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Circular economy and ecologically sustainable behaviour in the light of financial constraints: quantitative results from Austria

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Introduction: The circular economy (CE) has been proposed as a model for promoting both sustainability and economic growth, yet its social dimensions remain underexplored. This study investigates the relationship between financial constraints and the adoption of CE strategies, aiming to assess whether financial hardship influences individuals' ability to engage in sustainable practices.

Methods: The study utilises quantitative survey data from Austria ($n = 1,003$) collected in June 2022. A secondary analysis was conducted using bivariate and multivariate statistical techniques, including Welch-ANOVA and binary logistic regression. The study examines four CE strategies—reduce, share, second-hand, and repair—across product categories such as clothing, electronics, furniture, and toys. The key independent variable is financial constrain, while controls include willingness to engage in sustainable behaviour, accessibility of CE infrastructure and socio-demographic factors.

Results: The findings indicate that financial constraints significantly impact engagement in some CE strategies. Individuals facing financial difficulties are more likely to participate in cost-saving strategies such as buying second-hand goods (e.g., clothes OR = 1.38, electronics OR = 1.39) or repairing toys (OR = 1.48). Willingness to engage in sustainable behaviour is the strongest predictor across all strategies, while accessibility plays also a crucial role in adoption. Surprisingly, environmental awareness does not significantly predict actual sustainable behaviour, highlighting a gap between intention and action.

Discussion: The results suggest that financial constraints can act as both a barrier and a driver for sustainable behaviour. While affordability enhances participation in second-hand markets, financial barriers may hinder engagement in repair and sharing models. The study raises concerns about 'double injustice,' where low-income individuals not only bear greater environmental risks but also face challenges in accessing sustainable solutions.

KEYWORDS

circular economy, financial constrains, Austria, sustainable behaviour, social dimension

Introduction

The effects of environmental degradation or extreme weather events caused by climate change exacerbate existing inequalities and vulnerabilities (e.g., Downey and Hawkins, 2008; Tessum et al., 2019; Tyagi et al., 2014). Pollution, extreme temperatures, and other environmental health hazards are disproportionately affecting socio-economically disadvantaged populations. For instance, those with lower incomes are often forced to settle in riskier areas with inadequate infrastructure, which exposes them to additional disadvantages and vulnerabilities (Hallegatte et al., 2020). Consequently, socially vulnerable groups, such as those with low incomes, are more frequently exposed to risks and have limited capacity to cope with environmental disasters, degradation, and other adverse events like health crises (Adena and Myck, 2014) or inflation shock, such as the one currently occurring in Europe (Menyhert, 2022). Mitigating climate change therefore means not only protecting the environment, but also preventing social inequalities from widening. It may even be possible to use climate strategies to close the social divide. In this context, Circular economy (CE) has emerged as a novel narrative that seeks to facilitate both economic and sustainable development (Stahel, 2016). CE is a transformative model that aims to reduce waste, optimise resource use and promote sustainable development (Corvellec et al., 2022). It operationalises sustainability by focusing on principles such as reducing, reusing and recycling resources (Kirchherr et al., 2017). Although the concept has gained significant attention in recent years (Moreau et al., 2017; Old et al., 2022; Padilla-Rivera et al., 2020) and is now one of the most widely discussed terms in fields such as environmental economics (Geisendorf and Pietrulla, 2018), its origins trace back to Boulding (1966). The idea has been in circulation since at least the 1980s, notably through the work of Stahel and Reday-Mulvey (1981).

CE has already been taken up by European policy (European Commission, 2015) and in March 2020 the European Commission adopted 'A New Circular Economy Action Plan' one of the main building blocks of the European Green Deal (European Commission, 2020a). Although CE places emphasis on environmental and economic goals, its social dimensions are frequently under-explored and largely neglected (Corvellec et al., 2022; Korhonen et al., 2018; Murray et al., 2017; Schröder et al., 2020). Notably, studies examining the impact of CE on social inequalities are scarce (Schröder et al., 2020, p. 2). Murray et al. (2017, p. 376) argue that it is unclear how CE will lead to greater social equality, whether in terms of gender equality, financial equality or equality of social opportunity etc. However, the success of CE is contingent upon the active involvement of the broader societal spectrum (Cherry et al., 2018), particularly those facing disadvantages who may encounter obstacles when it comes to engagement (Ashton et al., 2022; Schröder et al., 2020). In the context of CE, financial constraints are not merely economic limitations but also social barriers, as they constitute part of socio-economic barriers that limit individuals' capabilities to participate in sustainable behaviours (Fu et al., 2024) and thus society. Consequently, financial constraints are a critical component in comprehending the social dimension of CE, as they underscore the challenges confronted by socio-economically disadvantaged groups in accessing and benefiting from circular practices.

