context, Higher Education Institutions (HEIs) can play a key role (Karatzoglou, 2013), since they can be seen as co-creators for sustainability (Trencher et al., 2014) having the responsibility to educate the students, who will be the leaders of the future society (Cortese, 2003). Moreover, HEIs can be seen as niches integrating sustainability in their core community values, carrying on experiments, and developing social innovations with which influence and change actual social systems, especially related to food consumption (Eatmon et al, 2016). Indeed, orienting the current consumption of food and beverages towards a more circular framework is one of the most important goals set by Agenda 2030. Food consumption is influenced by many factors (Symmank, 2019), among them packaging. High consumption rates of products along the last decades caused extraordinary increases in packaging wastes (especially single-use paper and plastic). According to Eurostat, European paper and plastic packaging wastes in 2018 were equal to 46.5 mln tons, most of them not recyclable. Therefore, a sustainable transition (Markard et al., 2012) towards a society in which the design, production and consumption of packaging follows the circular economy principles is necessary. To achieve this goal, it is indispensable

continuing to analyze the dimensions that constitute consumption dynamics, among them people and products. Although the academic literature is particularly interested and focused on packaging (especially eco-friendly packaging) in food consumption dynamics (Ketelsen et al, 2020), there are still many topics to explore (e.g. vending), and socio-psychological models to implement (e.g. Goal Framing Theory). The current Ph.D. thesis is placed within this scenario, and it aims to provide both academic contributions and practical implementation about the role played by HEIs in fostering students' pro-environmental behavior, and by eco-friendly attributes of packaging and personal goals in orienting students' consumptions of hot beverages and general product served within that type of packaging.

The thesis is structured into three chapters of interconnected and, at the same time, complementary topics, as follow:

Chapter 1 – it consists in a literature review of 147 scientific articles performed to understand the strategic steps that have been mostly focused on by higher education institutions (HEIs) in the last decade (2010–2020) to foster pro-environmental behavior (PEB) of students. The analysis represents an attempt to better contextualize the role of HEIs for sustainable development, to deeply investigate whether they are committed to sustainable transition management by focusing on student behavior, and to identify the research gaps. Among the research gaps, one of the most important ones identified regards the packaging and vending sectors, in particular the role of cups for hot beverages for sustainable development. This led to the development of two research studies, included within chapters 2 and 3.

Chapter 2 – it consists in an empiric research study performed within the University of Udine and aims at investigating students' opinions on what attributes a cup designed for vending machine hot beverages should possess to be perceived as eco-friendly. Moreover, by making use of a choice experiment, the study investigates how the attributes of plastic cups influence students' purchase decision and willingness to pay for a hot beverage. The research study represents the first attempt to better understand the role of perceptions on shaping consumers' purchase decisions of cups for hot beverages. Moreover, it made it possible to identify numerous research gaps that will be used to develop future research projects.

Chapter 3 – similar to chapter 2, it consists in an empiric research study performed within the University of Udine. By making use of a Structural Equation Model and of the Goal Framing Theory, it aims at better explaining the reasons driving university students' choices of products with eco-friendly packaging. The research study represents the first attempt to combine the Goal Framing Theory with the theories on perceptions and products' attributes. Moreover, it made it possible to identify some future research developments.

Although some limitations must be acknowledged on the empirical settings, both academic contributions and implications for destination managers emerged from the investigations and have been outlined in each chapter of the thesis. Furthermore, the first and second chapters have undergone review processes; the first has been published in the “*International Journal of Sustainability in Higher Education*”, while the second is currently in its final review phase at the “*International Journal of Consumer Studies*”. Both studies contributed to the academic debate and addressed further research paths.

The chapters presented in this Ph.D. thesis are the drafts from which the papers were implemented and enhanced, in collaboration with thesis supervisors.

REFERENCES

- Eatmon, T., Krill, H. and Rynes, J. (2016), “Food Production as a Niche Innovation in Higher Education”, in Leal Filho, W. and Zint, M. (Eds.), *The Contribution of Social Sciences to Sustainable Development at Universities*, Springer International Publishing, pp. 145–159.
- Gardner, G.T. and Stern, P.C. (1996), *Environmental Problems and Human Behavior*, Allyn and Bacon.
- Gifford, R. and Nilsson, A. (2014), “Personal and social factors that influence pro-environmental concern and behaviour: A review”, *International Journal of Psychology*, Vol. 49 No. 3, pp. 141–157.
- IPCC (2021), “Climate Change 2021 – The physical science basis”
- Jackson, T. (2017), “Prosperity Without Growth: Foundations for the Economy of Tomorrow”, ISBN: 978-1138935419
- Karatzoglou, B. (2013), “An in-depth literature review of the evolving roles and contributions of universities to Education for Sustainable Development”, *Journal of Cleaner Production*, Elsevier Ltd, Vol. 49, pp. 44–53.
- Ketelsen, M., Janssen, M., Hamm, U., 2020. Consumers’ response to environmentally-friendly food packaging - A systematic review. *J. Clean. Prod.* 254, 120123. <https://doi.org/10.1016/j.jclepro.2020.120123>
- Markard, J., Raven, R. and Truffer, B. (2012), “Sustainability transitions: An emerging field of research and its prospects”, *Research Policy*, Elsevier B.V., Vol. 41 No. 6, pp. 955–967.
- Raworth, K (2017), “Doughnut economy Seven Ways to Think Like a 21st-Century Economist”, ISBN: 1847941370
- Rockström, J., W. Steffen, K. Noone, Å. Persson, F. S. Chapin, E. F. Lambin, T. M. Lenton, *et al.* (2009), “A safe operation space for humanity”, *Nature*, Vol. 461 No. September, pp. 472–475.
- Rotmans, J., Kemp, R. and Van Asselt, M. (2001), *More Evolution than Revolution: Transition Management in Public Policy, Foresight*, Vol. 3, available at:<https://doi.org/10.1108/14636680110803003>.
- Steg, L. and Vlek, C. (2009), “Encouraging pro-environmental behaviour: An integrative review and research agenda”, *Journal of Environmental Psychology*, Elsevier Ltd, Vol. 29 No. 3, pp. 309–317.
- Symmank, C. (2019). Extrinsic and intrinsic food product attributes in consumer and sensory research: literature review and quantification of the findings. *Management Review Quarterly*, 69(1), 39-74.
- Trencher, G., Yarime, M., McCormick, K.B., Doll, C.N.H. and Kraines, S.B. (2014), “Beyond the third mission: Exploring the emerging university function of co-creation for sustainability”, *Science and Public Policy*, Vol. 41 No. 2, pp. 151–179.
- Tripathi, A. and Singh, M.P. (2016), “Determinants of sustainable/green consumption: A review”, *International Journal of Environmental Technology and Management*, Vol. 19 No. 3–4, pp. 316–358.
- Truelove, H.B. and Gillis, A.J. (2018), “Perception of pro-environmental behavior”, *Global Environmental Change*, Elsevier Ltd, Vol. 49 No. February, pp. 175–185.
- Vlek, C.A.J. and Steg, L. (2007), “Human behavior and environmental sustainability: Problems, driving forces, and research topics”, *Journal of Social Issues*, Vol. 63 No. 1, pp. 1–19.

CHAPTER 1

A LITERATURE REVIEW ON THE STRATEGIES IMPLEMENTED BY HIGHER EDUCATION INSTITUTIONS FROM 2010 TO 2020 TO FOSTER PRO-ENVIRONMENTAL BEHAVIOR OF STUDENTS

by

Alberto Bertossi and Francesco Marangon

published in the

“International Journal of Sustainability in Higher Education”

1.1 – ABSTRACT

Changing the present behavior of individuals toward a more sustainable lifestyle is a complex task requiring a well-established strategy and institutional commitment. The aim of this research is to understand the strategic steps, as proposed by Steg and Vlek (2009a) that have been mostly focused on by higher education institutions (HEIs) in the last decade (2010–2020) to foster PEB of students. A literature review was conducted following the approach given by Denyer and Tranfield (2009). Subsequently, the results of 147 articles from 22 journals were discussed using the seven-element system proposed by Lozano et al. (2013).

Findings suggest that, in the last decade, HEIs have increased their efforts to improve their understanding of the determinants of PEB of students and methods to foster PEB. However, the results indicated that the classification was similar to previous studies, with HEIs focused mainly on assessing students in terms of personal factors (*assessment and reporting* category), understanding the relationships among psychological determinants and their influence on student behavior (*research* category), and planning educational interventions (*education* category).

1.2 – INTRODUCTION

“The Chinese word crisis is made up of two characters. One represents danger and the other represents opportunity.” – John Fitzgerald Kennedy

Presently, the world is witnessing multiple crises that exhibit environmental, economic, and social aspects. Any of the United Nations (UN) reports or a book on global crises would include the following statements: “we have been living without respecting both the biological limits imposed by our planet and the social limits necessary for an evolved society” (Jackson, 2017; Raworth, 2018), or “If we don’t urgently change our ways of life, we jeopardize life itself” (Antonio Guterres at the 2019 Climate Action

Summit). In simple words, our planet, society, and lives are endangered, and we must take up a PEB, defined by Kollmuss and Agyeman (2002) as a series of conscious actions and choices taken to minimize one's personal impact on the natural or built world. Truelove and Gillis (2018) identified 130 PEBs which comprise such actions and choices. For example, “avoid buying non-local produce,” “participate in local environmental groups,” “purchase clothing from second-hand stores,” “shut down computer at night,” “walk/cycle instead of driving to places within one mile,” etc.

However, changing the behavior of individuals is complex. Everything we do or intent to do in a sustainable perspective stems from a complex mix of personal and contextual factors (Gifford and Nilsson, 2014a; Steg and Vlek, 2009b; Tripathi and Singh, 2016a; Truelove and Gillis, 2018). For example, (Testa et al., 2020) identified 48 drivers of green consumption that were divided into behavioral factors, products and producer-related factors, socio-demographic variables, intrapersonal values, personal capabilities, and varying contexts. Understanding which human behaviors to focus on, which are the drivers (and barriers) for PEB, and methods to influence (or overcome) them is essential to transition towards a society based on circular economy and sustainability (OECD, 2017). According to (Steg and Vlek, 2009a) and Schultz (2014), these steps represent the key elements that differentiate effective strategies from ineffective approaches, such as those planned by managers and policymakers. Once all the factors have been identified, developing the most suitable intervention to “nudge” individuals towards a desired behavior is possible (Thaler and Sunstein, 2008). Schultz (2014) defined a good intervention as the one that effectively overcomes behavioral barriers and maximizes benefits.

Governments or institutions can catalyze transition (Kemp et al., 2007). Among these, higher education institutions (HEIs) play a key role (Karatzoglou, 2013), since they are complex organizations with a multi-level field of action (Stephens and Graham, 2010), and act as “change agents” (Peer and Stoeglehner, 2013; Stephens et al., 2008) and “co-creators for sustainability” (Trencher et al., 2014). Moreover, they “*bear a profound, moral responsibility to increase the awareness, knowledge, skills, and values*” of their students, who are the future citizens and leaders (Cortese, 2003). Education, which is presently viewed as “*indispensable to changing people's attitudes [...], achieving environmental and ethical awareness, values and attitudes, skills and behavior consistent with sustainable development*” (UN, 1992), is a major tool used by the HEIs to implement societal transitions (Martin, 2012). However, knowledge acquisition alone is not sufficient to foster sustainable behavior (Gardner and Stern, 1996) since it only focuses on some factors that precede a behavior (Steg and Vlek, 2009a). PEB will be possible only by overcoming the internal and contextual barriers and supporting education with other practices (Gardner and Stern, 1996; Schultz, 2014). This support was defined as “nudge,” that is, any type of intervention aimed at ensuring easy decision-making by individuals and orienting them towards a desired outcome (Thaler and Sunstein, 2008). This approach has proven to be effective for addressing environmental sustainability and PEBs (Byerly et al., 2018). Thus, the approach focuses on establishing not only an informative but also a structural strategy (Steg and Vlek, 2009a). The first strategy (i.e. informative), which is effective for convenient and cost-effective PEBs, aims to increase knowledge,

awareness, change attitudes, values, and norms through education, prompts, and communication campaigns. Conversely, the second strategy (i.e. structural), which is more effective for difficult and expensive PEBs, aims to foster PEB by providing facilities and incentives, or stimulating the university environment.

Therefore, HEIs that intend to contribute to a sustainable transition towards a prosperous society should establish a holistic strategy organized as given by (Steg and Vlek, 2009a):

- 1) Identify a specific target behavior having negative environmental impacts.
- 2) Measure the actual behavior of students, assess the presence of relevant personal/contextual antecedents, and evaluate the possibility of a rational potential for change towards ecological aspects.
- 3) Understand the drivers that determine the desired behavior, identify the barriers that hinder the behavior, and assess the associated benefits.
- 4) Develop an intervention to “nudge” students towards PEB.

Previous studies have not examined whether HEIs utilize a holistic strategy to foster PEBs of students. Therefore, an original aspect of the present research study is to fill the research gap left by previous studies on the topic by developing an overview of the status of scientific research and identifying which of the above-mentioned four strategic steps were majorly employed by HEIs to change the behavior of students. To acquire this information, the authors reviewed scientific papers published during 2010–2020. The authors focused only on the last decade because it represents a historical period, during which environmental issues started receiving increased attention from governments and institutions globally; additionally, the most important worldwide strategies for sustainable development, known as “Agenda 2030,” were implemented in 2015 (UN, 2015).

To contextualize the results better, the seven-element system proposed by (Lozano et al., 2013) has been used. According to the authors, the HEI system comprises seven interlinked and interdependent elements: *institutional frameworks*, *campus operations*, *education*, *on-campus experiences*, *research*, *outreach and collaborations*, and *assessment and reporting*. This classification assists in research since it fragments a complex system into well-identified dimensions. Moreover, in our opinion, it assists managers to establish a holistic approach to sustainability since each element (excluding *institutional frameworks*) corresponds to one or more of the four strategic steps. Therefore, in the present study, the authors proposed that Steps 1 and 2 correspond to *assessment and reporting*, Step 3 corresponds to *research*, and Step 4 corresponds to *campus operations*, *education*, *on-campus experiences*, and *outreach and collaborations*.

The research study aims to answer the following research question:

Which strategic steps have HEIs focused on until now to foster PEB of students?

1.3 – METHODOLOGY

Research approach

This study followed the systematic literature review (SLR) approach proposed by (Denyer and Tranfield, 2009) and applied by other similar studies that focused on HEIs (Blanco-Portela et al., 2017; Ceulemans et al., 2015; Findler et al., 2019). An SLR is based on the basic principles of being systematic, transparent, replicable, and synthesizable (Tranfield et al., 2003). It includes five consecutive steps: 1) research question formulation, 2) study detection, 3) study selection and evaluation, 4) data synthesis and analysis, and 5) result reporting and application (Denyer and Tranfield, 2009).

Screening phase

After formulating the research question, the scientific papers were screened in January 2021 to identify the relevant studies in the fields of HEIs, sustainable development, and student behavior. The Scopus database was used as the main resource for the articles and was used in other similar studies, such as the bibliometric reviews by Hallinger and Chatpinyakoo (2019) and Mazon et al (2020). According to their views, Scopus covers a wide range of disciplines relevant to sustainability within HEIs, and is more extensive than the Web of Science regarding education disciplines.

To efficiently detect the most relevant documents, seven research keywords have been used: (“*Universit**” OR “*Campus*” OR “*Higher education*” OR “*College*”) AND (“*Behavio**”) AND (“*Sustainab**”) AND (“*Student**”). These search criteria resulted in a starting sample size of 1169 documents. To reduce the number of sources, the authors selected only the scientific articles published during 2010–2020 and further excluded conference papers, reviews, and book chapters, thereby reducing the sample size to 736. In the next step, journals with specific references to HEIs, education, management practices, sustainability, behavior, psychology, and the natural environment in their title were selected to include multiple topics; 22 key journals were selected, thus, shortlisting the number of articles to 231. This was followed by reading the abstract of the shortlisted 231 articles to ensure that the scientific study addressed sustainable development and student behavior issues in HEIs. Only the articles that directly analyzed the student behavior regarding sustainability in HEIs, internal/external factors that affect student behavior, and how HEIs can encourage PEB through managerial practices were considered. The final sample comprised 147 articles that were sufficient to allow an in-depth analysis and a transdisciplinary comparison of the contents. The above described steps are summarized in Table I.

	"Universit*" or "Campus" or "higher education" or "college" AND	
Research	"Behavio*" AND	1169
Keywords	"Sustainab*" AND	
	"Student*"	
Scientific articles (2010-2020)		736
Selected journals	"International Journal of Sustainability in Higher Education", "Sustainability Switzerland", "Journal of Cleaner Production", "Environmental Education Research", "International Journal of Sustainability Education", "Journal of Environmental Studies and Sciences", "Sustainability", "Applied Environmental Education and Communication", "International Journal of Sustainable Transportation", "Sustainability United States", "Ecopsychology", "International Journal of Environmental and Science Education", "Journal of Environmental Management", "Journal of Teacher Education for Sustainability", "Resources Conservation and Recycling", "Entrepreneurship and Sustainability Issues", "Environmental Engineering and Management Journal", "Journal of Environmental Protection and Ecology", "International Journal of Environmental Research and Public Health", "Journal of Applied Research in Higher Education", "Australian Journal of Environmental Education", "Environment Development and Sustainability"	231
Selected articles		147

Table I - Research parameters and number of articles obtained at each selection step

Classification phase

According to the contents, the articles were later classified into one or more of the seven elements proposed by Lozano et al. (2013) and used by Lozano et al. (2015) and Findler et al. (2019). The articles that: 1) evaluated students in terms of knowledge, environmental concerns, attitudes toward PEB, personal values, sustainable perceptions, etc.; 2) investigated whether students engage in daily sustainable actions (e.g., waste recycling, energy saving, sustainable mobility); and 3) explored the degree of campus sustainability regarding sustainable operations that can influence student behavior (e.g., the presence of waste managerial operations, water conservation practices, etc.) were included in the *assessment and reporting* category. Articles that explored whether and how some personal or contextual factors affected PEB of students were included in the *research* category. The two categories are similar since they correspond to the Steps 1–3 of the strategy proposed by Steg and Vlek (2009). Although both categories use an exploratory approach, the first is more generic and relies mainly on descriptive statistics, while the second uses statistical models, such structural equation models (Hoyle, 1995), and/or socio-psychological theories, such as the Theory of Planned Behavior (Ajzen, 1991) or the Value Belief Norm theory (Stern et al, 1999), typical of academic research.

Articles that used interventions and investigated behavioral changes of students were included in *campus operations*, *education*, *on-campus activities*, and *outreach and collaborations* categories, which corresponded to Step 4 of the strategy. Articles in the *campus operation* category discussed interventions on the built environment (e.g., provision of recycling bins), whereas those in the *education* category discussed classic educational interventions (e.g., sustainability courses or curricula reviews). Furthermore, articles in the *on-campus activities* category discussed general sustainable activities established for students (e.g., cooking workshops), and articles included in the *outreach and collaborations* category discussed activities that involved external stakeholder participation (e.g., development of a project for an NGO). Further details are given in Appendix A.

Main limitations of the methodology

Similar to other literature reviews, the methodology used in this study demonstrated some limitations: 1) Although the Scopus database was used in this research, other databases could include some interesting papers, which were not considered. 2) The authors focused only on peer-reviewed journals, and excluded conference papers, reports, book chapters, and sources from the gray literature. 3) The keywords used in this study led to some irrelevant results that were deleted from the perspective of this research since they did not directly investigate the PEB of students. 4) The authors focused only on journals that included references to the topic in their title although other journals that discussed PEB of students within HEIs exist. 5) Although the procedures by Lozano et al. (2015) were followed, a clear distinction between the categories was not possible occasionally; therefore, some scientific articles were assigned to more than one category. 6) The authors focused only on PEB of students and excluded studies that discussed pro-social behaviors (e.g., assistance to the elderly or volunteering in soup kitchens). However, the authors are aware that references to concepts, such as “sustainable development,” “prosperous society,” or “sustainable transition,” include consideration of how the behavior of individuals influences not only the environmental dimension, but also the social dimension.

1.4 – RESULTS

The analysis results of 147 articles are now presented. Since some papers were classified into one or more categories (as mentioned above), the results from Figure 2 and Table II refer to 179 articles.

Two distinct periods were observed based on the publication trends of the papers during the last decade (Figure 1). The first period (2010–2015) was characterized by a low interest in student behavior, confirmed by the low annual rate of scientific publications. In contrast, the second period (2016–2020) witnessed an exponential increase in the number of papers published, with the highest publication rate in 2020 ($n = 32$; 22%). This trend was consistent with previous studies (Hallinger and Chatpinyakoo, 2019; Mazon *et al.*, 2020), thereby confirming the increasing interest and involvement of HEIs in sustainable subjects since the last five years.

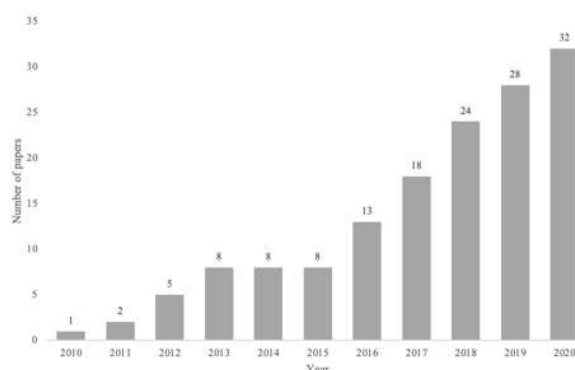


Figure 1 – Publication trend of the 147 papers

Figure 2 focuses on the categories investigated coupled with the publication trends shown in Figure 1. No dominant category was observed during 2010–2015. However, from 2016 onwards, an exponential increase in publications was observed in the *assessment and reporting*, *research*, and *education* categories. Contrastingly, the publication trends for *campus operations*, *on-campus experiences*, and *outreach and collaborations* categories increased marginally only from 2018 onwards.

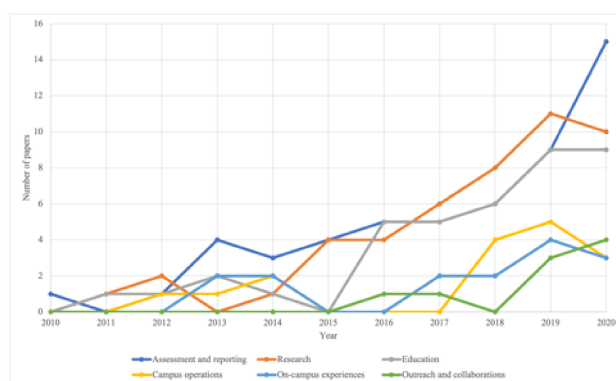


Figure 2 - Publications trend of the 147 papers per year and category

Overall, the *assessment and reporting* category included the highest number of publications (n = 53; 30%), followed by *research* (n = 47; 26%), and *education* (n = 39; 22%). Conversely, few papers in the *campus operations* (n = 16; 9%), *on-campus experiences* (n = 15; 8%), and *outreach and collaborations* (n = 9; 5%) categories were published (Table II).

The International Journal of Sustainability in Higher Education published articles most frequently (n = 53, 36%), followed by “Sustainability (Switzerland)” (n = 39, 27%), *Journal of Cleaner Production* (n = 12, 8%), and *Environmental Education Research* (n = 6, 4%) (Table III). These four journals represented 75% of the total publications.

	Assessment and reporting	Research	Education	Campus operations	On-campus experiences	Outreach and collaborations	Total
N.	53	47	39	16	15	9	179
%	30%	26%	22%	9%	8%	5%	100%

Table II - Paper distribution per category

Scientific journal	Number of research studies published	
International Journal of Sustainability in Higher Education	53	36%
Sustainability (Switzerland)	39	27%
Journal of Cleaner Production	12	8%
Environmental Education Research	6	4%
International Journal of Sustainable Transportation	5	3%
International Journal of Sustainability Education	4	3%
Resources, Conservation and Recycling	3	2%
International Journal of Environmental Research and Public Health	3	2%
Ecopsychology	3	2%
Applied Environmental Education and Communication	3	2%
Sustainability (United States)	2	1%
Journal of Teacher Education for Sustainability	2	1%
Journal of Environmental Studies and Sciences	2	1%
Journal of Environmental Management	2	1%
Journal of Applied Research in Higher Education	2	1%
International Journal of Environmental and Science Education	2	1%
Environment, Development and Sustainability	2	1%
Journal of Environmental Protection and Ecology	1	1%
Australian Journal of Environmental Education	1	1%
TOTAL	147	100%

Table III - Paper distribution per journal

The subsequent sections present the findings for each category in detail.

