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Embracing the Fair Price for a T-shirt

A combination of
technology, econometrics
and psychology helps to
bridge the fair price gap



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Embracing the fair price for a T-shirt

How can consumers be helped to embrace the fair price of products? That was the question at the heart of an experiment conducted by PwC. Our research focused on the additional price consumers would pay for a 'fair' T-shirt: recyclable, sustainably produced under acceptable labour conditions. Combining econometrics, experience design and psychology tools, we sought to generate the most realistic outcomes possible. We found that small nudges can help consumers make more sustainable shopping decisions.

How to tackle the green consumer paradox¹

For many goods, prices reflect only the visible costs, such as raw materials, production, transportation, labour, storage and marketing. The negative externalities or societal costs associated with the sourcing, production, transport, distribution and consumption are excluded. When producers properly address these externalities by shifting to more sustainable production or improving working conditions, their products become more expensive. Consumers are increasingly expressing a preference for sustainable production, yet their willingness to pay at the actual moment usually lags behind.² This is the 'green consumer paradox': a real and urgent problem in a broad range of products that needs a solution. That's why we asked ourselves how we could contribute to tackling it.

Combining technology, econometrics and psychology to unlock the willingness to pay

Studies into the willingness to pay for sustainable products are numerous. The same holds for studies into the 'true' or 'fair' price of sustainable products, including the costs of externalities. This study takes one step further and explores the extent to which consumers can be incentivised to embrace the fair price and pay it when shopping.

To achieve the closest approximation of a real moment of purchase, tools from three fields of knowledge have been combined:

- **Experience design technology** to create a prototype that mimics a real shopping environment (a T-shirt webshop in this case).
- Borrowed from **psychology**, several '**nudges**' were added for different groups of participants. Nudges are small interventions that point consumers in a certain direction by leveraging mental shortcuts to motivate action.
- **A discrete choice experiment** (or choice-based conjoint analysis), frequently used in **econometrics**, captures the gap between intentions and action. This method was used to quantify and map the drivers of consumer preferences through dilemmas rather than direct surveying.

It's psychology, stupid!

The result of the experiment shows that subtle, tailored nudges can lead consumers down the path to a more conscious choice. When compared to the control group, whose willingness to pay for a fair T-shirt was already high, nudged participants were **willing to pay up to €6.9 extra** for the same T-shirt.

Yes, we only conducted this experiment within our own company and did not apply it to a broader group of consumers. And we had participants make trade-offs only about a T-shirt, not other products. But the experiment indicates that psychology plays a substantial role in making sustainable decisions, over and beyond the price tag. And it turns out that a substantial part of the gap between classic pure economic rationality, i.e., price first and foremost, can be bridged by well-designed behavioural nudges.

This is good news. It allows providers of sustainable products to experiment further. We deliberately say 'further experimentation'. It is up to sustainability-driven companies like ours to 'get their hands dirty' and conduct similar experiments to address the green consumer paradox.

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A market failure: societal costs are not included in the price of clothes

An apparent mismatch between the price we pay and actual costs has led to a cost-price gap. Economists explain the difference between the true costs of a product and the actual price tag as the result of market failures. The price tag doesn't include all external costs to society created by external effects, ranging from pollution, water and land use, and carbon emissions during transport to underpayment or subpar working conditions at the production sites. In other words, the social costs are not reflected in the production costs and, subsequently, not in the consumer price.

The fashion industry is huge and growing, as is its footprint

With a global revenue of €1.5tn³, of which 22% is in the EU, the fashion industry is one of the largest in the world. It employs 3.45bn people globally and produces 100bn clothing items, of which 75bn end up burned or in landfills. The average garment is estimated to be worn only seven times before being discarded.⁴ Driven by social media, artificial intelligence and e-commerce, with 17% of global online sales, the industry is growing rapidly: global textile production doubled between 2000 and 2015 and is expected to increase by 63% by 2030.⁵ Furthermore, as the third largest industrial consumer of water and with 10% of global greenhouse gas emissions and a severe chemical footprint, the sector profoundly impacts the environment.⁶ Despite increasing pressure from the market⁷ and the regulators⁸, the change is slow and greenwashing is still prevalent.⁹

Fair pricing and fair buying is not a trend yet

Real prices of clothes have halved since 1990, and 40% of items are even sold at a markdown.¹⁰ The general trend is still not in the direction of fair prices and eco-friendly consumption. Even though aspirations to be more sustainable are growing, actions do not always follow intentions.¹¹ Surveys show that even though up to 80% of respondents claim to want to buy purpose-driven brands that advocate sustainability, only about 26% actually do.¹²

This paradox is especially strong among younger generations, who are simultaneously prominent advocates of sustainability and drivers of fast fashion. One-third of Gen Z and Millennials, mainly fueled by affordability and novelty, frequently shop at fast fashion stores.¹³

Why are we choosing a T-shirt as the product to study

We focused on a T-shirt because it is a familiar and relatively homogeneous product that everybody can relate to. Everyone buys a T-shirt now and then. Moreover, in fashion, an intangible value such as brand obscures the price-cost relationship. When it comes to 'plain' T-shirts, there is competition and choice, but the price-costs relationship isn't too blurred. In addition, a standard cotton T-shirt has a global and relatively simple supply chain compared to other goods, with many unpaid costs regardless. Hence, there is a clear cost-price gap to be studied.

What costs don't we pay when buying a conventional T-shirt?

Even for a relatively simple and standard product, such as a cotton T-shirt, many costs are not included. Based on the unpaid costs or externalities and using previous research, we estimate that that in 2023 the fair price of a T-shirt is €28.¹⁴ The price for a standard retail T-shirt is assumed to be around €10.¹⁵

Category	Cost	Explanation
Resources	Land use	Average cotton farm is 1.8km ² large.
	Water use	Cotton, native to dry and warm regions, is a very water intensive crop: 2700 litres of water are used to produce a cotton t-shirt, that is enough for a person to drink for 2.5 years.
	Water scarcity	Major cotton producing countries already suffer from frequent droughts and water scarcity.
	Energy and materials	Cultivating cotton farms, transporting cotton and producing T-shirts takes energy and materials.
	Carbon emissions	The carbon footprint of cotton is extraordinarily high: between 200 and 400 tonnes of CO ₂ per km ² . Transport emissions in the production chain constitute only around 2% of the fair price.
Environment	Chemical pollution	Cotton uses 24% and 11% of the world's insecticides and pesticides, respectively, harming the environment over time. Furthermore, synthetic fertilisers release nitrous oxide, which is 310 times more potent than CO ₂ .
	Deforestation	Often cotton farms replace forests and other natural areas.
	Soil degradation	Cotton cultivation severely degrades soil quality.
	Water pollution	Runoff of pesticides, fertilisers, and minerals from cotton fields contaminates rivers and lakes.
	Biodiversity and wildlife loss	Poor soil and water quality and deforestation impact biodiversity and wildlife.
	Waste	Not only cotton cultivation leads to waste, but also during garment manufacturing up to 25% of the materials is wasted. Only 1% of textiles waste is recycled into new fibres for clothing.
People	Health and safety	Cotton cultivation and garment manufacturing usually takes place in countries with lower labour and health standards and more issues of discrimination and harassment.
	Underpayment and overtime	Textile workers and cotton farmers tend to not only work long hours but also are usually paid below a living wage. It takes 4 days for a CEO of a fashion company to earn what an average worker earns in a year.
	Child labour	Most labour is done by young women. In some cases it is forced labour or child labour. Almost 21 million people in the world are victims of forced labour within the clothing and textile industry—11.4 million of these are women and girls.
	Forced labour	China accounts for about 50% of the world's textile production capacity. About 20% of the world's cotton comes from China, and 84% of that comes from Xinjiang: region in Northwest China, notorious with forced labour camps for large parts of the Uyghur population.
	Social security and rights	Many textile and garment producers lack adequate social security provisions, including annual, sick and parental leave.