This paper investigates the extent to which financial constraints influence individuals' engagement with various circular economy

(CE) strategies. As Europe increasingly prioritises sustainability in its development agenda. It is therefore important to proactively integrate the social dimension into CE frameworks to address structural and socioeconomic barriers that hinder equitable participation. By conceptualizing CE as a socially inclusive model, this paper seeks to contribute to the development of policies and practices that prioritise both environmental sustainability and social justice.

A brief state of research

The term 'circular economy' can be understood as operationalisation of the concept of sustainability (Kirchherr et al., 2017). Alternatively, it is often linked to a range of strategies, some of which have existed for decades, aimed at extending resource lifespans and promoting sustainable resource use (Corvellec et al., 2022). However, CE lacks a singular definition, with existing frameworks varying significantly—from the basic 3R model to more comprehensive 10R strategies (Reike et al., 2018). These strategies include: refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, recover. Importantly, the degree to which consumers are actively involved in these strategies depends on the specific activities and implementation models within a given framework. Korhonen et al. (2018) describe it as follows:

'CE is a sustainable development initiative with the objective of reducing the societal production-consumption systems' linear material and energy throughput flows by applying materials cycles, renewable and cascade-type energy flows to the linear system. CE promotes high value material cycles alongside more traditional recycling and develops systems approaches to the cooperation of producers, consumers and other societal actors in sustainable development work' (p. 547).

CE sounds like a promising concept, but Kirchherr et al. (2017) note that only 13% of CE definitions include all three—environmental, economic, social—dimensions of the sustainability concept. This lack of a social dimension is surprising, considering the long-standing research on individual strategies encompassed within the CE framework, and the identification of numerous social determinants associated—for instance—with sustainable consumption patterns. However, the results are less clear: Tripathi and Singh (2016) show in a review that the evidence broadly supports a positive relationship between education and sustainable consumption behaviour, but the evidence on gender and income is much more ambiguous. Furthermore, the incorporation of multiple strategies within CE, ranging from 3R to 10R strategies with varying degrees of consumer focus, serves to further complicate its understanding and application (Reike et al., 2018). From a consumer perspective, CE strategies can be broadly understood as encompassing all aspects of sustainable consumer behaviour. As Corvellec et al. (2022) emphasise, the central tenet of CE lies in the adoption of a more holistic approach that integrates multiple strategies simultaneously, rather than focusing on isolated actions. Despite this upon examination of the limited number of studies that explicitly focus on CE and consider the consumer perspective across socio-economic inequalities, it is notable that this

'synopsis of strategies' claimed by CE is often overlooked, with Gwozdz et al. (2017) being a notable exception.

To date, studies have focused on various aspects of the circular economy, such as willingness to participate in new food provisioning practices (Borrello et al., 2020), willingness to buy aquaponics products (Suárez-Cáceres et al., 2021), mobile phones with higher repairability and durability (Bigerna et al., 2021) or products from ecologically sustainable farming (Chen et al., 2018). Broadly speaking, these studies suggest that people with financial constraints may be less willing to adopt environmentally sustainable behaviour. However, caution should be taken when interpreting results based on 'willingness to pay' alone, as this does not necessarily reflect an individual's overall willingness or intention to adopt sustainable behaviour. Furthermore, it is worth noting that households with lower incomes generally have a smaller ecological footprint (Buhl et al., 2019). While willingness to pay can be a useful measure, it is important to recognise that affordability is central in determining whether green products or CE strategies are accessible across different income levels (Cherry et al., 2018; Coderoni and Perito, 2020). Therefore, it can be argued that financial constraints, and thus affordability, are important factors in the adoption of sustainable behaviour (Hüttel et al., 2018).

Theoretical frame and assumptions

Ajzen's (1991) Theory of Planned Behaviour (TPB) is often used and provides valuable insights into the psychological processes leading to sustainable behaviour—for example, from environmental awareness to the three dimensions of TPB—attitude, subjective norms, perceived behavioural control—to willingness to pay for green products (Fu et al., 2024; García-Salirrosas et al., 2024). It also highlights the gaps between intention and actual behaviour, which require internal factors (such as skills and physical stamina) and external factors (such as resources and legal barriers) that are necessary to perform the behaviour (Ajzen, 2020). Therefore, intention alone is not always indicative of behaviour, as individuals are often impeded by structural and situational constraints from acting on their intentions to engage in sustainable practices. The inequality theoretical perspective on sustainability behaviour can be developed by combining the TPB with Sen's (1992) capability approach, which is an important concept in poverty research (Richter, 2019) and has already been applied to the field of sustainable development (Voget-Kleschin, 2013). This approach moves beyond psychological intention and highlights how structural barriers, such as financial constraints or accessibility, limit individuals' actual ability to engage in CE practices.