Assessment and reporting and Research

These two categories exhibited the highest number of publications. This suggests that HEIs depend largely on a “passive approach” to change behavior of students, thereby focusing on Steps 1 and 2 (*assessment and reporting*) and Step 3 (*research*) of the strategy proposed by Steg and Vlek (2009).

In *assessment and reporting*, the most common action was to evaluate students based on well-defined variables (attitudes, awareness, perceptions, knowledge, etc.). For example, Nikolic et al. (2020), Eagle et al. (2015) and McNamara *et al.* (2014) examined the attitude of students towards sustainable development, sustainability issues, and campus sustainability policies, respectively. Further, Migliorini et al. (2020) investigated the level of knowledge of students regarding sustainable food systems, Alsaati et al. (2020) and Edumadze *et al.* (2014) explored awareness on sustainable development and environmental impacts of electronic wastes, respectively, in students. Correia et al. (2020) and Gazzola et al. (2020) focused on the perceptions of students regarding campus sustainable practices and the circularity of the fashion industry, respectively. In general, each paper analyzed the behavior of students using descriptive statistics.

In the *research* category, many scientific articles were available that investigated the association between different types of variables, and whether the variables could explain and influence target behavior. For example, Naz et al. (2020) used multiple regression and explorative factor analysis to investigate the effect of willingness to pay, environmental knowledge, and perceived effectiveness of

students on their green purchase intentions. Further, the structural equation model built by Liao and Li (2019) investigated whether environmental education, environmental knowledge, attitudes, subjective norms, and perceived behavior control explained solid waste segregation on campus. Some papers relied on socio-psychological theories and models. For example, Liu *et al.* (2018) investigated the factors that affect public engagement of students using the Value-Belief-Norm theory (Stern *et al.*, 1999). Moreover, Der-Karabetian (2014) used the Superordinate Goal Theory (Sherif, 1966) to examine whether the perceived impact of globalization, global and national belonging, perceived personal risk, and world mindedness values could significantly predict sustainable behaviors. Chakraborty *et al.* (2017) used the Goal Framing Theory (Lindenberg and Steg, 2007) to examine the relationship between personal goals and pro-environmental intentions of students.

The results evidently indicated that most papers in both categories focused primarily on the role of personal factors. However, papers that directly discussed contextual factors were also observed, albeit in a small number. For example, Watson *et al.* (2015) investigated whether living in green dorms affected advocacy, conservation, and recycling behaviors of students. Mitra and Nash (2019) explored how the built environment (e.g., presence of on-street cycling facilities and neighborhood road types) influenced the travel behavior of students. Furthermore, Sima *et al.* (2019) analyzed how campus greening initiatives are reflected in curricula, behavioral patterns of students and teachers, and administrative actions.

Education

This category was most investigated among the articles that included the “active approach.” Our results indicated that HEIs attempted to foster PEBs of students mainly through “classic” revisions in the academic curricula by including sustainable topics (Qu, 2020; Hay and Eagle, 2020; Sidiropoulos, 2018) and organizing courses and workshops (Abner *et al.*, 2019; Connell and Kozar, 2012a; Fernández *et al.*, 2016; Foster and Stagl, 2018a; Hay and Eagle, 2020; Kalsoom and Khanam, 2017; Merritt *et al.*, 2018; Mosher and Desrochers, 2014; Navarro *et al.*, 2020; Qu *et al.*, 2020; Savelyeva and Douglas, 2017; Yeung *et al.*, 2017; Yu *et al.*, 2017). Most papers included in this category generally focused on providing students with a broad view of sustainable development (e.g. Kalsoom and Khanam, 2017; Savelyeva and Douglas, 2017; Merritt *et al.*, 2018). Other studies focused on more specific topics, such as food (Albareda-Tiana *et al.*, 2018), textile and apparel industry (Abner *et al.*, 2019) and sustainable consumption (Collins *et al.*, 2018), thus, providing students with new viewpoints based on the triple bottom line approach of sustainability. Additionally, some papers focused on the development of innovative and transdisciplinary teaching methodologies based on active and experiential learning (Albareda-Tiana *et al.*, 2018; Carmichael and Handa, 2014; Collins *et al.*, 2018; Pearson *et al.*, 2011; Terrón-López *et al.*, 2020; Ting and Cheng, 2017), or based on the use of new tools (e.g., ecological footprint calculator) to address daily personal problems (Collins *et al.*, 2018). This approach type could

enrich knowledge (Foster and Stagl, 2018b; Savelyeva and Douglas, 2017), raise awareness (Carmichael and Handa, 2014; Kalsoom and Khanam, 2017), develop a sense of agency (Merritt et al., 2018), acquire competency (e.g., autonomous learning, global mindset, ability to solve problems, and decision-making) (Terrón-López *et al.*, 2020), and influence PEB of students (Pearson et al., 2011).

However, focusing only on educational interventions is insufficient. Knowledge itself cannot overcome internal barriers, such as financial convenience or appearance (Collins et al., 2018; Connell and Kozar, 2012b), or change habits, such as those related to food (Collins et al., 2018). Therefore, HEIs should also implement other types of interventions that consider the surrounding environment, student participation in on-campus activities, and student involvement in projects or activities in the external community.

Campus operations, on-campus experiences, and outreach and collaborations

According to the nudge theory (Thaler and Sunstein, 2008), ability to manipulate the surrounding environment to orient individuals towards a particular desirable behavior is a fundamental skill for all types of managers. Schultz (2014) identified and described several types of contextual interventions; subsequently, in the *campus operations* category, the authors observed several studies that were consistent with his observations. For example, Cheung et al. (2018) explained that providing recycling bins and publishing posters enhanced the knowledge, attitude, and intended behavior of students regarding waste recycling. Becker and Carmi (2019) demonstrated the effectiveness of parking fees on discouraging the use of cars by students. Similar results were demonstrated by Poortinga and Whitaker (2018), who discussed the effectiveness of charges on disposable cups to promote the use of reusable cups. However, lack of a detailed study on the causative factors of student behavior and whether future programs could solve a particular problem presents a risk of developing ineffective interventions. For example, Mikhailovich and Fitzgerald (2014) estimated that eliminating the use of disposable water bottles from the campus led to unexpected outcomes, such as a decrease in the quantity of water consumed by students.

Participation of students in on-campus activities refers to the *on-campus experiences* category. According to Mazon et al. (2020), a high degree of sustainability within the campus can be achieved only when students are representatives of sustainable practices. However, the authors observed an absence of a “bottom-up” approach, and our results were partially consistent with their findings. Most universities attempted to influence student behavior by encouraging them to participate in “top-down” activities, such as internships programs (Hayles, 2019), cooking workshops (McDonough et al., 2014), mandatory sustainable activities (Felgendreher and Löfgren, 2018), and daily or long-term challenges (Bloodhart et al., 2013; Lambert and Cushing, 2017). However, the authors observed that the involvement of students was evident although it was not closely associated with the “bottom-up” approach as discussed by Mazon et al. (2020). The outcomes (e.g., knowledge acquisition, behavior

change, and development of professional skills, such as critical thinking) were consistent with the *education* category.

Positive results were achieved by focusing on *outreach and collaborations*. Our results indicated that the students of HEIs can increase their knowledge and awareness and improve their skills by undertaking projects in the external community. For example, Mercer et al. (2017) discussed how a new method of game education developed by university students influenced the skills, knowledge, and critical thinking of primary school children and university students. Díaz-Iso et al. (2019) explained how the exposure to real activities enhanced learning of some sustainable development principles among Spanish students. Chen et al. (2020) observed similar results in their study wherein they discussed how foreign exchange programs and involvement in various activities positively influenced the professional identity and career choice intentions of students. Finally, Browne *et al.* (2020) demonstrated that students participation in local or regional projects positively influenced their PEB and critical thinking skills.

1.5 – DISCUSSION

Transition implies a change process with the transformation of a character of the society along institutional, organizational, and socio-cultural dimensions (Markard et al., 2012; Rotmans et al., 2001). Individual behavior is one of the many aspects included in the socio-cultural dimension. If a society intends to achieve sustainability, behavioral changes are required. Moreover, individuals should perceive the future from a new sustainable viewpoint. To foster individuals towards increased sustainable behaviors, old rules and managerial/political practices that have been used until now must be eliminated, and new behavioral strategies must be developed. However, these strategies should not consider only the outcomes but also upstream psychological processes. Without the presence of a holistic approach, a risk of developing ineffective interventions exists.

Presently, the society has created awareness on the necessity of a change in the behavior of individuals. The current economic and social system must be replaced with a system that is based on sustainable development and a circular economy. The Agenda 2030 established in 2015 includes the Sustainable Development Goals (UN 2015) that were designed to foster and guide the entire society through a sustainable transition. Among these, the behavior of individuals plays a key role. HEIs can contribute majorly to achieve a sustainable society since they can act as “change agents” and “co-creators for sustainability” (Peer and Stoeglehner, 2013; Stephens et al., 2008; Trencher et al., 2014). This can be supported by encouraging PEB in students.

The present study indicated that since 2016, HEIs have been actively responding to the need of a sustainable society by developing new managerial strategies that consider both socio-psychological and contextual factors affecting student behavior. Moreover, HEIs are increasing their efforts to understand how to influence student behavior and increasing awareness on how to structure effective campus-based operations. The Agenda 2030 (UN, 2015) played a key role in encouraging HEIs worldwide to act for a

sustainable transition and to develop new innovative and holistic strategies. Subsequently, many institutions increased their efforts to implement sustainable practices within their systems after signing a declaration (Lozano et al., 2015; Ruiz-Mallén and Heras, 2020).

However, the results exhibited a classification similar to that observed by Lozano et al. (2015) and Findler et al. (2019), that is, HEIs focused mainly on assessing students in terms of personal factors (*assessment and reporting* category), understanding the relationships among psychological determinants and their influence on student behavior (*research* category), and planning educational interventions (*education* category). Interventions that consider the surrounding environment (*campus operations*), participation of students in on-campus activities (*on-campus experiences*), and student involvement in projects or activities in the external community (*outreach and collaborations*) were less considered. Thus, a holistic strategy for implementing sustainable development is still lacking. The authors present three possible, but not exhaustive explanations for this gap:

- 1) HEIs are complex systems with concealed internal tensions and contradictions that act as barriers to holistic approaches and sustainable transitions (Hoover and Harder, 2015). According to Hugé et al. (2018), Sánchez (2016), and Blanco-Portela et al. (2017), the main barriers for sustainable development within a university are: a) considering sustainability as an add-on; b) difficulty in acquiring integrative thinking, transdisciplinary learning, and interdisciplinary cooperation; c) absence of leadership, vision, coordination, and government regulations; and d) budgetary constraints, deficient organizational structure, inertia, and resistance.
- 2) HEIs are now beginning to understand that depending only on education to influence student behavior is not sufficient, and a new strategy needs to be developed. However, developing a new strategy takes time and requires a preliminary analysis of the core problem. This could explain the increased focus on the *assessment and reporting* and *research* categories.
- 3) Among the available interventions, HEIs focus mostly on *education* probably because: a) it is their primary aim (Martin, 2012) and b) it is simpler to organize a course on sustainable development or review a curriculum than think and create new innovative methods to influence student behavior. Moreover, all the “active” and contextual interventions are conducted by administrative offices and not published by researchers and professors in scientific journals. Indeed, new effective interventions do require additional work, development of new knowledge, search for economic funds, and can cause bureaucratic difficulties (Blanco-Portela et al., 2017). These barriers could explain the causes for lower number of publications in *campus operations*, *on-campus experiences*, and *outreach and collaborations* than in *education*.

1.6 – CONCLUSIONS

The present research contributes to the development of scientific literature focused on the key role of HEIs in sustainable development. Despite the observed classification and the presence of a “passive” rather than an “active” strategy, the authors believe that HEIs can successfully implement the holistic approach promoted by Agenda 2030 that is necessary for a sustainable transition. Therefore, it is only a matter of time before HEIs would act as leaders in implementing sustainable development in the society by fostering PEBs of students.

Moreover, this study lays the foundation for future research developments. As highlighted previously, the authors focused only on PEBs of students. However, studies that consider other behavioral types (e.g., pro-social) that are indispensable for sustainable development would be valuable. Furthermore, whether the hypotheses developed to explain the observed classification reflects the reality could be investigated. Additionally, in-depth analysis of the topic that focuses on each of the identified categories could be conducted. Finally, future studies could explore and understand the interventions within campuses, as well as the effectiveness, by developing methods and creating a general “guideline” for managers.

REFERENCES

- Abner, M., Baytar, F. and Kreiner, D. (2019), “Applying the ESD approach in textile and apparel education”, *International Journal of Sustainability in Higher Education*, Vol. 20 No. 1, pp. 75–90.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Albareda-Tiana, S., Vidal-Raméntol, S., Pujol-Valls, M. and Fernández-Morilla, M. (2018), “Holistic approaches to develop sustainability and research competencies in pre-service teacher training”, *Sustainability (Switzerland)*, Vol. 10 No. 10, p. 3698.
- Alsaati, T., El-Nakla, S. and El-Nakla, D. (2020), “Level of sustainability awareness among university students in the Eastern province of Saudi Arabia”, *Sustainability (Switzerland)*, Vol. 12 No. 8, pp. 1–15.
- Becker, N. and Carmi, N. (2019), “Changing trip behavior in a higher education institution: The role of parking fees”, *International Journal of Sustainable Transportation*, Taylor & Francis, Vol. 13 No. 4, pp. 268–277.
- Blanco-Portela, N., Benayas, J., Pertierra, L.R. and Lozano, R. (2017), “Towards the integration of sustainability in Higher Education Institutions: A review of drivers of and barriers to organisational change and their comparison against those found of companies”, *Journal of Cleaner Production*, Elsevier Ltd, Vol. 166, pp. 563–578.
- Bloodhart, B., Swim, J.K. and Zawadzki, M.J. (2013), “Spreading the eco-message: Using proactive coping to aid eco-rep behavior change programming”, *Sustainability (Switzerland)*, Vol. 5 No. 4, pp. 1661–1679.
- Byerly, H., Balmford, A., Ferraro, P.J., Hammond Wagner, C., Palchak, E., Polasky, S., Ricketts, T.H., *et al.* (2018), “Nudging pro-environmental behavior: evidence and opportunities”, *Frontiers in Ecology and the Environment*, Vol. 16 No. 3, pp. 159–168.
- Carmichael, C.E. and Handa, N. (2014), “Sustainability literacy counts : raising awareness through a preparatory University program”, *International Journal of Sustainability Education*, Vol. 9 No. 4, pp. 17–29.
- Ceulemans, K., Molderez, I. and Van Liedekerke, L. (2015), “Sustainability reporting in higher education: A comprehensive review of the recent literature and paths for further research”, *Journal of Cleaner Production*, Elsevier Ltd, Vol. 106, pp. 127–143.

- Chen, T.P., Lee, K.Y., Kabre, P.M. and Hsieh, C.M. (2020), “Impacts of educational agritourism on students’ future career intentions: Evidence from agricultural exchange programs”, *Sustainability (Switzerland)*, Vol. 12 No. 22, pp. 1–19.
- Cheung, T.Y., Fok, L., Cheang, C.C., Yeung, C.H., So, W.M.W. and Chow, C.F. (2018), “University halls plastics recycling: a blended intervention study”, *International Journal of Sustainability in Higher Education*, Vol. 19 No. 6, pp. 1038–1052.
- Collins, A., Galli, A., Patrizi, N. and Pulselli, F.M. (2018), “Learning and teaching sustainability: The contribution of Ecological Footprint calculators”, *Journal of Cleaner Production*, Elsevier Ltd, Vol. 174, pp. 1000–1010.
- Connell, K.Y.H. and Kozar, J.M. (2012), “Sustainability knowledge and behaviors of apparel and textile undergraduates”, *International Journal of Sustainability in Higher Education*, Vol. 13 No. 4, pp. 394–407.
- Correia, E., Conde, F., Nunes, R. and Viseu, C. (2020), “Students’ perceptions of HEI regarding environmental sustainability – a comparative analysis”, *International Journal of Sustainability in Higher Education*, Vol. 21 No. 4, pp. 629–648.
- Cortese, A.D. (2003), “The Critical Role of Higher Education in Creating a Sustainable Future”, *Planning for Higher Education*, Vol. 31 No. 3, pp. 15–22.
- Denyer, D. and Tranfield, D. (2009), “Producing a systematic review”, in Buchanan, D. and Bryman, A. (Eds.), *The Sage Handbook of Organizational Research Methods*, Sage, London, pp. 671–689.
- Díaz-Iso, A., Eizaguirre, A. and García-Olalla, A. (2019), “Extracurricular activities in higher education and the promotion of reflective learning for sustainability”, *Sustainability (Switzerland)*, Vol. 11 No. 17, p. 4521.
- Eagle, L., Low, D., Case, P. and Vandommele, L. (2015), “Attitudes of undergraduate business students toward sustainability issues”, *International Journal of Sustainability in Higher Education*, Vol. 16 No. 5, pp. 650–668.
- Felgendreher, S. and Löfgren, Å. (2018), “Higher education for sustainability: can education affect moral perceptions?”, *Environmental Education Research*, Routledge, Vol. 24 No. 4, pp. 479–491.
- Fernández, M., Alférez, A., Vidal, S., Fernández, M.Y. and Albareda, S. (2016), “Methodological approaches to change consumption habits of future teachers in Barcelona, Spain: Reducing their personal Ecological Footprint”, *Journal of Cleaner Production*, Vol. 122, pp. 154–163.
- Findler, F., Schönherr, N., Lozano, R., Reider, D. and Martinuzzi, A. (2019), “The impacts of higher education institutions on sustainable development: A review and conceptualization”, *International Journal of Sustainability in Higher Education*, Vol. 20 No. 1, pp. 23–38.
- Foster, G. and Stagl, S. (2018), “Design, implementation, and evaluation of an inverted (flipped) classroom model economics for sustainable education course”, *Journal of Cleaner Production*, Elsevier Ltd, Vol. 183, pp. 1323–1336.
- Gardner, G.T. and Stern, P.C. (1996), *Environmental Problems and Human Behavior*, Allyn and Bacon.
- Gazzola, P., Pavione, E., Pezzetti, R. and Grechi, D. (2020), “Trends in the fashion industry. The perception of sustainability and circular economy: A gender/generation quantitative approach”, *Sustainability (Switzerland)*, Vol. 12 No. 7, pp. 1–19.
- Gifford, R. and Nilsson, A. (2014), “Personal and social factors that influence pro-environmental concern and behaviour: A review”, *International Journal of Psychology*, Vol. 49 No. 3, pp. 141–157.
- Hallinger, P. and Chatpinyakoo, C. (2019), “A bibliometric review of research on higher education for sustainable development, 1998-2018”, *Sustainability (Switzerland)*, Vol. 11 No. 8, available at: <https://doi.org/10.3390/su11082401>.
- Hay, R. and Eagle, L. (2020), “Impact of integrated sustainability content into undergraduate business education”, *International Journal of Sustainability in Higher Education*, Vol. 21 No. 1, pp. 131–143.
- Hayles, C.S. (2019), “INSPIRE sustainability internships : Promoting campus greening initiatives through student participation”, *International Journal of Sustainability in Higher Education*, Vol. 20 No. 3, pp. 452–469.
- Hoover, E. and Harder, M.K. (2015), “What lies beneath the surface? the hidden complexities of organizational change for sustainability in higher education”, *Journal of Cleaner Production*, Vol. 106 No. February, pp. 175–188.
- Hoyle, R. H. (1995). *The structural equation modeling approach: Basic concepts and fundamental issues*.
- Hugé, J., Mac-Lean, C. and Vargas, L. (2018), “Maturation of sustainability in engineering faculties – From emerging issue to strategy?”, *Journal of Cleaner Production*, Vol. 172, pp. 4277–4285.
- Kaloom, Q. and Khanam, A. (2017), “Inquiry into sustainability issues by preservice teachers: A pedagogy to enhance

- sustainability consciousness”, *Journal of Cleaner Production*, Vol. 164, pp. 1301–1311.
- Karatzoglou, B. (2013), “An in-depth literature review of the evolving roles and contributions of universities to Education for Sustainable Development”, *Journal of Cleaner Production*, Elsevier Ltd, Vol. 49, pp. 44–53.
- Kemp, R., Loorbach, D. and Rotmans, J. (2007), “Transition management as a model for managing processes of co-evolution towards sustainable development”, *International Journal of Sustainable Development and World Ecology*, Vol. 14 No. 1, pp. 78–91.
- Lambert, M. and Cushing, K.K. (2017), “How low can you go?: Understanding ecological footprint reduction in university students, faculty and staff”, *International Journal of Sustainability in Higher Education*, Vol. 18 No. 7, pp. 1142–1156.
- Liao, C. and Li, H. (2019), “Environmental education, knowledge, and high school students’ intention toward separation of solid waste on campus”, *International Journal of Environmental Research and Public Health*, Vol. 16 No. 9, available at:<https://doi.org/10.3390/ijerph16091659>.
- Lindenberg, S. and Steg, L. (2007), “Normative, gain and hedonic goal frames guiding environmental behavior”, *Journal of Social Issues*, Vol. 63 No. 1, pp. 117–137.
- Lozano, R., Ceulemans, K., Alonso-Almeida, M., Huisingh, D., Lozano, F.J., Waas, T., Lambrechts, W., *et al.* (2015), “A review of commitment and implementation of sustainable development in higher education: Results from a worldwide survey”, *Journal of Cleaner Production*, Vol. 108, pp. 1–18.
- Lozano, R., Lozano, F.J., Mulder, K., Huisingh, D. and Waas, T. (2013), “Advancing Higher Education for Sustainable Development: International insights and critical reflections”, *Journal of Cleaner Production*, Vol. 48, pp. 3–9.
- Markard, J., Raven, R. and Truffer, B. (2012), “Sustainability transitions: An emerging field of research and its prospects”, *Research Policy*, Elsevier B.V., Vol. 41 No. 6, pp. 955–967.
- Martin, B.R. (2012), “Are universities and university research under threat? Towards an evolutionary model of university speciation”, *Cambridge Journal of Economics*, Vol. 36 No. 3, pp. 543–565.
- Mazon, G., Pereira Ribeiro, J.M., Montenegro de Lima, C.R., Castro, B.C. and Andrade Guerra, J.B.S.O. de A. (2020), “The promotion of sustainable development in higher education institutions: top-down bottom-up or neither?”, *International Journal of Sustainability in Higher Education*, No. August, available at:<https://doi.org/10.1108/IJSHE-02-2020-0061>.
- McDonough, T., Hendrickson-Nelson, M. and Plourde, H. (2014), “Modifying Students’ Intentions to Eat Sustainably”, *The International Journal of Sustainability Education*, Vol. 9 No. 2, pp. 31–49.
- Mercer, T.G., Kythreotis, A.P., Robinson, Z.P., Stolte, T., George, S.M. and Haywood, S.K. (2017), “The use of educational game design and play in higher education to influence sustainable behaviour”, *International Journal of Sustainability in Higher Education*, Vol. 18 No. 3, pp. 359–384.
- Merritt, E., Hale, A. and Archambault, L. (2018), “Changes in pre-service teachers’ values, sense of agency, motivation and consumption practices: A case study of an education for sustainability course”, *Sustainability (Switzerland)*, Vol. 11 No. 1, p. 155.
- Migliorini, P., Wezel, A., Veromann, E., Strassner, C., Średnicka-Tober, D., Kahl, J., Bügel, S., *et al.* (2020), “Students’ knowledge and expectations about sustainable food systems in higher education”, *International Journal of Sustainability in Higher Education*, Vol. 21 No. 6, pp. 1087–1110.
- Mikhailovich, K. and Fitzgerald, R. (2014), “Community responses to the removal of bottled water on a university campus”, *International Journal of Sustainability in Higher Education*, Vol. 15 No. 3, pp. 330–342.
- Mosher, H.R. and Desrochers, M. (2014), “The effects of information regarding sustainability issues and behavioral self-management instruction on college students’ energy conservation”, *International Journal of Sustainability in Higher Education*, Vol. 15 No. 3, pp. 359–370.
- Navarro, V., Martínez, O., Miranda, J., Rada, D., Bustamante, M.Á., Etaio, I., Lasa, A., *et al.* (2020), “Including aspects of sustainability in the degree in Human Nutrition and Dietetics: An evaluation based on student perceptions”, *Journal of Cleaner Production*, Vol. 243, available at:<https://doi.org/10.1016/j.jclepro.2019.118545>.
- Naz, F., Oláh, J., Vasile, D. and Magda, R. (2020), “Green purchase behavior of university students in Hungary: An empirical study”, *Sustainability (Switzerland)*, Vol. 12 No. 23, pp. 1–21.