Sources: IDH and True Price: The True Price of Cotton from India (2014); FarmProgress; GlobalData; Environmental Justice Foundation; Organic Authority; Good on You; Bloomberg; Oxfam; USDA.

What is the real price of a T-shirt?

Standard Retail Price
€ 10,-

Fair Price
€ 28,-



Cotton T-shirt value chain steps:

The production process of a cotton T-shirt typically consists of:

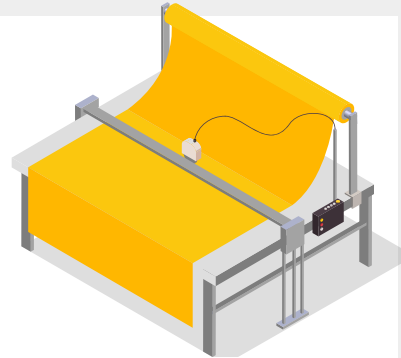
- The production of raw materials and fabric
- Design and manufacturing of clothing
- Dyeing and colouring
- Distribution and retail.

Prices are not evenly distributed in the value chain. When we look at the retail price, manufacturers get 17%, wholesalers receive 24% and retailers earn 59% of the retail price.¹⁶

Sources: Sustainably Chic, Fashionza, Visual Capitalist, World's Top Exports, Euro news, GlobalTrademag.



The production of raw materials and fabric mainly takes place in China (23%), India (21%), United States (15%) and Brazil (10%).



Dyeing and colouring is dominated by China, Bangladesh, Thailand and Indonesia.



Design and manufacturing primarily happens in China (16%), Bangladesh (15%), Germany (5.8%) and Turkey (5.6%).



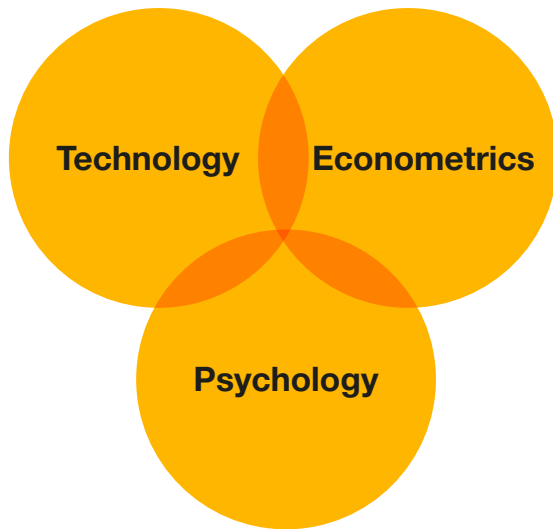
Distribution, retail and consumption of T-shirts per capita is led by the United Kingdom (9 per person), United States (9 per person) and Germany (6 per person).



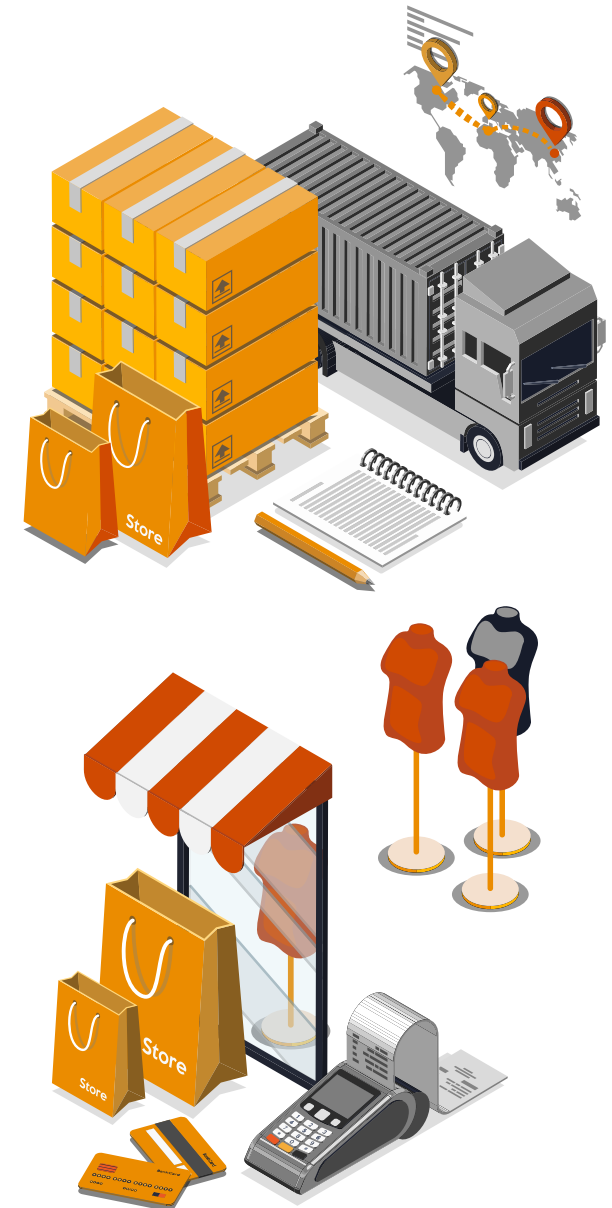
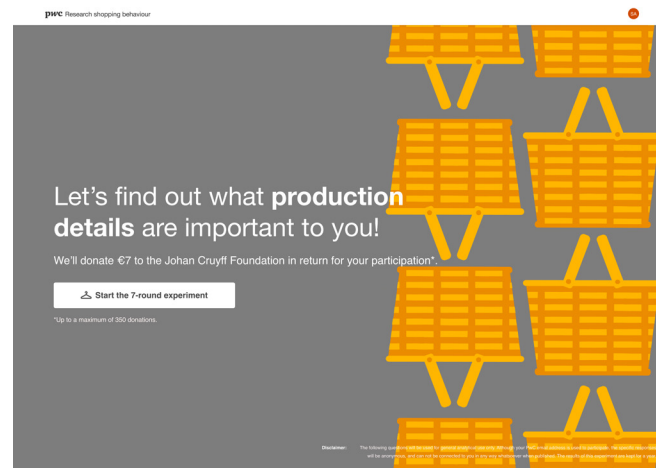
Fair pricing and fair buying is not a trend yet. Real prices of clothes have halved since 1990, and 40% of items are even sold at a markdown.

The experiment: what did we do

To understand whether we can bridge the fair price gap, we combined three important tools:



Technology and experience: a 'real' webshop
Conventional surveys or preference studies can be too lengthy, unappealing and repetitive. For this reason, we decided to create a website replicating real-life shopping experiences and adding a 'fun factor' for participants. This is especially important in the context of nudging, which requires visual inputs for more effective results.



“ Conventional surveys or preference studies can be too lengthy, unappealing and repetitive. For this reason, we decided to create a website replicating real-life shopping experiences and adding a ‘fun factor’ for participants.



What is a discrete choice experiment?