Key concepts for the capability approach are 'capability' and 'function'. According to Sen (1985) each individual has a set of capabilities that 'represent what a person can do or be' (p. 674). The function is closely related to the capabilities—'functionings are 'beings and doings', such as being nourished, being confident, being able to travel, or taking part in political decisions' (Alkire, 2005, p. 118). The set of all possibilities, known as the capability set, includes everything that people are capable of doing or being, and is limited by goods and services, but above all by individual or socio-structural factors. It is important to emphasise that it is not only about the quantity of resources—of course these also play a role—but it is also about factors

or conditions that, together with the resources, make the function possible. 'Inequalities in health care can precipitate capability failures in health and nutrition even when personal incomes are not that low in international standards' (Sen, 1992, p. 115). In terms of sustainable behaviour—whether to be sustainably nourished (to stay it with Sen's diction)—it is crucial that socio-cultural (including situational) and individual factors as conditions co-constitute capabilities. This is because they span the space of capabilities and frame the decision-making process, as described in TPB, through preferences, attitudes, and expected individual benefits. From this perspective, an individual's capacity to engage in CE strategies is contingent not solely on their awareness or willingness (as described in the TPB), but also on their capabilities, which are shaped by access to resources, financial security or sociostructural conditions. Consequently, financial limitations and accessibility directly influence capabilities, which in turn influence whether CE strategies are adopted. Therefore, the choice of CE strategies must be located in the space of capabilities and then selected. From the perspective of inequality, the question arises as to what extent people have ecologically sustainable capabilities and whether these capabilities can or should be chosen to lead to an ecologically sustainable function.

This paper, therefore, examines the relationship between the adoption of CE strategies and financial constraints, while controlling for additional factors such as accessibility (also in the context of capabilities) environmental awareness and willingness to engage in sustainable behaviour (in context of TPB), age, and education level. The research question guiding this study is as follows: To what extent do financial constraints influence the adoption of CE strategies, when controlled for by willingness to engage in sustainable behaviour, accessibility, and socio-demographic factors?

So, we assume that financial constraints are influencing engagement in CE strategies, which can be explained by Theory of Planned Behaviour (TPB) and the Capability Approach. This integration highlights how both psychological factors (awareness and willingness) and structural barriers (insufficient resources as an expression of financial constraints and in addition accessibility) shape sustainable behaviour. Furthermore, the incorporation of control variables, including gender, age and education, enables the examination of their potential impact on CE engagement. There are two limitations to consider. Firstly, capturing capabilities is challenging and has been the subject of debates within the research community (Karimi et al., 2016). Therefore, we focus on the function, i.e., the realised behaviour. Secondly, there is the question of which sustainability (CE) strategies and areas of consumption should be included. According to Kirchherr et al. (2017), the 3R combination—reduce, reuse, recycle—is the most common and, in addition to the repair strategy, often linked to consumer consumption (Reike et al., 2018) while the strategy rethinking in terms of sharing is gaining in importance (Trabucchi et al., 2019). However, recycling is widely accepted in Austria and well-established practice. Given this context, the study focused on the other CE strategies mentioned—reduce, share, reuse and repair. It was also important to consider the product groups surveyed in combination with the strategies. The European Union's action plan refers to 'electronics, ICT and textiles' and 'furniture' (European Commission, 2020b, p. 5), which were included in the present study. In addition, toys were included in the analysis for contrast and because their environmental impacts cannot be ignored (Levesque et al., 2022); the toy sector has the highest direct

plastic intensity of all commodity sectors (UNEP, 2014, p. 27). As a result, a total of 16 combinations were tested in the context of financial constraints, such as reducing the amount of clothes, sharing electronic devices or repairing furniture.

Methods

Quantitative data from a research project (Anderluh et al., 2023) will be used and re-analysed through secondary analysis to answer the research question. The operationalisation, sample and analysis methods are described below.

Operationalisation

The *bivariate analysis* uses two dependent variables: respondents' willingness to adopt sustainable behaviours and their current level of realisation in practicing such behaviours. Willingness was measured on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). The current realisation was measured in three categories: 1 'not at all', 2 'sometimes', and 3 'most of the time'. To examine whether financial constraints are associated with both variables, respondents were asked to rate how their household makes ends meet on a 6-point scale ranging from 1 'with great difficulty' to 6 'very easy'. Due to a limited number of respondents at both ends of the scale, the variable was split into two categories: 0 'rather/very easy' and 1 'some/great difficulties'. This variable was used as an independent variable in both bivariate and multivariate analyses.

The *multivariate analysis* is conducted to test the influence of financial constraints on the current level of realisation of the 16 combinations, while controlling for other factors, which shape the space of capabilities. Based on the *bivariate analysis*, the dependent variable 'realisation' was binary coded into 0 'never' and 1 'sometimes or most of the time' to test if a strategy is used at least sometimes.