- Nikolic, V., Vukic, T., Maletaski, T. and Andevski, M. (2020), “Students’ attitudes towards sustainable development in Serbia”, *International Journal of Sustainability in Higher Education*, Vol. 21 No. 4, pp. 733–755.
- Pearson, E., Dorrian, J. and Litchfield, C. (2011), “Harnessing visual media in environmental education: Increasing knowledge of orangutan conservation issues and facilitating sustainable behaviour through video presentations”, *Environmental Education Research*, Vol. 17 No. 6, pp. 751–767.
- Peer, V. and Stoeglehner, G. (2013), “Universities as change agents for sustainability-framing the role of knowledge transfer and generation in regional development processes”, *Journal of Cleaner Production*, Elsevier Ltd, Vol. 44 No. 2013, pp. 85–95.
- Qu, Z., Huang, W. and Zhou, Z. (2020), “Applying sustainability into engineering curriculum under the background of ‘new engineering education’ (NEE)”, *International Journal of Sustainability in Higher Education*, Vol. 21 No. 6, pp. 1169–1187.
- Rockström, J., W. Steffen, K. Noone, Å. Persson, F. S. Chapin, E. F. Lambin, T. M. Lenton, *et al.* (2009), “A safe operation space for humanity”, *Nature*, Vol. 461 No. September, pp. 472–475.
- Rotmans, J., Kemp, R. and Van Asselt, M. (2001), *More Evolution than Revolution: Transition Management in Public Policy, Foresight*, Vol. 3, available at:<https://doi.org/10.1108/14636680110803003>.
- Ruiz-Mallén, I. and Heras, M. (2020), “What sustainability? Higher Education Institutions’ pathways to reach the Agenda 2030 goals”, *Sustainability (Switzerland)*, Vol. 12 No. 4, available at:<https://doi.org/10.3390/su12041290>.
- Sánchez, J.G. (2016), “Universities in transition: Overcoming barriers and creating pathways for sustainability”, *University Engagement and Environmental Sustainability*, pp. 61–73.
- Savelyeva, T. and Douglas, W. (2017), “Global consciousness and pillars of sustainable development: A study on self-perceptions of the first-year university students”, *International Journal of Sustainability in Higher Education*, Vol. 18 No. 2, pp. 218–241.
- Schultz, P.W. (2014), “Strategies for promoting proenvironmental behavior: Lots of tools but few instructions”, *European Psychologist*, Vol. 19 No. 2, pp. 107–117.
- Sherif, M. (1966), *In Common Predicament: Social Psychology Of intergroup Conflict and Cooperation.*, Houghton Mifflin comp.
- Sidiropoulos, E. (2018), “The personal context of student learning for sustainability: Results of a multi-university research study”, *Journal of Cleaner Production*, Vol. 181, pp. 537–554.
- Steg, L. and Vlek, C. (2009), “Encouraging pro-environmental behaviour: An integrative review and research agenda”, *Journal of Environmental Psychology*, Elsevier Ltd, Vol. 29 No. 3, pp. 309–317.
- Stephens, J.C. and Graham, A.C. (2010), “Toward an empirical research agenda for sustainability in higher education: exploring the transition management framework”, *Journal of Cleaner Production*, Elsevier Ltd, Vol. 18 No. 7, pp. 611–618.
- Stephens, J.C., Hernandez, M.E., Román, M., Graham, A.C. and Scholz, R.W. (2008), “Higher education as a change agent for sustainability in different cultures and contexts”, *International Journal of Sustainability in Higher Education*, Vol. 9 No. 3, pp. 317–338.
- Stern, P.C., Dietz, T., Abel, T., Guagnano, G.A. and Kalof, L. (1999), “A value-belief-norm theory of support for social movements: The case of environmentalism”, *Human Ecology Review*, Vol. 6 No. 2, pp. 81–97.
- Terrón-López, M.J., Velasco-Quintana, P.J., Lavado-Anguera, S. and del Carmen Espinosa-Elvira, M. (2020), “Preparing sustainable engineers: A project-based learning experience in logistics with refugee camps”, *Sustainability (Switzerland)*, Vol. 12 No. 12, pp. 1–17.
- Testa, F., Pretner, G., Iovino, R., Bianchi, G., Tessitore, S. and Iraldo, F. (2020), *Drivers to Green Consumption: A Systematic Review, Environment, Development and Sustainability*, Springer Netherlands, available at:<https://doi.org/10.1007/s10668-020-00844-5>.
- Thaler, R.H. and Sunstein, C.R. (2008), *Nudge: Improving Decisions about Health, Wealth, and Happiness*, Yale University Press.

- Ting, D.H. and Cheng, C.F.C. (2017), “Developing pro-environmental behaviour: ecotourism fieldtrip and experiences”, *International Journal of Sustainability in Higher Education*, Vol. 18 No. 7, pp. 1212–1229.
- Tranfield, D., Denyer, D. and Smart, P. (2003), “Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review”, *British Journal of Management*, Vol. 14 No. 3, pp. 207–222.
- Trencher, G., Yarime, M., McCormick, K.B., Doll, C.N.H. and Kraines, S.B. (2014), “Beyond the third mission: Exploring the emerging university function of co-creation for sustainability”, *Science and Public Policy*, Vol. 41 No. 2, pp. 151–179.
- Tripathi, A. and Singh, M.P. (2016), “Determinants of sustainable/green consumption: A review”, *International Journal of Environmental Technology and Management*, Vol. 19 No. 3–4, pp. 316–358.
- Truelove, H.B. and Gillis, A.J. (2018), “Perception of pro-environmental behavior”, *Global Environmental Change*, Elsevier Ltd, Vol. 49 No. February, pp. 175–185.
- UN. (1992), “UN Conference on Environment and Development - Agenda 21”, Rio de Janeiro, available at: <https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf>.
- UN. (2015), “Transforming our world: the 2030 Agenda for sustainable development”, available at: [https://sustainabledevelopment.un.org/content/documents/21252030 Agenda for Sustainable Development web.pdf](https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf).
- Vlek, C.A.J. and Steg, L. (2007), “Human behavior and environmental sustainability: Problems, driving forces, and research topics”, *Journal of Social Issues*, Vol. 63 No. 1, pp. 1–19.
- Watson, L., Johnson, C., Hegtvædt, K.A. and Parris, C.L. (2015), “Living green: Examining sustainable dorms and identities”, *International Journal of Sustainability in Higher Education*, Vol. 16 No. 3, pp. 310–326.
- Yeung, S.K., So, W.M.W., Cheng, N.Y.I., Cheung, T.Y. and Chow, C.F. (2017), “Comparing pedagogies for plastic waste management at university level”, *International Journal of Sustainability in Higher Education*, Vol. 18 No. 7, pp. 1039–1059.
- Yu, T.Y., Yu, T.K. and Chao, C.M. (2017), “Understanding Taiwanese undergraduate students’ pro-environmental behavioral intention towards green products in the fight against climate change”, *Journal of Cleaner Production*, Elsevier Ltd, Vol. 161, pp. 390–402.

CHAPTER 2

WHAT MAKES HOT BEVERAGE VENDING MACHINE CUPS ECO-FRIENDLY? A RESEARCH INTO CONSUMER VIEWS AND PREFERENCES

by

Alberto Bertossi, Stefania Troiano, and Francesco Marangon

under review at the

“International Journal of Consumer Studies”

2.1 – ABSTRACT

Single-use packaging have largely dominated our economy, causing huge environmental impacts. Therefore, global, as well as European regulations, urge supply chains to develop new eco-friendly materials to orient the production and consumption toward a circular framework. However, it is also important to investigate consumers’ perceptions and preferences over these new solutions. The present research study focused on single-use cups for hot beverages served at vending machines and aimed: 1) to explore university students’ opinions on what intrinsic and extrinsic attributes a generic cup should possess to be perceived as eco-friendly; 2) to investigate, by making use of a choice experiment, how some intrinsic and extrinsic eco-friendly attributes of a real plastic cup dispensed by vending machines placed within the University of Udine (Italy) influenced students’ purchase decision and willingness to pay for a hot beverage. For both studies, results indicate that intrinsic and extrinsic attributes play a key role in shaping consumers’ perceptions, purchase choices, and willingness to pay. The analyses demonstrated that students are attracted by the idea of a cup (even if made by plastic) that communicates its environmental properties through corresponding labels and information, and it’s made by materials that guarantee biodegradability, recyclability, or reusability. These findings are in line with previous studies investigating the role of packaging attributes in consumers’ food and beverage preferences. Moreover, they can be useful for both vending operators that want to improve their business towards more sustainable aspects, and plastic manufacturers to contribute to a new circular economy for plastic items.

2.2 – INTRODUCTION

The vending sector in Europe is a growing food and beverages market, with a total revenue of €17.2 billion in 2019. There are approximately 4.3 million vending machines (VMs) around Europe, of which

1.5 million are hot drinks free-standing VMs, that is, all machines positioned in private or public spaces serve hot beverages (mainly coffee, tea, chocolate, or milk-based specialties), and in which the cup is dispensed automatically with the final drink.¹ The main function of these machines is to serve take-away hot drinks in single-use cups (which are a specific type of packaging made of plastic or paper coupled with plastic coating) suitable for easy drinking, with no technical or health risks for consumers. It has been estimated that in 2019, the average number of hot beverages served by a single machine per week in Europe was above 200, and that hot beverages' revenue was equal to €11 billion (corresponding to nearly 65% out of the total European vending revenue). Greece uses 600 million single-use coffee cups per year, and this number increases in Germany, reaching 2.8 billion disposable cups with an average lifespan of 15 minutes (Miller et al., 2019). Overall, over 500 billion hot beverages served within plastic and paper single-use cups are consumed annually worldwide (UNEP, 2021), with huge environmental consequences. The 2.8 billion disposable cups create nearly 28,000 tons of waste in Germany (representing 10-15% of the total volume of public waste bins), while less than 1% of the 3 billion cups used in the United Kingdom is recycled (Miller et al., 2019). Mismanagement of the ever-increasing number of disposable wastes, coupled with low recycling rates due to material properties (both for plastic and paper) (UNEP, 2021), has resulted in these single-use cups becoming one of the ten most commonly found litter items on beaches around the world (Ocean Conservancy, 2020). This fact is true especially for plastic cups, whose low degradation rate (Chamas et al., 2020) makes them highly persistent in the environment (Ali et al., 2021; Lebreton et al., 2018). Regarding paper cups, 16 billion disposable polythene-coated (PE-coated) paper cups are used each year, resulting in 6.5 million trees being cut down and 4 billion gallons of water used annually (Suskevics and Grönman, 2019). Witnessing the creation of what is commonly known as the "Great Pacific Garbage Patch" (Lebreton et al., 2018), destruction of marine and terrestrial ecosystems and impacts on industries like tourism, fishing, and shipping (UNEP, 2021), has prompted the global community to plan effective strategies to transform the single-use items economy into a new model, in line with the circular economy principles. Put simply, the circular economy is about designing products in such a way that the materials can be continuously and safely recycled into new materials or products having properties equivalent to those of the original material (Bocken et al., 2016). For example, at a global level, Resolution 9 of the Fourth United Nations Environment Assembly held in 2019 encouraged member states to act 1) to design new eco-friendly and resource-efficient alternatives to single-use plastic products and packaging; 2) to define the rules of a new economic model that encourages the consumption of sustainable items; 3) to raise consumers' awareness of the importance of sustainable consumption and on the sustainable alternatives to single-use plastic products and packaging. Similarly, the European Commission issued the "European strategy for plastics in a circular economy" (European Commission, 2018) and the Directive 904/2019 (also known as "single-use plastic directive"). Both regulations define the future European scenarios for plastic economy, where design and production of items fully respect the needs of reuse, repair, and

¹ Info provided by the European Vending & Coffee Service Association

recycling. In particular, the entire supply chains are called to rethink, improve, and implement sustainable packaging design solutions; to stop the production of some single-use items made of fossil resources in favor of innovative and alternative materials to guarantee the achievement of higher recyclability rates by 2030; and to greater responsibility and commitment in raising consumer awareness. Although the Directive 904/2019 did not focus on banning disposable plastic cups for hot beverages, but only on a reduction of their production and sale to be achieved by 2026, vending sector should not underestimate the challenges posed by the European Union regulations mentioned above (European Commission, 2018), and invest in developing sustainable cups design solutions to increase recyclability or reusability (Bocken et al., 2016; Heidbreder et al., 2019). The same reasoning is valid for paper cups as well. Indeed, even if they are not made of fossil resources, the hydrophilic nature and porosity of paper makes it necessary to coat it with other materials, such as plastic, in turn, making the recycling process more difficult and inefficient (Otto et al., 2021; UNEP, 2021).

To contribute to the achievement of a “Sustainable Consumption Transition” (SCT) condition, defined by Tseng et al (2020) as *“a complex process of transitioning from unsustainable consumption to sustainable consumption to ensure environmental friendliness while maintaining and enhancing the quality of life for future generations”*, circular supply chains must not just consider the various production and distribution processes, but also the consumption processes (Kirchherr et al., 2017). However, although consumer has been recognized as the sustainable business models’ most central enabler, and the key to the success of SCT (Tseng et al, 2020), “little is known about its’ willingness to participate in a circular economy” (Kirchherr et al., 2017), because many organizations are yet to adopt a market-oriented perspective (Lemke and Luzio, 2014). According to the literature, consumers are still often skeptical about eco-friendly products and packaging (Lemke and Luzio, 2014), and this prevents them from purchasing these products (Goh and Balaji, 2016; Nguyen et al., 2019). One of the reasons for this skepticism is that, consumers are unable to perceive whether a product is sustainable due to the fact that firms fail to both translate consumers’ perceptions into products attributes, and to communicate these eco-friendly properties clearly and efficiently (Lemke and Luzio, 2014; Tseng and Hung, 2013; Tseng et al, 2020). Failing to meet consumers’ perceptions of a product’s eco-friendly quality negatively influence their expectations and, in turn, purchase decisions of that product (Tseng and Hung, 2013). However, the opposite of this, making consumers perceive the ecological characteristics of a product can satisfy their expectations and push them to purchase it, is also true (Steenis et al., 2018). An economic model, in line with SCT principles, can be considered complete and efficient only if consumers’ purchase decisions shift from conventional to sustainable products by making products’ sustainability more salient and perceptible (Tseng et al, 2020). Therefore, it is fundamental to listen to consumers’ opinions and investigate their preferences over these new eco-friendly solutions. Investigating how consumers perceive products should be viewed as important data, that could be used to detect issues and for providing better alternatives (Lemke and Luzio, 2014).

2.2.1 Aim of the research study

The present research study is placed within this framework, and it aims to contribute to the development of academic knowledge on vending sector in two ways:

1) by exploring university students' opinions on what attributes a generic cup for hot beverage should possess to be perceived as eco-friendly.

2) by examining, through a choice experiment, how some attributes of a generic hot beverages (i.e. cup intrinsic and extrinsic attributes, and sale price of the beverage) could influence students' purchase decision and willingness to pay (WTP) for that beverage dispensed by VMs placed within a university campus.

The research has been performed at an Italian university campus (i.e. the University of Udine), since Italy is the largest vending market around the world, with more than 800.000 vending machines located in public and private spaces, especially universities. Therefore, it represents the perfect market where valuable information for the sustainable development of the sector can be obtained.

An original aspect of this research is to fill the gap left by previous and current studies on vending sector, still too much focused on exploring how to increase individuals' consumptions of healthy products (e.g., Grech and Allman-Farinelli, 2015; Hua and Ickovics, 2016). Despite in literature three studies that discuss cups for hot beverages exist (Piqueras-Fiszman and Spence (2012) about the influence of the color of the cup on consumers' perceptions; Potting and van der Harst (2015) and UNEP (2021) about the environmental impacts of single-use cups), our research represents the first academic attempt to provide to vending operators, as well as public and private institutions that rely on the service, a consumers' viewpoint on the importance of eco-friendly attributes of cups for hot beverages able to influence consumers' perceptions and consumption choices of beverages. As it will deeply discussed, when consumers purchase food products (in this case, hot beverages), their decision rely on how much quality and value they perceive through beverage intrinsic and extrinsic attributes (Symmank, 2019), among them eco-friendly packaging.

This study is organized as follows. Section 1 discusses the gaps and study objectives. Section 2 reviews the theoretical background on the role of perceptions and products' attributes in consumers' decisions. Section 3 explains the method and data analysis. Section 4 discusses the results. Section 5 presents the contributions of the study for both theory and practice. Finally, Section 6 presents a conclusion and the study's limitations.

2.3 - THEORETICAL BACKGROUND

2.3.1 - Role of perceptions and products' attributes

Sustainable consumption implies the use of products and goods that minimize the environmental impacts along their life cycle (Paul et al., 2016). Such products are known as green products (Dangelico and Pontrandolfo, 2010), and their consumption is influenced by many factors, both personal and contextual (Tripathi and Singh, 2016). However, the product itself plays a key role in consumption dynamics. Put simply, purchase decisions rely on how far consumers are able to perceive the product's benefits (in this case, environmental benefits) in terms of quality and values through its intrinsic and extrinsic attributes (Zeithaml, 1988; Steenkamp, 1990). Only by making these attributes more salient consumers' perceptions of benefits and, consequently, their purchase intentions can be positively influenced. This is valid for many types of products (de Medeiros et al., 2016; Sharma and Foropon, 2019), among them food products (Symmank, 2019). About intrinsic food products attributes, academic literature identified appearance, smell, taste, and texture, while brand, claims, product information, labels, packaging, and price constitute extrinsic attributes (Symmank, 2019).

Below, we will discuss how two extrinsic attributes, that is packaging with eco-friendly attributes and sale price, can influence consumers' perceptions and purchase decisions of food products

2.3.2 - Green packaging attributes

According to the recent literature review by Ketelsen et al (2020), consumers generally show positive attitudes and preferences towards food products with eco-friendly packaging. Eco-friendly packaging is designed to minimize environmental impacts along its life cycle, just like green products. It is difficult to provide a holistic definition of green packaging, since it should embrace both industrial and consumer views, which often don't correspond (Zeng and Durif, 2019). To align with the framework proposed by Zeithaml (1988), we considered only consumers' view by making use of the definition as well as the classification of attributes proposed by Magnier and Crié (2015), who describe green packaging as one that evokes explicitly or implicitly the product's eco-friendliness via its intrinsic and extrinsic attributes.

2.3.2.1 - Intrinsic attributes

Intrinsic attributes are those associated with the structure of a material—size, weight and shape, type and quantity, and properties (Magnier and Crié, 2015). The literature shows that consumers perceive as green those packaging that: are composed of recycled, recyclable, biodegradable or bio-based materials (Boesen et al., 2019; Jerzyk, 2016; Magnier and Crié, 2015; Scott and Vigar-Ellis, 2014; Sijtsema et al., 2016; Zeng and Durif, 2019); are made of paper (Lindh et al., 2016; Nguyen et al., 2020) or glass (Boesen et al., 2019); and, present a size appropriate for the product and reduce over-packaging (Magnier and Crié, 2015; Zeng and Durif, 2019). The perception of these attributes may positively influence consumers' purchase intentions of daily products (Magnier and Crié, 2015; Steenis et al.,

2018), as well as of food products (Lindh et al, 2016; Ketelsen et al, 2020). As for the material, despite plastic is perceived as a highly impactful one (Boesen et al., 2019; Lindh et al., 2016; Steenis et al., 2017), consumers tend to evaluate it positively if it possesses some eco-friendly attributes, such as recyclability (Orset et al., 2017).

2.3.2.2 - Extrinsic attributes

Extrinsic attributes are associated with the graphic (i.e. type of color, images, logos or symbols) and relevant information (i.e. environmental labeling, general environmental claims, disposal information) (Magnier and Crié, 2015), and are important for consumers to perceive packaging as green, as well as to influence their purchase decisions of food products (Ketelsen et al, 2020). Literature shows that green packages should be visually appealing (Nguyen et al., 2020), with white/brown or dull colors (Boz et al., 2020; Herbes et al., 2020; Scott and Vigar-Ellis, 2014), and images showing nature or environmental protection (Magnier and Crié, 2015) and logos (Herbes et al., 2020; Smith and Brower, 2012; Songa et al., 2019). It is difficult for consumers to perceive environmental qualities in packaging based on color and images alone, especially if the design is conventional. To overcome this barrier, graphics should be supported by information (Magnier and Crié, 2015). Wensing et al. (2020) demonstrated how environmental information congruent with labels led consumers to perceive packaging containing cherry tomatoes as more innovative, healthy, natural, and eco-friendly. Similarly, Kao and Du (2020) found consumers were more willing to buy a product if high-quality arguments complement the message from the images. The literature makes it seem that only detailed (Wensing et al., 2020), verbal (Gleim et al., 2013) and congruent (Magnier and Schoormans, 2015) environmental information has the power to influence consumers' perceptions (Tseng et al, 2020). It is also important to use claims to involve consumers into the products' life cycle (Narula and Desore, 2016) and to make them feel like actors contributing to sustainable changes (Iraldo and Melis, 2020).

2.3.3 - Product price and willingness to pay

Besides the packaging eco-friendly attributes identified by Magnier and Crié (2015), there is another product attribute that may shape consumers' purchase decisions of food and beverages, such as the price (Boz et al., 2020; Symmank, 2019), whose role in consumer decision-making is controversial. For example, according to Martinho et al. (2015) and van Birgelen et al. (2009), consumers are more willing to purchase a product with green packaging as long as the price feature is fulfilled (i.e. only if price remains unchanged). On the contrary, Hao et al. (2019) found that price plays a minor role in consumers decisions compared to other factors. In general, consumers are more willing to pay a price premium for food products, and it seems that eco-friendly intrinsic and extrinsic attributes of packaging may play a key role (Ketelsen et al., 2020). In their work, Klaiman et al. (2016) found that packaging recyclability

(an intrinsic attribute) positively influenced consumers' WTP for fruit juices, with the highest value for plastic. Similar evidence has been found by Orset et al. (2017) regarding water contained in recyclable plastic bottles. In parallel, Wensing et al. (2020) discovered that the use of labels combined with video and texts (extrinsic attributes) had the strongest positive effect on consumers' WTP for cherry tomatoes among different strategies.

2.4 – METHODS

A two-part questionnaire was developed during 2020, tested in February 2021, and emailed in March 2021 to both undergraduate and master's degree students of the University of Udine in northern Italy. The first part of the survey included general socio-demographic questions (e.g. gender, age, field of study). The second included several questions targeted at 1) exploring students' opinions on the attributes a cup for hot beverages should possess to be perceived as eco-friendly, and 2) determining how such eco-friendly attributes influence the purchase decision and WTP for the beverage dispensed in that cup (choice experiment). Before the submission, the entire questionnaire has been evaluated and accepted by the ethics review board being part of the Public Relations Office of the University to guarantee the maintenance of privacy of each student.

2.4.1 - *Study 1 – cup attributes*

To investigate what properties a cup for hot beverages should possess to be perceived as eco-friendly, students were asked to assign a score to each of the intrinsic/extrinsic attributes shown in the questionnaire using a 5-point Likert scale ranging from 1 = unimportant to 5 = very important), as shown in Table 1 and Appendix A. For choosing the attributes, we referred to Magnier and Crié (2015).

Type	Attribute
Intrinsic	Small dimensions
	Less material
	Recycled material
	Recyclable material
	Biodegradable material
	Reusable material
Extrinsic	Color
	Images of nature or landscapes
	Eco-labels type 1
	Eco-labels type 2
	Information supporting eco-labels
	Disposal info
	NGO approval
	General environmental info

Table 1 - Intrinsic and extrinsic attributes chosen to investigate students' perceptions

2.4.2 - Study 2 – Choice experiment

In the theoretical background, it was discussed how consumers' perceptions, preferences, and purchase decisions of food products depend on many factors (Symmank, 2019), among them eco-friendly intrinsic/extrinsic attributes of packaging, and the sale price of the product. Moreover, packaging eco-friendly attributes seem to also have the power to influence consumers to pay a premium for the food product served within that packaging.

