

Intrinsic motivation strongly affects the readiness toward circular food consumption: evidence from the motivation–opportunity–ability model

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Abstract

Purpose – This study empirically explores the factors that influence consumers' readiness toward engagement in circular food consumption.

Design/methodology/approach – A conceptual model based on the motivation–opportunity–ability (MOA) framework was developed. In addition to all the classical relationships in this theoretical framework, respondents' age and education were added to the model. An online survey was conducted, resulting in an overall sample of 411 Italian participants. Data were statistically analyzed by using partial least squares structural equation modeling (PLS-SEM).

Findings – The results indicated that motivation, opportunity and ability had positive effects on consumers' readiness toward engagement in circular food consumption (CFC). Of all the constructs, intrinsic motivation had the most significant impact on consumers' readiness toward engagement in CFC. The results also showed that sociodemographic traits—particularly age and gender—significantly influenced consumer readiness toward engagement in CFC. Practical and policy implications are proposed based on the study findings.

Originality/value – The study analyzes factors influencing consumers' readiness to engage in CFC. While great attention has been paid toward circular economy (CE) implementation in food consumption, empirical evidences on how to prompt the consumers' readiness toward CFC are still lacking. More specifically, the authors explore for the first time, sociopsychological factors affecting consumers' readiness to reduce, reuse and recycle technical components of food products, using the MOA theory as conceptual model.

Keywords Circular economy, CFC, MOA, PLS-SEM

Paper type Research paper

1. Introduction

Consumption and production systems are increasingly being compelled to move toward more sustainable pathways, particularly in more developed economies. While the United Nations Sustainable Development Goals (SDGs) explicitly commit to sustainable consumption and

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production patterns (SDG 12), the European Union (EU) strongly advocates for transitioning from the current linear model of production and consumption to an integrated circular bioeconomy. This approach aims to optimize the use/reuse of natural capital or facilitate its regeneration, thereby reducing the overall environmental impact (Muscio and Sisto, 2020). For instance, the EU Circular Economy Package and EU Action Plan for the Circular Economy (CE) include specific measures and legislative proposals to support the transition toward the CE (Ghisellini and Ulgiati, 2020). Indeed, to achieve the target of climate neutrality by 2050 and decouple economic growth from resource use, the EU is pushing the transition toward a CE approach [1], mostly in the agri-food sector (European Commission, 2020). In recent years, several studies have pointed out the unsustainability of agri-food systems from the environmental viewpoint (Muscio and Sisto, 2020) as such systems cause environmental degradation, food loss and waste generation, thereby jeopardizing global food security (Zhang *et al.*, 2022; Esposito *et al.*, 2020). Even if both food production and consumption are considered responsible for the main environmental impacts, such as greenhouse gas emissions, water pollution and biodiversity loss (Annunziata *et al.*, 2019), consumers have been considered key agents for sustainable development, playing a critical role in the transition toward sustainable food systems (Annunziata *et al.*, 2019; De Bernardi *et al.*, 2023). However, research on consumption in the direction of circular food systems is limited and fragmented (do Canto *et al.*, 2021).

According to do Canto *et al.* (2021), the transition toward a CE requires a change in consumer behavior, such as an increase in consumer demand for green products. Recent studies have examined the transition towards a CE in food consumption, introducing the term “circular food consumption” (CFC) as a food-related practice integrated into systematic thinking (Borrello and Cembalo, 2022; do Canto *et al.*, 2021). However, there is a lack of empirical research on consumer readiness toward CFC systems, and the existing studies are limited and fragmented (do Canto *et al.*, 2021). Therefore, this study fills this gap in the literature by empirically investigating the sociopsychological antecedents of consumer readiness toward CFC. Previous studies have analyzed the antecedents of food consumption through the lens of cognitive-behavioral models (Gallagher *et al.*, 2022; Dorce *et al.*, 2021; Raimondo *et al.*, 2022), identifying external and internal factors affecting consumer behavior. Internal factors include personal motivation, values, attitude, knowledge and emotions (Čapienè *et al.*, 2021). External factors represent the forces affecting the internal factors; these include institutional, economic, social and cultural elements of the macro-environment (Kollmuss and Agyeman, 2002). Several cognitive models have been proposed as general models to interpret consumers’ choices and behaviors, such as the theory of planned behavior (Ajzen, 1985), the subjective culture model (Triandis, 1980) and the theory of trying (Bagozzi and Warshaw, 1990). The motivation–opportunity–ability (MOA) framework represents a cognitive model that was specifically designed to interpret pro-environmental and pro-social consumer behavior (MacInnis *et al.*, 1991; Ölander and Thøgersen, 1995). This framework includes three primary explanatory components of individual choices: 1. “Motivation”; 2. “Opportunity” and 3. “Ability.” “Motivation” represents “*the motivation of the actor to choose one or the other of alternative acts toward the target object*” (Ölander and Thøgersen, 1995, p. 361); “Opportunity” refers to circumstances in which people are facilitated to behave in the desired way (Zhu, 2016). Finally, “Ability” refers to the actor’s ability to carry out their intention (Ölander and Thøgersen, 1995).

The focus areas of empirical studies on consumer behavior that apply the MOA framework include home energy conservation (Baumhof *et al.*, 2018), organic food consumption (Zhu, 2016) and use of public transportation (Thøgersen, 2009). More recent studies have applied the MOA framework to analyze food waste (von Kameke and Fisher, 2018; van Geffen *et al.*, 2020; Soma *et al.*, 2021). However, to the best of our knowledge, no study has yet applied the MOA model to CFC; additionally, no empirical study has investigated beyond the recycling aspect of CFC (do Canto *et al.*, 2021).

Accordingly, the current study investigates, for the first time, the reduce, reuse and recycle (3 R) (Sohal and De Vass, 2022) approach in food consumption by using the MOA model, focusing on packaging, the technical component of food products (Borrello and Cembalo, 2022), which can be reduced, reused and finally recycled. In particular, this study investigates the transition toward CE by analyzing how sociopsychological factors—in terms of motivation, opportunity and ability—affect consumers' readiness toward engagement in CFC. While the MOA framework has been recently applied in the domain of food waste (von Kameke and Fisher, 2018; van Geffen *et al.*, 2020; Soma *et al.*, 2021) and organic sustainable consumption (Zhu, 2016), there is no research on its application to interpret the determinants of the transition toward CFC.