The financial situation is the first predictor entered into the models. It was measured and coded as described above. To control for the association between current behaviour and financial problems, additional independent variables were included. Therefore, willingness was also defined as an independent variable and grouped into three categories 1 'rather disagree', 2 'neither', and 3 'rather agree' before being coded as dummy variable due to non-linearity. To measure the accessibility of the strategies—sharing, second-hand and repair—respondents were asked to rate on a 7-point scale whether they know of or have access to certain places. In case of multiple items, additive indices were calculated. Due to non-linearity, accessibility was grouped into three categories: 1 'rather low', 2 middle, 3 'rather high', and dummy coded. The same grouping procedure was applied to the question of whether people consider themselves to be environmentally aware—this subjective measure was also rated on a 7-point scale and is indicator of TPB dimensions (García-Salirrosas et al., 2024).

In addition, based on existing literature (Tripathi and Singh, 2016) socio-demographic variables such as gender, education, and age were included in the analysis. Due to the very limited number of cases, only the manifestations 0 'male' and 1 'female' could be analysed. Respondents' highest level of education was classified according to national standards and transformed into the ISCED 2011 classification, with three categories: 1 'ISCED 0–2', 2 'ISCED 3–4', 3 'ISCED 5–8'. The

age variable was grouped into four categories: 1 'below 30', 2 '30–44', 3 '45–64', and 4 '65+'; all three variables mentioned were dummy coded.

Sample

While the conception of the survey was done by the research team (Anderluh et al., 2023) a survey agency was contracted to conduct the online population survey in June 2022. Invitations to the online survey were sent out every day, including weekends, at different times of the day in order to encourage participation from different sections of the population. The net sample is $n = 1,003$. Weighting factors were calculated using data on the structure of the population. However, it should be noted that the online sample is limited to web-active individuals aged 16+ in Austria and therefore older people and marginalised groups may be underrepresented. As a result, the trends observed may be underestimated. Nevertheless, Table 1 shows an acceptable distribution of socio-demographic variables.

Analysis

Analysis was carried out using SPSS 27. Initially, a *bivariate analysis* was conducted to test whether the groups differed in terms of (a) willingness to adopt a strategy for each product group and (b) current behaviour. Due to the lack of homogeneity of variance, Welch-ANOVAs were used to test willingness. Current behaviour was tested between groups using a Chi² test and, if significant, Cramer's V was used to assess the strength of the relationship. Secondly, to examine the association between financial constraints and all other variables, 16 binary logistic regression models were conducted, with current realisation as the binary dependent variable and financial burden and all control variables mentioned as explanatory variables. Statistical tests were performed at a significance level of $\alpha = 0.05$, and in logit regressions, the significance level of $\alpha = 0.10$ is also indicated to show potential trends.

Results

The univariate analysis reveals that the willingness to adopt the tested CE strategies in Austria can generally be described as medium to high. Ten of the 16 cases tested have a mean score above 4, which is the midpoint of the response scale. The highest mean scores were recorded for the reduction of toys (5.80) and the repair of electronic devices (5.56). On the other hand, sharing furniture (2.08) and clothes (2.59) received the lowest mean scores (Tables 2, 3, column 'total'). These results are not surprising, but certainly interesting if one considers that sharing furniture in rented accommodation (e.g., kitchen) is common in Austria and (online) platforms for sharing clothes have been entering the market or playing a role for decades in the case of festive clothing (e.g., ball gowns or smoking jackets). It should be noted that the meanings of sharing and renting are not necessarily congruent, but both involve not owning something but using it for a fee. This core idea may be unpopular among respondents. From a broader perspective, the average of the mean scores per strategy has the following order: reduce (5.21), repair (4.83), second-hand (4.13), and sharing (2.61).

TABLE 1 Distribution in sample and population (age 16+).

Variable	Manifestation	Distribution in Sample	Distribution in Population
Make ends meet	0 = (rather/very) easy	0 = 47.8%	–
	1 = (some/great) difficulties	1 = 52.2%	
Environmental awareness	1 = (rather) low	1 = 9.3%	–
	2 = middle	2 = 14.9%	
	2 = (rather) high	2 = 75.8%	
Highest formal education (ISCED)	1 = ISCED 0–2	1 = 9.5%	1 = 24.9%
	2 = ISCED 3–4	2 = 72.6%	2 = 48.7%
	3 = ISCED 5–8	3 = 17.9%	3 = 26.4%
Gender	0 = female	0 = 51.1%	0 = 51.2%
	1 = male	1 = 48.9%	1 = 48.8%
Age	1 = under 30	1 = 19.8%	1 = 20.8%
	2 = 30–44	2 = 23.9%	2 = 23.5%
	3 = 45–65	3 = 37.3%	3 = 33.95%
	4 = 65+	4 = 19.0%	4 = 22.5%

ISCED 2011 = International Standard Classification of Education Version 2011; Distribution in the population was taken from the information system Statcube of Statistics Austria (values from 2020).