When faced with several products with different attributes, consumers will choose the one with a combination of attributes they perceive as the most able to maximize their utility. This is the foundation of the Lancasterian demand theory (Lancaster, 1966) on which choice experiments (CE) are based. By approximating consumers' real-world purchasing behavior, CE has proved very useful in economic research for estimating consumer evaluations and preferences for specific attributes of consumer goods (Luce, 1959; McFadden, 1974) and connecting individuals' WTP to each attribute (Hanley et al., 1998). In particular, it allows to investigate the type of preferences by making use of econometric models, especially Multinomial Logit Model (MNL) and Latent Classes Model (LCM). MNL permits to obtain a first overview of responses by considering them as homogeneous, that is assuming no differences among consumers. Despite its mathematical simplicity of estimation, the MNL model has quite restrictive assumptions, which may not realistically portray the choice making process by consumers when faced with choice tasks on various alternatives of goods and services (Train, 1998). Imposing an assumption of preference and response homogeneity when, in fact, there is heterogeneity results in biased and inconsistent parameters and choice probability estimates. That's why a MNL analysis could

be followed by a LCM analysis, which considers consumers' responses as heterogeneous, enables estimation of unbiased and consistent models, and improves the accuracy and reliability of analytical results (Greene, 2003).

CE has been used to investigate consumers attitudes toward organic products (Cosmina, 2016; Gallenti et al., 2016; Troiano et al., 2016) and food markets (Stöckigt et al., 2018). However, from the scant literature on green packaging (Klaiman et al., 2017, 2016; Wensing et al., 2020), we didn't find any study that explores consumers' preferences for hot beverages served within eco-friendly cups by using this methodology. Therefore, with this study we aimed to fill this gap. For the experiment, we imagined a hypothetical market for goods. Consumers were faced with a different number of scenarios for several goods, each of them characterized by a combination of attributes. Our CE focused on buying a hot beverage (i.e. coffee, tea, chocolate, or milk specialties) served in real plastic cups with eco-friendly attributes dispensed by VMs placed within the university. By means of a fractional factorial orthogonal design (see similar studies, such as Marangon et al (2016) and Cosmina et al (2016)), 18 alternatives (or profiles) were selected. Six scenarios were prepared, each containing four alternatives: three showing a cup with a specific combination of attributes, and a no-choice option. During the experiment, students were asked to imagine buying a hot beverage from a VM and choosing the cup with the combination of attributes they preferred. For choosing the attributes, we relied on the information provided by the manufacturer about the ecological properties of the cup and on the results obtained through a focus group. Second, we referred to Magnier and Crié (2015) to classify these attributes as intrinsic or extrinsic and identified 2-3 levels for each attribute (Table 2). To help students during the decision-making process, a brief explanation of the environmental aspects of each attribute and corresponding levels was given to them before the experiment (see Appendix A).

The first attribute we focused on is type of material, an intrinsic attribute of packaging. In their work, Magnier and Crié (2015) do not refer to specific materials (i.e. plastic or paper) but only to their ecological properties (e.g. recyclable, or made from renewable resources). For the purpose of the experiment, we went beyond their research and focused on plastic, since it is the only material of the cups dispensed by the VMs placed within the University of Udine. The two identified levels refer to the type of plastic used: 1) innovative, ecological, and recyclable mix of plastic and natural mineral salts, and 2) traditional recyclable plastic.

The second attribute is labels, an extrinsic attribute of packaging. According to Magnier and Crié (2015), there are two types of labels: labels as logos (i.e. graphical cues), and environmental labels (i.e. informational cues). The type of labels we included in the experiment correspond to graphical cues, that is “recyclable” and “low carbon emissions” logos. We also included a third level showing the combination of the previous two (i.e. recyclable + low carbon emissions).

The third and fourth attributes concern environmental information, an extrinsic attribute. The first type of information we included was about the environmental properties of the cup, that is “recyclable through an innovative recycling system,” “40% CO₂ emissions saving during production,” and a

combination of both. The second type of information relates to which environmental project can be supported through the purchase of a beverage dispensed in that cup: “protecting and safeguarding of local hives,” and “replanting of trees in Kenya or Ecuador”. We chose this last attribute since the vending operator who manages the service within the university declared to support these two types of projects with sales of hot beverages. Even if the both types of information had not been identified by Magnier and Crié (2015), they could be considered as “general environmental claims.”

The fifth and last attribute we chose for the experiment is the sale price of the beverage dispensed with that cup, identified by three levels: 0.05€, 0.10€, and 0.15€. Price is an essential element in a CE, since it allows estimating the WTP for each attribute level by dividing the coefficients of each attribute level (β) by the price attribute coefficient (β_{price}):

$$WTP = -\beta/\beta_{price}$$

To simplify the decision-making process and reduce the stress of choosing among four alternatives in each choice set, each attribute level was described using words, images, or symbols (Figure 1).

2.4.3 - Data analysis

The CE data were analyzed using Nlogit6© software, relying both on a multinomial logit (MNL) model and a latent class model (LCM). The first considers respondents’ preferences as homogeneous and has been used to gain a first explorative view of the results. The second considers respondents’ preferences as heterogeneous, and is extremely useful to deeply explore consumers’ preferences for cup attributes and their differences in decision strategies (Mcfadden and Train, 2000).

Attribute	Levels
Price (€/cup)	0,05€; 0,1€; 0,15€
Material	Recyclable plastic; mix of plastic and mineral salts
Eco-labels	Low carbon (LC); 100% Recyclable (Re); LC + Re
Eco-info	-40% CO ₂ ; Innovative recycling system (IRS); -40% CO ₂ + IRS
Eco-project	Safeguard of local hives; Replanting trees in Kenya or Ecuador

Table 2 - Cup attributes and their corresponding levels identified for the CE












GROUP 1	A	B	C	D
				
Price (€/cup)	0,05€	0,1€	0,15€	
Material	Recyclable plastic	Mix of plastic and mineral salts	Mix of plastic and mineral salts	NONE OF THE ALTERNATIVES
Eco-labels				
Eco-info	-40% CO ₂		-40% CO ₂ 	
Eco-project				
Choose your favorite alternative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 1 - Graphical example of a choice set

2.5 - RESULTS

In the entire month during which the questionnaire was available online, 618 complete responses were obtained. Respondents were mainly bachelor students (n = 416; 67%), mainly female (n = 415; 67%), more than half aged around 19–22 (n = 345; 56%) and enrolled in "Agricultural sciences" (22%), "Economy" (15%), and "Modern languages" (14%) courses (Table 3).

Data	Number of respondents	Percentage
Gender		
Male	199	32%
Female	415	67%
Academic position		
Bachelor student	416	67%
Master student	202	33%
Age		
19-22	345	56%
23-26	168	27%
27-30	47	8%
30 +	58	9%
Field of study		
Agricultural sciences	135	22%
Economy	91	15%
Modern languages	88	14%
Medicine	83	13%
Engineering and architecture	76	12%
Arts and cultural heritage	75	12%
Mathematics and physics	49	8%
Law	16	3%
Biotechnology	5	1%

Table 3 - Socio demographic characteristics of respondents

2.5.1 - Students' perceptions of cup attributes

When students were asked about the attributes they considered most important to consider a cup for hot beverages eco-friendly, post-consumption properties (i.e. intrinsic attributes) occupied the first four places in the ranking (Fig. 2). Indeed, for more than 80% of respondents, it was “important” and “very important” that a cup is made of a biodegradable, recyclable, or recycled material. Reusable material occupies the fourth position, and is considered “important” and “very important” by 67% of respondents. The remaining intrinsic attributes regarding structure (i.e. "less material" and "small dimensions") are perceived definitely as less important.

As for extrinsic attributes, the presence of disposal information, eco-labels (type 1 and 2), environmental information, and NGO approval is perceived mainly as "important" and "moderately important" rather than "very important". In the end, the remaining extrinsic attributes (i.e. images and color) are considered by 58% and 64% of respondents as “slightly important” and “unimportant,” respectively.

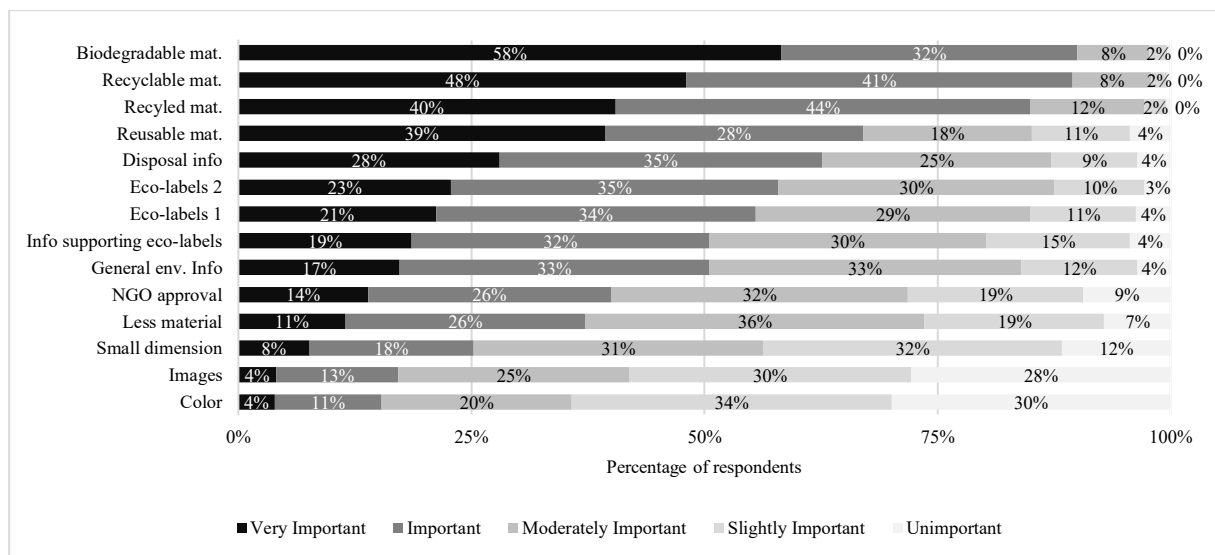


Figure 2 - Preferences for single-use cups' attributes

2.5.2 - Results of the choice experiment

The MNL analysis considers respondents as having homogeneous preferences. Looking at its results (Table 4), the coefficient of the alternative specific constant (ASC) is significant and negative (-2.54), suggesting that respondents gain a higher utility from choosing one of the plastic cups than from choosing the "none of the alternatives" option. As for packaging elements, students are more sensitive to extrinsic (i.e. labels and product environmental information) than intrinsic (i.e. the material) attributes, but this difference is not clear. Specifically, students seem to prefer cups that show more than one label (low carbon + recyclable) (0.77) and more than one environmental performance information coherent

with labels (40% CO₂ saving + innovative recycling). This last point can be understood by observing the coefficients referred to the single information (-0.80 for "40% of CO₂ saving" and -0.54 for "innovative recycling"). Negative coefficients show that the utility perceived by consumers decreases significantly in the presence of products with only one environment-specific information. In terms of material, respondents tend to prefer cups composed of a mixture of plastic and mineral salts (0.25) rather than those composed entirely of plastic, even if recyclable. The analysis also revealed a significant, albeit weak, sensitivity to price increases (-0.09). Finally, the study found a complete indifference to information about the "safeguard of local hives" environmental project supported through the purchase of hot beverages served in the cup (0.02).

Compared to MNL, LCM allows considering respondents as heterogeneous to differentiate them into classes, to investigate the differences that appear among these classes, and to estimate WTP. The definition of the best number of classes is an exogenous process, and scholars usually rely on the comparison of the Akaike information criterion (AIC), Bayesian information criterion (BIC), the value of the log likelihood (LL) function, and the McFadden Pseudo R-squared for different latent class models. Considering their values shown in Table 5 for each model, the fact that these criteria did not provide a univocal result, and the difficulty in understanding the meaning of the results in the case of a high number of classes, we opted for a 4-class model with AIC index equal to 7.284, BIC index equal to 7.502, LL index equal to -3607.218, and MFR² index equal to 0.298 (Table 4 and Table 5).

Looking at the LCM results (Table 4), as for MNL, the ASC coefficient is significant and negative for most of the respondents, suggesting a higher utility from choosing one of the plastic cups than from choosing the "none of the alternatives" option. However, some differences from the MNL analysis appear. First, classes 1 and 4 are made up of individuals that could be defined, according to the stated preferences as "Local sustainable developers" and "External sustainable developers," respectively. The reason is that, when asked to choose a hot drink, they positively evaluate the combination of plastic and natural mineral salts (0.85 for class 1 and 5.45 for class 4) and the information about economic support for sustainable project. In particular, class 1 is more interested in the safeguard of local hives (0.53), while class 4 prefers reforestation of trees in Kenya or Ecuador (-3.09). The interest found in sustainable projects is particularly relevant as it is the aspect that most differentiates the heterogeneous respondents (LCM) from the homogeneous ones (MNL). The class 1 respondents also appear to be very sensitive to information about the cup's environmental performance, preferring cups with combinations of information than those with only one fact (-0.75, -0.38), unlike class 4 respondents (0.59 ns, 0.69 ns). Regarding WTP, it was possible to estimate it only for class 1, since price sensitivity for class 4 appeared to be non-significant (-0.16 ns). The analysis for WTP shows mixed results: in particular, WTP is positive both for the mixture of plastic and mineral salts (0.42 €) and for eco-projects (0.26 €), while it is negative for single labels (-0.19 €) and single information (-0.37 € and -0.19 €). However, these last results also suggest that WTP could be positive for the combined information.

Compared to classes 1 and 4, the respondents of classes 2 and 3 seem to pay no attention to the information about environmental projects. Class 2 includes individuals defined AS “Strong traditionalists,” as they give great importance to price increase (-0.31) and to the presence of only recyclable plastic as a structural material instead of a mixture (-1.26). They represent classic old-style consumers who are not willing to pay a price premium for green packaging. Indeed, WTP is negative, except for cups showing more than one label (0.02 €/cup). Class 3, however, is represented by “Weak traditionalists” individuals, more interested in extrinsic attributes than structural ones. In particular, it is very important for them that the environmental characteristics are communicated in a congruent way. Class 3 is the only class that shows a lot of interest in both combined labels (1.13) and combined information (-1.44; -0.92). It was not possible to estimate WTP for class 4.

Variable	MNL	LCM							
	Coeff. (S.E.)	Class 1		Class 2		Class 3		Class 4	
		Coeff. (S.E.)	WTP (€/cup)	Coeff. (S.E.)	WTP (€/cup)	Coeff. (S.E.)	WTP (€/cup)	Coeff. (S.E.)	WTP (€/cup)
ASC	-2.54 (0.10) ***	-2.28 (0.36) ***	/	-6.33 (1.15) ***	/	-2.92 (0.28) ***	/	4.26 (1.29) ***	/
Price	-0.09 (0.00) ***	-0.02 (0.01) *	/	-0.32 (0.07) ***	/	-0.00 (0.01) ns	/	-0.16 (0.12) ns	/
“Low carbon” + “100% recyclable” labels	0.77 (0.05) ***	0.15 (0.13) ns	/	0.51 (0.23) **	0.02	1.13 (0.14) ***	/	-1.36 (1.57) ns	/
“100% recyclable” label	0.37 (0.07) ***	-0.38 (0.17) **	- 0.19	-0.40 (0.65) ns	/	0.29 (0.16) *	/	2.08 (1.50) ns	/
“Safeguard of local hives” project	0.02 (0.07) ns	0.53 (0.18) ***	0.26	0.72 (0.48) ns	/	-0.24 (0.16) ns	/	-3.09 (1.70) *	/
Mix of plastic and mineral salts	0.25 (0.09) **	0.85 (0.23) ***	0.42	-1.27 (0.47) ***	-0.04	-0.21 (0.20) ns	/	5.46 (2.30) **	/
“40% CO ₂ saving” info	-0.80 (0.09) ***	-0.75 (0.25) ***	-0.37	-1.56 (0.66) **	-0.05	-1.44 (0.25) ***	/	0.59 (1.48) ns	/
“Innovative recycling system” info	-0.54 (0.05) ***	-0.38 (0.14) ***	-0.19	-1.13 (0.86) ns	-0.04	-0.92 (0.15) ***	/	0.69 (0.87) ns	/
Estimated latent class probability		0.28		0.27		0.40		0.04	
LCM statistical indices		LL -3607.218		AIC 7.284		BIC 7.502		McFadden R ² 0.298	

Note: Number of observations: 618.

Single, double, and triple asterisk (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% level, respectively.

N.s. indicates “not statistically significant”.

Table 4 - Choice experiment results: MNL and LCM models

	LCM-2	LCM-3	LCM-4	LCM-5
LL	-3928.746	-3692.115	-3607.218	-3590.361
AIC	7.891	7.436	7.284	7.269
BIC	7.997	7.598	7.502	7.542
MF R ²	0.236	0.282	0.298	0.301

Note: AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; LL = Log Likelihood; MF R² = McFadden Pseudo R-squared

Table 5 - Models criteria comparison

2.6 - DISCUSSION

2.6.1 - Students' opinions about cup attributes

To the best of our knowledge, this is the first research study that explores consumers' opinions on the features that a hot beverage vending machine cup should possess to be perceived as eco-friendly, and the first with Italian university student participants. Our results seem to confirm the central role of intrinsic properties of packaging (i.e., biodegradability, recyclability and reusability) previously highlighted by other international studies performed, for example, in Poland and France (Jerzyk, 2016; Orset et al., 2017), Denmark (Boesen et al., 2019), and South Africa (Scott and Vigar-Ellis, 2014). In other words, consumers are attracted by the idea of a cup designed according to the circular economy principles (Steenis et al., 2018), preferring a cup able to minimize its environmental impact by decomposing into the environment, being reintroduced into the production cycle, or being reused again and again. The importance of such properties for consumers has been demonstrated in the qualitative study by Magnier and Crié (2015), and recently reviewed and discussed by Nguyen et al. (2020) and Otto et al. (2021): according to the authors, consumers consider packaging made by materials with post-consumption properties, that can contribute to overcome current disposal issues while decreasing environmental impacts, as eco-friendly. By focusing on cups for hot beverages, this present study is similar to the one performed by Boesen et al. (2019), who discovered that “recyclability” and “biodegradability” are the two parameters most frequently chosen by Danish consumers (79% and 76%, respectively) to assess environmental sustainability of liquid food packaging (soft drinks, in particular). Our results are also consistent with Orset et al. (2017), who demonstrated that French consumers have positive attitudes toward water bottles made of recyclable or biodegradable plastic. This positive attitude can be explained by the fact that such properties give the impression of an environmentally-friendly packaging to consumers (Otto et al., 2021). A recent meta-analysis of the environmental impacts of single-use cups for beverages demonstrated that, in general, cups made by biodegradable (e.g., polylactic acid, or PLA) or recyclable materials may have lower life cycle impacts compared to traditional fossil-source alternatives (UNEP, 2021). However, this is not always true, and environmental impacts are strongly influenced by the geographical context in terms of production and end-of-life technologies. Among all the post-consumption properties, the one found to significantly decrease environmental

burden is “reusability” (UNEP, 2021). Results of the meta-analysis show that reusable cups are more environmentally sound than any other single-use alternative, regardless of the material, as long as washing between uses is efficient. Our study integrates these findings with consumers’ opinions, demonstrating that 67% of the respondents consider “reusability” as a valuable and indispensable property to perceive a hot beverage cup as eco-friendly, below “recyclability” and “biodegradability.” These data are in line with Scott and Vigar-Ellis, (2014), who discovered that 84.5% of South African consumers perceived “reusability” as a benefit associated with environmentally-friendly packaging.

While our analysis confirmed the importance of material properties, it rejected the role played by the other two intrinsic attributes, that is lower quantity of material and smaller dimensions. Indeed, Italian students do not seem to consider them as fundamental attributes to perceive a hot beverage cup as eco-friendly. These results are in contrast with the findings of Magnier and Crié (2015) and Boesen et al. (2019), according to which consumers perceive packaging made by as low a quantity of material as possible and small in size, as eco-friendly. A possible explanation could be that cups for hot beverages are perceived as already designed with a reasonable size compared to the quantity of beverage they will contain and produced without additional packaging material. Therefore, consumers may not perceive the need for structural improvements.

Beside intrinsic attributes, students seem to pay adequate attention also to the presence of extrinsic attributes in the form: a) of labels and logos certifying both the eco-friendliness of the production cycle (eco-label type 1), and the ecological properties of the cup, such as its recyclability or biodegradability (eco-label type 2); b) of disposal information (where to dispose the cup after use); c) of verbal or numerical claims supporting the message of labels (for example, by providing simple and detailed information on the environmental benefits of the production cycle or recycling phase in terms of CO₂ savings). Our results are in line with previous research about the role played by labels and information (Gleim et al., 2013; Herbes et al., 2020; Magnier and Schoormans, 2015; Tseng et al, 2020; Wensing et al., 2020). According to Herbes et al. (2020), the attribute on which consumers focus most to differentiate green packaging from conventional packaging is the label. However, labels must be supported by trustworthy environmental information to help consumers make accurate assessments about the impact of their purchases (Tseng et al, 2020). For example, in their work, Wensing et al. (2020) demonstrated that packaging may be perceived more innovative, healthy, natural, and eco-friendly when labels are supported by their description, plus general info about the environmental benefits of ecological post-consumption properties of the material. Similarly, Klaiman et al. (2016) and Orset et al. (2017) found that providing more information about the environmental benefits of recycling and composting increased consumers’ WTP for beverage packaging. The extrinsic attributes found as important by other authors in the consumers’ perception of a general packaging as eco-friendly, but not confirmed by the present study about cups for hot beverages, are stylish elements such as the use of green or brown color or images evoking eco-friendliness. According to Magnier and Crié (2015), Magnier and Schoormans (2015), Nguyen et al. (2020) and Scott and Vigar-Ellis (2014), consumers rely on attractive design in

terms of color, and images to differentiate eco-friendly packaging from conventional packaging. However, our results seem to be more in line with Martinho et al. (2015), who demonstrated that packaging design is not a relevant feature. Indeed, the type of color and the presence of images of nature/landscapes are not indispensable for students to perceive a hot beverage cup as eco-friendly. Magnier and Schoormans (2015) help to explain our data; they found that if consumers possess high concern for the environment, they can sometimes consider stylish elements, such as color, as secondary compared to the presence of information demonstrating the eco-friendliness of packaging. Our sample included students mainly aged around 19–22, belonging to what is known as Generation Z, and recognized as a generation that cares about environmental issues (Dwidienawati et al., 2021). Therefore it is possible that, just as happened with Magnier and Schoormans (2015), the students we interviewed were very sensitive to environmental issues, and this led them to consider color and images as irrelevant features to perceive a cup for hot beverages as eco-friendly. We want to highlight that, even if our data show the irrelevance of color and images, this does not mean they cannot be used for other purposes. For example, both attributes are fundamental to make consumption experiences more pleasant by connecting to consumers' past memories and experiences (Kao and Du, 2020) or by influencing their sensory evaluations of hot beverages (Piqueras-Fiszman and Spence, 2012).

2.6.2 - Value of choice experiment

The choice experiment confirmed some of the results obtained from the first study about students' opinions on cups' features, especially the role of intrinsic (i.e. the material) and extrinsic (i.e. product environmental information and eco-labels) attributes. As demonstrated by the MNL analysis, students perceive a higher utility from buying hot beverages dispensed in cups composed of an innovative and ecological material and communicating their environmental performance through matching eco-labels and information. In particular, students' perceived utility seems slightly higher for extrinsic rather than intrinsic attributes. In other words, when consumers face real plastic cups for hot beverages, they tend to pay more attention to the presence of information and labels rather than type of material. However, as revealed by the LCM analysis, preferences also depend on the type of consumer. Indeed, for some respondents (classes 1, 2 and 4), the type of material plays a primary role. For classes 1 and 4 (made by local/external sustainable developers), the presence of an innovative mix of plastic and mineral salts is more important, probably because they associate it with "bio-based plastic" or "biodegradable plastic" concepts, and, in turn, a more eco-friendly material (Sijtsema et al., 2016). In contrast, class 2 (composed of traditional consumers) considers the conventional recyclable plastic a better solution, probably because they associate the innovative mixture with a decrease in the quality of the material (Newman et al., 2014).

Beside this, the choice experiment also demonstrated how the type of environment-related information can influence consumers' perceived utility. Both the MNL and LCM analyses revealed a

higher preference for hot beverages served within cups with more than one environmental information, as well as labels describing CO₂ saving along the cup life cycle and the benefits related to an innovative recycling system; students perceive a slightly higher utility from the first type (CO₂ savings). In the presence of credible information about eco-efficiency of cups coherent with eco-labels and the integration of sustainable concepts about production cycle and post-consumption phase, consumers may be perceiving plastic cups as relatively more innovative, healthy, and eco-friendly (Wensing et al., 2020). Higher perceived naturalness can, in turn, mediate the effects on purchase intentions of products (Steenis et al., 2018). In other words, once any hidden information is disclosed, consumers can consider to choose eco-friendly products (Lemke and Luzio, 2014), even if served within packaging made of plastic. However, the disclosure of too much information about sustainable design innovation do not necessarily increase purchase intentions (Steenis et al., 2018); the same may happen with the disclosure of additional information not strictly related to product design. This could be the reason why economic support for sustainable projects represents the least impactful attribute on consumers' choices. As revealed by the MNL analysis, consumers do not perceive utility from this type of information. However, as previously discussed, preferences depend on the type of consumer. According to the LCM analysis, only classes 1 and 4 demonstrated interest in the safeguarding of local hives and replanting of trees in Kenya or Ecuador, respectively; they may be representing niches that include proactive consumers interested in sustainable development and products that encourage them to be part of the change by supporting local/external projects. Similarly, all the other respondents probably represent the traditional type of consumer, who is skeptical when a product shows too many sustainable improvements.