However, we expect, coherently with Olander and Thøgersen (1995) that the MOA might successfully interpret the determinants of the transition toward CFC due to the following two main reasons: (1) the prediction of a behavior with an environmental impact improves if ability and opportunity are taken into consideration and (2) the MOA model is particularly suitable for predicting behaviors linked to goals requiring discipline, ability and resources that are relevant in this case. Thus, two research questions arise: (1) is the MOA model effective in explaining consumer readiness toward CFC (RQ1)? and, if the answer to the first question is affirmative, (2) which factor has the greatest influence on consumers' readiness toward CFC (RQ2)?

The RQ1 and RQ2 were accomplished through a structured survey involving 411 Italian respondents; subsequently, constructs were analyzed through partial least squares structural equation modeling (PLS-SEM). The remainder of the paper is organized as follows: Section 2 presents the study background and the theoretical framework while Section 3 reveals the materials and methods applied in the study. Results are presented in Section 4 and discussed in Section 5. Finally, Section 6 concludes.

2. Study background

2.1 Circular food consumption and the 3 Rs approach

It is widely acknowledged that the introduction of CE pathways in the agri-food sector should involve both the production and consumption stages (Zhang *et al.*, 2022; Hamam *et al.*, 2021; Esposito *et al.*, 2020). Recently, significant attention has been paid to CE implementation in food consumption as reshaping consumer behavior is required for CE implementation (Borrello *et al.*, 2020; Lehtokunnas *et al.*, 2022). CE implementation in food consumption is relatively new in the scientific literature and is recently conceptualized by do Canto *et al.* (2021) and Borrello and Cembalo, 2022, as circular food behavior or CFC practice. The two notions are basically the same as both can be described as a set of consumers food-related activities and practices, part of consumers' lifestyles that foster circular economy by going beyond recycling (Borrello and Cembalo, 2022). It is not limited to a single moment of the individual decision-making (i.e. shopping) (Aschemann-Witzel *et al.*, 2019), while it involves a systematic thinking approach (do Canto *et al.*, 2021).

Even though CFC represents a wide concept, the scientific literature has to date provided only a partial and fragmented representation (do Canto *et al.*, 2021). Indeed, empirical studies have mainly examined CFC by focusing solely on one dimension (the so-called "R") of the CE. As shown by Table 1, although the representation of R-imperatives for CE ranges from 3 R to 10 R (Sohal and De Vass, 2022; Reike *et al.*, 2018), the empirical literature interprets CE implementation by using the reduce, reuse and recycle concepts separately and applying them to a such specific activity. Previous literature has spent emphasis on analyzing factors affecting consumers behavior to reduce food waste (Dudziak *et al.*, 2022; Varese *et al.*, 2022) or recycle food by-products (Alonso-Muñoz *et al.*, 2022; Cattaneo *et al.*, 2019; Coderoni and Perito, 2021), also defining the Consumer Effort Index (CEI) by looking at CE categories (Paparella *et al.*, 2023). Other studies focused on analyzing consumers' willingness to reduce the intake of

Source	Definition	Type of study	Study site	Dimensions analyzed	Main results
Aschemann-Witzel et al. (2019)	N.A.	Conceptual	N.A.	Reduce	Definition of six necessary transformations to which sensory consumer science can make a contribution
Aiking and de Boer (2019)	N.A.	Conceptual and empirical	Netherland	Reduce	Health may be crucial in persuading consumers to abandon their conservative attitudes and embark on a diet transition
Cattaneo et al. (2019)	N.A.	Empirical	Italy	Recycle	Positive attitudes towards food by-products were found, even in people characterized by a greater food neophobia and lower education level
do Canto et al. (2021)	Adoption of a circular food-related lifestyle in which food consumption is a part of systematic thinking	Review	N.A.	Reduce, reuse, recycle	The path towards circular food behaviors could start with small changes (linear behaviors), going through slightly more transformative practices (transitioning behaviors) until reaching circular practices (circular behaviors)
Coderoni and Perito (2021)	N.A.	Empirical	Italy	Recycle	Giving information about the environmental and health attributes of products may increase millennials' preference for food products enriched with upcycled ingredients
Spartano and Grasso (2021)	N.A.	Empirical	UK	Reduce	Educating and informing consumers about the benefits of feeding hens with insects may increase intentions to consume eggs from insect-fed hens

Table 1.
List of studies focusing on CFC, typology, study area, dimension analyzed and main results

(continued)

Source	Definition	Type of study	Study site	Dimensions analyzed	Main results
Alonso-Muñoz <i>et al.</i> (2022)	N.A.	Review	N.A.	Recycle	The main research topic of circular food waste management concern the recovery and valorisation of food waste. However, these processes need the consideration of social aspects which are currently understudied
Borrello and Cembalo (2022)	A set of consumers food-related practices that foster circular economy by going beyond recycling	Conceptual	N.A.	Reduce, reuse, recycle	Definition and identification of main circular food consumption practices
Dudziak <i>et al.</i> (2022)	N.A.	Empirical	Poland	Reduce	Consumers seem to be aware of the excessive food discarding in their households and they recognize their role in reducing food waste
Dagevos and Taufik (2023)	N.A.	Empirical	Netherland	Reduce	Consumers prefer processed insect-based foods in which insects are invisible to the consumption of whole insects
Varese <i>et al.</i> (2022)	N.A.	Review	N.A.	Reduce	To improve consumers' perception of suboptimal food, four interventions are proposed: on the supply chain, on personal experience and awareness campaigns, on promoting circular economy, and on marketing and advertising campaigns
Our study	N.A.	Empirical	Italy	Reduce, reuse, recycle	Consumers motivation, opportunity, and ability play a relevant role on their readiness to engage in circular food consumption

Source(s): Authors' own construction

Table 1.

animal' proteins (Spartano and Grasso, 2021; Dagevos and Taufik, 2023), for example, by consuming insects (Aiking and de Boer, 2019). Borrello *et al.* (2017) analyzed the willingness of consumers to return organic food waste to retailers. Indeed, since food is made of biodegradable materials that can be safely returned to the environment, its biological component does not lend itself to reuse in a direct way (do Canto *et al.*, 2021). As a result, it is tricky to conduct a more comprehensive analysis of CFC, such as by applying the CE's main 3 Rs at the same time (reduce, reuse and recycle) in particular for the biological component of food. However, the 3 Rs perspective can be applied straightforwardly to the technical component of food products, packaging (Borrello and Cembalo, 2022), which needs to be reduced, reused and recycled as well. Thus, a step forward could be to investigate CFC by examining the technical components of food products using all the 3 Rs related practices, rather than focusing on a specific activity.