The *bivariate analysis* highlights two interesting aspects: in 13 out of the 16 combinations, people with financial constraints show a slightly higher willingness to adopt the strategies. For example, those with financial constraints have an average score of 4.93 compared to 4.52 for the group without financial constraints in the strategy of reducing electronic equipment (Tables 2, 3, column ‘making ends meet’). However, the strength of the association is low and only significant in 7 out of 13 cases. Only in three product groups tested in the ‘repair strategy,’ non-significant reverse trends towards higher acceptance in the group with no financial constraints are found. Overall, the financially constrained are more likely to be willing to adapt, which is supported by the second trend. People with financial difficulties are more likely to report having already used the strategies. Conversely, the proportion of people without financial difficulties who do not use the strategies at all is significantly higher in 6 out of 16 cases. For example, significantly more people without financial difficulties do not share furniture (65.2%, $p = 0.028$) and do not buy second-hand electronic devices (42.6%, $p < 0.001$). It is important to note that for the Second-Hand strategy, although relatively equal proportions of both groups use the strategy ‘most of the time,’ the proportion of refusals is higher among those without financial constraints. This shows that in both groups there are proportions who use the strategies, but people with financial difficulties are more likely to be forced to do so at least ‘sometimes.’ The logical consequence of this is that a smaller proportion of people with financial difficulties answered, ‘not at all.’ This observation will be tested further.

The 16 logistic models ($n = 1.001$) have Nagelkerke’s R^2 s > 0.13 and Hosmer-Lemeshow tests > 0.05 , indicating that all models are acceptable. Table 4 shows the significant results for financial burden, and also includes the combination of repairing electronic devices to illustrate further findings. The full tables for all 16 combinations can be found in the supplement (Supplementary Tables A1–A4).

The results of the study confirm the findings of the *bivariate analysis*, with the exception of two cases. The previously observed significant correlation between second-hand furniture as well as the

correlation between sharing furniture and financial constraint, is diminished and becomes non-significant in the multivariate analysis. However, the multivariate analysis reveals a previously hidden correlation between financial constraints and toy sharing. In summary, financial constraints play a significant role in 5 of the 16 sustainable strategies studied: second-hand clothes (OR = 1.38), second-hand electronic devices (OR = 1.39), second-hand toys (OR = 1.54), toy sharing (OR = 1.33) and repairing toys (OR = 1.48). In other words, people who are under financial pressure are 1.33–1.48 times more likely to engage in these sustainable strategies than those who are not. For the other sustainable strategies, the variable ‘making ends meet’ does not play a statistically significant role, even at a higher level of significance. Unsurprisingly, willingness to engage in sustainable behaviour is also a key factor, significantly increasing the likelihood. In addition to the high odds ratio (OR) for second-hand clothes (OR = 8.95) found in Table 4, repairing clothes (OR = 11.45), reducing furniture (OR = 11.28) and reducing toys (OR = 10.5) also have very high values (see Appendix). In summary, for all combinations tested, a high degree of willingness significantly increases the likelihood of sustainable behaviour. The second key factor—for sharing, second-hand and repair—is accessibility, which is significant at least when respondents rate it as ‘high.’ For example, as shown in Table 4, the likelihood of repairing toys increases by a factor of 1.91 (medium accessibility) or 2.81 (high accessibility). Higher levels of formal education also increase the likelihood, particularly in the area of repair (e.g., Table 4, electronic devices). Gender plays a role in two aspects: people who identify themselves as female are more likely to repair electronic devices (OR = 1.43) but less likely to share electronic devices (OR = 0.77) than those who identify themselves as male, although the significance level is < 0.1 . Age also plays a role in some of the combinations tested. For example, older age groups are more likely to use the strategy of repairing electronic devices and reducing furniture, but less likely to use the strategy of sharing clothes and electronic devices. Interestingly, older people (65+) are

TABLE 2 Uni- and bivariate analysis (reduce and share).