Finally, the choice experiment made it possible to estimate consumers' WTP a price premium for hot beverages served within cups with a particular attribute level. In general, recent research shows that consumers are more willing to pay a premium for products with green packaging (Hao et al., 2019; Ketelsen et al., 2020; Steenis et al., 2018; Wensing et al., 2020), and that the type of material, its properties and available information play a key role (Klaiman et al., 2016; Orset et al., 2017; Wensing et al., 2020). However, our study is partially in line with these findings. The MNL analysis revealed a significant, albeit weak, sensitivity to price increases. In other words, when considered as homogeneous, consumers tend to dislike paying more for hot beverages dispensed in ecological cups. However, as previously discussed, WTP depends on both the type of consumer and the attribute of packaging considered. The only two classes for which it was possible to estimate WTP are 1 and 2. The WTP for class 1 is definitely higher and more positive compared to class 2. Indeed, proactive consumers are willing to pay a price premium for beverages dispensed in cups composed of an innovative mixture of materials and that support the safeguard of local hives, by 0.42 € and 0.26 € respectively. Moreover, the results suggest that their WTP would be also positive in the presence of combined environmental information. In contrast, class 2 is much more sensitive to price increases, which is reflected in their lower WTP compared to class 1. Moreover, class 2 declines to pay a premium if the cup is composed of

an innovative mix and if there is only one information. This suggests that class 2 would be willing to pay more for hot beverages served within classic recyclable cups with more than one info. Overall, our results confirmed that both intrinsic (i.e. type of material) (Klaiman et al., 2016; Orset et al., 2017) and extrinsic attributes (i.e. information) (Wensing et al., 2020) have the power to influence consumers' WTP of hot beverages.

2.7 - CONCLUSIONS

This study makes several contributions to the academic literature and to the debate about the single-use items economy and the role of the vending sector. Our results can be extremely useful for both disposable items manufacturers and vending companies, in the backdrop of recent EU policies requiring them to include circular economy principles in the product design phases.

First, it provides an in-depth analysis of the set of ecological cues perceived and interpreted as such by consumers and available to marketers and designers to signify the ecological nature of single-use cups for hot beverages. According to the results, consumers perceive a cup for hot beverages as eco-friendly if: 1) composed of a material that can degrade into the environment (i.e., biodegradable), that can be recovered through efficient and innovative recycling systems (i.e., recyclable), or that can be reused several times before being disposed (i.e., reusable); 2) demonstrating and certifying its eco-friendliness through eco-labels and verbal/numerical environmental claims. Other attributes, such as less packaging material, smaller dimensions, color, and images evoking eco-friendliness are perceived as unimportant. However, we recommend caution in using these results. Even if the use of bio-based materials (e.g., polylactic acid or PLA) to produce packaging is perceived positively by consumers (Taufik et al., 2020), and can be beneficial for the environment compared to traditional plastic- and paper-based items (UNEP, 2021), industrial technology is still underdeveloped to include biodegradability as a material property of cups for hot beverages and make them as cheap and efficient as traditional materials (EASAC, 2020). Certainly, PLA production is about twice as expensive as, for example, PE (EASAC, 2020), and its mechanical properties are still insufficient to hold hot beverages served at 80-90°C without risks for consumers. Moreover, Taufik et al. (2020) found that, even if consumers demand more biodegradable packaging, many of them are still unfamiliar with the concept of "biodegradable material" (Sijtsema et al., 2016), resulting in the implementation of incorrect disposal processes and negating the environmental benefits. Therefore, given all these temporary barriers, the vending industry should orient their efforts in both increasing recyclability rates of their single-use cups (plastic and paper) and develop reusable solutions (UNEP, 2021). In such a context, RiVending in Italy is an example of an innovative cycle of recovery and recycling of polystyrene cups. Launched in 2019, the end goal of the project is the "cup2cup" phase that aims to use recycled plastic to produce new cups for vending machines, responding, in turn, to the European objectives of reducing single-use plastics and creating a true circular economy.

Second, by making use of a choice experiment, the research study both confirms and extends existing knowledge about the importance of ecological attributes of packaging in shaping consumer perceptions, purchase decisions, and WTP for a hot beverage by focusing, for the first time, on plastic cups for hot beverages dispensed by VMs. As demonstrated by previous studies, so far consumers have been restraining in the purchase of eco-friendly products because firms have failed to translate consumers' perceptions into product attributes. Skepticism seems to be greater for plastic packaging compared to other materials (Boesen et al., 2019; Lewis et al., 2010; Steenis et al., 2017) because consumers evaluate packaging eco-friendliness based on post-consumption impacts (Heidbreder et al., 2019; Herbes et al., 2020), preferring materials easily decomposable, such as paper (Nguyen et al., 2020), over those potentially persistent, such as plastic. However, our study demonstrates that cups for hot beverages (even if made by plastic) can be perceived as eco-friendly and chosen by consumers if they are designed to be minimizing its environmental impact post-consumption, and if they communicate their actual environmental properties through labels and information. Moreover, the choice experiment revealed that not all consumers give the same importance to the same attributes, and that heterogeneity in preferences and opinions exists. Therefore, when planning informational campaigns, marketers should make use of these results to highlight the environmental benefits, to involve consumers into the products' life cycle (Narula and Desore, 2016) and make them feel like actors contributing to sustainable changes (Iraldo and Melis, 2020).

The study has some limitations, generating scope for additional research on the topic. First, our research focused on university students by approximating their purchase decisions; hence, it is important to extend the research to the average consumer's behavior in other contexts (e.g., companies, public offices and spaces) to better understand consumer preferences. Second, we concentrated on plastic cups, and more choice experiments using other alternatives, such as paper or bio-plastic, and other attributes would be helpful. Third, we relied on students' self-declared opinions about the expected sustainable properties of the cup. Therefore, additional studies using a more qualitative approach are needed. Indeed, a qualitative study is essential to surface relevant constructs in consumer decision making. Finally, a study that investigates the determinants (both psychological and contextual) of consumers' purchase decisions regarding eco-friendly cups would be valuable. In this case, a structural equation model that explore which factor is the most influential would expand the scientific literature, and help vending companies in adjusting their service and offer.

REFERENCES

- Ali, S.S., Elsamahy, T., Koutra, E., Kornaros, M., El-Sheekh, M., Abdelkarim, E.A., Zhu, D., Sun, J., 2021. Degradation of conventional plastic wastes in the environment: A review on current status of knowledge and future perspectives of disposal. *Sci. Total Environ.* 771, 144719. <https://doi.org/10.1016/j.scitotenv.2020.144719>
- Bocken, N.M.P., de Pauw, I., Bakker, C., van der Grinten, B., 2016. Product design and business model strategies for a circular economy. *J. Ind. Prod. Eng.* 33, 308–320. <https://doi.org/10.1080/21681015.2016.1172124>
- Boesen, S., Bey, N., Niero, M., 2019. Environmental sustainability of liquid food packaging: Is there a gap between Danish

- consumers' perception and learnings from life cycle assessment? *J. Clean. Prod.* 210, 1193–1206.
<https://doi.org/10.1016/j.jclepro.2018.11.055>
- Boz, Z., Korhonen, V., Koelsch Sand, C., 2020. Consumer Considerations for the Implementation of Sustainable Packaging: A Review. *Sustainability* 12, 2192. <https://doi.org/10.3390/su12062192>
- Chamas, A., Moon, H., Zheng, J., Qiu, Y., Tabassum, T., Jang, J.H., Abu-Omar, M., Scott, S.L., Suh, S., 2020. Degradation Rates of Plastics in the Environment. *ACS Sustain. Chem. Eng.* 8, 3494–3511.
<https://doi.org/10.1021/acssuschemeng.9b06635>
- Cosmina, M., 2016. Reprint of “Attitudes towards honey among Italian consumers: A choice experiment approach.” *Appetite* 106, 7.
- Cosmina, M., Gallenti, G., Marangon, F., & Troiano, S. (2016). Consumers' preferences for ethical attributes of coffee: a choice experiment in the Italian market. *Italian Review of Agricultural Economics*, 71(1), 314-324.
- Dangelico, R.M., Pontrandolfo, P., 2010. From green product definitions and classifications to the Green Option Matrix. *J. Clean. Prod.* 18, 1608–1628. <https://doi.org/10.1016/j.jclepro.2010.07.007>
- de Medeiros, J.F., Ribeiro, J.L.D., Cortimiglia, M.N., 2016. Influence of perceived value on purchasing decisions of green products in Brazil. *J. Clean. Prod.* 110, 158–169. <https://doi.org/10.1016/j.jclepro.2015.07.100>
- Dwidienawati, D., Abdinagoro, S.B., Gandasari, D., Tjahjana, D., 2021. Do generation Y and Z really concern about environmental issues? *IOP Conf. Ser. Earth Environ. Sci.* 729, 012137. <https://doi.org/10.1088/1755-1315/729/1/012137>
- EASAC, 2020. Packaging plastics in the circular economy.
- European Commission, 2019. Direttiva (UE) 2019/ del Parlamento europeo e del Consiglio, del 5 giugno 2019, sulla riduzione dell'incidenza di determinati prodotti di plastica sull'ambiente 19.
- European Commission, 2018. A european strategy for plastic in a circular economy.
- Gallenti, G., Troiano, S., Cosmina, M., Marangon, F., 2016. Ethical and sustainable consumption in the Italian coffee market: a choice experiment to analyse consumers' willingness to pay. *Ital. Rev. Agric. Econ.* 153-176.
<https://doi.org/10.13128/REA-20077>
- Gleim, M.R., Smith, J.S., Andrews, D., Cronin, J.J., 2013. Against the Green: A Multi-method Examination of the Barriers to Green Consumption. *J. Retail.* 89, 44–61. <https://doi.org/10.1016/j.jretai.2012.10.001>
- Goh, S.K., Balaji, M.S., 2016. Linking green skepticism to green purchase behavior. *J. Clean. Prod.* 131, 629–638.
<https://doi.org/10.1016/j.jclepro.2016.04.122>
- Grech, A., Allman-Farinelli, M., 2015. A systematic literature review of nutrition interventions in vending machines that encourage consumers to make healthier choices: Efficacy of vending machine interventions. *Obes. Rev.* 16, 1030–1041.
<https://doi.org/10.1111/obr.12311>
- Greene, W. H. (2003). *Econometric analysis*. Pearson Education India.
- Hanley, N., Wright, R.E., Adamowicz, V., 1998. Using Choice Experiments to Value the Environment. *Environ. Resour. Econ.* 11, 413–428.
- Hao, Y., Liu, H., Chen, H., Sha, Y., Ji, H., Fan, J., 2019. What affect consumers' willingness to pay for green packaging? Evidence from China. *Resour. Conserv. Recycl.* 141, 21–29. <https://doi.org/10.1016/j.resconrec.2018.10.001>
- Heidbreder, L.M., Bablok, I., Drews, S., Menzel, C., 2019. Tackling the plastic problem: A review on perceptions, behaviors, and interventions. *Sci. Total Environ.* 668, 1077–1093. <https://doi.org/10.1016/j.scitotenv.2019.02.437>
- Herbes, C., Beuthner, C., Ramme, I., 2020. How green is your packaging—A comparative international study of cues consumers use to recognize environmentally friendly packaging. *Int. J. Consum. Stud.* 44, 258–271.
<https://doi.org/10.1111/ijcs.12560>
- Hua, S.V., Ickovics, J.R., 2016. Vending Machines: A Narrative Review of Factors Influencing Items Purchased. *J. Acad. Nutr. Diet.* 116, 1578–1588. <https://doi.org/10.1016/j.jand.2016.06.378>
- Iraldo, Fabio; Melis, Michela, 2020. Beyond greenwashing. Edizioni Ambiente.
- Jerzyk, E., 2016. Design and Communication of Ecological Content on Sustainable Packaging in Young Consumers' Opinions. *J. Food Prod. Mark.* 22, 707–716. <https://doi.org/10.1080/10454446.2015.1121435>

- Kao, T.-F., Du, Y.-Z., 2020. A study on the influence of green advertising design and environmental emotion on advertising effect. *J. Clean. Prod.* 242, 118294. <https://doi.org/10.1016/j.jclepro.2019.118294>
- Ketelsen, M., Janssen, M., Hamm, U., 2020. Consumers' response to environmentally-friendly food packaging - A systematic review. *J. Clean. Prod.* 254, 120123. <https://doi.org/10.1016/j.jclepro.2020.120123>
- Kirchherr, J., Reike, D., Hekkert, M., 2017. Conceptualizing the circular economy: An analysis of 114 definitions. *Resour. Conserv. Recycl.* 127, 221–232. <https://doi.org/10.1016/j.resconrec.2017.09.005>
- Klaiman, K., Ortega, D.L., Garnache, C., 2017. Perceived barriers to food packaging recycling: Evidence from a choice experiment of US consumers. *Food Control* 73, 291–299. <https://doi.org/10.1016/j.foodcont.2016.08.017>
- Klaiman, K., Ortega, D.L., Garnache, C., 2016. Consumer preferences and demand for packaging material and recyclability. *Resour. Conserv. Recycl.* 115, 1–8. <https://doi.org/10.1016/j.resconrec.2016.08.021>
- Lancaster, K.J., 1966. A new approach to consumer theory. *J. Polit. Econ.* 74, 26.
- Lebreton, L., Slat, B., Ferrari, F., Sainte-Rose, B., Aitken, J., Marthouse, R., Hajbane, S., Cunsolo, S., Schwarz, A., Levivier, A., Noble, K., Debeljak, P., Maral, H., Schoeneich-Argent, R., Brambini, R., Reisser, J., 2018. Evidence that the Great Pacific Garbage Patch is rapidly accumulating plastic. *Sci. Rep.* 8, 4666. <https://doi.org/10.1038/s41598-018-22939-w>
- Lemke, F., Luzio, J.P.P., 2014. Exploring Green Consumers' Mind-Set toward Green Product Design and Life Cycle Assessment: The Case of Skeptical Brazilian and Portuguese Green Consumers. *J. Ind. Ecol.* 18, 619–630. <https://doi.org/10.1111/jiec.12123>
- Lewis, H., Verghese, K., Fitzpatrick, L., 2010. Evaluating the sustainability impacts of packaging: the plastic carry bag dilemma. *Packag. Technol. Sci.* 23, 145–160. <https://doi.org/10.1002/pts.886>
- Lindh, H., Olsson, A., Williams, H., 2016. Consumer Perceptions of Food Packaging: Contributing to or Counteracting Environmentally Sustainable Development?: Consumer Perceptions of Food Packaging. *Packag. Technol. Sci.* 29, 3–23. <https://doi.org/10.1002/pts.2184>
- Luce, R., 1959. Individual choice behavior. A theoretical analysis. John Wiley & Sons, New York.
- Magnier, L., Crié, D., 2015. Communicating packaging eco-friendliness: An exploration of consumers' perceptions of eco-designed packaging. *Int. J. Retail Distrib. Manag.* 43, 350–366. <https://doi.org/10.1108/IJRDM-04-2014-0048>
- Magnier, L., Schoormans, J., 2015. Consumer reactions to sustainable packaging: The interplay of visual appearance, verbal claim and environmental concern. *J. Environ. Psychol.* 44, 53–62. <https://doi.org/10.1016/j.jenvp.2015.09.005>
- Marangon, F., Tempesta, T., Troiano, S., & Vecchiato, D. (2016). Toward a better understanding of market potentials for vegan food. A choice experiment for the analysis of breadsticks preferences. *Agriculture and Agricultural Science Procedia*, 8, 158-166.
- Martinho, G., Pires, A., Portela, G., Fonseca, M., 2015. Factors affecting consumers' choices concerning sustainable packaging during product purchase and recycling. *Resour. Conserv. Recycl.* 103, 58–68. <https://doi.org/10.1016/j.resconrec.2015.07.012>
- McFadden, D., 1974. Conditional logit analysis of qualitative choice behavior, in: *Frontiers in Econometrics*. Zarembka P., New York, pp. 105–142.
- McFadden, D., Train, K., 2000. Mixed MNL models for discrete response. *J Appl Econ* 24.
- Miller, S., Bolger, M., Copello, L., 2019. Reusable solutions: how governments can help stop single-use plastic pollution.
- Narula, S.A., Desore, A., 2016. Framing green consumer behaviour research: opportunities and challenges. *Soc. Responsib. J.* 12, 1–22. <https://doi.org/10.1108/SRJ-08-2014-0112>
- Newman, G.E., Gorlin, M., Dhar, R., 2014. When Going Green Backfires: How Firm Intentions Shape the Evaluation of Socially Beneficial Product Enhancements. *J. Consum. Res.* 41, 823–839. <https://doi.org/10.1086/677841>
- Nguyen, A.T., Parker, L., Brennan, L., Lockrey, S., 2020. A consumer definition of eco-friendly packaging. *J. Clean. Prod.* 252, 119792. <https://doi.org/10.1016/j.jclepro.2019.119792>
- Nguyen, T.T.H., Yang, Z., Nguyen, N., Johnson, L.W., Cao, T.K., 2019. Greenwash and Green Purchase Intention: The Mediating Role of Green Skepticism. *Sustainability.* 11, 2653. <https://doi.org/10.3390/su11092653>
- Ocean Conservancy, 2020. Report 2020 - Together, we are team ocean.

- Orset, C., Barret, N., Lemaire, A., 2017. How consumers of plastic water bottles are responding to environmental policies? *Waste Manag.* 61, 13–27. <https://doi.org/10.1016/j.wasman.2016.12.034>
- Otto, S., Strenger, M., Maier-Nöth, A., Schmid, M., 2021. Food packaging and sustainability – Consumer perception vs. correlated scientific facts: A review. *J. Clean. Prod.* 298, 126733. <https://doi.org/10.1016/j.jclepro.2021.126733>
- Paul, J., Modi, A., Patel, J., 2016. Predicting green product consumption using theory of planned behavior and reasoned action. *J. Retail. Consum. Serv.* 29, 123–134. <https://doi.org/10.1016/j.jretconser.2015.11.006>
- Piqueras-Fizman, B., Spence, C., 2012. The Influence of the Color of the Cup on Consumers' Perception of a Hot Beverage: The Influence of the Color of the Cup. *J. Sens. Stud.* 27, 324–331. <https://doi.org/10.1111/j.1745-459X.2012.00397.x>
- Potting, J., van der Harst, E., 2015. Facility arrangements and the environmental performance of disposable and reusable cups. *Int. J. Life Cycle Assess.* 20, 1143–1154. <https://doi.org/10.1007/s11367-015-0914-7>
- Scott, L., Vigar-Ellis, D., 2014. Consumer understanding, perceptions and behaviours with regard to environmentally friendly packaging in a developing nation. *Int. J. Consum. Stud.* 38, 642–649. <https://doi.org/10.1111/ijcs.12136>
- Sharma, A., Foropon, C., 2019. Green product attributes and green purchase behavior: A theory of planned behavior perspective with implications for circular economy. *Manag. Decis.* 57, 1018–1042. <https://doi.org/10.1108/MD-10-2018-1092>
- Sijtsema, S.J., Onwezen, M.C., Reinders, M.J., Dagevos, H., Partanen, A., Meeusen, M., 2016. Consumer perception of bio-based products—An exploratory study in 5 European countries. *NJAS - Wagening. J. Life Sci.* 77, 61–69. <https://doi.org/10.1016/j.njas.2016.03.007>
- Smith, K.T., Brower, T.R., 2012. Longitudinal study of green marketing strategies that influence Millennials. *J. Strateg. Mark.* 20, 535–551. <https://doi.org/10.1080/0965254X.2012.711345>
- Songa, G., Slabbinck, H., Vermeir, I., Russo, V., 2019. How do implicit/explicit attitudes and emotional reactions to sustainable logo relate? A neurophysiological study. *Food Qual. Prefer.* 71, 485–496. <https://doi.org/10.1016/j.foodqual.2018.04.008>
- Steenis, N.D., van der Lans, I.A., van Herpen, E., van Trijp, H.C.M., 2018. Effects of sustainable design strategies on consumer preferences for redesigned packaging. *J. Clean. Prod.* 205, 854–865. <https://doi.org/10.1016/j.jclepro.2018.09.137>
- Steenis, N.D., van Herpen, E., van der Lans, I.A., Ligthart, T.N., van Trijp, H.C.M., 2017. Consumer response to packaging design: The role of packaging materials and graphics in sustainability perceptions and product evaluations. *J. Clean. Prod.* 162, 286–298. <https://doi.org/10.1016/j.jclepro.2017.06.036>
- Steenkamp J.E.M., 1990. Conceptual model of the quality perception process. *J. Business Research*, 21(4), 309-333
- Stöckigt, G., Schiebener, J., Brand, M., 2018. Providing sustainability information in shopping situations contributes to sustainable decision making: An empirical study with choice-based conjoint analyses. *J. Retail. Consum. Serv.* 43, 188–199. <https://doi.org/10.1016/j.jretconser.2018.03.018>
- Suskevics, Grönman, 2019. Single-Use Paper Cups Circularity Improvement and Environmental Impact Mitigation Measures for Lappeenranta University of Technology Campus. *Proceedings.* 16, 58. <https://doi.org/10.3390/proceedings2019016058>
- Symmank, C. (2019). Extrinsic and intrinsic food product attributes in consumer and sensory research: literature review and quantification of the findings. *Management Review Quarterly*, 69(1), 39-74.
- Taufik, D., Reinders, M.J., Molenveld, K., Onwezen, M.C., 2020. The paradox between the environmental appeal of bio-based plastic packaging for consumers and their disposal behaviour. *Sci. Total Environ.* 705, 135820. <https://doi.org/10.1016/j.scitotenv.2019.135820>
- Train, K. E. (1998). Recreation demand models with taste differences over people. *Land economics*, 230-239.
- Tripathi, A., Singh, M.P., 2016. Determinants of sustainable/green consumption: a review. *Int. J. Environ. Technol. Manag.* 19, 43.
- Troiano, S., Marangon, F., Tempesta, T., Vecchiato, D., 2016. Organic vs local claims: substitutes or complements for wine consumers? A marketing analysis with a discrete choice experiment. *New Medit* 8.

- Tseng, M.-L., Sujanto, R.Y., Iranmanesh, M., Tan, K., Chiu, A.S., 2020. Sustainable packaged food and beverage consumption transition in Indonesia: Persuasive communication to affect consumer behavior. *Resour. Conserv. Recycl.* 161, 104933. <https://doi.org/10.1016/j.resconrec.2020.104933>
- Tseng, S.-C., Hung, S.-W., 2013. A framework identifying the gaps between customers' expectations and their perceptions in green products. *J. Clean. Prod.* 59, 174–184. <https://doi.org/10.1016/j.jclepro.2013.06.050>
- UNEP, 2021. Single-use beverage cups and their alternatives.
- van Birgelen, M., Semeijn, J., Keicher, M., 2009. Packaging and Proenvironmental Consumption Behavior: Investigating Purchase and Disposal Decisions for Beverages. *Environ. Behav.* 41, 125–146. <https://doi.org/10.1177/0013916507311140>
- Wensing, J., Caputo, V., Carraresi, L., Bröring, S., 2020. The effects of green nudges on consumer valuation of bio-based plastic packaging. *Ecol. Econ.* 178, 106783. <https://doi.org/10.1016/j.ecolecon.2020.106783>
- Zeithaml, V.A., 1988. Consumer Perceptions of Price, Quality, and Value: A Means-End Model and Synthesis of Evidence 22.
- Zeng, T., Durif, F., 2019. The Influence of Consumers' Perceived Risks towards Eco-Design Packaging upon the Purchasing Decision Process: An Exploratory Study. *Sustainability* 11, 6131. <https://doi.org/10.3390/su11216131>

APPENDIX A - Extract of the questionnaire sent to the students

First section	Please, provide your personal data.
	<p>Gender</p> <p><i>Male</i></p> <p><i>Female</i></p> <p>Year of birth</p> <p>Nationality</p> <p>Academic position</p> <p><i>Bachelor student</i></p> <p><i>Master student</i></p> <p>Field of study</p> <p><i>Agricultural sciences</i></p> <p><i>Biotechnology</i></p> <p><i>Economy</i></p> <p><i>Law</i></p> <p><i>Engineering and architecture</i></p> <p><i>Modern languages</i></p> <p><i>Arts and cultural heritage</i></p> <p><i>Medicine</i></p> <p><i>Mathematics and physics</i></p>
Second section	<p>This is the second section of the questionnaire, focused on hot beverages vending machines service within the University of Udine. This type of machines serves hot drinks in a cup, which is a type of packaging. Like any packaging, it has certain characteristics: the type of material used, the presence of graphic elements and the presence of general information.</p> <p>In order to make the service more ecological, it is essential to involve consumers and listen to their opinions.</p> <p>The purpose of this section is to understand which features a cup for hot beverages should possess to be perceived as eco-friendly</p> <hr/> <p>Using a 5 points scale, (from 1 = unimportant to 5 = very important), please indicate how much you consider important the presence of the following attributes to perceive a cup for hot beverages as eco-friendly</p> <hr/> <p>Small dimensions</p> <p>Lower quantity of material</p> <p>Recycled material</p> <p>Recyclable material</p> <p>Biodegradable material</p> <p>Reusable material</p> <p>Color (for example, green or white)</p> <p>Images referred to the nature or landscapes (for example, trees)</p> <p>Labels showing a low environmental impactful production process (e.g. "eco-label", or "Nordic Swan)</p> <p>Labels showing an ecological property of the cup (e.g. "100% recyclable", or "Low carbon emissions")</p> <p>Information supporting eco-labels (e.g. detailing the environmental impact in terms of CO₂ emitted, or the technological innovation used for production process)</p> <p>Disposal information</p>

NGO approval

General environmental claims (e.g. "ecological material")

You will now face 6 different purchasing situations. Select the solution with the attributes you prefer. Below there is a more detailed description of each attribute:

Price - it represents the price increase of the hot beverage dispensed within a cup with certain attributes (type of material, type of label, type of environmental information, and environmental project financed).