Discrete choice experiment (DCE) or choice-based conjoint analysis, is an econometric method to gather preferences indirectly. Compared to other methods, it provides valid estimates based on observed choice behaviour, is cost-effective, time-efficient and flexible in including new price and product combinations.¹⁷

- In a DCE, participants are typically presented with multiple rounds asking them to choose among a set of choice alternatives.
- Every alternative contains several variables or ‘attributes’, and each attribute has a number of variations or ‘levels’.
- By slightly tweaking the attribute-level combinations per alternative each round, participants must make trade-offs that reveal their real preferences among different attributes and levels.
- In most cases, it is not possible to always have the most desirable attribute-level combination. Hence, a DCE allows one to implicitly infer participant preferences without directly asking them to be stated.
- Thus, it is a method that helps understand people’s preferences and choices by providing them with a set of options and asking them to make trade-offs among the given attributes.

We used this method to discover preferences around the aspects of a T-shirt, but it could also be used to analyse people’s commuting patterns, for example.¹⁸ By providing different options, such as taking public transportation, driving, biking, or walking, with common attributes, like price and trip duration, we can study in which scenarios – for what price and trip duration combinations – people opt for a given option.

Econometrics: revealing customer’s preferences

A discrete choice experiment (DCE) is a quantitative method to obtain preferences from participants without directly asking them, as is done in conventional surveys. Since survey responses (stated preferences) are considered inferior to actual behaviours (revealed preferences), we performed a discrete choice experiment.

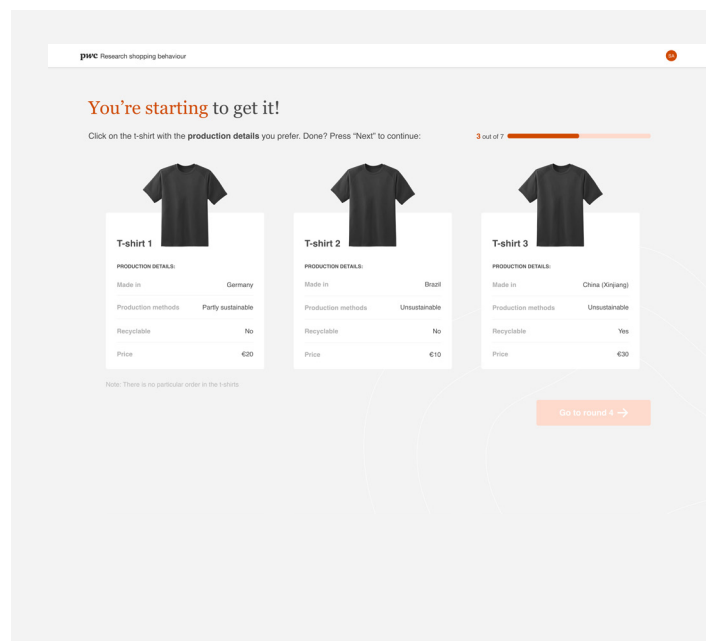


Three alternative T-shirts with four attributes

In our experiment, participants were presented with seven rounds of three alternative T-shirts, each with four attributes with two or three levels. The T-shirts shown in terms of attributes and levels, as well as the rounds and the round order were the same for all groups.

During each round, the participants had to decide which combinations of attributes and levels they value the most, allowing us to observe the trade-offs between aspects such as production method, recyclability, country of origin and price.

In setting up the attributes, we focused on the cultivation and production phases, which comprise around 60% of the T-shirt's fair price.¹⁹ For example, contrary to expectations, transport only accounts for about 2% of the fair price.²⁰



Country of production

In our experiment, the country of production is a proxy for social aspects of T-shirt production, such as pay and working conditions. We chose China (Xinjiang), Brazil and Germany as the levels of this attribute because they are ranked²¹ as having low, medium and high worker pay and working conditions, respectively.

Besides, these countries play a major role in the global textile supply chain²². China (Xinjiang) was chosen instead of just China to emphasise the role Xinjiang plays in cotton production and because of allegations of human rights violations in that region²³.

Production method

To focus on the raw and production side, included an encompassing attribute for different levels of sustainability: fully/partly/not sustainable production methods.

Recyclable:

To assess the demand for recyclable goods, we introduced two categories - recyclable and non-recyclable.

Price:

To approximate the available options on the market, we added three price options - €10, €20 and €30.

“ Social norms, or the actions and opinions of others, can act as a form of peer pressure.

Psychology: nudging

Nudging is a classic behavioural economics and psychology tool consisting of subtle and implicit interventions in the decision-making context to influence people’s choices.²⁴ We attempted to nudge the participants to influence their selection of T-shirts, favouring the more sustainable option. Participants were randomly allocated to one of four groups, one of which had no nudges (the control group), and the rest had one of three distinct nudges each: priming, framing and social norms. The outcomes of the nudge groups were compared to the control group.

The results of framing, which is about the deliberate use of words or phrasing to evoke a certain interpretation, were insufficient and unidentifiable, so we do not include the results of this nudge in this publication.

What is priming?

Priming is a psychological term that refers to how exposure to one stimulus influences how a person reacts to subsequent and related stimuli. Or, in simple terms, how a stimulus affects the response. For example, can you fill in the gaps and complete the word hereafter?

G _ _ _ N

If the first word that came to mind was ‘green’, congratulations! You have been successfully primed! Possibly because of the article’s subject (which is quite ‘green’ or sustainability-focused). Or perhaps because your brain noticed the green font at the beginning of the paragraph, making it more likely for you to retrieve that word and concept.

The effects of priming have been well-proven since the 1980s in research settings, but they are generally known for not being long-lasting. We were interested in our research to test whether this well-known effect would work on our participants by triggering an emotion or making a concept more accessible, leading to a sustainable choice.

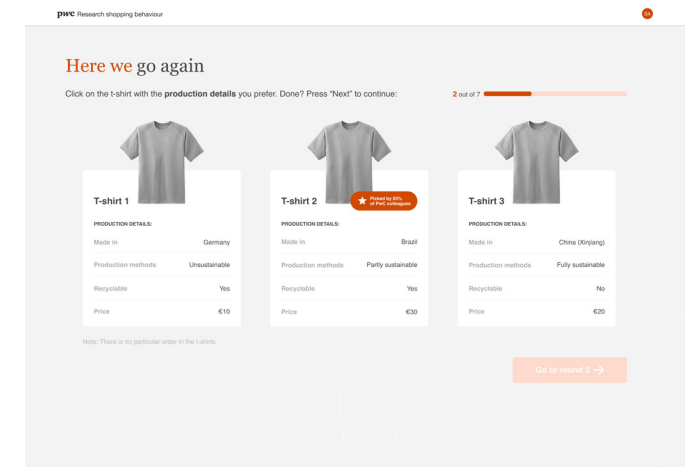
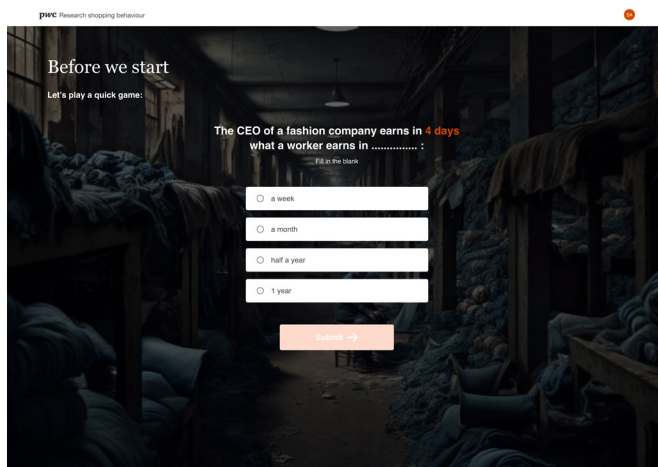
How did we use priming?

