

# Identifying the 'Low-Hanging Fruit' of consumer behaviour changes necessary to facilitate the transition towards circular economies.

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## Introduction

The rapid expansion of humanity over the past century implies that we now consume resources at significantly quicker rates than their replenishment (Esposito et al., 2017). Addressing this imbalance requires a breakaway from the existing linear 'take-make-dispose' consumption patterns (Ghisellini et al., 2016) and the adoption of new economic models like the circular economy, which can moderate resource consumption levels. Despite vast research surrounding CE, the role of the consumers is an element of this concept that is still under-represented (Wastling et al., 2018). Our research aims to fill this gap by isolating what we call the 'low-hanging fruit', i.e. behavioural changes that have high acceptability among consumers relative to their environmental benefit.

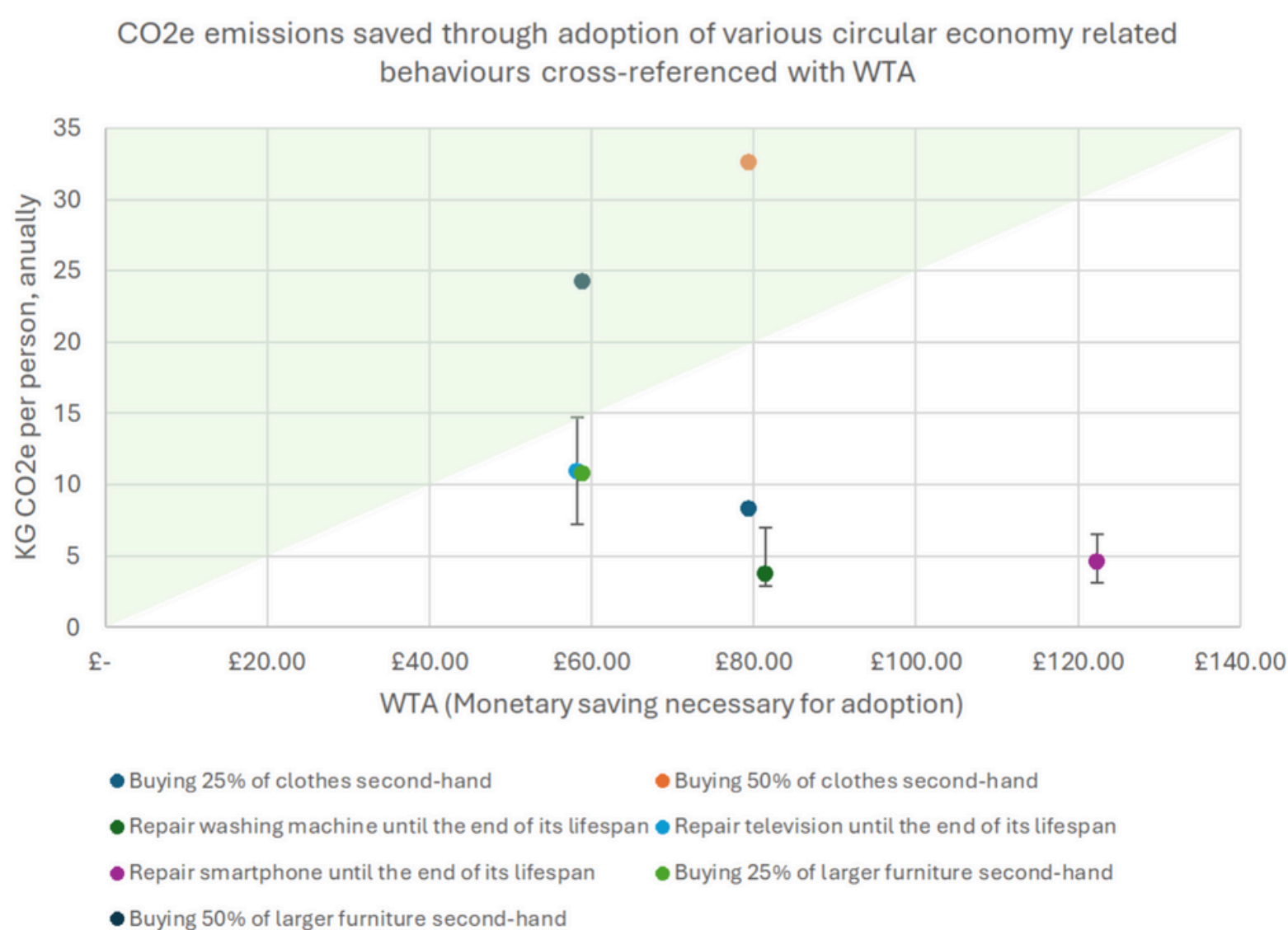
## Methods

To determine consumer preferences, we conducted a discrete choice modelling experiment. Participants were presented with ten randomised choice cards, each offering two mutually exclusive alternatives with varying levels for each behavioural change (i.e. buying 0%, 25% or 50% of clothing bought second-hand.) Each alternative also included a hypothetical monetary saving, which served as a measure of participants' willingness to accept (WTA) these behavioural changes. Participant responses were analysed using R. The experiment aimed to reveal subconscious preferences by determining the amount of money consumers require to save in order to adopt each behavioural change.