Material - it refers to the material of the cup, which can be composed entirely by recyclable plastic, or by an innovative mixture in which 20-40% of the polystyrol normally used for the production of conventional cups has been replaced by natural mineral salts, with consequent lower environmental impacts.



Logo - It indicates the type of logo / logos present on the cup and showing a particular eco-friendly attribute (100% recyclable or low carbon emissions)

Environmental info



Rivending project - it is an innovative closed circuit recycling process exclusively for cups in the vending sector. It is a "zero waste process" because the plastic used is entirely recycled and reintroduced in the production cycle, with advantages in terms of quality and lower environmental impacts.

-40% CO₂

- 40% CO₂ - it is a project that permitted to reduce the amount of CO₂ emitted by 40% (compared to a traditional cup) thanks to design and technological innovations in the production process.

Environmental project



Replanting trees in Kenya or Equador - it is a project that has joined the company that manages the vending machines service within university, to which the sum declared in the price "will be devolved"



Safeguard of local hives - it is a project that has joined the company that manages the vending machines service within university, to which the sum declared in the price "will be devolved"

	A	B	C	D
GROUP 1				
Price (€/cup)	0,05€	0,1€	0,15€	
Material	Recyclable plastic	Mix of plastic and mineral salts	Mix of plastic and mineral salts	NONE OF THE ALTERNATIVES
Eco-labels				
Eco-info	-40% CO ₂		-40% CO ₂ ,	
Eco-project				
Choose your favorite alternative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CHAPTER 3

ANALYSIS OF THE ROLE OF PERSONAL GOALS, PRODUCT ATTRIBUTES AND PERCEPTIONS IN INFLUENCING THE PURCHASE OF PRODUCTS WITH ECO-FRIENDLY PACKAGING

by

Alberto Bertossi, Federico Nassivera, and Francesco Marangon

3.1. ABSTRACT

Consumers' purchase decisions of green products rely on several motivations, and scientific literature has always mainly focused on intrinsic factors. The Goal Framing Theory is one of the many theoretical frameworks developed to provide an exhaustive explanation, highlighting the role of personal goals. However, it is important to remember that the type of product and packaging also play a key role in these dynamics. Indeed, they can influence consumers' perceptions of sustainability, and, in turn, final purchase decisions through intrinsic and extrinsic attributes. The present research study aims to contribute to the advancing of scientific literature by combining these two theoretical backgrounds. We developed a questionnaire sent to university students, and a structural equation model that appeared to be suitable to explain the motives behind students' purchase decisions of a product with eco-friendly packaging. Our results confirmed the role of personal goals and perceptions of eco-friendliness of a packaging with intrinsic/extrinsic ecological attributes in influencing purchase decisions. Moreover, results also highlighted how personal goals and students' perceptions of eco-friendliness of packaging can influence and fulfill each other.

3.2. INTRODUCTION

With the term "packaging" we refer to one of the elements that compose a product. Its role is particularly important, since: 1) it protects and preserves the product; 2) it is the companies' "presentation ticket" through which they can show consumers their values; 3) it is the first thing consumers see, and it informs them about the quality and benefits they can obtain through purchase at the time they are actually deciding in the store (Ampuero and Vila, 2006; Silayoi and Speece, 2007)

However, beside its role in consumption dynamics, when we talk about packaging, we should also take into consideration its environmental impacts. The increase of consumption of products along the last decade has been associated to an increase in both packaging wastes and CO₂ emissions. According

to Eurostat², the total amount of packaging waste generated in Europe in 2018 was around 77.5 million of tonnes, with paper and cardboard contributing with 31.8 million tonnes (41%), followed by plastic (14.8 million tonnes; 19%), glass (14.5 million tonnes; 19%) wood (12.5 million tonnes; 16%) and metal (3.9 million tonnes; 5%). In terms of Green House Gases (GHGs) emitted, Su et al. (2020) calculated that the total emissions linked to packaging in the express delivery services in China accounted for 13.2 million tonnes of CO₂ in 2018, with paper-based and plastic-based packaging contributing with 11 Mt-CO₂ and 2.2 Mt-CO₂, respectively. Moreover, not all types of packaging are recyclable, leading to make use of incineration, landfilling, or, in the worst cases, releasing into the environment. For example, Ali et al. (2021) discovered that only 14% of the total plastic wastes produced since 1950 has been sent to recycling. The remaining 86% has been incinerated (14%) and released into marine and terrestrial ecosystems (72%). Therefore, a sustainable transition (Markard et al., 2012) towards a society in which the production and consumption of packaging follows the circular economy principles is necessary. In other words, to reach the sustainable goals set by the Agenda 2030 in 2015, especially the 12th goal “Responsible consumption and production”, it is necessary to: 1) establish laws and regulations that set new standards for the production and marketing of more eco-friendly packaging; 2) incentivize companies to invest in the research and development of more eco-compatible materials, in the design of packaging with higher recyclability or reusability features, and in marketing strategies; 3) continue to analyze the dynamics that govern individuals’ consumption decisions, in order to orient them towards the purchase of ecological products.

About this last point, academic research has always sought to find the best model to explain the determinants of individuals’ pro-environmental behavior, especially green consumption (Zhang and Dong, 2020). Among the most used classic theories, we can find: the Theory of Reasoned Action, and its evolution, the Theory of Planned Behavior (Ajzen, 1991); the Norm Activation Model (Schwartz, 1977); and the Value-Belief Norm theory (Stern et al., 1999). All these models hold the viewpoint that individuals’ green consumption is mainly determined by psychological factors, such as awareness (Xu et al., 2020), knowledge (Tong et al., 2020), values (Jacobs et al., 2018), and beliefs (Kim et al., 2016). However, other theoretical models exist, like the Goal Framing Theory (GFT) developed by Lindenberg and Steg (2007). The GFT represents an interesting theory since it both integrates the classic models and goes beyond their assumption that consumers are rational individuals (Lindenberg and Steg, 2007; Steg and Vlek, 2009). In brief, the GFT assumes that consumers engage in pro-environmental behavior for hedonic, gain or normative goals, and that all of them can coexist each other (Steg et al., 2014). Hedonic goals lead individuals to seek ways to improve their feelings; gain goals lead individuals to seek ways to increase their personal resources (money, time, or social status); normative goals lead individuals to seek ways to contribute to the sustainability of the environment and of the society (Steg et al., 2014).

² https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Packaging_waste_statistics

However, external factors influencing green purchasing should also be considered, especially the role of products attributes. In this sense, the GFT is useful since it assumes that pro-environmental behaviors are strongly influenced by situational factors (Steg et al, 2014). More precisely, although a pro-environmental behavior is the right one to maintain, it cannot be convenient in terms of money or time, or it is not very stimulating, or it is effortful. In order to overcome these barriers, a solution is to make the action more pleasurable, less expensive, or easier to take (Steg et al, 2014). The same reasoning can be applied to green products consumption. Therefore, it is about to design a product with features perceived by consumers as able to fulfill their goals. In this sense, the Theory of Consumption Values (Sheth et al., 1991) assumes that individuals' consumption choices depend on how much they perceive the product as able to fulfill five core values (functional, social, emotional, epistemic, and conditional) through its attributes. In other words, products' attributes can influence consumers' perceived utility of that product to satisfy their needs.

Between psychological factors and products attributes, there is the role played by consumers' perceptions. Perceptions can explain why consumers tend to not purchase green products. According to the literature, consumers are often confused, skeptical and demotivated over eco-friendly products and packaging (Lemke and Luzio, 2014; Narula and Desore, 2016). As demonstrated by Goh and Balaji (2016), skepticism can negatively influence the purchase of green products. This is caused by a lack of perception of the sustainable attributes of product/packaging due to inadequate communication by manufacturers (Narula and Desore, 2016; Smith and Brower, 2012; Steenis et al., 2018; Tseng et al., 2020). Therefore, persuasive information is needed to increase consumers' trust in products and firms (Chen et al., 2015; Kao and Du, 2020; Stöckigt et al., 2018), as well as to foster their willingness to buy such products and develop a sustainable society (Lee et al., 2020; Tseng et al., 2020). As demonstrated by Steenis et al. (2018), increased perceived sustainability positively contributes to purchase intentions.

3.2.1 Aim and scope of the research

The present research aims to contribute to the scientific literature by combining the GFT with the theories on consumers' perceptions in order to better explain the determinants of green purchasing behavior. In particular, it aims to demonstrate how the purchase of products with eco-friendly packaging can be influenced by both personal goals and the way consumers perceive packaging through its intrinsic and extrinsic attributes. Moreover, it aims to investigate the relationship between personal goals and intrinsic/extrinsic attributes of packaging.

3.3. THEORETICAL BACKGROUND

3.3.1 *The Goal Framing Theory*

The Goal-framing Theory (GFT) is a socio-psychological theory born to explain the determinants of a behavior. Developed by Lindenberg and Steg (2007) this theory affirms that behaviors, especially pro-environmental, are guided by three goals: hedonic (associated to emotions and feelings), gain (associated to reward or profit), and normative (associated to the appropriateness of actions). A goal can be defined as a "*desirable outcome (i.e. outcome associated with positive affect) that can be achieved through behavior*" (van Osselaer and Janiszewski, 2012). The idea behind the GFT is that everyone has a "goal frame" (i.e. a goal that is stronger than the others), which guides our final behavior, affects our choices and influences our evaluation of a certain situation (Lindenberg and Steg, 2007; Steg et al., 2016, 2014). The other two goals remain in the background, supporting or hindering the first one. The type of "goal frame" depends on which kind of values people are driven by (i.e. hedonic, egoistic, altruistic or biospheric) (Lindenberg and Steg, 2007; Steg et al., 2014). Therefore, people with hedonic goal as goal frame possess strong hedonic values and they will engage in pro-environmental behaviors, actions or choices to derive fun and pleasure (Lindenberg and Steg, 2007; Steg et al., 2014). In line with the theory, Awuni and Du (2016) and Tang et al. (2020) demonstrated the role of emotions and happiness/pleasure as determinants of green purchasing intentions and behaviors, respectively. Other studies found similar results, highlighting the important role of novelty seeking (Choi and Johnson, 2019; Gonçalves et al., 2016; Lin and Huang, 2012), and an adventurous spirit (Choi and Johnson, 2019). People with gain goal as goal frame possess strong egoistic values and they will engage in pro-environmental behavior to obtain advantages for themselves, that is an economic benefit or an increase in their social status (Lindenberg and Steg, 2007; Steg et al., 2014). In line with the theory, Chakraborty et al. (2017) found a positive and significant relationship between gain goals and pro-environmental behaviors. One of the reasons was an improvement of the self-image among peer groups. Awuni and Du (2016) found a similar result, highlighting the role of social value as a determinant of green purchasing intention. This is in line with previous literature (Griskevicius et al., 2010; Kumar and Ghodeswar, 2015; Yadav and Pathak, 2016). Finally, people with normative goal as goal frame possess strong altruistic or biospheric values and they will behave responsibly, make a choice with the least negative impact, or engage in socially useful activities "because it is the right thing to do" or because they feel morally obliged (Lindenberg and Steg, 2007; Steg et al., 2014). Normative goals are the strongest to predict a pro-environmental behavior (Steg et al., 2014), and this has been found also for green purchasing (Chakraborty et al., 2017; Tang et al., 2020; Yadav and Pathak, 2016). For example, applying the GFT in their studies, Chakraborty et al. (2017) and Tang et al. (2020) found positive and significant relationships between normative goals and pro-environmental/green consumption behaviors, respectively.

Based on the above discussion, we state that there is a positive relationship between the three types of goals and green purchase intention. More specifically, the following three hypotheses will be investigated:

H1a - Hedonic goal positively influences purchase intentions of products with eco-friendly packaging

H1b - Gain goal positively influences purchase intentions of products with eco-friendly packaging

H1c - Normative goal positively influences purchase intentions of products with eco-friendly packaging

3.3.2 – The role of perceptions and packaging attributes

From the previous paragraph, it is clear that the role of personal values and, in turn, personal goals, is fundamental to predict green purchasing intentions and behaviors (Tripathi and Singh, 2016). However, it seems that there still exists a missing piece necessary to strengthen the values-intentions relationship and, in turn, translate intentions into actions. According to Tseng and Hung (2013), higher emphasis should be given to consumers' expectations over products, the perceived features (in terms of quality and value) to fulfill those expectations, and the existing gap between the two factors. For the purposes of the present research study, we will focus only on the role of perceptions. The role of expectations will only be used for a better understanding of the topic.

3.3.2.1 – The importance of perceptions

In the classic consumers' studies, product expectations refer to what consumers expect or imagine seeing in a product (Kupiec and Revell, 2001). Before purchase, consumers "assess" if a product is capable to fulfill their type of expectation. According to Zeithaml (1988), this evaluation relies on how far consumers are able to perceive the product's benefits (in this case, environmental benefits) in terms of quality and values through its intrinsic and extrinsic attributes. Therefore, making intrinsic and extrinsic attributes more salient can positively influence consumers' perceptions of benefits and, in turn, their purchase intentions (Ryu et al., 2010; Steenis et al., 2018). This is valid both for green products (de Medeiros et al., 2016; Sharma and Foropon, 2019) and for green packaging (Lindh et al., 2016; Magnier and Crié, 2015; Steenis et al., 2018).

3.3.2.2 – Intrinsic and extrinsic ecological attributes of packaging

Intrinsic attributes are those linked to the structure and physical properties of a material (Magnier and Crié, 2015). According to the literature, consumers are more willing to purchase a packaging that is perceived as recyclable, recycled, biodegradable or reusable (Boesen et al., 2019; Jerzyk, 2016; Scott and Vigar-Ellis, 2014; Sijtsema et al., 2016; Zeng and Durif, 2019); presents a size appropriate for the

product (i.e. smaller dimensions) and reduce over-packaging (Magnier and Crié, 2015; Zeng and Durif, 2019). Therefore, we believed that both size/quantity and post-consumption properties are positively linked to green purchase intentions, and proposed the following hypothesis:

H2a - A packaging perceived as eco-friendly thanks to its structural attributes positively influences consumers' purchase intentions

Extrinsic attributes are associated with the graphic (i.e. type of color, images, logos or symbols) and relevant information (i.e. environmental labeling, general environmental claims, disposal information) (Magnier and Crié, 2015). Literature shows that green packages should be visually appealing (Nguyen et al., 2020), with white/brown or dull colors (Boz et al., 2020; Herbes et al., 2020; Scott and Vigar-Ellis, 2014), and images showing nature or environmental protection (Magnier and Crié, 2015). Since it is difficult for consumers to perceive environmental qualities in packaging based on color and images alone, graphics should be supported by information (Magnier and Crié, 2015). Wensing et al. (2020) demonstrated how environmental information led consumers to perceive packaging as more innovative, healthy, natural and eco-friendly. Similarly, Kao and Du (2020) found consumers were more willing to buy a product if high-quality arguments complement the message from the images.

Therefore, beside intrinsic attributes, we believed that both visual and informational attributes are positively linked to green purchase intentions, and proposed the following hypotheses:

H2b - A packaging perceived as eco-friendly thanks to its visual attributes positively influences consumers' purchase intentions

H2c - A packaging perceived as eco-friendly thanks to its informative attributes positively influences consumers' purchase intentions

So far, we discussed that purchase intentions are directly influenced by consumers' perceptions and consumers' personal goals (i.e. hedonic, gain and normative). We can now add another piece to the theory, stating that purchase intentions depend also on the ability of the packaging of the product to fulfill the type of personal goal (van Osselaer and Janiszewski, 2012). Thus, perceptions of eco-friendliness of packaging, if in line with personal goals, can mediate the relationship between personal goals and purchase intentions via intrinsic and extrinsic ecological attributes. In other words, intrinsic and extrinsic ecological attributes can act as mediators by evoking emotions, by increasing personal benefits or by showing a lower environmental impact. Therefore, hedonic consumers will buy products with packaging perceived as capable to fulfill hedonic expectations (e.g. fun and pleasure); gain consumers will buy products perceived as capable to fulfill egoistic expectations (e.g. an increase in their social status); normative consumers will buy products perceived as capable to fulfill altruistic or biospheric expectations (e.g. the protection of the environment). The presence of ecological visual cues

(e.g. a “recyclable material” logo or the type of color) (Liao et al., 2015; Songa et al., 2019), the communication of ecological structural cues (e.g. plant-based materials as component of a plastic bottle, or bio-based products) (Koenig-Lewis et al., 2014; Sijtsema et al., 2016) or ecological informational cues (e.g. a strong environmental argument quality) (Kao and Du, 2020) can influence consumers’ reactions to the product, triggering positive or negative emotional responses. Basing on the literature, if a product with green attributes satisfies emotional and epistemic needs (i.e. hedonic expectations) (Choi and Johnson, 2019; Gonçalves et al., 2016; Lin and Huang, 2012), by evoking positive emotions, it will have stronger effects on green purchasing behavior (Koenig-Lewis et al 2014; Songa et al 2019; Kao and Du, 2020) .

Based on this, we state that consumers with hedonic goal as goal frame are more willing to purchase products with green packaging if the packaging is perceived as able to evoke positive emotions through its intrinsic and extrinsic attributes. Therefore, the following three hypotheses will be investigated:

H3a – Hedonic goals lead consumers to perceive a packaging with appropriate structural attributes as eco-friendly

H3b – Hedonic goals lead consumers to perceive a packaging with appropriate visual attributes as eco-friendly

H3c – Hedonic goals lead consumers to perceive a packaging with appropriate informative attributes as eco-friendly

Intrinsic and extrinsic ecological attributes carry a high symbolic value (Zabkar and Hosta, 2013). If appropriately communicated, ecological attributes of products can increase consumer's social reputation (i.e. egoistic expectation). As deeply discussed by Griskevicius et al. (2010), green products purchase is associated to an altruistic behavior. Therefore, peer groups tend to consider green consumers as people ready to sacrifice for the welfare of the planet (i.e. as altruistic and prosocial) and as more socially desirable (Griskevicius et al., 2010; Zabkar and Hosta, 2013). This effect is enhanced if the price is higher than conventional products, and if the purchase action is done in a public context (Griskevicius et al., 2010).

Based on this, we state that consumers with gain goal as goal frame are more willing to purchase products with green packaging if the packaging is perceived as able to increase their social reputation through its intrinsic and extrinsic attributes. Therefore, the following three hypothesis will be investigated:

H4a – Gain goals lead consumers to perceive a packaging with appropriate structural attributes as eco-friendly

H4b – Gain goals lead consumers to perceive a packaging with appropriate visual attributes as eco-friendly

H4c – Gain goals lead consumers to perceive a packaging with appropriate informative attributes as eco-friendly

Finally, intrinsic and extrinsic ecological attributes can lead consumers to evaluate the packaging as an element that cares about the protection of the environment (e.g. it can help to reduce pollution) and the well-being of others (e.g. less materials now means more materials for future generations) (Magnier and Cri , 2015). In their work, Steenis et al (2018) demonstrated that consumers were more willing to buy products with packaging perceived as sustainable and in line with their biospheric values. Moreover, knowing the sustainable features of packaging increased consumers' moral satisfaction, which, in turn, positively influenced their purchase intentions.

Based on this, we state that consumers with normative goal as goal frame are more willing to purchase products with green packaging if the packaging is perceived as an element bring benefits for the environment and society through its intrinsic and extrinsic attributes. Therefore, the following three hypotheses will be investigated:

H5a – Normative goals lead consumers to perceive a packaging with appropriate structural attributes as eco-friendly

H5b – Normative goals lead consumers to perceive a packaging with appropriate visual attributes as eco-friendly

H5c – Normative goals lead consumers to perceive a packaging with appropriate informative attributes as eco-friendly

3.4. – METHODS

3.4.1 – *Data collection*

For the purposes of this research, a two-part questionnaire was developed during 2020, tested in February 2021 through submission to a limited number of students and checking of their responses' validity and comprehensiveness, and officially emailed in March 2021 to all undergraduate and master's degree students of the University of Udine in northern Italy (equal to a sample of 14,714 students). The first part of the survey included five general socio-demographic questions, that is gender, age, nationality, academic position, and field of study. The second part included several questions targeted at operationalize the constructs included in the model. Before the submission, the entire questionnaire was evaluated and accepted by the ethics review board of the Public Relations Office of the University to guarantee the maintenance each student's privacy. The questionnaire remained available online for two months; 618 responses were collected at the end of this period, and the data obtained were analyzed.

3.4.2 – Proposed models and Exploratory Factor Analysis

Our first proposed model (Figure 1) contained seven constructs, identified by a total of 29 items. During the survey, students were asked to assign a score to each item using a 5-point Likert scale ranging from 1 = unimportant to 5 = very important. The Goal Framing Theory scale was used to evaluate the type of goal-frame students possess, that is hedonic, gain or normative. It contained 13 items (6 for hedonic goal, 3 for gain goal, 4 for normative goal), which were adapted from the scales developed by Awuni and Du (2016) and Tang et al (2019). The “perception of packaging attributes” scale was developed to investigate what intrinsic and extrinsic attributes a packaging should possess to be perceived as eco-friendly. It contained 13 items: 6 for intrinsic (i.e. structural) attributes, 7 for extrinsic attributes (i.e. 4 for visual attributes, 3 for informative attributes), which were extracted from the qualitative studies by Magniers and Criè (2015), Zeng and Durif (2019) and Nguyen et al. (2020). Finally, the purchase intentions scale was used to assess students’ purchase intentions of products with a green packaging. It contained 3 items, which were adapted from Liang et al (2019).

Since the “perception of packaging attributes” scale was the only one that has never been tested in a model, we performed an Exploratory Factor Analysis (EFA) to assess the correct number of factors and their relations using R Software version 4.0.4, *psych* package (Revelle, 2021), and *fa.parallel()* and *fa()* functions. Given the results obtained (Figure 2), the analysis suggested 4 as the best number of factors to use for the model, instead of the 3 (i.e. structural, visual and informative) we extracted from the literature (Magniers and Criè, 2015). In particular, the analysis revealed that two of the six items forming the structural attributes (i.e. STR_1 and STR_2) were part of a new construct we called “size and material attributes” (MR3), and referred to the size of packaging and the quantity of material used. The remaining four attributes (STR_3, STR_4, STR_5 and STR_6) were included into “post-consumption attributes” (MR4), and referred to post-consumption properties, that is biodegradability/recyclability/reusability. The factor analysis also revealed that two of the four items forming the visual attributes (i.e. VIS_3 and VIS_4) were, instead, part of “informative attributes” (MR1).

Therefore, we adapted the scales and model to the EFA results, obtaining a new model (Figure 3), new research hypotheses (Table 1), and a new scale for the attributes of packaging (Table 2).