First, we asked three brief questions to test people’s knowledge about sustainable fashion facts, such as water intensity of cotton, the proportion of clothes that are recycled and wages, showing the correct answer afterward. This approach attempted to prime people for all attributes included in the experiment.

Second, we also displayed a background image of a sweatshop with stacks of clothing (a negative prime) to invoke an emotional reaction that shadows unsustainable fashion. The remaining elements of the experiment looked the same as for the control group.

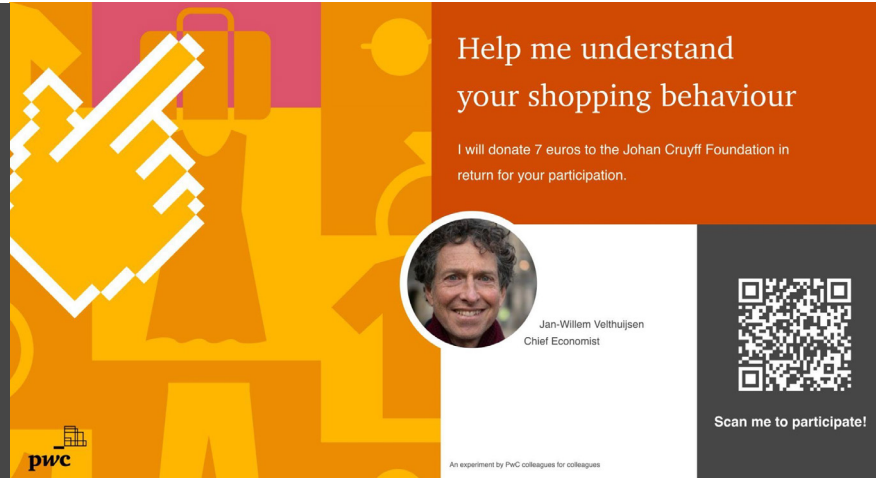
What are social norms?

Social norms, or the actions and opinions of others, can act as a form of peer pressure. Knowing how our peers behave indicates how we are expected to act about specific topics, usually leading us to conform and adopt the group’s choice. We do this not only because of an intrinsic desire to ‘fit in’ but also because we subconsciously trust that the group knows better. The effectiveness of social norms is so widely recognised that governments have also been using them, for example, to increase tax compliance²⁵ or reduce smoking.²⁶



“

We reached 655 participants of different ages, genders, and lines of service.



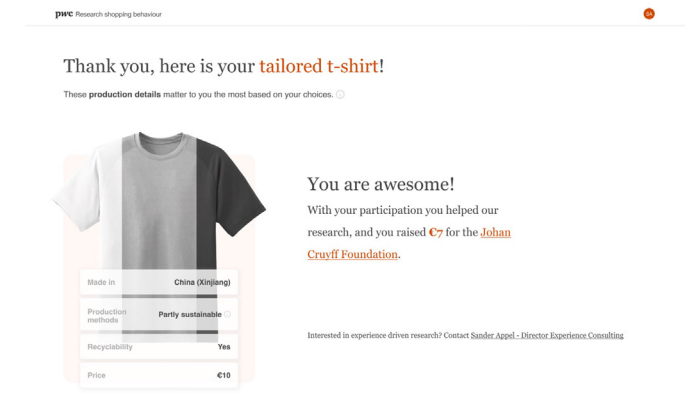
How did we do the experiment at PwC?

- We did not give away any information before the experiment, only that we were studying shopping behaviour.
- We informed about the experiment through email, visual promotion and standing in the office building.
- Furthermore, we encouraged participation by offering a €7 donation per completed experiment to the Johan Cruyff Foundation for up to 350 responses.
- It was possible to participate either through a website or via a mobile QR code.
- The participants were randomly divided into four groups: a control and three nudge groups (priming, framing and social norm).
- We needed 330 participants for our experiment design, and we exceeded that by reaching 655 participants (see Appendix page 21 for summary statistics).
- After the end of the experiment, we asked participants to state their demographic information (gender and age), line of service at PwC, how they dispose of their clothes and which attribute is the most important to them.
- Lastly, the participants could also see a T-shirt generated based on their choices.

A famous psychology study²⁷ found that people engaged in more sustainable behaviour (reusing hotel towels) when a social norm nudged them. People were more willing to reuse their towels when a card on their door was asking for collaboration with the hotel to save the environment. This led to a 36% reuse rate. However, even more people reused their towels if the card also stated that almost 75% of hotel guests were doing so (48% reuse rate). Hence, a minor change informed by psychological theory can yield improved results for existing business practices aimed at helping the environment.

How did we use social norms?

In our experiment, we labelled the most sustainable alternatives with a star and text saying a given percent of colleagues chose it in each round. The labels were not placed based solely on price, so the most sustainable option in this condition was not necessarily the most expensive one.



Results: nudging is a tool to address the green consumer paradox

Which nudges worked better in this experiment?

Different nudges might be appropriate depending on the desired behaviour, populations and area of interest. In our case, both priming and social norm nudging techniques significantly affected participants' choices but led to different outcomes.



How did we assess the results?

Firstly, we looked at the summary statistics (more in Appendix page 21) for the sample's representativeness. Then we measured:

1. The willingness to pay (WTP)²⁸ in each nudge group for a given attribute-level.
2. The WTP range²⁹ per attribute, or the difference in WTP for the lowest and highest utility attribute-level.
3. The relative attribute importance³⁰ in terms of total WTP.
4. How many times the nudged alternative was picked.

Then we looked at three comparison angles:

1. For the priming nudge, we compared the WTP for each attribute-level in the nudged group to the control group. A positive difference indicates a desired effect of the nudge: it means people are willing to pay more for this attribute-level.
2. Similarly, we compared the relative attribute importance in the nudge group to the control group. A positive difference shows that this attribute is more important in the nudge group compared to the control group.
3. In the social norm group, we counted how many times the nudge option was picked compared to the same alternative and round in the control group.