To determine the environmental impact of each behavioural change and their respective levels, our study relied on secondary data. We separated the behaviours into two groups: repairing electronics and buying second-hand. For each group, we derived a formula to calculate the annual reduction in carbon dioxide equivalent (CO2e) emissions per person in the UK. These formulas can be seen on the right

## Results

The results of the survey results and the carbon impact modelling are illustrated in the figure below. The behaviours in the green section of the diagram are what we are calling the 'low hanging fruit', i.e. their relative environmental benefit is higher than their WTA costs. This only applies to two behavioural changes, namely, buying 50% of clothes second-hand and buying 50% of larger furniture items second-hand. The top of the error bar for television repair also just sits within the area.



## Acknowledgements

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## Bibliography

- Esposito, M., Tse, T. and Soufani, K. 2017. The circular economy: An opportunity for renewal, growth, and stability. Thunderbird International Business Review. 60(5), pp.725-728.  
 Ghisellini, P., Cialani, C. and Ulgiati, S. 2016. A Review on Circular Economy: the Expected Transition to a Balanced Interplay of Environmental and Economic Systems. Journal of Cleaner Production. 114(7), pp.11-32.  
 Wastling, T., Charnley, F. and Moreno, M. 2018. Design for Circular Behaviour: Considering Users in a Circular Economy. Sustainability. 10(6), p.1743.

## Aims and objectives

**Primary objective:** Calculate the willingness to accept (WTA) of five behavioural changes and compare this with the CO2e emissions these behaviors would reduce to identify those that offer the greatest environmental benefit relative to their WTA, i.e. the "low-hanging fruit".

**Secondary objective:** Explore means of incorporating neuroscientific practices into choice experiments to eliminate biases such as the hypothetical bias

	Alt.1	Alt.2
Second-hand clothes	50% (half)	25% (a quarter)
Washing machine	5 years	9-10 years - out of fashion
Television	6-7 years - out of fashion	4 years
Smartphone	2-3 years - out of fashion	Every year
Second-hand furniture	50% (half)	25% (a quarter)
Money saved/year	£380	£ 170

Figure 1: Example of choice card presented to participants:

$$E_s = \frac{E_p}{Y} - \frac{E_p}{Y + (Y \times r \times L)}$$

- $E_s$  CO2e emissions saved through repair/year (in kg CO2e)  
 $E_p$  CO2e emissions from production per electronic (in kg CO2e/unit)  
 $Y$  average years of use per unit  
 $r$  percentage of phones that are repairable (expressed as a decimal)  
 $L$  lifespan extension indicated in the survey as percentage of  $Y$  (expressed as a decimal)

Figure 2: Formula for 'repairing electronics' group

$$E_s = (P_s - P_c) \times E_u \times Q_y \times D$$

- $E_s$  CO2e emissions saved through buying second-hand per person  
 $P_s$  percentage of units bought second-hand listed in survey (either 50% or 25%)  
 $P_c$  current percentage of units already bought second-hand  
 $E_u$  CO2e emissions associated with a single unit from cradle-to-grave  
 $Q_y$  units bought per year, per person  
 $D$  displacement rate (expressed as a decimal)

Figure 3: Formula for 'buying second-hand' group

## Discussion and Future

The discussion covered queries we came across during our research. On a very surface level, we dove into the hypothetical bias (HB) present in choice experiments, particularly the increased bias in willingness-to-accept (WTA) studies due to strategic behaviour. Our research showed that HB is prevalent in both environmental and consumer economics studies. To overcome this, we explore the potential of neuroeconomics, which integrates brain function into economic decision-making

Furthermore, we also questioned to what extent the second-hand clothing market is truly environmentally sustainable. Overall, we found that the boom of the second-hand apparel market in the UK has demonstrated potential issues that might hinder the environmental benefits they generate. Nonetheless, our discussion argues that the rise of P2P platforms such as Vinted and Depop are resolving these issues, not only through their business model but also by reducing their model's emissions.

The reliability of these results is undermined by the short six-week duration of the project. In order to have some kind of results, we at times relied on improper methodology and unreliable data. Nonetheless, we also believe our research model serves as a blueprint for a new approach to understanding consumer preferences surrounding climate change solutions which can be amended based on the issues we experienced. Therefore, over the coming year we hope to continue our research ourselves as well as disseminate it through social platforms and conferences