To effectively implement CFC, it is essential that the presence of a strong sense of collaboration and participation among individuals, which required their active engagement (do Canto *et al.*, 2021). Consumer engagement is influenced by various individual factors, such as cognitive, emotional and behavioral aspects (Hollebeek, 2011). Among these, individual motivations for change appear to be a crucial component (Flaherty *et al.*, 2019). As for consumers' food-related activities, previous studies have pointed out the efficacy of the MOA model in providing a clear understanding of pro-environmental behavior that requires, as in CFC, high level of consumers engagement as well (Bettiga *et al.*, 2018). For that reason, the current study draws on the MOA framework (Olander and Thøgersen, 1995; Rothschild, 1999), to investigate the internal and external factors affecting consumers' readiness to engage toward reducing, reusing and recycling the technical components of food products.

2.2 The motivation-opportunity-ability model

Following the development of several behavioral theories from 1980 to 1990 to create an attitude model covering behaviors that are not completely volitional, the MOA model was conceived in 1995 by Olander and Thøgersen (1995). Some of the prior models include the theory of planned behavior (Ajzen, 1985), the subjective culture model (Triandis, 1980) and the theory of trying (Bagozzi and Warshaw, 1990). Olander and Thøgersen (1995) found that within the environmental domain, the prediction of behavior improves considerably by including ability and opportunity as moderators of the relationship between attitude and behavior. The core of the MOA theory is that a behavior is more likely to be performed if a consumer (1) perceives it as supporting their interest and is aware of the consequences of not acting (motivation), (2) has options available and accessible to encourage the behavior (opportunity) and (3) has skills and knowledge to perform the behavior (ability) (van Geffen *et al.*, 2020). More precisely, motivation includes the drivers of intention-setting, such as personal values, attitudes and subjective norms (Olander and Thøgersen, 1995), while opportunity includes factors in the consumer environment that can be drivers or barriers in performing that specific behavior. Ability refers to a consumer's capability to successfully perform a behavior (Olander and Thøgersen, 1995). Following Olander and Thøgersen (1995), according to whom the MOA framework is particularly useful in explaining behaviors linked to goals requiring abilities, resources and discipline, the current study aims to explore the motivations, opportunities and abilities of consumers to reduce, reuse and recycle (3 R) the technical components of food products. Of particular interest is the identification of factors that could potentially facilitate consumer engagement in CFC. This study focuses on not only responsible shopping (Mylan *et al.*, 2016) but also on activities in the domestic sphere to investigate the aspects of reuse and recycling linked to the technical components of food products.

2.3 Theoretical framework and research hypotheses development

2.3.1 Impacts of motivation, opportunity and ability on consumers' readiness toward engagement in CFC.

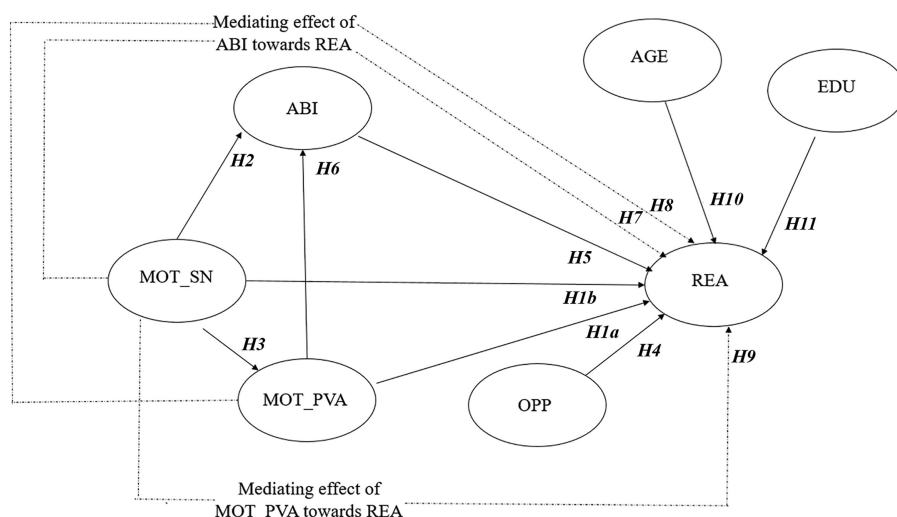
Our implementation of the MOA consists of five main constructs: intrinsic and extrinsic motivations, opportunity, ability and readiness toward engagement in

CFC. Moreover, two sociodemographic aspects of consumers, age and education, were considered (Figure 1).

According to Olander and Thøgersen (1995), “the motivational factor is a felt moral obligation, which may start out as a social norm, but which may quickly become an internalized personal norm” (Olander and Thøgersen, 1995, p. 362). Here, motivations are considered as two separate constructs: one referring to intrinsic motivation that includes personal values and attitudes (MOT_PVA) and the other referring to extrinsic motivation that includes social norms (MOT_SN). Both personal values and attitudes have been demonstrated to influence pro-environmental food-related behaviors (Aguirre Sánchez *et al.*, 2021; Gallagher *et al.*, 2022). Personal values and attitudes have been recently identified by Bolwig *et al.* (2021) among the main individual factors affecting food waste and sustainable food behaviors in general. Similarly, Jang and Cho (2022) showed how personal values positively affect consumers’ intentions to purchase plant-based meat alternatives, while Gallagher *et al.* (2022) revealed how individual attitude has a strong effect on intention to reduce food waste. Accordingly, the following hypotheses are proposed:

H1a. Intrinsic motivation (MOT_PVA) has a direct and positive impact on readiness (REA) toward engagement in CFC.

Extrinsic motivation includes social pressure to recognize a behavior as inappropriate or appropriate (Krupka and Weber, 2009). In marketing research, social influence is considered to be one of the most effective behavioral change methods (Ran *et al.*, 2022). Indeed, social pressure, such as information campaigns, could stimulate CFC practices by enhancing consumers’ knowledge and information (do Canto *et al.*, 2021), thus increasing consumers’ ability to perform that specific behavior. Consequently, the following hypotheses are formulated:



Note(s): MOT_SN = Extrinsic motivation (inc. social norm); MOT_PVA = Intrinsic motivation (inc. personal values and attitude); OPP = opportunity; ABI = ability; REA = readiness; EDU: education. Direct effects are marked with continuous lines while indirect effects are marked with dashed lines

Source(s): Authors’ own construction

Figure 1.
Graphical representation of the proposed model

H1b. Extrinsic motivation (MOT_SN) has a direct and positive impact on readiness (REA) toward engagement in CFC.