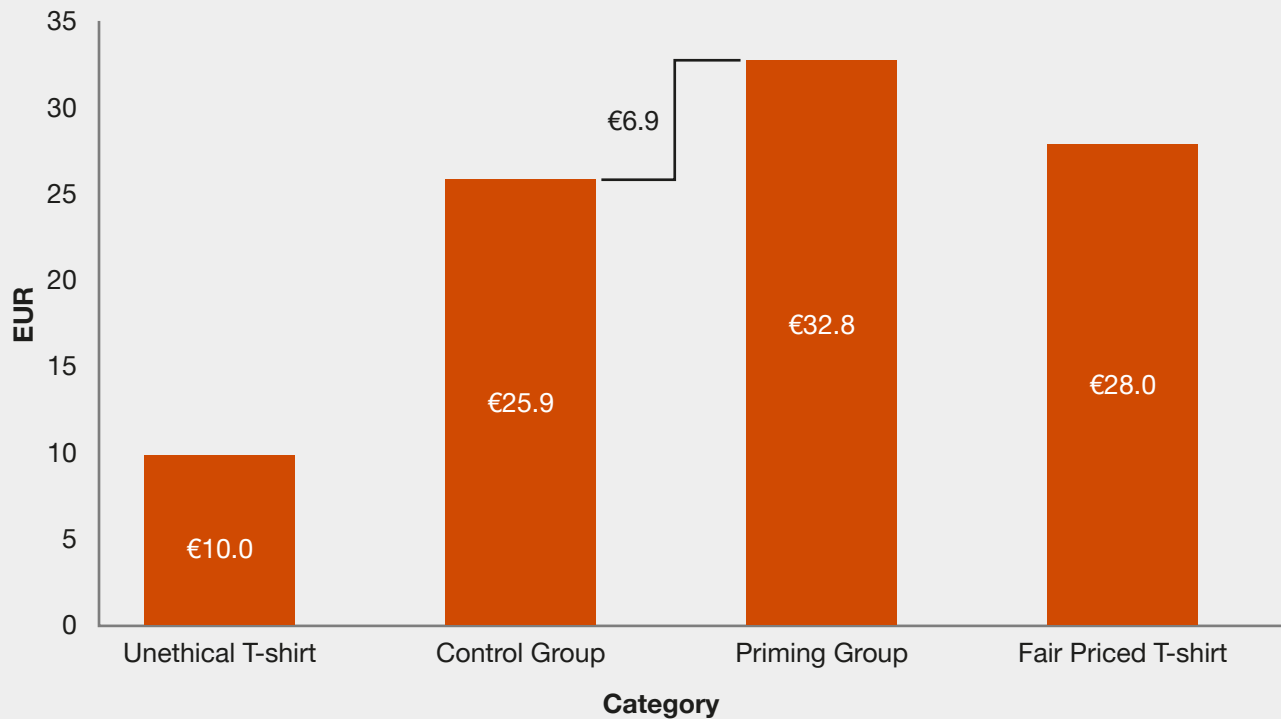
We also compared how the results differ comparing the nudge groups in total, as well as splitting them based on gender³¹ and age³².



In our case, both priming and social norms nudging techniques significantly affected participants' choices but led to different outcomes.

Willingness to pay comparison

Primed participants were willing to pay 6.9 EUR more for a fair priced T-shirt on average



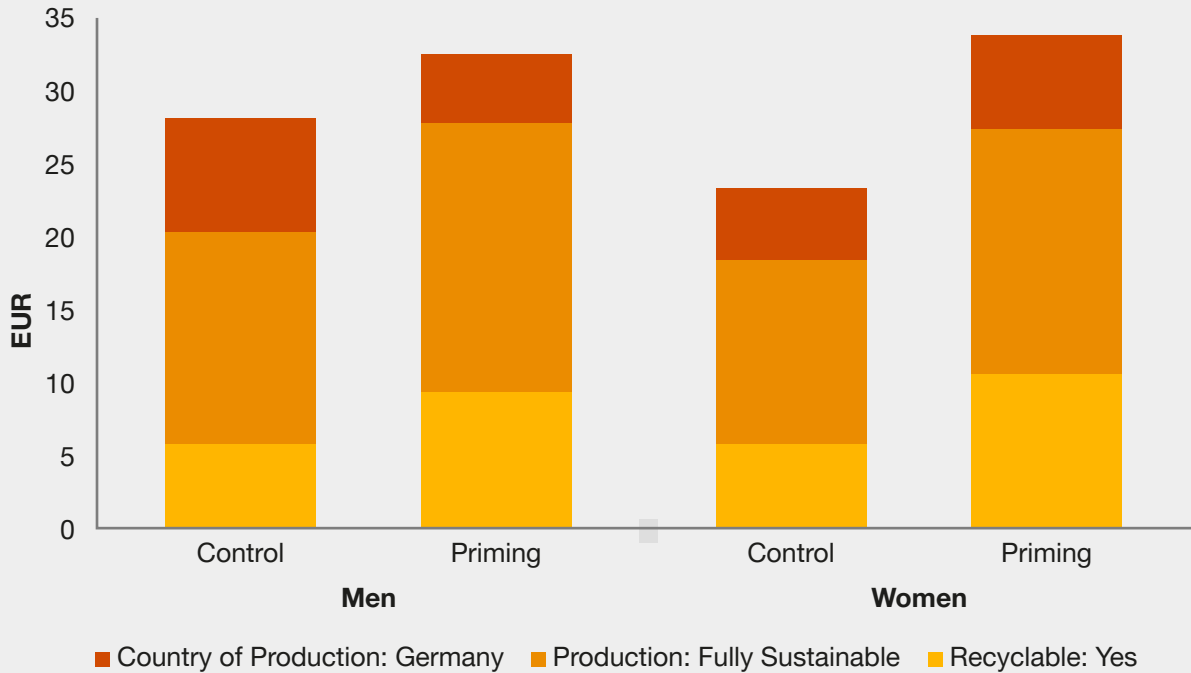
Priming:

Priming raised the willingness to pay by almost €7

Overall, priming participants on the importance of the attributes made it more likely for them to choose the fair T-shirt³³ compared to the control group.

- Participants in the control group already had a relatively high willingness to pay (€25.9) for a fair T-shirt, albeit slightly lower than the assumed fair market price (€28).
- We observed that people in the priming group were willing to pay up to €6.9 more for the same fair-priced T-shirt as in the control group (€32.8 versus €25.9), which is more than the assumed fair-priced T-shirt price.