			Overall	Make ends meet		Test/ <i>p</i> -value
				With (some/great) difficulties	(Rather/very) easy	
Strategy: Reduce						
Clothes	Willingness	Mean	5.37	5.39	5.36	Welch/0.786
	Realisation	Not at all	12.0%	12.0%	11.9%	Chi²/0.846
		Sometimes	42.9%	42.1%	43.8%	
		Most of the time	45.1%	45.9%	44.3%	
Electronic devices	Willingness	Mean	4.73	4.93	4.52	Welch/0.001
	Realisation	Not at all	19.2%	18.2%	20.4%	Chi²/0.151
		Sometimes	42.9%	41.1%	44.8%	
		Most of the time	37.9%	40.7%	34.8%	
Furniture	Willingness	Mean	4.96	5.07	4.83	Welch/0.058
	Realisation	Not at all	19.0%	17.7%	20.4%	Chi²/0.084
		Sometimes	40.9%	38.9%	43.1%	
		Most of the time	40.0%	43.3%	36.5%	
Toys	Willingness	Mean	5.80	5.83	5.77	Welch/0.589
	Realisation	Not at all	15.8%	14.1%	17.7%	Chi²/0.058
		Sometimes	32.8%	35.9%	29.4%	
		Most of the time	51.4%	50.0%	52.9%	
Strategy: Share						
Clothes	Willingness	Mean	2.59	2.73	2.44	Welch/0.025
	Realisation	Not at all	56.1%	54.3%	58.1%	Chi²/0.132
		Sometimes	19.9%	22.4%	17.3%	
		Most of the time	23.9%	23.3%	24.6%	
Electronic devices	Willingness	Mean	2.74	2.92	2.54	Welch/0.004
	Realisation	Not at all	54.8%	53.2%	56.6%	Chi²/0.463
		Sometimes	21.6%	22.9%	20.0%	
		Most of the time	23.7%	23.9%	23.4%	
Furniture	Willingness	Mean	2.08	2.22	1.92	Welch/0.008
	Realisation	Not at all	62.1%	59.2%	65.2%	Chi²/0.028 Cramer-V = 0.084
		Sometimes	13.3%	15.9%	10.4%	
		Most of the time	24.7%	24.9%	24.4%	
Toys	Willingness	Mean	3.04	3.07	3.00	Welch/0.609
	Realisation	Not at all	56.0%	52.8%	59.6%	Chi²/0.082
		Sometimes	21.0%	23.1%	18.8%	
		Most of the time	22.9%	24.1%	21.7%	

Numbers in bold are important values. Tests in bold are significant.

less likely to use the strategy of repairing toys (OR = 0.57) compared to those under 30. This tendency is also observed for the strategy of reducing toys (OR = 0.565, $p < 0.01$), which can be explained by the role of grandparents, who are probably more interested in giving to their grandchildren. Table 5 shows all significant predictors.

As illustrated in Table 5, the key predictors of engagement in CE strategies are indicated. Across all strategies, willingness remains a significant and most important predictor, underscoring the notion

that motivation plays a critical role in sustainable behaviour. Furthermore, it can be seen that financial constraints are salient for second-hand purchases and sharing or repairing of toys, suggesting that these may serve as cost-saving mechanisms. Accessibility emerges as another key factor, with greater availability of repair services, sharing platforms and second-hand markets significantly increasing participation. Education also emerges as a determinant of repair behaviour, suggesting that individuals with higher levels of education are more likely to repair rather than discard items. The

TABLE 3 Uni-and *bivariate analysis* (second-hand and repair).

			Overall	Make ends meet		Test/ <i>p</i> -value
				With (some/great) difficulties	(Rather/very) easy	
Strategy: Second-Hand						
Clothes	Willingness	Mean	3.85	4.07	3.61	Welch/0.002
	Realisation	Not at all	35.2%	30.8%	40.0%	Chi/0.008 Cramer-V = 0.098
		Sometimes	39.6%	42.8%	36.0%	
		Most of the time	25.2%	26.4%	24.0%	
Electronic devices	Willingness	Mean	3.90	4.21	3.55	Welch/<0.001
	Realisation	Not at all	36.8%	31.5%	42.6%	Chi/0.001 Cramer-V = 0.121
		Sometimes	40.3%	45.1%	35.1%	
		Most of the time	22.9%	23.3%	22.3%	
Furniture	Willingness	Mean	4.21	4.56	3.82	Welch/<0.001
	Realisation	Not at all	32.2%	27.5%	37.4%	Chi/0.004 Cramer-V = 0.106
		Sometimes	44.0%	47.1%	40.5%	
		Most of the time	23.8%	25.4%	22.1%	
Toys	Willingness	Mean	4.59	4.66	4.50	Welch/0.251
	Realisation	Not at all	35.3%	30.8%	40.2%	Chi/0.004 Cramer-V = 0.106
		Sometimes	38.5%	42.6%	34.0%	
		Most of the time	26.2%	26.6%	25.8%	
Strategy: Repair						
Clothes	Willingness	Mean	4.32	4.28	4.36	Welch/0.571
	Realisation	Not at all	26.1%	26.5%	25.7%	Chi/0.954
		Sometimes	41.9%	41.6%	42.2%	
		Most of the time	32.0%	31.9%	32.2%	
Electronic devices	Willingness	Mean	5.56	5.47	5.65	Welch/0.097
	Realisation	Not at all	14.1%	15.5%	12.7%	Chi/0.187
		Sometimes	48.2%	45.6%	51.0%	
		Most of the time	37.6%	38.9%	36.3%	
Furniture	Willingness	Mean	4.98	4.94	5.03	Welch/0.483
	Realisation	Not at all	24.1%	23.5%	24.8%	Chi/0.706
		Sometimes	43.6%	43.0%	44.2%	
		Most of the time	32.3%	33.5%	31.0%	
Toys	Willingness	Mean	4.46	4.51	4.41	Welch/0.492
	Realisation	Not at all	35.6%	31.9%	39.6%	Chi/0.020 Cramer-V = 0.088
		Sometimes	36.9%	37.6%	36.0%	
		Most of the time	27.6%	30.5%	24.4%	

Numbers in bold are important values. Tests in bold are significant.

impact of age on CE engagement is not uniform, suggesting that engagement in CE strategies shifts across life stages.