H2. Extrinsic motivation (MOT_SN) has a direct and positive effect on ability (ABI).

O'Fallon and Butterfield (2013) stated that consumers compare their own values to the notions of peer norms considered as standards. Accordingly, intrinsic motivation could be influenced by extrinsic motivation. Thus, the following hypothesis is proposed:

H3. Extrinsic motivation (MOT_SN) has a direct and positive impact on intrinsic motivation (MOT_PVA).

Lack of opportunity indicates a lack of an environmental mechanism that restrains an individual from performing a behavior. In the consumer environment, opportunity refers to factors imposing restrictions on the behavior that consumers are able to perform (i.e. high cost of product, food infrastructure and technical appliances) (van Geffen *et al.*, 2020). Conversely, if an opportunity is sufficiently provided, consumer behavior is performed. For example, van Geffen *et al.* (2020) identified the proximity of supermarkets and their opening hours as an opportunity to reduce food waste since allow consumers to buy day by day. Therefore, the following hypothesis is proposed:

H4. Opportunity (OPP) has a direct positive impact on readiness (REA) toward engagement in CFC.

As stated above, the concept of ability refers to the skills and knowledge required to perform a behavior successfully (van Geffen *et al.*, 2020). Indeed, several studies have found that improving consumers' time-management skills as well as their cooking abilities or food knowledge may reduce food waste (van Geffen *et al.*, 2020; Gallagher *et al.*, 2022). Similarly, Lelicińska-Serafin *et al.* (2023) highlighted the knowledge of physical and chemical characteristics of food waste as a critical factor for reducing waste in domestic settings.

In 1995, Ölander and Thøgersen stated that ability affects behavior and mediates the relationship between consumer attitude and behavior. Accordingly, a direct positive effect of intrinsic motivation on ability is hypothesized, with a consequent indirect effect of intrinsic motivation on behavioral intention, mediated by ability. Briefly, the following two hypotheses are proposed:

H5. Ability (ABI) has a positive impact on readiness (REA) toward engagement in CFC.

H6. Intrinsic motivation (MOT_PVA) has a direct and positive effect on ability (ABI).

Based on the above, ability and motivation mediate the effects of some constructs on consumers' readiness (REA) toward engagement in CFC, thus generating the following three mediating effects:

H7. Ability (ABI) mediates the impact of extrinsic motivation (MOT_SN) on readiness (REA) toward engagement in CFC.

H8. Ability (ABI) mediates the impact of intrinsic motivation (MOT_PVA) on readiness (REA) toward engagement in CFC.

H9. Intrinsic motivation (MOT_PVA) mediates the effect of social norms (MOT_SN) on readiness (REA) toward engagement in CFC.

2.3.2 Impacts of age and education on consumers' readiness toward engagement in CFC. The effects of age and education on food consumption have been extensively investigated (Feil *et al.*, 2020; Hoek *et al.*, 2021). Many studies have found a positive relationship between the intention to buy green products and a high level of education; however, these studies have

found a negative relationship between the intention to buy green products and older age (Tikka *et al.*, 2000; Pillai, 2013). Moreover, other researchers found a positive relationship between education and the propensity to make sustainable food choices (Hoek *et al.*, 2021), such as buying organic food products (Feil *et al.*, 2020). Previous studies have also found that younger consumers are more prone to choose sustainable food. Lastly, Liere and Dunlap (1980) found age and education consistently associated with environmental concern. Accordingly, younger and highly educated consumers may display more readiness toward engagement in CFC. Therefore, the following hypotheses were proposed:

H10. Consumers' age (AGE) has a negative impact on readiness (REA) toward engagement in CFC.

H11. Consumers' education (EDU) has a positive impact on readiness (REA) toward engagement in CFC.

3. Materials and method

3.1 Data collection and survey

An online survey was administered to a snowball convenience sample in 2022 by using social networks. To reach a wider number of participants, the questionnaire was sent through different messaging and communication platforms (e.g. Facebook, Twitter, WhatsApp, email). Despite the well-known limitations of the online survey that include, among others, reliance on self-reports and assumed attention to stimuli (Cloudy *et al.*, 2021), the snowball convenience sample has some interesting advantages, such as low cost and a low likelihood of interviewer-induced error (Denscombe, 2006).

The survey administration was anonymous to minimize social desirability biases. Participants approved the informed permission form, stating that they were at least 18 years old, and were told about the confidentiality of the data collection before beginning the questionnaire. The sample size was set at 400 to satisfy an effect size (correlation between latent constructs) equal to 0.16, and a power of 95, according to the a priori power analysis (Faul *et al.*, 2009). The planned sample size was inflated to 440 (+10%) to protect against poor compliance.

The survey was conducted in two steps. The first section included items generating the following five latent variables: MOT_PVA, MOT_SN, OPP, ABI and REA. Due to the lack of empirical research on CFC, the characterization of latent variables and thus, items definition was based in accordance with previous studies using the MOA and ad-hoc adapted to this specific study context. In detail, previous studies focusing on social and environmental marketing practices (Akhtar *et al.*, 2022; Tweneboah-Koduah *et al.*, 2020) and on sustainable consumption (Zhu, 2016; Baumhof *et al.*, 2018; Testa *et al.*, 2020) have been taken into consideration. Overall, 15 items have been defined, three for each latent construct, and are measured through a seven-point Likert scale that ranges from 1 ("strongly disagree") to 7 ("strongly agree"). Items are presented in Table A1 in the Appendix.

The second and final section of the survey included items relating to the following sociodemographic characteristics of the respondents: age, gender, education (university degree or not) and living area (urban or rural). These statements were translated into Italian. The total time employed by the participants to complete both sections of the survey was approximately 5 min.

3.2 Empirical analysis

After data collection, PLS-SEM was performed to investigate consumers' readiness toward CFC. PLS-SEM is a multivariate technique widely used to analyze consumer preferences and

buying behavior in both observational and experimental settings (Raimondo *et al.*, 2022; Caracciolo *et al.*, 2020; Hair *et al.*, 2019). Several recent studies have applied PLS-SEM to investigate consumer behavior through the theory of planned behavior (TPB) (Raimondo *et al.*, 2022; Gallagher *et al.*, 2022) as well as through the MOA (Ahmad *et al.*, 2021).