Gender differences in the willingness to pay for a fair T-shirt



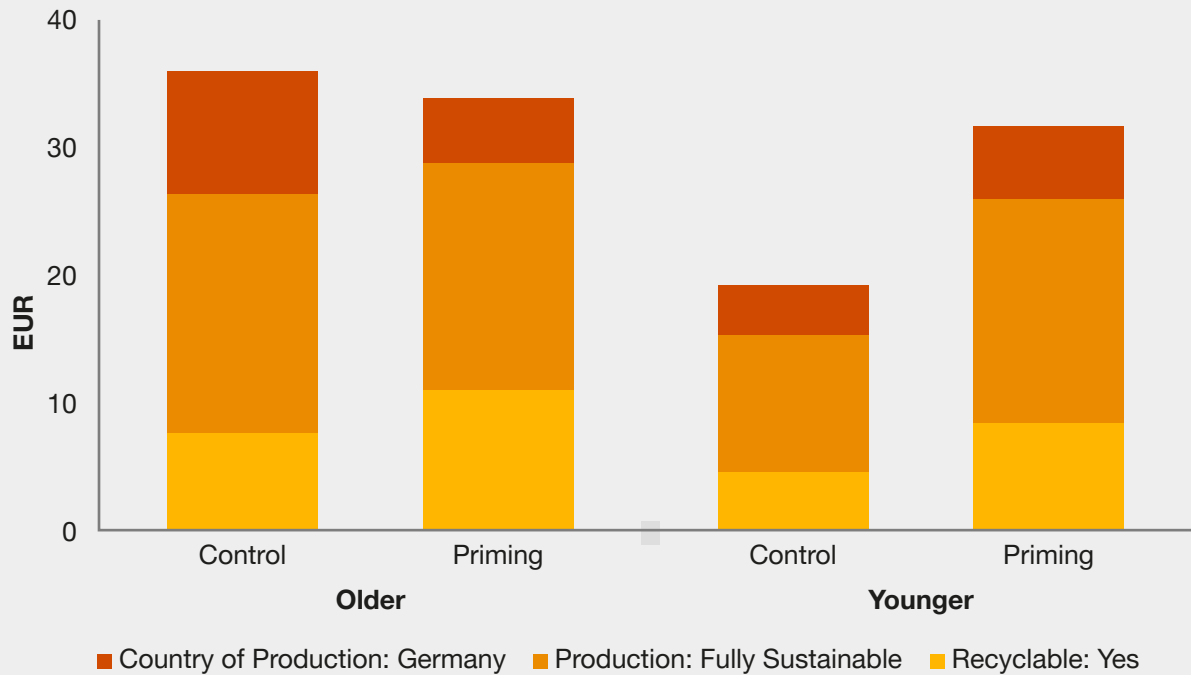
Gender differences on priming effects

- Priming worked on both men and women, leading them to pay a higher price for a T-shirt. The effect seemed more pronounced in the women’s cohort: women’s WTP in the control group was €5 lower than that for men, and in the priming condition, the WTP of women exceeded the men’s WTP by €2.
- Men in the priming group (€32) were willing to pay €4 more for the same T-shirt than men in the control group (€28).
- Likewise, women in the priming group (€34) were willing to pay €11 more than women in the control group (€23).

Difference in WTP for men in priming and control groups **+ €4**

Difference in WTP for women in priming and control groups **+ €11**

Age differences in willingness to pay for a fair priced T-shirt



Age differences on priming effects

The results are also interesting when comparing younger and older participants, with the younger cohort showing more of a positive effect of priming on their WTP.

- This is possibly also due to the considerable difference in WTP between the two age groups in the control group, where older participants were willing to pay €17 more than their younger colleagues.
- Older participants were already willing to pay €8 more than the average fair price of €28. Therefore, observing a positive effect of priming on this cohort could not be expected.
- Younger participants' willingness to pay was €19 in the control group and €34 in the priming group, a difference of €15.
- However, older participants' willingness to pay this time was €3 higher in the control group: €36 versus €33.

Difference in WTP for older participants in priming and control groups

- €3

Difference in WTP for younger participants in priming and control groups

+ €15

Social norm:

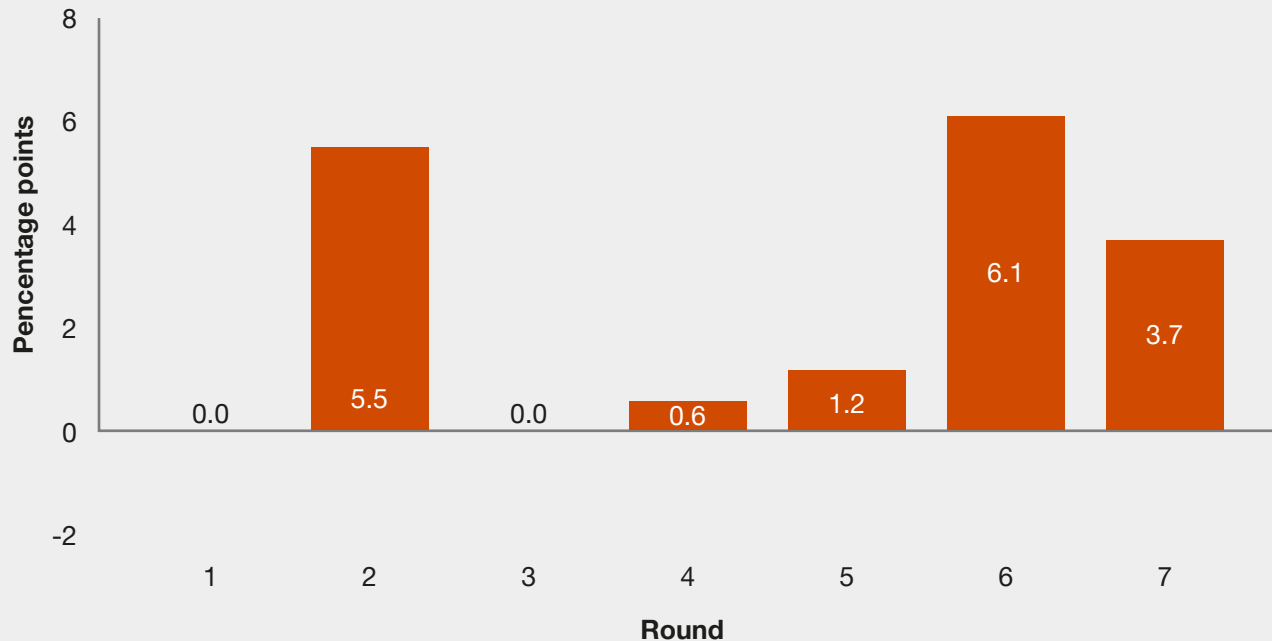
Participants chose more often the T-shirt that their colleagues had 'chosen' too

To assess the social norm's effectiveness, we looked at how much more frequently participants in this group clicked on the labelled alternative than the control group.

The alternative with the nudge was not necessarily the most expensive option, although it was the most sustainable one in terms of attributes.³⁴ Therefore, even though we already anticipated that this alternative would be picked more frequently from a sustainability point of view, we saw that the social norm enhanced this effect. It predictably led participants to choose based on their peers' preferences.

We saw a clear pattern: in almost every round, people in the social norm group were more often (in total up to 17 percentage points, see graph below) clicking on the labelled alternative compared to the control. However, when it comes to the results in terms of gender and age, the effectiveness of social norms was much more pronounced in females and younger participants, indicating that these groups were more likely to follow their peers' behaviour.

The effect of the social norm nudge (compared to the control group)