A notable finding is that environmental awareness does not predict actual CE engagement in the multivariate analysis. Even in an additional *bivariate analysis*, weak correlations were found only in a few combinations, mostly in the strategy of reducing. This may be surprising. While almost all combinations of willingness and environmental awareness are correlated, this does not necessarily mean that people act on their intentions. In other words, although

there is a positive correlation between environmental awareness and willingness to change, this has not yet led to a significant increase in the implementation of sustainable strategies. It is possible that the items used in the survey were too generous. On the other hand, it must be questioned whether the strategies, even if they are ecologically beneficial, are actually implemented by the population for this or other reasons. In the end, the theoretically formulated gap between capabilities, intentions and behaviour becomes evident.

TABLE 4 Logistic regressions—realisation at least sometimes.

	Second-Hand			Share	Repair	
	Clothes	Electronic devices	Toys	Toys	Toys	Electronic devices
Make ends meet (ref. rather/very easy)						
(Some/great) difficulties	1.38*	1.39*	1.54**	1.33*	1.48*	0.89
Willingness (ref. rather disagree)						
Neither	2.98**	2.76**	2.17**	2.52**	3.19**	3.23**
Rather agree	8.95**	6.36**	4.33**	2.98**	5.14**	6.19**
Accessibility (re. rather low)						
Middle	1.53*	1.52**	1.56*	1.55**	1.22	1.91*
Rather high	2.67**	3.18**	2.29**	2.94**	3.06*	2.81**
Environmental awareness (ref. rather low)						
Middle	1.08	1	0.86	1.07	0.93	0.65
Rather high	0.86	0.85	0.76	1.17	0.73	1.13
Highest formal education (ref. ISCED 0–2)						
ISCED 3–4	1.7	1.36	1.29	0.98	1.51	1.97*
ISCED 5–8	1.36	1.47	1.3	1.03	1.54	1.81
Gender (ref. male)						
Female	1.28	0.87	0.92	0.83	0.92	1.43
Age (ref. <30)						
30–44	1.13	0.96	1.05	0.85	0.81	2.07*
45–64	1.12	0.93	1.08	0.93	0.75	2.08*
65+	1.43	1.4	1.09	1.2	0.57*	1.81
$\chi^2/\text{df}/p$	267.462/13/<0.001	232.554/13/<0.001	146.641/13/<0.001	118.455/13/<0.001	165.928/13/<0.001	114.233/13/<0.001
Nagelkerke's R^2	0.322	0.283	0.187	0.150	0.210	0.194
Hosmer-Lemeshow	$p = 0.141$	$p = 0.558$	$p = 0.082$	$p = 0.314$	$p = 0.902$	$p = 0.849$
n	1.001	1.001	1.001	1.001	1.001	1.001

Odds-ratios are shown. Values in bold are significant at $p < 0.05$; ** at $p < 0.01$; values in bold without * are significant at $p < 0.1$.

Discussion

The results show that in many cases no significant differences were found between the group with and without financial constraints. However, in some instances, people facing financial constraints showed a slightly higher willingness to adopt sustainable strategies and were more likely to use them, at least occasionally. It can be inferred that, assuming these strategies are low(er)-cost alternatives, they may serve as coping mechanisms in the context of financial constraints. Financial burdens appear to influence sustainable behaviour in certain areas, even when controlling for factors such as environmental awareness and willingness. The results align with prior research findings (e.g., Bigerna et al., 2021; Chen et al., 2018; Suárez-Cáceres et al., 2021). The key issue is whether sustainable products, services or behaviours are affordable. This assertion is substantiated by the recurrent association observed between financial burden and the adoption of second-hand strategies, which is a cost-effective approach and is readily accessible through various online portals, shops and flea markets. Conversely, repairs may necessitate resources, and it is questionable whether individuals facing financial constraints can easily obtain them.

Bivariate analysis lends support to this interpretation, revealing a marginally higher, albeit non-significant, willingness towards repairs among individuals without financial constraints (with the exception of toys). This observation raises a critical question: who has the capacity—both in terms of skills and financial means—to carry out or facilitate repairs? In the context of an active involvement of the broader societal spectrum, ensuring the right to repair is not enough; it is equally important to guarantee the practical ability to do so.