The PLS-SEM method consists of two parts: measurement (or outer) and structural (or inner) models. The former provides relationships between latent constructs (or latent variables) and the items they are defined by, whereas the structural model shows the relationships between latent constructs themselves (Venturini and Mehmetoglu, 2019). Among the main advantages of PLS-SEM are its ability to detect statistically significant relationships with small sample sizes, accommodate non-normal data, include multiple indicators per construct, and handle complex models featuring numerous relationships (Hair *et al.*, 2019). The algorithm used to estimate the PLS-SEM model comprised three steps: First, the latent construct scores were estimated by using an iterative process; subsequently, the measurement and structural model parameters were estimated in the second and third steps, respectively. Once the measurement model was specified, it was evaluated by using the diagnostic criteria suggested by Sarstedt *et al.* (2022): first, indicator reliability (reflective factor loadings >0.4) and internal consistency reliability (Cronbach's alpha, Dillon-Goldstein's (DG) rho and rho A > 0.6 in exploratory research) were assessed. Subsequently, the convergent and discriminant validity of the measurement model were assessed. Convergent validity is achieved when the average variance extracted (AVE) of the construct is equal to or higher than 0.5, while discriminant validity is achieved by the Fornell-Larcker criterion, where the square root of the average variance extracted (AVE) is compared with the correlation of latent constructs (Dorce *et al.*, 2021; Venturini and Mehmetoglu, 2019). Finally, to assess the severity of common method bias, collinearity among the constructs was tested (Kock, 2015); subsequently, the Harmon one-factor test was implemented (Podsakoff *et al.*, 2003). The structural model assessment was based on path coefficient values (Venturini and Mehmetoglu, 2019; Hair *et al.*, 2014). All statistical analyses were performed by using Stata 16 (StataCorp LP, College Station, TX, USA).

4. Results

4.1 Descriptive statistics

A preliminary pilot test with 35 participants did not identify any misinterpretations of the questions or wording issues. A total of 440 responses have been collected. Then, 29 responses have been excluded by the analysis due to invalid responses, resulting in a final sample size of 411 participants. Sociodemographic information showed that the participants (153 male and 258 female) were mostly aged between 18 and 50 years (86%) and living in an urban area (54%). Of the 411 respondents, 113 (27%) had a university degree, while the 8% ($n = 33$) declared a higher level of education.

Of the 15 initial items, one related to ability was excluded because it had a factor loading lower than 0.4. All the mean scores of the items were relatively high, ranging from 3.79 (OPP.1) to 5.59 (ABI.11). Specifically, all items related to consumer readiness toward engagement in CFC (REA. 12, REA.13 and REA.14) had a mean value higher than 5. The descriptive statistics of the respondents' sociodemographic characteristics and each considered item can be found in Appendix Tables A2 and A3, respectively.

4.2 PLS-SEM output

4.2.1 *The measurement model.* Table 2 presents the results of the measurement model. To assess the validity of the measurement model (Venturini and Mehmetoglu, 2019), the researchers of this study first analyzed the relationships between the latent constructs and items (indicator reliability) showing factor loadings above the threshold of 0.4, ranging from

Item	OPP	MOT_SN	MOT_PVA	ABI	REA	AGE	EDU
OPP.1	0.549						
OPP.2	0.901						
OPP.3	0.499						
MOT_SN.4		0.644					
MOT_SN.5		0.804					
MOT_SN.6		0.758					
MOT_PVA.7			0.682				
MOT_PVA.8			0.746				
MOT_PVA.9			0.793				
ABI.10				0.868			
ABI.11				0.819			
REA.12					0.816		
REA.13					0.822		
REA.14					0.874		
AGE						1.000	
EDU							1.000
Cronbach's α	0.518	0.598	0.597	0.598	0.787	1.000	1.000
DG	0.699	0.781	0.785	0.832	0.876	1.000	1.000
Rho A	0.697	0.627	0.611	0.607	0.791	1.000	1.000

Note(s): MOT_SN = Extrinsic motivation (inc. social norm); MOT_PVA = Intrinsic motivation (inc. personal values and attitude); OPP = opportunity; ABI = ability; REA = readiness

Source(s): Authors' own elaboration

Table 2.
Factor loadings,
Cronbach's α , rho A
and average variance
extracted (AVE) of the
measurement model

0.5 to 0.8. One item regarding ability was excluded from the analyses due to a poor loading. Regarding internal consistency, the most popular indexes, such as Cronbach's alpha, Dillon-Goldstein's rho (DG) and rho A coefficient, were considered. While the DG rho value was equal or above 0.7 and the rho A coefficient value was above 0.6 for all considered constructs, the Cronbach's alpha value was below the threshold value of 0.6 for opportunity (OPP), motivation (MOT_SN & MOT_PVA) and ability (ABI) constructs. According to Hinton (2004), Cronbach's alpha values with a range of 0.5–0.7 are considered moderate alpha values, meaning that they are still acceptable, especially for psychological research (Nguyen *et al.*, 2020). Moreover, the Dillon-Goldstein's rho and the rho A coefficient are often preferred in practice because Cronbach's alpha tends to underestimate internal consistency reliability (Sarstedt *et al.*, 2022; Venturini and Mehmetoglu, 2019). The average variance extracted (AVE) scores were close to the threshold of 0.50 (indicating convergent validity), while the results of the Fornell–Larcker criterion showed that none of the squared correlations had a higher value than the AVE scores, indicating that the discriminant validity of the constructs was established (Table A4 in the Appendix).

4.2.2 The structural model. The results of the direct and indirect effects of the structural model are given in Table 3 and illustrated in Figure 2. Each oval corresponds to a latent construct, and the arrows represent the hypothesized relationships among the constructs. Path coefficients indicate the direction and magnitude of the direct relationship between the two constructs, while R^2 indicates the goodness of fit of the structural model. The estimates confirm [2] that all hypotheses related to the relationships among the constructs were accepted at p -value lower than 0.1, except for the effect of education on consumers' readiness toward engagement in CFC (being just above the threshold of 10%). Regarding the structural model's goodness of fit, the R^2 value of 0.38 shows a satisfactory predictive ability of the MOA model in evaluating consumers' readiness toward CFC.