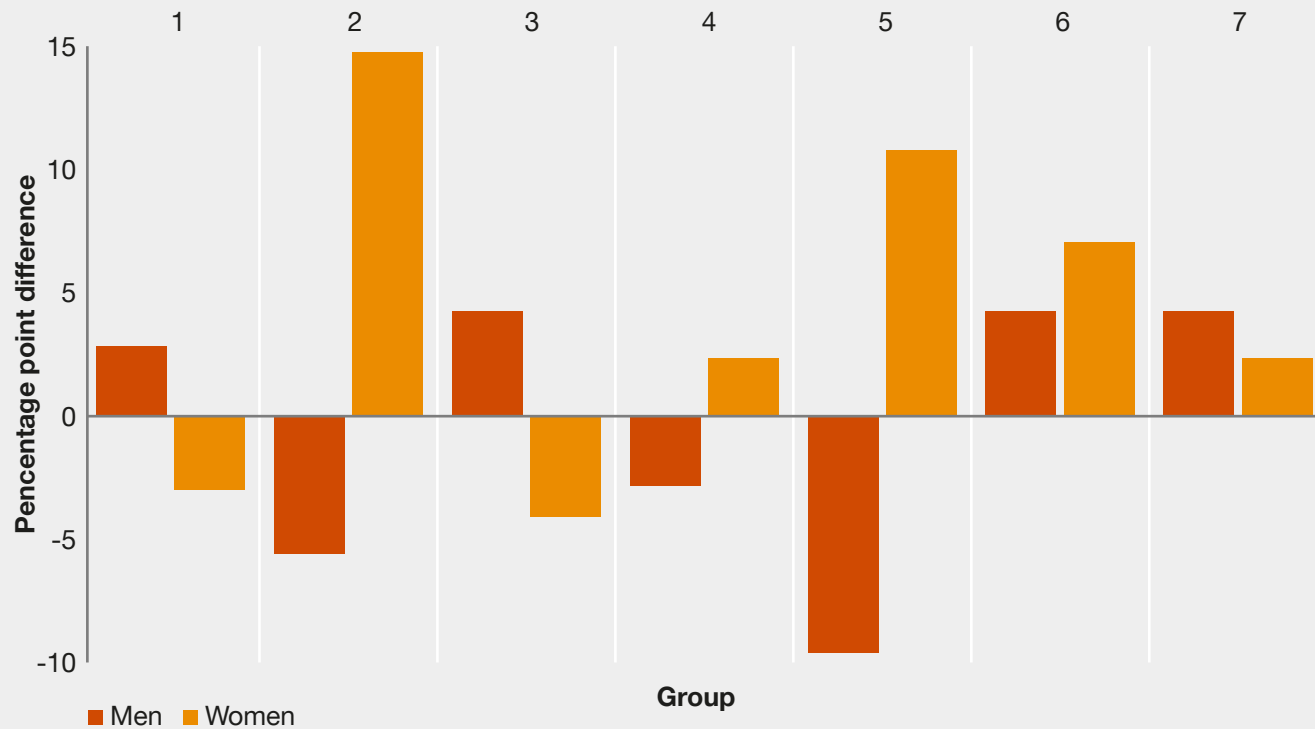




Nudging through the display of social norms predictably led participants to choose based on their peers' preference.

Gender differences per round in following the social norm nudge

Percentage point difference compared to control group



Differences between men and women when nudged with social norms

In almost every round, women picked the labelled alternative more often than men and 30 percentage points more than their female colleagues in the control group. On the other hand, men in the social norm group picked the labelled alternative 2.7 percentage points less than men in the control group. This indicates that women were 'encouraged' by the social norm, while it largely did not affect men.

Percentage point difference in clicking on the alternative with the social norm label compared to the control group for men

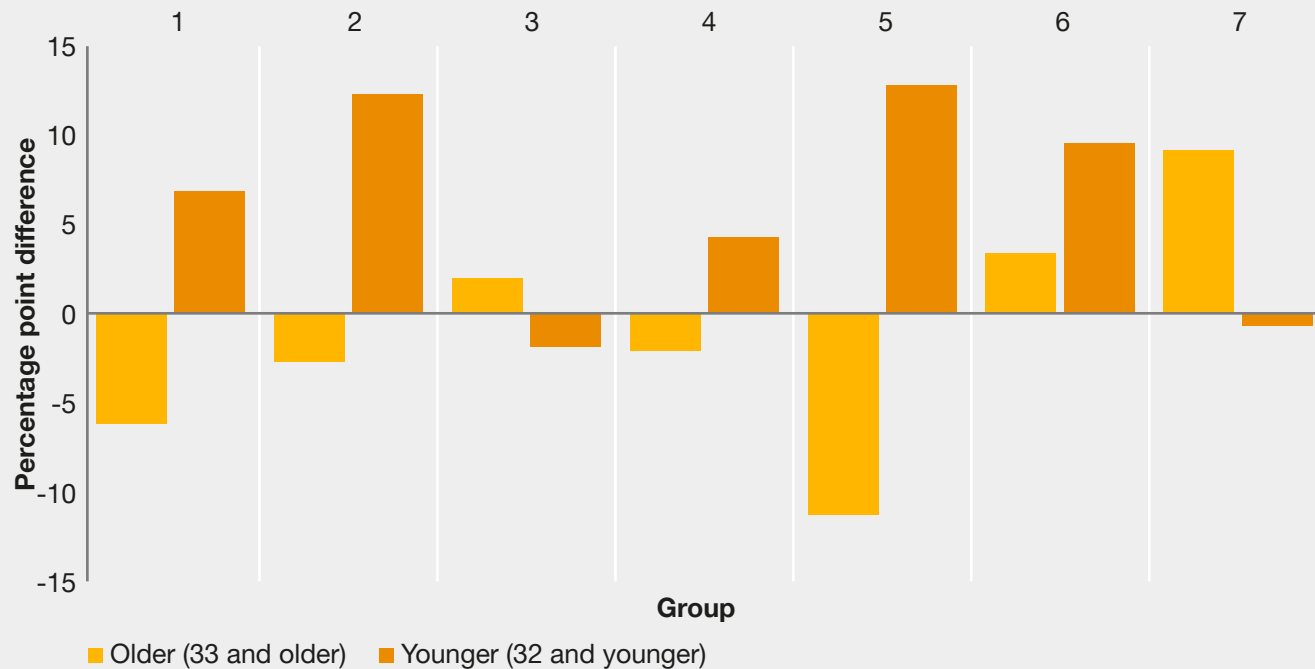
- 2.7 ppt

Percentage point difference in clicking on the alternative with the social norm label compared to the control group for women

+ 30 ppt

Age differences in following the social norm nudge

Percentage point difference compared to control group



Differences in age when nudged with social norms

A similar split as with the priming condition can also be observed between younger and older participants in the social norms group. Younger participants clicked up to 43 percentage points more often on the labelled alternative than their peers in the control group. On the other hand, older participants clicked 8.3 percentage points less on the labelled alternative, indicating almost being ‘discouraged’ by the label.

Given the already high willingness to pick the most expensive and sustainable option without nudging, it is perhaps once again unsurprising to observe that nudging did not work (and possibly even backfired) for this group. At the same time, it had an effect on the younger cohort.

The results show how the choice of nudging is essential to consider when working with different audiences (within fashion, at least). It seems that men and older participants were less likely to adopt the popular choice, with older participants almost unwilling to conform. This could be due to the experimental design or the sector chosen for the experiment (fashion) which could arguably be more engaging for a female and younger audience.

Percentage point difference in clicking on the alternative with the social norm label compared to the control group for older participants

- 8.3 ppt

Percentage point difference in clicking on the alternative with the social norm label compared to the control group for younger participants

+ 43 ppt

Perhaps those who are more subject to the green consumer paradox or who have a more sustainable mindset are more receptive to being nudged in this direction. While it is hard for us to draw a conclusion of this kind here, we recommend carefully considering the audience for the most effective nudging technique and pricing thresholds.

Other findings

- All groups ranked ‘production method’ as the most important attribute, followed by ‘price’. The attributes ‘country’ and ‘recyclability’ came on third or fourth place, depending on the nudge group (see page 28 in Appendix).
- This leads us to conclude that, on average, participants were more perceptive to environmental rather than social aspects: they were willing to pay more for attributes indicating sustainable production instead of the country of production, which we used as a proxy for labour standards. This could also be due to the proxy used for social considerations, which might have been perceived as a too indirect representation of labour conditions.
- We asked people after the experiment to state their most important attribute when making their choices. We compared that to what they did in the experiment. We found that participants were all in all quite aligned with what they said was important and how they actually made their choices, with some minor differences (page 28 in Appendix).

What should we take into account when looking at these results?

There are, of course, certain limitations to our results. In terms of the sample, we only conducted this experiment within our own company and did not apply it to a broader group of consumers. We also had participants make trade-offs about a plain T-shirt to avoid other influencing variables, such as style, having an effect. But of course, the fashion world is much more complicated and attractive than that. Furthermore, we obtained estimates on a group level and not per individual.