3.4.3 – Data analysis

Data management and analysis was performed using R Software version 4.0.4 and *lavaan* package (Rosseel, 2012). The analysis followed a two steps approach, as proposed by Anderson and Gerbing (1988). The first part of the approach included a Confirmatory Factor Analysis (CFA) to assess the correct measure of the latent variables. Standardized factor loadings of each measurement item, reliability (Cronbach's α coefficient) and Average Variance Extracted (AVE) for each latent factor were

assessed to check the reliability and validity of the sample data, as well as the consistency and reliability of the measurement scales for each construct.

Secondly, the proposed hypotheses were tested using a Structural Equation Model, as this method is more suitable to make explicit the structure of causal relationships among latent variables (Cohen et al., 1990). The fit indexes of the proposed model (χ^2/df , SRMR, CFI, TLI and RMSEA) were evaluated to verify how well the hypothesized model reproduces the observed covariance matrix.

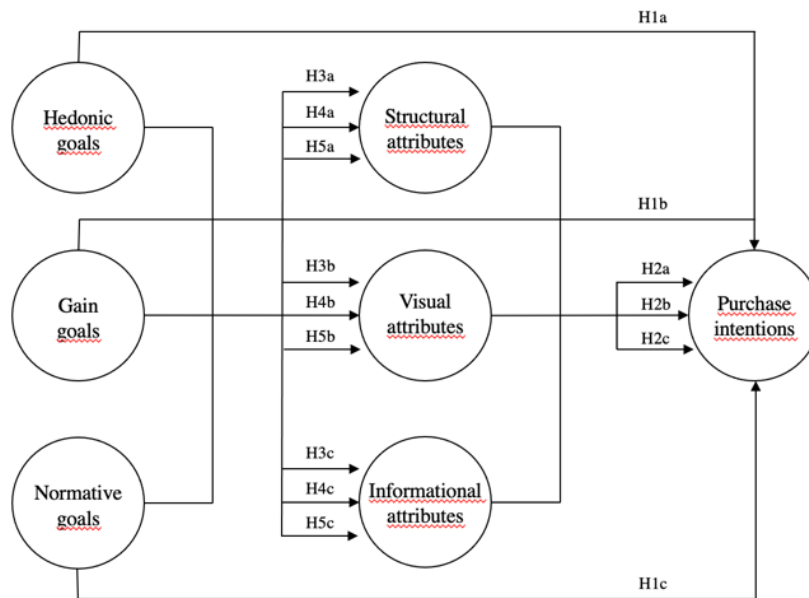


Figure 1 – first model

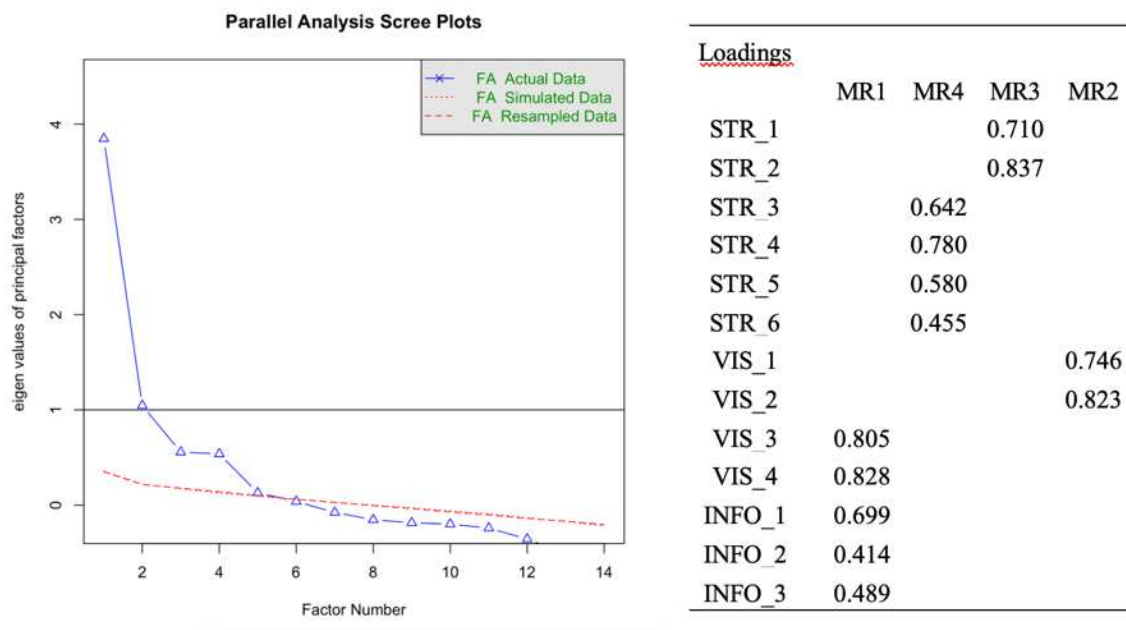


Figure 2 – results by *fa.parallel* (on the left) and *fa* (on the right) functions in R

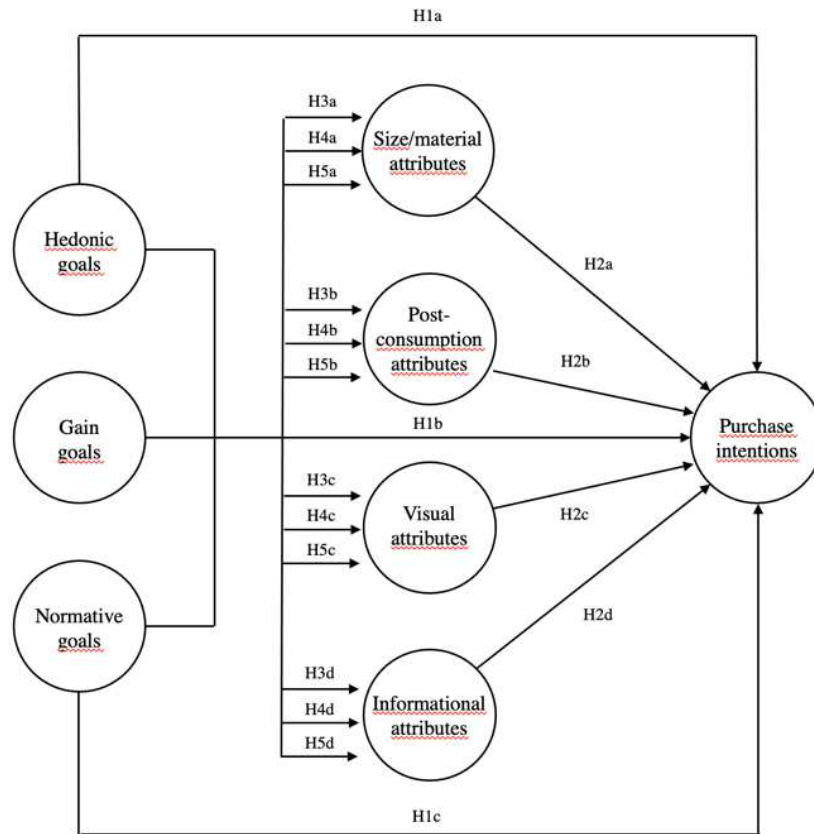


Figure 3 – second model after EFA

Old research hypotheses	New research hypotheses
H2a A packaging perceived as eco-friendly thanks to its structural attributes positively influences consumers' purchase intentions	H2a A packaging perceived as eco-friendly thanks to its appropriate size and its lower over-packaging positively influences consumers' purchase intentions
H2b A packaging perceived as eco-friendly thanks to its visual attributes positively influences consumers' purchase intentions	H2b A packaging perceived as eco-friendly thanks to its post-consumption properties positively influences consumers' purchase intentions
H2c A packaging perceived as eco-friendly thanks to its informative attributes positively influences consumers' purchase intentions	H2c A packaging perceived as eco-friendly thanks to its color or images linked to the environment and nature positively influences consumers' purchase intentions
	H2d A packaging perceived as eco-friendly thanks to the presence of environmental information positively influences consumers' purchase intentions
H3a Hedonic goals lead consumers to perceive a packaging with appropriate structural attributes as eco-friendly	H3a Hedonic goals lead consumers to perceive a packaging with appropriate size and lower over-packaging as eco-friendly
H3b Hedonic goals lead consumers to perceive a packaging with appropriate visual attributes as eco-friendly	H3b Hedonic goals lead consumers to perceive a packaging with post-consumption properties as eco-friendly
H3c Hedonic goals lead consumers to perceive a packaging with appropriate informative attributes as eco-friendly	H3c Hedonic goals lead consumers to perceive a packaging with color or images linked to the environment and nature as eco-friendly
	H3d Hedonic goals lead consumers to perceive a packaging with environmental information as eco-friendly
H4a Gain goals lead consumers to perceive a packaging with appropriate structural attributes as eco-friendly	H4a Gain goals lead consumers to perceive a packaging with appropriate size and lower over-packaging as eco-friendly
H4b Gain goals lead consumers to perceive a packaging with appropriate structural attributes as eco-friendly	H4b Gain goals lead consumers to perceive a packaging with post-consumption properties as eco-friendly
H4c Gain goals lead consumers to perceive a packaging with appropriate structural attributes as eco-friendly	H4c Gain goals lead consumers to perceive a packaging with color or images linked to the environment and nature as eco-friendly
	H4d Gain goals lead consumers to perceive a packaging with environmental information as eco-friendly

<i>H5a Normative goals lead consumers to perceive a packaging with appropriate structural attributes as eco-friendly</i>	H5a Normative goals lead consumers to perceive a packaging with appropriate size and lower over-packaging as eco-friendly
<i>H5b Normative goals lead consumers to perceive a packaging with appropriate visual attributes as eco-friendly</i>	H5b Normative goals lead consumers to perceive a packaging with post-consumption properties as eco-friendly
<i>H5c Normative goals lead consumers to perceive a packaging with appropriate informative attributes as eco-friendly</i>	H5c Normative goals lead consumers to perceive a packaging with color or images linked to the environment and nature as eco-friendly
	H5d Normative goals lead consumers to perceive a packaging with environmental information as eco-friendly

Table 1 – old hypotheses developed from scientific literature (on the left); new research hypotheses developed after EFA (on the right)

3.5 – RESULTS

In the entire month during which the questionnaire was available online, 618 complete responses were obtained. Respondents were mainly bachelor students (n = 416; 67%), mainly female (n = 415; 67%), more than half aged around 19–22 (n = 345; 56%) and enrolled in "Agricultural sciences" (22%), "Economy" (15%), and "Modern languages" (14%) courses (Table 2).

Data	Number of respondents	Percentage
Gender		
Male	199	32%
Female	415	67%
Academic position		
Bachelor student	416	67%
Master student	202	33%
Age		
19-22	345	56%
23-26	168	27%
27-30	47	8%
30 +	58	9%
Field of study		
Agricultural sciences	135	22%
Economy	91	15%
Modern languages	88	14%
Medicine	83	13%
Engineering and architecture	76	12%
Arts and cultural heritage	75	12%
Mathematics and physics	49	8%
Law	16	3%
Biotechnology	5	1%

Table 2 - Socio demographic characteristics of respondents

3.5.1 – Measurement model

The results obtained from the CFA suggest that the measurement model and its associated measurement items are valid and reliable (Table 3). The factor loading for most of the items resulted to be greater than 0.7. The Cronbach's alpha (α) of each construct was above or very close to the general threshold of 0.70, ranging from 0.67 to 0.91, which indicates an adequate level of reliability or internal consistency in the measurement items (Nunnally, 1994). Moreover, the AVE for each construct is above or very close to the cut-off point of 0.50, ranging from 0.43 to 0.77. The only two constructs showing an AVE < 0.5 are the ones related to gain goals and post-consumption properties of packaging (AVE = 0.43 for both). According to the classic theory, an AVE below 0.5 should be considered not adequate. However, Fornell and Larcker (1981) said that if the AVE is less than 0.5, but composite reliability is higher than 0.6, the convergent validity of the construct can be still considered adequate. Therefore, since the composite reliability of the two constructs is equal to 0.67 and 0.74, respectively, we can accept the corresponding AVE.

3.5.2 – Model fit and hypotheses test

The CFA indicated a reasonable model fit for the data obtained. According to Hooper et al (2008), to be considered as acceptable, the Chi-square normalized by degrees of freedom (χ^2/df) should not exceed 3; both the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR) should not exceed 0.08; both the Comparative Fit Index (CFI) and the Tucker–Lewis index (TLI) should not be below 0.90. Our results demonstrated that all the indexes are within the acceptance thresholds ($\chi^2/df = 2.96$; RMSEA = 0.057; SRMR = 0.067; CFI = 0.923; TLI = 0.912), and that the proposed model can be considered adequate.

Figure 4 and Table 4 shows the standardized path coefficients for the estimates of the structural model. Our data seem to confirm the positive influence of hedonic and normative goals on purchase intentions of products with eco-friendly packaging, supporting H1a (0.35, $p < 0.001$) and H1c (0.49, $p < 0.001$). On the contrary, the model seems to reject H1b and the influence of gain goals (-0.14, $p < 0.001$).

Regarding the influence on purchase intentions of how consumers perceive a packaging as eco-friendly basing on its attributes, our model confirms the role of post-consumption properties and informational attributes, supporting H2b (0.08, $p < 0.05$) and H2d (0.14, $p < 0.001$). On the contrary, both size/material attributes (0.01, $p > 0.05$) and visual attributes (0.00, $p > 0.05$) seem to not play a key role in influencing consumers' green purchase intentions. Therefore, H2a (0.02, $p > 0.05$) and H2c (0.00, $p > 0.05$) are rejected.

Regarding how consumers' goals influence their perception of packaging, our model showed mixed results. Hedonic goals seem to lead consumers to perceive a packaging as eco-friendly if it possesses

appropriate size and lower over-packaging (0.32, $p < 0.01$), and post-consumption properties (0.40, $p < 0.001$), supporting, in turn, H3a and H3b. On the contrary, their influence seems to be not significant in the presence of a packaging with color and images linked to nature (-0.1, $p > 0.05$) and informative attributes (0.09, $p > 0.05$). The influence of gain goals appeared to be not significant in the presence of a packaging with appropriate size and lower over-packaging (0.03, $p > 0.05$), post-consumption properties (0.01, $p > 0.05$) and environmental information (0.07, $p > 0.05$). Therefore, H4a, H4b and H4d are rejected. However, we found a positive and significant relationship with a packaging with color and images linked to nature (0.38, $p < 0.001$), supporting H4c. Finally, normative goals seem to influence consumers' perceptions only in the presence of a packaging showing informative attributes (0.46, $p < 0.001$), supporting H5d and rejecting H5a (0.1, $p > 0.05$), H5b (0.15, $p > 0.05$) and H5c (0.07, $p > 0.05$).

Constructs and sources	Items	SFL	α	AVE
GFT hedonic goal (adapted from Awuni & Du, 2016; Tang et al, 2019)	I derive happiness and satisfaction when I purchase products with eco-friendly packaging	0.822	0.90	0.59
	Purchase of products with eco-friendly packaging makes me feel a better person	0.785		
	Eco-friendly packaging are more visually pleasing compared to traditional ones	0.628		
	I like purchase products with eco-friendly packaging	0.845		
	I am easily to be moved by the advertisements of products with eco-friendly packaging	0.722		
	I feel proud when I purchase products with eco-friendly packaging	0.806		
GFT gain goal (adapted from Awuni & Du, 2016; Tang et al, 2019)	Buying products with eco-friendly packaging improve the way that I am perceived	0.771	0.67	0.43
	Eco-friendly packaging possess more health benefits compared to the traditionals	0.509		
	Buying products with eco-friendly packaging may improve my social status	0.666		
"GFT normative goal (adapted from Tang et al, 2019)"	I buy products with eco-friendly packaging because I have the consciousness and awareness of environmental protection	0.826	0.79	0.51
	I personally feel morally obliged to purchase products with eco-friendly packaging	0.581		
	Buying products with eco-friendly packaging may reduce carbon footprint and slow climate change	0.543		
	I buy products with eco-friendly packaging because I have strong environmental responsibility	0.864		
Size and shape attributes of packaging (adapted from Magniers & Criè, 2015; Zeng et al, 2019; Nguyen et al 2020)	Small dimensions	0.794	0.77	0.62
	Less material	0.793		
Post-consumption attributes of packaging (adapted from Magniers & Criè, 2015; Zeng et al, 2019; Nguyen et al 2020)	Recycled material	0.715	0.74	0.43
	Recyclable material	0.720		
	Biodegradable material	0.659		
	Reusable material	0.516		
Visual attributes of packaging (adapted from Magniers & Criè, 2015; Zeng et al, 2019)	Color (e.g. green, white or brown)	0.809	0.77	0.62
	Images of nature or landscapes	0.766		
Informational attributes of packaging (adapted from Magniers & Criè, 2015; Zeng et al, 2019; Nguyen et al 2020)	Labels showing low environmental impact production (e.g. Ecolabel)	0.875	0.82	0.50
	Labels showing ecological properties (e.g. 100% recyclable)	0.872		
	Environmental info supporting the message showed by labels	0.690		
	Disposal info	0.457		
	General environmental claims (e.g. eco-friendly product)	0.563		
Green purchase intentions (adapted from Liang et al 2019)	For the future, I intend to purchase products with eco-friendly packaging	0.942	0.91	0.77
	I am willing to purchase products with eco-friendly packaging	0.806		
	I will make an effort to purchase products with eco-friendly packaging	0.878		

Table 3 – new scales after EFA, and CFA results (SFL = standardized factor loadings; α = Crombach's Alpha; AVE = average variance extracted)

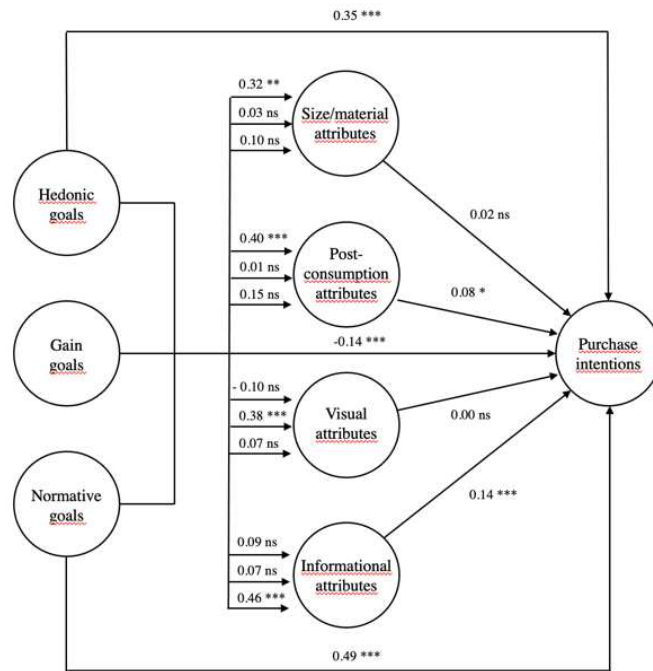


Figure 4 - Standardized path coefficients

	Hypothesis	Std path coefficients	Supported
H1a	Hedonic goals of consumers positively influence purchase intentions of products with eco-friendly packaging	0.35 ***	Yes
H1b	Gain goals of consumers positively influence purchase intentions of products with eco-friendly packaging	-0.14 ***	No
H1c	Normative goals of consumers positively influence purchase intentions of products with eco-friendly packaging	0.49 ***	Yes
H2a	A packaging perceived as eco-friendly thanks to its appropriate size and its lower over-packaging positively influences consumers' purchase intentions	0.025 (n.s.)	No
H2b	A packaging perceived as eco-friendly thanks to its post-consumption properties positively influences consumers' purchase intentions	0.081 *	Yes
H2c	A packaging perceived as eco-friendly thanks to its color or images linked to the environment and nature positively influences consumers' purchase intentions	0.001 (n.s.)	No
H2d	A packaging perceived as eco-friendly thanks to the presence of environmental information positively influences consumers' purchase intentions	0.137 ***	Yes
H3a	Hedonic goals lead consumers to perceive a packaging with appropriate size and lower over-packaging as eco-friendly	0.307 **	Yes
H3b	Hedonic goals lead consumers to perceive a packaging with post-consumption properties as eco-friendly	0.367 ***	Yes
H3c	Hedonic goals lead consumers to perceive a packaging with color or images linked to the environment and nature as eco-friendly	-0.134 (n.s.)	No
H3d	Hedonic goals lead consumers to perceive a packaging with environmental information as eco-friendly	0.068 (n.s.)	No
H4a	Gain goals lead consumers to perceive a packaging with appropriate size and lower over-packaging as eco-friendly	0.044 (n.s.)	No
H4b	Gain goals lead consumers to perceive a packaging with post-consumption properties as eco-friendly	0.014 (n.s.)	No
H4c	Gain goals lead consumers to perceive a packaging with color or images linked to the environment and nature as eco-friendly	0.409 ***	Yes
H4d	Gain goals lead consumers to perceive a packaging with environmental information as eco-friendly	0.112 *	Yes
H5a	Normative goals lead consumers to perceive a packaging with appropriate size and lower over-packaging as eco-friendly	0.107 (n.s.)	No
H5b	Normative goals lead consumers to perceive a packaging with post-consumption properties as eco-friendly	0.180 (n.s.)	No
H5c	Normative goals lead consumers to perceive a packaging with color or images linked to the environment and nature as eco-friendly	0.082 (n.s.)	No
H5d	Normative goals lead consumers to perceive a packaging with environmental information as eco-friendly	0.479 ***	Yes

Table 4 - Standardized path coefficients

3.6 – DISCUSSION

The aim of the research study was to contribute to scientific research by determining the influence of personal goals and perceptions on purchase intentions of products with eco-friendly packaging. According to the Goal Framing Theory (Lindenberg and Steg, 2007; Steg et al., 2016, 2014), individuals' pro-environmental behavior, choices and actions are driven by three life goals: hedonic (e.g. to derive happiness, pleasure, or to feel proud); gain (e.g. to increase social reputation, social status, or to safeguard personal health); normative (e.g. to protect the environment and society because it is the right thing to do). Our model seems to partially confirm the theory. Indeed, more than 50% of the respondents declared to enjoy, feel happy, satisfied and a better person when purchasing a product with eco-friendly packaging. In parallel, more than 60% of respondents declared to purchase products with eco-friendly packaging because they have the consciousness and awareness of environmental protection, they have environmental responsibility, and because the purchase of these products can contribute slowing down climate changes. According to our results, these hedonic and normative motives seem to be strong enough to influence future green purchasing, and this is in line with the findings by Awuni and Du (2016), Chakraborty et al (2017) and Tang et al (2019). On the contrary, gain goals seem to discourage the purchase of products with eco-friendly packaging. Indeed, for more than 70% of respondents, purchasing a product with eco-friendly packaging doesn't improve their social status or the way they are perceived by peers. These results seem to contradict the findings by Awuni and Du (2016), who demonstrated that people tend to purchase green products to increase their social reputation. Probably, students who seek for social acceptance tend to consider eco-friendly packaging as an element not able to increase their social status enough, compared to the type of product.

The theoretical background we relied on stated that, beside personal goals, green purchase intentions depend also on how much consumers perceive eco-friendly that packaging (Ryu et al., 2010; Steenis et al., 2018), and on its ability to fulfill personal goals (van Osselaer and Janiszewski, 2012). Therefore, our model aimed to confirm this theory taking into consideration both intrinsic and extrinsic attributes. According to our results, a packaging can positively influence consumers' purchase intentions if it is perceived as eco-friendly thanks to both its intrinsic (i.e. post-consumption properties, such as biodegradability, recyclability and reusability) and extrinsic attributes (i.e. the presence of environmental information, such as eco-labels, disposal info, general environmental claims). Both attributes seem to positively fulfill consumers' hedonic and normative goals, respectively. In other words, the presence of post-consumption properties positively influences consumers' perceptions, and, in turn, purchase intentions, thanks to their ability to arise positive emotions, that is to make them feel happy, satisfied or proud. These findings are in line with the results by Koenig-Lewis et al (2014), who demonstrated that a plastic bottle made of plant-based material (and, in turn, with a higher biodegradability rate) influenced respondents purchase intentions by evoking positive emotions. In parallel, the presence of environmental information positively influences consumers' perceptions, and,

in turn, purchase intentions, thanks to its ability to demonstrate them the environmental benefits and properties, and to reinforce even more their altruistic and biospheric values. These findings are in line with the results by Wensing et al (2020) and Steenis et al (2018). Indeed, the authors demonstrated that, when consumers perceive a packaging as sustainable via its environmental information and in line with their biospheric values, they feel morally satisfied, more willing to pay and to purchase a product with that packaging. Our findings seem to also confirm the Theory of Consumption Values (Sheth, 1991), according to which being able to arise emotions and satisfy the desire of knowledge through the provision of information are two of the five consumption values of a product on which consumers focus when they make a choice (i.e. emotional and epistemic values). Literature demonstrated that this is valid even for green purchasing (Lin & Huang, 2012; Gonçalves et al, 2016; Awuni and Du, 2016). Therefore, we can state that consumers are more willing to purchase a product with a green packaging if it perceived as eco-friendly thanks to the presence of some ecological attributes able to satisfy their hedonic or normative goals.