All the path coefficients were in the expected direction. The findings showed that motivation, opportunity, and ability had positive effects on consumers' readiness toward

Table 3.
Results of the
structural model

Hypotheses	Coeff.	p-value	Effect	Result
H1a MOT_PVA → REA	0.301	0.000	Direct	Accepted
H1b MOT_SN → REA	0.102	0.023	Direct	Accepted
H2 MOT_SN → ABI	0.127	0.004	Direct	Accepted
H3 MOT_SN → MOT_PVA	0.414	0.000	Direct	Accepted
H4 OPP → REA	0.207	0.000	Direct	Accepted
H5 ABI → REA	0.200	0.000	Direct	Accepted
H6 MOT_PVA → ABI	0.538	0.000	Direct	Accepted
H7 MOT_SN → ABI → REA	0.025	0.017	Indirect	Accepted
H8 MOT_PVA → ABI → REA	0.108	0.000	Indirect	Accepted
H9 MOT_SN → MOT_PVA → REA	0.124	0.000	Indirect	Accepted
H10 AGE → REA	-0.100	0.011	Direct	Accepted
H11 EDU → REA	0.064	0.102	Direct	Not Accepted

Note(s): MOT_SN = Extrinsic motivation (inc. social norm); MOT_PVA = Intrinsic motivation (inc. personal values and attitude); OPP = opportunity; ABI = ability; REA = readiness

Source(s): Authors' own elaboration

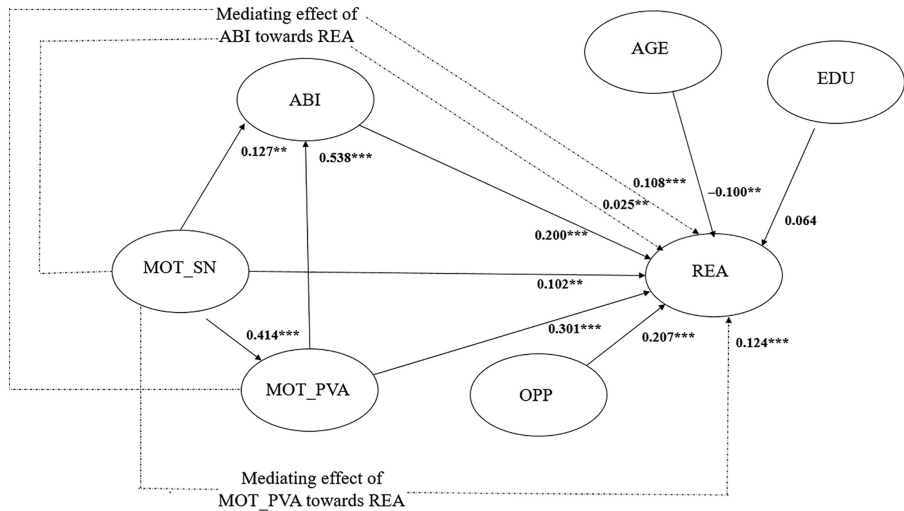


Figure 2.
Graphical
representation of the
results of direct effects

Note(s): * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ MOT_SN = Extrinsic motivation (inc. social norm); MOT_PVA = Intrinsic motivation (inc. personal values and attitude); OPP = opportunity; ABI = ability; REA = readiness; EDU: education. Dotted arrows indicate indirect effects

Source(s): Authors' own construction

engagement in CFC, confirming H1a, H1b, H4 and H5. Intrinsic motivation, in terms of personal values and attitudes, was found to be the strongest predictor of REA (H1a: $\beta = 0.301$; $p < 0.001$), followed by opportunity (H4: $\beta = 0.207$; $p < 0.001$) and ability (H5: $\beta = 0.200$; $p < 0.001$). Extrinsic motivation, in terms of social norms, also had a positive effect on consumers' readiness toward engagement in CFC, but with a low magnitude (H1b: $\beta = 0.102$; $p = 0.023$). Regarding the direct effects of sociodemographic variables on consumers' readiness toward engagement in CFC, the findings revealed a low but negative effect of age

on consumers' readiness toward engagement in CFC (H10: $\beta = -0.100$; $p = 0.011$), indicating that older consumers are less ready to engage in CFC; additionally, more educated consumers are more ready to engage in CFC than uneducated consumers, although this relationship is not significant at 10% (H11: $\beta = 0.064$; $p = 0.102$). Further, consumers' ability toward engagement in CFC was shown to be significantly influenced by motivation (both extrinsic and intrinsic), confirming H2 ($\beta = 0.127$; $p = 0.004$) and H6 ($\beta = 0.538$; $p < 0.001$), while intrinsic motivation to engage in CFC was significantly influenced by extrinsic motivation (H3: $\beta = 0.414$; $p < 0.001$).

As assumed, ability and intrinsic motivation mediated the effects of some constructs on consumers' readiness toward engagement in CFC, thus confirming H7, H8 and H9. Indeed, all hypothesized indirect relationships were supported and statistically significant. The main indirect effect ($\beta = 0.0.124$; $p < 0.001$) was found between extrinsic motivation (MOT_SN) and readiness (REA) toward engagement in CFC, which was mediated by intrinsic motivation (MOT_PVA); the lowest indirect effect was also found between extrinsic motivation (MOT_SN) and readiness (REA) toward engagement in CFC, but it was mediated by ability (ABI) ($\beta = 0.025$; $p = 0.017$).

To check the collinearity issue of the structural model as well as the common method bias, the variance inflation factor analysis and the Harmon one-factor test were performed, respectively. The latter showed that one factor explained approximately 44% of the covariance, which was below the threshold of 50%, while the variance inflation factor analysis showed values lower than 3.3 (Table A5 in the Appendix). The results indicated the absence of common method bias and pathological collinearity among the constructs (Kock, 2015).

5. Discussion

The results from the structural model confirm all the proposed direct and indirect relationships (H1–H11), except for the direct effect of education on consumers' readiness toward engagement in CFC (being just above the threshold of 10%). This proves that the MOA model is a useful framework that is valuable for investigating sociopsychological aspects affecting consumers' transition toward CFC. Several key findings are based on observations from the structural model. These findings have political and scientific implications. The first original finding is that the results show that both extrinsic and intrinsic motivations, opportunities and abilities influence consumers' readiness to shift toward a CFC approach. Indeed, this is the first empirical study to explore consumers' engagement in CFC (i.e. reducing, reusing and recycling) by using the MOA framework, which precludes direct comparisons with other research. However, some studies have investigated the sociopsychological aspects affecting sustainable food consumption (Dorce *et al.*, 2021; Gallagher *et al.*, 2022), while others have analyzed consumer food waste by using the MOA theory (Soma *et al.*, 2021; van Geffen *et al.*, 2020).