The findings regarding sharing may be somewhat surprising. Bivariate analysis reveals a significantly higher willingness to share among individuals facing financial challenges. While it is true that this model is not a novel concept and that possibilities such as barter circles exist, it is uncertain whether they are accessible everywhere or whether there is enough trust within a community (He et al., 2021). On the other hand, companies are increasingly adopting the sharing economy as a business model. In certain areas, this can benefit households with financial constraints. For example, car sharing can provide an affordable alternative to owning a car for short-term needs. The environment also benefits from the sharing of certain goods. Nevertheless, if this model becomes pervasive, there

TABLE 5 Matrix of significant predictors.

	Reduce	Share	Second-Hand	Repair
Clothes	Willingness Education	Willingness Accessibility Age	Financial burden Willingness Accessibility	Willingness Accessibility Education
Electronic devices	Willingness	Willingness Accessibility Age	Financial burden Willingness Accessibility	Willingness Accessibility Education Age
Furniture	Willingness Age	Willingness Accessibility	Willingness Accessibility Education	Willingness Education
Toys	Willingness	Financial burden Willingness Accessibility	Financial burden Willingness Accessibility	Financial burden Willingness Accessibility Age

Predictors with significance level of $\alpha = 0.05$.

is a risk that low-income households will be marginalised and excluded due to the associated costs. Accordingly, policymakers must consider how monetized sharing services can remain financially accessible.

In the area of reduction, the lack of significant differences between income groups may seem paradoxical, as people with lower incomes typically have lower levels of consumption or have to cut back. However, our results do not contradict this finding, as our analysis did not measure the actual amount of clothes or toys, but rather the willingness and realisation of reduction at a personal level. Therefore, the two groups seem to have comparable perceptions, although the starting points are likely to be different in terms of the amount of consumption to be reduced.

The findings of this paper strengthen the capability approach and TPB. On the one hand, results underscore that, willingness is a key driver of CE engagement. On the other hand, individuals with limited financial resources are more likely to adopt practices that mitigate financial burden, such as second-hand purchases and sharing and the limited accessibility reduce the chance for sustainable behaviour. This finding aligns with Sen's (1992) argument that capabilities are co-constituted by individual and socio-structural factors, underscoring the necessity for CE policies that address affordability and infrastructure to broaden people's capability sets. By conceptualizing CE participation through the lens of capability limitations, this study underscores the necessity of formulating inclusive sustainability policies that do not presume equal capacity for engagement but instead aspire to augment individuals' genuine opportunities to partake in CE practices.

A limitation of this study is that the sample was obtained online and, although quota-stratified, certain groups may be underrepresented. To address this issue, multivariate analyses were conducted to control for other variables. However, in order to obtain a model that was comparable across all 16 combinations, only a limited number of variables could be included and these had to be categorised to ensure acceptable model quality. While this approach may have resulted in relatively coarse analyses, the study still provides valuable insights and a comprehensive perspective by combining different strategies and product groups.

Conclusion

The findings suggests that (a) it is not awareness per se, but the resulting willingness to act sustainably, that is more important in determining whether sustainable behaviour is adopted and (b) underscore the intricate interplay among financial constraints, accessibility, socio-demographic factors, and sustainable behaviours, emphasising the necessity for policies that enhance the financial and structural accessibility of CE strategies. In this context two crucial aspects in particular require discussion and attention.

- Firstly, evidence suggests that individuals experiencing financial constraints are often compelled to adopt cost-saving sustainable strategies. However, research also indicates that these populations suffer disproportionately from environmental degradation. This prompts the following question: Does this signify a double injustice, where economically vulnerable individuals not only bear a heavier social burden but also an increased environmental burden?
- This brings us to the second point: the urgency of ecological change. A significant reduction in the per capita ecological footprint is imperative. However, this challenge does not only apply to high-income households, as footprints are unequally distributed. In certain European countries, even the lowest incomes exceed the planet's tolerable level. This is evident when examining both the carbon footprint (Lévay et al., 2021) and the ecological footprint (Ferreira et al., 2023). But how can we prevent those who already contribute the least to the impending environmental catastrophe from losing even more?

Consequently, as Peeters et al. (2015) contend, 'citizens have entitlements to a minimum of each of the capabilities necessary to live a life compatible with human dignity. [...] It is not all that clear, however, that the biophysical constraints of the ecosphere will allow us to guarantee these capabilities' (p. 377). For the circular economy to be seen as a viable solution, it needs to deepen its engagement with social issues to ensure that environmental and social benefits are mutually assured.

Data availability statement

The data analysed in this study is subject to the following licenses/restrictions: the dataset presented in this article is not available as the full microdata set is not authorised for distribution. Requests to access these datasets should be directed to lukas.richter@fhstp.ac.at.

Ethics statement

Ethical approval was not required for the studies involving humans because ethical approval is not required for an anonymous online opinion survey in accordance with the local legislation and institutional requirements. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

LR: Writing – original draft, Writing – review & editing. MK: Investigation, Writing – review & editing.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The author(s) declare that Generative AI was used in the creation of this manuscript. DeepL was used to proofread the paper.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/frsus.2025.1570573/full#supplementary-material>

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