Results also showed that both some intrinsic (i.e. smaller dimensions and lower over packaging) and extrinsic (i.e. color and images referred to nature) attributes didn't influence consumers' perceptions and, in turn, purchase intentions. In other words, consumers seem to not perceive a packaging that possess adequate size, a lower quantity of material and color/images recalling environmental landscapes as eco-friendly enough. This, in turn, could prevent them to be willing to purchase green products in the future. These findings are in contrast with the ones of the qualitative study by Magniers and Criè (2015). Indeed, the authors found that "over packaging removal", "size", "color", and "images" are four attributes considered as important by consumers to perceive a packaging as eco-friendly. Despite this, our results showed a positive and significant relationships between hedonic goals and "small dimensions"/ "lower over packaging", and between gain goals and "color"/"images". Therefore, even if these attributes didn't influence perceptions of sustainability and, in turn, purchase intentions, their presence seemed to have fulfilled both hedonic (by arising emotions) and gain goals (by improving social status), respectively. Even this last finding seems to confirm the Theory of Consumption Values (Sheth, 1991). Indeed, being able to improve the way consumers are perceived by peers, helping them by making a good impression, is one of the five consumption values (together with emotional and epistemic ones) on which consumers focus when they make a green choice (Lin & Huang, 2012; Gonçalves et al, 2016; Awuni and Du, 2016).

3.7 – CONCLUSIONS

Ecological intentions are influenced by many factors. According to the Goal Framing Theory, one of the most important factors researchers should consider in their theoretical models is the role played by personal goals. That is, individuals' pro-environmental behavior is determined not only by attitudes, level of knowledge, beliefs, morality, and so on, but also on their desire to do something for themselves,

the society or both. The fact that an individual decides to behave responsibly to contribute protecting the environment (normative goal) doesn't mean that, in parallel, he/she doesn't want to feel proud for his/her action (hedonic goal) or to be considered as an altruistic person by peer groups (gain goal). Moreover, it doesn't mean that his/her behavior will not change according to the situation. Therefore, everyone possesses several types of personal goals, which can coexist, support or hinder each other, and which are sensitive to the context and situation.

By combining the Goal Framing Theory with the theories on perceptions and product attributes within a structural equation model, the research study demonstrated how students' purchase intentions of products with eco-friendly packaging is influenced not only by personal factors, but also by product features, and perceptions. Products features can be considered as a contextual factor able to influence personal goals through perceptions. To the best of our knowledge, this is the first research study that aimed to explain purchase intentions of products with green packaging by making use of the proposed theoretical framework. Personal goals appeared to play a positive role in influencing consumption dynamics, especially hedonic and normative. On the contrary, gain goals seemed to be not in line with purchase intentions. Moreover, our model demonstrated how packaging attributes can influence both purchase intentions and personal goals. Indeed, if consumers perceive a product with eco-friendly packaging as sustainable, they are more willing to purchase it since they feel fulfilled their personal goals.

Despite the interesting results obtained, we encountered some limitations. First of all, for the purposes of the research we didn't focus on a specific type of packaging. Therefore, it shouldn't be taken for granted that our results would be the same if considering a specific packaging (e.g. for food). Second, even if the fit indexes, statistical reliability, and validity made the model acceptable, some constructs and scale items appeared to be not completely adequate, influencing, in turn, the robustness of the analysis. Therefore, future research studies should consider this, and develop new items, to increase the robustness of the model. Finally, we focused only on a specific type of consumer (i.e. university students). Therefore, future research studies considering other consumers would be valuable.

REFERENCES

- Ajzen, I., 1991. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50, 179–211.
[https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Ali, S.S., Elsamahy, T., Koutra, E., Kornaros, M., El-Sheekh, M., Abdelkarim, E.A., Zhu, D., Sun, J., 2021. Degradation of conventional plastic wastes in the environment: A review on current status of knowledge and future perspectives of disposal. *Sci. Total Environ.* 771, 144719. <https://doi.org/10.1016/j.scitotenv.2020.144719>
- Ampuero, O., Vila, N., 2006. Consumer perceptions of product packaging. *J. Consum. Mark.* 23, 100–112.
<https://doi.org/10.1108/07363760610655032>
- Anderson, J.C., Gerbing, D.W., 1988. Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. *Psychol. Bull.* 103, 411–423.
- Awuni, J.A., Du, J., 2016. Sustainable Consumption in Chinese Cities: Green Purchasing Intentions of Young Adults Based

- on the Theory of Consumption Values: Green Purchasing in Chinese Cities. *Sustain. Dev.* 24, 124–135.
<https://doi.org/10.1002/sd.1613>
- Boesen, S., Bey, N., Niero, M., 2019. Environmental sustainability of liquid food packaging: Is there a gap between Danish consumers' perception and learnings from life cycle assessment? *J. Clean. Prod.* 210, 1193–1206.
<https://doi.org/10.1016/j.jclepro.2018.11.055>
- Boz, Z., Korhonen, V., Koelsch Sand, C., 2020. Consumer Considerations for the Implementation of Sustainable Packaging: A Review. *Sustainability* 12, 2192. <https://doi.org/10.3390/su12062192>
- Chakraborty, A., Singh, M.P., Roy, M., 2017. A study of goal frames shaping pro-environmental behaviour in university students. *Int. J. Sustain. High. Educ.* 18, 1291–1310. <https://doi.org/10.1108/IJSHE-10-2016-0185>
- Chen, Y.-S., Lin, Ching-Ying, Weng, Chia-Sui, 2015. The Influence of Environmental Friendliness on Green Trust: The Mediation Effects of Green Satisfaction and Green Perceived Quality. *Sustainability* 7, 10135–10152.
<https://doi.org/10.3390/su70810135>
- Choi, D., Johnson, K.K.P., 2019. Influences of environmental and hedonic motivations on intention to purchase green products: An extension of the theory of planned behavior. *Sustain. Prod. Consum.* 11.
- Cohen, P., Cohen, J., Teresi, J., Marchi, M., Velez, C.N., 1990. Problems in the Measurement of Latent Variables in Structural Equations Causal Models. *Appl. Psychol. Meas.* 14, 183–196. <https://doi.org/10.1177/014662169001400207>
- de Medeiros, J.F., Ribeiro, J.L.D., Cortimiglia, M.N., 2016. Influence of perceived value on purchasing decisions of green products in Brazil. *J. Clean. Prod.* 110, 158–169. <https://doi.org/10.1016/j.jclepro.2015.07.100>
- Fornell, C., Larcker, D., 1981. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *J. Mark. Res.* 18, 39–50.
- Goh, S.K., Balaji, M.S., 2016. Linking green skepticism to green purchase behavior. *J. Clean. Prod.* 131, 629–638.
<https://doi.org/10.1016/j.jclepro.2016.04.122>
- Gonçalves, H.M., Lourenço, T.F., Silva, G.M., 2016. Green buying behavior and the theory of consumption values: A fuzzy-set approach. *J. Bus. Res.* 69, 1484–1491. <https://doi.org/10.1016/j.jbusres.2015.10.129>
- Griskevicius, V., Tybur, J.M., Van den Bergh, B., 2010. Going green to be seen: Status, reputation, and conspicuous conservation. *J. Pers. Soc. Psychol.* 98, 392–404. <https://doi.org/10.1037/a0017346>
- Herbes, C., Beuthner, C., Ramme, I., 2020. How green is your packaging—A comparative international study of cues consumers use to recognize environmentally friendly packaging. *Int. J. Consum. Stud.* 44, 258–271.
<https://doi.org/10.1111/ijcs.12560>
- Hooper, D., Coughlan, J., Mullen, M.R., 2008. Structural Equation Modelling: Guidelines for Determining Model Fit 6, 8.
- Jacobs, K., Petersen, L., Hörisch, J., Battenfeld, D., 2018. Green thinking but thoughtless buying? An empirical extension of the value-attitude-behaviour hierarchy in sustainable clothing. *J. Clean. Prod.* 203, 1155–1169.
<https://doi.org/10.1016/j.jclepro.2018.07.320>
- Jerzyk, E., 2016. Design and Communication of Ecological Content on Sustainable Packaging in Young Consumers' Opinions. *J. Food Prod. Mark.* 22, 707–716. <https://doi.org/10.1080/10454446.2015.1121435>
- Kao, T.-F., Du, Y.-Z., 2020. A study on the influence of green advertising design and environmental emotion on advertising effect. *J. Clean. Prod.* 242, 118294. <https://doi.org/10.1016/j.jclepro.2019.118294>
- Kim, H., Kim, J., Oh, K.W., Jung, H.J., 2016. Adoption of Eco-Friendly Faux Leather: Examining Consumer Attitude With the Value-Belief-Norm Framework. *Cloth. Text. Res. J.* 34, 239–256. <https://doi.org/10.1177/0887302X16656439>
- Koenig-Lewis, N., Palmer, A., Dermody, J., Urbye, A., 2014. Consumers' evaluations of ecological packaging – Rational and emotional approaches. *J. Environ. Psychol.* 37, 94–105. <https://doi.org/10.1016/j.jenvp.2013.11.009>
- Kumar, P., Ghodeswar, B.M., 2015. Factors affecting consumers' green product purchase decisions. *Mark. Intell. Plan.* 33, 330–347. <https://doi.org/10.1108/MIP-03-2014-0068>
- Kupiec, B., Revell, B., 2001. Measuring consumer quality judgements. *Br. Food J.* 103, 7–22.
<https://doi.org/10.1108/00070700110382911>
- Lee, E.J., Bae, J., Kim, K.H., 2020. The effect of environmental cues on the purchase intention of sustainable products. *J.*

- Bus. Res. 120, 425–433. <https://doi.org/10.1016/j.jbusres.2019.10.048>
- Lemke, F., Luzio, J.P.P., 2014. Exploring Green Consumers' Mind-Set toward Green Product Design and Life Cycle Assessment: The Case of Skeptical Brazilian and Portuguese Green Consumers. *J. Ind. Ecol.* 18, 619–630. <https://doi.org/10.1111/jiec.12123>
- Liao, L.X., Corsi, A.M., Chrysochou, P., Lockshin, L., 2015. Emotional responses towards food packaging: A joint application of self-report and physiological measures of emotion. *Food Qual. Prefer.* 42, 48–55. <https://doi.org/10.1016/j.foodqual.2015.01.009>
- Lin, P.-C., Huang, Y.-H., 2012. The influence factors on choice behavior regarding green products based on the theory of consumption values. *J. Clean. Prod.* 22, 11–18. <https://doi.org/10.1016/j.jclepro.2011.10.002>
- Lindenberg, S., Steg, L., 2007. Normative, Gain and Hedonic Goal Frames Guiding Environmental Behavior. *J. Soc. Issues* 63, 117–137. <https://doi.org/10.1111/j.1540-4560.2007.00499.x>
- Lindh, H., Olsson, A., Williams, H., 2016. Consumer Perceptions of Food Packaging: Contributing to or Counteracting Environmentally Sustainable Development?: Consumer Perceptions of Food Packaging. *Packag. Technol. Sci.* 29, 3–23. <https://doi.org/10.1002/pts.2184>
- Magnier, L., Crié, D., 2015. Communicating packaging eco-friendliness: An exploration of consumers' perceptions of eco-designed packaging. *Int. J. Retail Distrib. Manag.* 43, 350–366. <https://doi.org/10.1108/IJRDM-04-2014-0048>
- Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: An emerging field of research and its prospects. *Res. Policy* 41, 955–967. <https://doi.org/10.1016/j.respol.2012.02.013>
- Narula, S.A., Desore, A., 2016. Framing green consumer behaviour research: opportunities and challenges. *Soc. Responsib. J.* 12, 1–22. <https://doi.org/10.1108/SRJ-08-2014-0112>
- Nguyen, A.T., Parker, L., Brennan, L., Lockrey, S., 2020. A consumer definition of eco-friendly packaging. *J. Clean. Prod.* 252, 119792. <https://doi.org/10.1016/j.jclepro.2019.119792>
- Nunnally, J.C., 1994. *Psychometric Theory*. McGraw-Hill, New York.
- Revelle W (2021). *psych: Procedures for Psychological, Psychometric, and Personality Research*. Northwestern University, Evanston, Illinois. R package version 2.1.9, <https://CRAN.R-project.org/package=psych>.
- Rosseeel Y (2012). “lavaan: An R Package for Structural Equation Modeling.” *Journal of Statistical Software*, 48(2), 1–36. <https://www.jstatsoft.org/v48/i02/>.
- Ryu, K., Han, H., Jang, S. (Shawn), 2010. Relationships among hedonic and utilitarian values, satisfaction and behavioral intentions in the fast-casual restaurant industry. *Int. J. Contemp. Hosp. Manag.* 22, 416–432. <https://doi.org/10.1108/09596111011035981>
- Schwartz, S.H., 1977. Normative Influences on Altruism, in: *Advances in Experimental Social Psychology*. Elsevier, pp. 221–279. [https://doi.org/10.1016/S0065-2601\(08\)60358-5](https://doi.org/10.1016/S0065-2601(08)60358-5)
- Scott, L., Vigar-Ellis, D., 2014. Consumer understanding, perceptions and behaviours with regard to environmentally friendly packaging in a developing nation. *Int. J. Consum. Stud.* 38, 642–649. <https://doi.org/10.1111/ijcs.12136>
- Sharma, A., Foropon, C., 2019. Green product attributes and green purchase behavior: A theory of planned behavior perspective with implications for circular economy. *Manag. Decis.* 57, 1018–1042. <https://doi.org/10.1108/MD-10-2018-1092>
- Sheth, J.N., Newman, B.I., Gross, B.L., 1991. Why we buy what we buy: A theory of consumption values. *J. Bus. Res.* 22, 159–170. [https://doi.org/10.1016/0148-2963\(91\)90050-8](https://doi.org/10.1016/0148-2963(91)90050-8)
- Sijtsema, S.J., Onwezen, M.C., Reinders, M.J., Dagevos, H., Partanen, A., Meeusen, M., 2016. Consumer perception of bio-based products—An exploratory study in 5 European countries. *NJAS - Wagening. J. Life Sci.* 77, 61–69. <https://doi.org/10.1016/j.njas.2016.03.007>
- Silayoi, P., Speece, M., 2007. The importance of packaging attributes: a conjoint analysis approach. *Eur. J. Mark.* 41, 1495–1517. <https://doi.org/10.1108/03090560710821279>
- Smith, K.T., Brower, T.R., 2012. Longitudinal study of green marketing strategies that influence Millennials. *J. Strateg. Mark.* 20, 535–551. <https://doi.org/10.1080/0965254X.2012.711345>

- Songa, G., Slabbinck, H., Vermeir, I., Russo, V., 2019. How do implicit/explicit attitudes and emotional reactions to sustainable logo relate? A neurophysiological study. *Food Qual. Prefer.* 71, 485–496.
<https://doi.org/10.1016/j.foodqual.2018.04.008>
- Steenis, N.D., van der Lans, I.A., van Herpen, E., van Trijp, H.C.M., 2018. Effects of sustainable design strategies on consumer preferences for redesigned packaging. *J. Clean. Prod.* 205, 854–865.
<https://doi.org/10.1016/j.jclepro.2018.09.137>
- Steg, L., Bolderdijk, J.W., Keizer, K., Perlaviciute, G., 2014. An Integrated Framework for Encouraging Pro-environmental Behaviour: The role of values, situational factors and goals. *J. Environ. Psychol.* 38, 104–115.
<https://doi.org/10.1016/j.jenvp.2014.01.002>
- Steg, L., Lindenberg, P., Keizer, K., 2016. Intrinsic Motivation, Norms and Environmental Behaviour: The Dynamics of Overarching Goals. *Int. Rev. Environ. Resour. Econ.* /9, 179–207. <https://doi.org/10.1561/101.00000077>
- Steg, L., Vlek, C., 2009. Encouraging pro-environmental behaviour: An integrative review and research agenda. *J. Environ. Psychol.* 29, 309–317. <https://doi.org/10.1016/j.jenvp.2008.10.004>
- Stern, P., Dietz, T., Abel, T., Guagnano, G., Kalof, L., 1999. A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism. *Hum. Ecol. Rev.* 6, 81–97.
- Stöckigt, G., Schiebener, J., Brand, M., 2018. Providing sustainability information in shopping situations contributes to sustainable decision making: An empirical study with choice-based conjoint analyses. *J. Retail. Consum. Serv.* 43, 188–199. <https://doi.org/10.1016/j.jretconser.2018.03.018>
- Su, Y., Duan, H., Wang, Z., Song, G., Kang, P., Chen, D., 2020. Characterizing the environmental impact of packaging materials for express delivery via life cycle assessment. *J. Clean. Prod.* 274, 122961.
<https://doi.org/10.1016/j.jclepro.2020.122961>
- Tang, Y., Chen, S., Yuan, Z., 2020. The effects of hedonic, gain, and normative motives on sustainable consumption: Multiple mediating evidence from China. *Sustain. Dev.* 28, 741–750. <https://doi.org/10.1002/sd.2024>
- Tong, Q., Anders, S., Zhang, J., Zhang, L., 2020. The roles of pollution concerns and environmental knowledge in making green food choices: Evidence from Chinese consumers. *Food Res. Int.* 130, 108881.
<https://doi.org/10.1016/j.foodres.2019.108881>
- Tripathi, A., Singh, M.P., 2016. Determinants of sustainable/green consumption: a review. *Int. J. Environ. Technol. Manag.* 19, 43.
- Truong, V.A., Lang, B., Conroy, D.M., 2021. Are trust and consumption values important for buyers of organic food? A comparison of regular buyers, occasional buyers, and non-buyers. *Appetite* 161, 105123.
<https://doi.org/10.1016/j.appet.2021.105123>
- Tseng, M.-L., Sujanto, R.Y., Iranmanesh, M., Tan, K., Chiu, A.S., 2020. Sustainable packaged food and beverage consumption transition in Indonesia: Persuasive communication to affect consumer behavior. *Resour. Conserv. Recycl.* 161, 104933. <https://doi.org/10.1016/j.resconrec.2020.104933>
- Tseng, S.-C., Hung, S.-W., 2013. A framework identifying the gaps between customers' expectations and their perceptions in green products. *J. Clean. Prod.* 59, 174–184. <https://doi.org/10.1016/j.jclepro.2013.06.050>
- van Osselaer, S.M.J., Janiszewski, C., 2012. A Goal-Based Model of Product Evaluation and Choice. *J. Consum. Res.* 39, 260–292. <https://doi.org/10.1086/662643>
- Vega-Zamora, M., Torres-Ruiz, F.J., Parras-Rosa, M., 2019. Towards sustainable consumption: Keys to communication for improving trust in organic foods. *J. Clean. Prod.* 216, 511–519. <https://doi.org/10.1016/j.jclepro.2018.12.129>
- Wensing, J., Caputo, V., Carraresi, L., Bröring, S., 2020. The effects of green nudges on consumer valuation of bio-based plastic packaging. *Ecol. Econ.* 178, 106783. <https://doi.org/10.1016/j.ecolecon.2020.106783>
- Xu, X., Wang, S., Yu, Y., 2020. Consumer's intention to purchase green furniture: Do health consciousness and environmental awareness matter? *Sci. Total Environ.* 704, 135275. <https://doi.org/10.1016/j.scitotenv.2019.135275>
- Yadav, R., Pathak, G.S., 2016. Young consumers' intention towards buying green products in a developing nation: Extending the theory of planned behavior. *J. Clean. Prod.* 135, 732–739. <https://doi.org/10.1016/j.jclepro.2016.06.120>

- Zabkar, V., Hosta, M., 2013. Willingness to act and environmentally conscious consumer behaviour: can prosocial status perceptions help overcome the gap?: Willingness to act and environmental behaviour. *Int. J. Consum. Stud.* 37, 257–264. <https://doi.org/10.1111/j.1470-6431.2012.01134.x>
- Zeithaml, V.A., 1988. Consumer Perceptions of Price, Quality, and Value: A Means-End Model and Synthesis of Evidence 22.
- Zeng, T., Durif, F., 2019. The Influence of Consumers' Perceived Risks towards Eco-Design Packaging upon the Purchasing Decision Process: An Exploratory Study. *Sustainability* 11, 6131. <https://doi.org/10.3390/su11216131>
- Zhang, X., Dong, F., 2020. Why Do Consumers Make Green Purchase Decisions? Insights from a Systematic Review. *Int. J. Environ. Res. Public. Health* 17, 6607. <https://doi.org/10.3390/ijerph17186607>

FINAL CONSIDERATIONS AND FUTURE DEVELOPMENTS

The chapters presented so far are three new attempts to gain a better and deeper knowledge on how drive university students' behavior towards a pro-environmental behavior. The first chapter focused on the role of Higher Education Institutions (HEIs) and their strategies implemented along the last decade. Results demonstrated how HEIs have been playing a passive rather than active role in influencing students' behavior since 2010. However, this was necessary, since, to change a behavior, it is first fundamental to identify and evaluate the psychological and contextual variables, and how they relate each other. Only through preliminary studies (i.e. assessment and research) it is possible to define the best theoretical framework to set the most effective strategy. The second and third chapters can be considered as two examples of research studies with a passive approach. Indeed, both studies aimed to better understand how students' purchasing intentions of hot drinks served with an eco-friendly cup and of products with eco-friendly packaging, respectively, could be influenced by both their personal perceptions / goals and product attributes. Both studies helped to the advancing of scientific literature. Indeed, the second chapter focused on vending sector, in particular on the role played by hot beverages cups with ecological attributes, which is an unexplored research topic. In parallel, the third chapter combined, for the first time, the Goal Framing Theory with the theories on perceptions and products' attributes.

All the research studies also laid the foundations for interesting future developments:

1 – One of the main limitations of the first chapter was focusing only on pro-environmental behavior, excluding from the research parameters pro-social behavior (e.g., assistance to the elderly or volunteering in soup kitchens). References to concepts, such as “sustainable development,” “prosperous society,” or “sustainable transition,” include consideration of how the behavior of individuals influences not only the environmental dimension, but also the social dimension. Therefore, a new research study that will take into consideration how university students engage in social activities and will investigate the role played by these activities in creating a prosperous society by making use of the same methodology would be valuable. Moreover, additional research studies that deeply investigate the role of nudges (not addressed within the present study) are essential.

2 – The literature review conducted for the second chapter highlighted a research gap about the “sustainable development” concept within vending sector. In particular, most of the research studies focus on: a) how to increase individuals' consumptions of healthy products through an arrange of products within vending machines; b) investigating the nutritional composition of the products sold to classify them as “healthy” or “unhealthy”. No scientific papers discussing if and how the vending market is in line with the recent regulations on ecological transition were found. Therefore, a research study that take into consideration this perspective is fundamental. Moreover, the research study presented in

the second chapter was the first considering the role of hot beverage cups for sustainability topic. I think that this is a research topic that should be deeper investigated. Therefore, future developments could include a new choice experiment, comparing plastic cups with paper cups. Moreover, it would also be very interesting exploring if and how an eco-friendly cup can influence sensory expectations of consumers of hot beverages (e.g. coffee, chocolate, milk-based specialties).

3 – The third chapter was the first study that combined the Goal Framing Theory (GFT) with the theories on consumers' perceptions and product attributes. However, I think that a new research study to confirm the theoretical approach would be valuable. Moreover, I noticed that the GFT matches very well with the Theory of Consumption Values (TCV). As explained in the theoretical background, the TCV assumes that individuals' consumption decisions rely on how much they perceive a product as able to fulfill functional, social, emotional, epistemic, and conditional values. An in-depth analysis highlighted that these product values match with the personal goals identified by GFT. Therefore, a future research study could combine these two theories, providing new theoretical frameworks to be used to explain individuals' consumption choices.

ACKNOWLEDGMENTS

I want to thank my Ph.D. supervisor, prof. Francesco Marangon, for having supported me during these three years of academic studies, for having always suggested the best ways to improve our works, and for having taught me to observe the surrounding environment with curiosity and passion. Many thanks also to prof. Stefania Troiano and prof. Federico Nassivera for their precious teachings during the development of the studies presented in chapters 2 and 3. Finally, I want to thank prof. Daniel Vecchiato of the University of Padua, and prof. Katia Laura Sidali of the University of Verona for having reviewed my thesis, and for having provided valuable suggestions to make all the works readable and impactful.