The results showed that both intrinsic and extrinsic motivations, opportunity, and ability had positive effects on consumers' readiness toward engagement in CFC. This finding is in line with that of Olander and Thøgersen (1995), who suggested motivation, ability and opportunity as the main determinants of consumer behavior regarding impact on the environment. Specifically, motivation has a direct and positive effect on consumers' readiness toward engagement in CFC. These findings are in line with those of Awuni and Du (2016) and Zhao *et al.* (2014), who found that social norms and personal values positively influence the intention to buy organic fruits, which is an antecedent of sustainable food consumption. Moreover, previous studies have found that lack of opportunity and insufficient ability are barriers to sustainable consumer behavior (Zhu, 2016; van Geffen *et al.*, 2020). For example, van Geffen *et al.* (2020) found that abilities and opportunities affect consumers' readiness to

reduce food waste, whereas a recent study investigating factors affecting sustainable food consumption in Germany concluded that opportunity, in terms of price availability, is the main factor affecting sustainable food choices (Seubelt *et al.*, 2022). The direct positive effect of opportunity on consumers' readiness toward engagement in CFC is supported by previous studies (Alam *et al.*, 2020), emphasizing the perceived availability of a product as an important predictor of food consumption behavior.

The second key finding is that motivation positively affected a consumer's ability to engage in CFC. The effect of social pressure, as well as personal values and attitudes, on the consumers' ability to engage in a specific behavior, has long been established in the scientific literature (Halicka *et al.*, 2021; Matthies *et al.*, 2012; Salmivaara and Lankoski, 2021; Ölander and Thøgersen, 1995). For instance, Halicka *et al.* (2021) found that parental sanctions affect a child's ability to engage in pro-environmental behavior, while Heidbreder *et al.* (2019) found that information campaigns strengthen the implementation of recycling schemes. On the other hand, the effect of personal values and attitudes as a predictor of ability is less investigated, making our finding the first in this domain. However, this result confirms the mediating role of ability between motivation and behavior, as theorized by Ölander and Thøgersen (1995).

Moreover, internal motivation toward engagement in CFC was significantly influenced by external motivation, thus showing the third key finding. Our results agree with those of Hsu *et al.* (2020), who showed that the opinion of someone important to an individual may largely influence their thoughts and views. Several studies have tested the effects of social norms on individual attitudes (Hsu *et al.*, 2016, 2020). For example, Hsu *et al.* (2020) recently analyzed consumer interest in choosing sustainable food; they showed a direct effect of social pressure on consumers' attitudes toward purchasing sustainable food.

Regarding the mediation analysis, our results provided novel empirical evidence, indicating that ability mediated the impact of motivations on consumers' readiness toward engagement in CFC, thus confirming H7 and H8. Our findings also showed the indirect effect of extrinsic motivation on consumers' readiness toward engagement in CFC, mediated by intrinsic motivation (H9).

Regarding the sociodemographic aspects considered in the study, respondents with a university degree were found to be more ready to engage in CFC than respondents without a university degree. Although the relationship is slightly above the 10% threshold, this reflects previous findings, whereby more educated people are often found to consume more sustainable food (Hansmann *et al.*, 2020; Gallagher *et al.*, 2022). For example, Hansmann *et al.* (2020) showed a positive influence of the level of education on the self-reported consumption of organic food products; additionally, highly educated people have been found to be less willing to pay for plastic bags, showing stronger plastic-free behavior than less educated consumers (Heidbreder *et al.*, 2019). Our results also align with those of Franzen and Vogl (2013), who demonstrated a positive effect of educational level on environmental awareness. In this regard, the level of education may increase consumers' knowledge of environmental problems, thus enhancing their environmental concerns and promoting more sustainable food consumption.

Older respondents were found to be less ready to engage in CFC than younger respondents. This is interesting, as previous study have showed that younger people are more prone to engage in more sustainable food behaviors (Siegrist and Hartmann, 2019; Rimal *et al.*, 2005; Heidbreder *et al.*, 2019). For example, Siegrist and Hartmann (2019) showed that younger Swiss consumers are more likely to consume meat substitutes than older consumers. Moreover, in their literature review on plastic consumption, Heidbreder *et al.* (2019) found that younger consumers are more willing to give up over-packaging in the food sector in order to help the environment (Elgaaied-Gambier, 2016), while older Croatian consumers are not concerned about packaging material when they purchase food products

(Draskovic *et al.*, 2009). One explanation for this could be that younger consumers may be more ready to engage in CFC, being more prone to protecting the environment for their future.

6. Conclusions

The implementation of CE in the agri-food sector is gaining momentum (Esposito *et al.*, 2020; Hamam *et al.*, 2021). Rethinking consumption is becoming mandatory, thus requiring increasing engagement in CFC (Borrello and Cembalo, 2022). This study empirically explored the sociopsychological factors that affect engagement in CFC. Specifically, the 3 R concept (reduce, reuse and recycle) is used to identify the impact of consumers' motivation, ability and opportunity on their readiness toward engagement in CFC. Statistical analysis by employing PLS-SEM was performed on an MOA model that included two sociodemographic variables (age and education) in addition to motivation, opportunity and ability. To the best of our knowledge, this is the first empirical study to analyze CFC, and it is also the first study wherein the MOA model was tested for predicting consumers' readiness toward engagement in CFC. In response to the first research question (RQ1), the results showed that the MOA model represents a useful framework for investigating the sociopsychological aspects affecting consumers' readiness toward engagement in CFC. Overall, this study highlights the importance of opportunity, ability, and motivation for increasing consumers' readiness toward engagement in CFC, as well as the impact of sociodemographic aspects on consumers' readiness toward engagement in CFC. When addressing the RQ2, intrinsic motivation emerged as the most influential construct on consumers' readiness for CFC, succeeded by ability, opportunity and extrinsic motivation. Changing consumer personal values and attitudes and improving individual ability and opportunity should be considered impactful for increasing consumers' readiness toward engagement in CFC.

6.1 Theoretical implications

The findings of this study add important empirical evidence to the recent literature on CFC, giving theoretical implications for academics. To the best of our knowledge, this represents the first known empirical study examining food consumption using the 3 Rs perspective. Unlike previous studies, we did not focus on a single food product; instead, we studied overall food consumption. An important scientific implication involves differentiating intrinsic and extrinsic motivations, helping future research using MOA to better predict behaviors and recommend suitable practical actions.

6.2 Practical implications

Empirical evidence on consumers' readiness toward engagement in CFC can also have practical implications, assisting the design of future strategies, campaigns and policies to broaden the implementation of CE in food consumption. For instance, informational campaigns on environmental damage due to food consumption that emphasize the negative role of packaging made with virgin resources, should be promoted to strengthen individual motivations toward engagement in CFC.

Policy-makers could enhance consumers' readiness toward engagement in CFC by providing economic incentives to consumers to buy circular products, that is, products that have been produced, transformed and sold through the implementation of the reducing, reusing and recycling approaches. Moreover, economic incentives and tax benefits could be introduced to reduce, reuse and recycle food packaging. Policymakers and retailers should also increase consumers' ability to reduce, reuse and recycle food packaging. For instance, supermarkets should be equipped with machines to sterilize plastic and aluminum food packaging (Anderson *et al.*, 2020), thus allowing its use and reuse multiple times. However, this emerging area requires further efforts from academics and practitioners to implement

smart and effective solutions at a low cost. The study findings also revealed that specific information campaigns emphasizing the central role of the consumer in the transition toward a CE could increase consumers' motivation (both attitude and social pressure), thus increasing their readiness toward engagement in CFC.

6.3 Study limitations and future line of research

This study has some limitations. First, the results were obtained from a convenience sample; thus, the study results are not generalizable. Moreover, the survey relied on self-reported information, resulting in an increased likelihood of cognitive bias and inaccuracy. Moreover, we analyzed consumer readiness, which is linked more to intention than effective behavior. Future research should observe actual consumer behavior, like circular food consumption practices. Future studies could also explore consumers' readiness toward CFC by exploring approaches apart from 3 R (10 R is now available in the literature) (Sohal and De Vass, 2022) by testing other theoretical frameworks and comparing them to the MOA model. Moreover, future studies could employ a more extensive sample size to enhance the generalizability of the results. Despite its weakness, our study provided, for the first time, valuable insights into the sociopsychological aspects affecting consumers' readiness toward CFC and on how to improve consumers' engagement through opportunity, ability and motivation.

Notes

1. https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en
2. More formally, p -values less than 0.1 suggest that the null hypothesis of absence of relationship cannot be supported by data.

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Appendix

Construct	Item	Statement	Reference
Opportunity	OPP.1	Government provides subsidy and tax benefits if I consume eco-friendly food products	Adapted from: Baumhof et al. (2018) , Tweneboah-Koduah et al. (2020)
	OPP.2	I am ready to pay premium price for buying eco-friendly food products	
	OPP.3	There are eco-friendly food products at cheaper rate as compared to that of non-eco-friendly food products	
Motivation	MOT_SN.4	The market offers eco-friendly food products at a convenient price	Adapted from: Tweneboah-Koduah et al. (2020) , Zhu (2016) , Olander and Thøgersen (1995)
	MOT_SN.5	People who are important to me would I have a circular approach (reducing, reusing and recycling) when I consume food	
	MOT_SN.6	Public institutions would I have a circular approach (reducing, reusing and recycling) when I consume food	
	MOT_PVA.7	When I consume food, I could cause environmental damage	
	MOT_PVA.8	I reduce the consumption of food products produced and packaged with virgin resources	
	MOT_PVA.9	I describe myself as an environmentally responsible consumer	
Ability	ABL.10	I can reduce, reuse and recycle food packaging	Adapted from: Tweneboah-Koduah et al. (2020) , Zhu (2016)
	ABL.11	I can reduce food waste	
Readiness	REA.12	I prefer to buy food products that are produced and packaged by following the circular economy approach (reduce, reuse and recycle)	Adapted from: Akhtar et al. (2022) , Testa et al. (2020)
	REA.13	I prefer reuse and then recycle food packaging	
	REA.14	I prefer to buy food products that are produced and packaged with recycled and or renewable materials	

Note(s): MOT_SN = Extrinsic motivation (inc. social norm); MOT_PVA = Intrinsic motivation (inc. personal values and attitude)

Source(s): Authors' own construction

Table A1.
Description of items

		Freq.	Percentage (%)
BFJ 126,2	<i>Gender</i>		
	Male	153	37
	Female	258	63
736	<i>Age</i>		
	18–50 years old	353	86
	>50 years old	58	14
	<i>Education</i>		
	Primary and secondary school	40	10
	High school	225	55
	University	113	27
	Post-university	33	8
	<i>Living area</i>		
	Rural area	188	46
	Urban area	223	54

Table A2. Descriptive statistics of the sample
Source(s): Authors' own elaboration

Item	Mean	Std. Dev.	Min	Max
OPP.1	3.79	1.70	1	7
OPP.2	5.27	1.47	1	7
OPP.3	4.02	1.71	1	7
MOT_SN.4	3.99	1.67	1	7
MOT_SN.5	5.06	1.62	1	7
MOT_SN.6	4.34	1.74	1	7
MOT_PVA.7	5.57	1.38	1	7
MOT_PVA.8	4.30	1.56	1	7
MOT_PVA.9	5.45	1.39	1	7
ABI.10	4.86	1.60	1	7
ABI.11	5.59	1.35	1	7
REA.12	5.36	1.37	1	7
REA.13	5.38	1.48	1	7
REA.14	5.42	1.35	1	7

Table A3. Descriptive statistics of item
Note(s): MOT_SN = Extrinsic motivation (inc. social norm); MOT_PVA = Intrinsic motivation (inc. personal values and attitude); OPP = opportunity; ABI = ability; REA = readiness
Source(s): Authors' own elaboration

Item	OPP	MOT_SN	MOT_PVA	ABI	REA	AGE	EDU
OPP	1.000						
MOT_SN	0.176	1.000					
MOT_PVA	0.241	0.172	1.000				
ABI	0.144	0.122	0.349	1.000			
REA	0.212	0.145	0.295	0.233	1.000		
AGE	0.008	0.001	0.020	0.002	0.002	1.000	
EDU	0.004	0.006	0.006	0.006	0.000	0.012	1.000
<i>AVE</i>	<i>0.454</i>	<i>0.545</i>	<i>0.550</i>	<i>0.713</i>	<i>0.702</i>	<i>1.000</i>	<i>1.000</i>

Note(s): MOT_SN = Extrinsic motivation (inc. social norm); MOT_PVA = Intrinsic motivation (inc. personal values and attitude); OPP = opportunity; ABI = ability; REA = readiness

Source(s): Authors' own elaboration

Table A4. Discriminant validity with the Fornell-Larcker criterion

	MOT_PVA	ABI	REA
OPP			1.440
MOT_SN	1.000	1.207	1.337
MOT_PVA		1.207	1.855
ABI			1.587
AGE			1.047
EDU			1.022

Note(s): MOT_SN = Extrinsic motivation (inc. social norm); MOT_PVA = Intrinsic motivation (inc. personal values and attitude); OPP = opportunity; ABI = ability; REA = readiness

Source(s): Authors' own elaboration

Table A5. Multicollinearity check (variance inflated factors – VIFs)

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