In addition, even though our approach reveals preferences and is better than only asking about them, it is not actual buying behaviour. People are generally bad at predicting their behaviour in the future, and a better predictor would be to compare actual buying behaviour. That is where our future research might focus on. However, that has data limitations.

For additional improvements on our research, it would be interesting to study how long-lasting the effects of nudging are, in particular for emotional priming, which in our study was combined with raising awareness. For the social norm, it would be interesting to test whether the effect of the same nudge but applied to a different type of product that might appeal more to a male and older audience would be different or not.

Moreover, ethical considerations about the use of nudges have been raised before³⁵, challenging the legitimacy of their use given the perceived fine line between merely guiding and paternalism that does not fully consider people’s autonomy. However, these techniques are not new to marketing, where nudges have been widely used to increase sales.³⁶ Nevertheless, in designing such nudges, it is important to also align with the regulatory stance.³⁷

Thus, using such techniques for our own benefit (e.g., by a government to safeguard citizens’ health) can be one of the many tools in an arsenal for benevolent action. In the specific context of our study, we also see more and more consumers wanting to make a more sustainable choice but struggling with it. In cases like that, benevolent nudging can be helpful.

Conclusions and implications

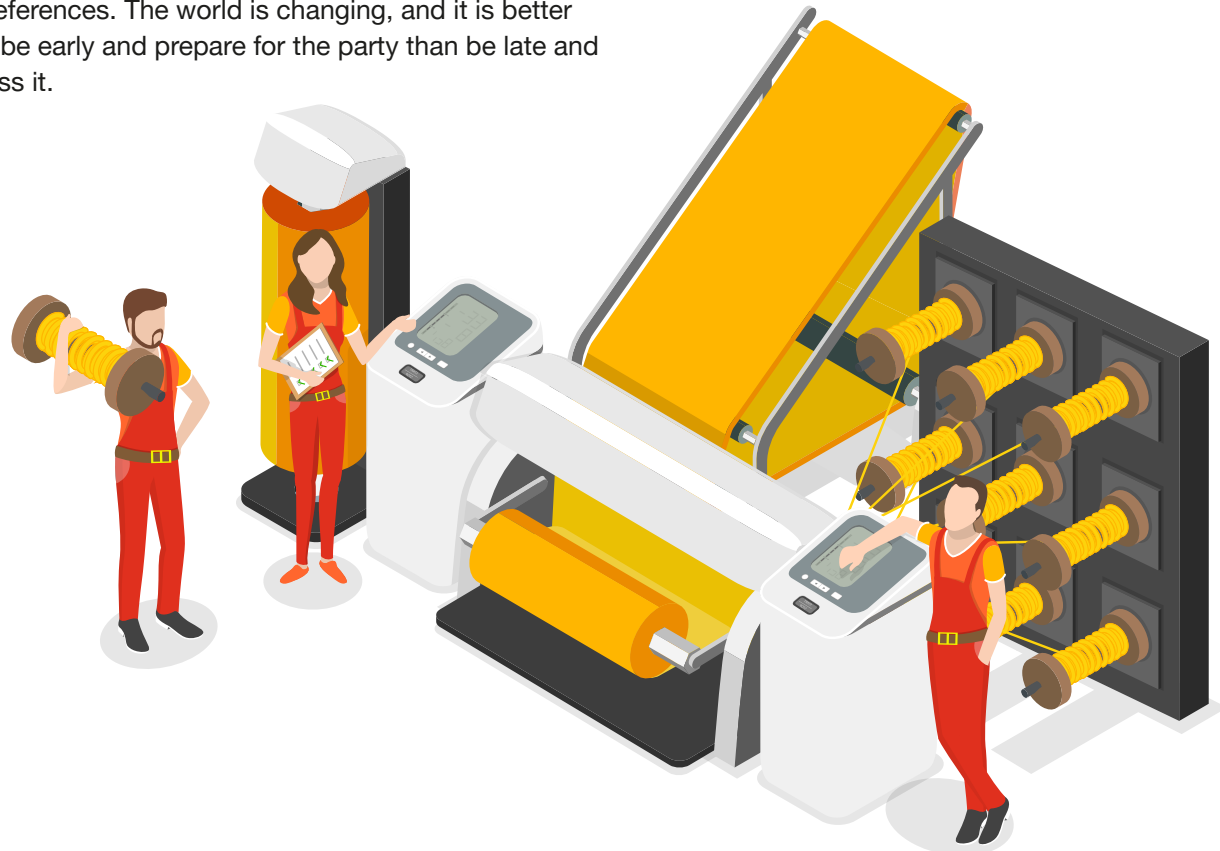
To guarantee a more sustainable world, everyone has to play a part. Policymakers have to put the right incentives in place. The legislative proposals of the European Commission, i.e. the Green Claims Directive, are already a great step-forward from regulators to help companies and customers. Companies also have to integrate Environment, Social, and Governance (ESG) into their 'business as usual' and align with the regulatory and market shifts. In addition, consumers have to adapt their consumption patterns and 'vote with their dollars' to move the market in a more sustainable direction.

In this study, we once again confirmed that nudging works. Priming clearly affected choosing more sustainably across genders and ages. Therefore, we can conclude it was an effective nudge for driving this behaviour in such an environment. Similarly, social norm achieved the desired effect for younger and female participants.

This implies that companies, governments, or other institutions that want to influence people to make more sustainable choices can use nudges in their messaging, marketing and communication of their products or services. That is not a novel insight per se, as it has been a viable tool in psychology and behavioural economics for a while. However, what is novel is that even such slight nudges can be applied to tackle the green consumer paradox substantially and guide more sustainable choices.

Furthermore, modern problems require an interdisciplinary approach: which we did by combining technology, econometrics and psychology.

We encourage other companies to adopt a similar approach: 'get your hands dirty' and try out novel and practical ways to see if you can shift market preferences. The world is changing, and it is better to be early and prepare for the party than be late and miss it.



Appendix 1 - Sample

- We split our sample of 655 participants equally in four groups: control, priming, social norm and framing, each with 164 participants (priming had 163).
- Furthermore, it consisted of 53% women, 45% men and 2% other genders. That is similar enough to PwC's distribution - 55% men and 45% women.
- In addition, 71% of our participants were younger than 40.

Number of participants

Group	Total Number of Participants	Men	Women	Younger (32 and younger) Participants	Older (33 and older) Participants
Control	164	72	89	80	84
Priming	163	79	79	79	83
Social Norm	164	72	91	86	75
Framing	164	73	88	86	75
Total	655	296	347	331	317



Appendix 2 - Methodological Approach

Designing the discrete choice experiment

The design principles of the experiment largely followed Pérez-Troncoso (2020)³⁸, Eggers et al. (2022)³⁹ and Hauber et al. (2016)⁴⁰. Firstly, based on academic studies, articles and expert interviews, we identified the attributes and their levels, as well as the nudges that would fit our research goals. To balance statistical power with user experience, we decided to conduct a seven-round discrete choice experiment with three alternatives and either three or two levels per attribute.

Number of rounds

Furthermore, from an estimation point of view, a guideline for choosing the number of rounds is $l-k$, where l is the total number of levels and k is the total number of attributes. In addition, some studies tend to include a 'no choice' option to help with setting a reference level. However, because that would require at least an extra round, based on our experimental approach, we decided to not include it.

Sample size

Moreover, a challenge in conjoint or similar studies is that the experiment is designed with a given number of participants in mind, which in most cases is difficult to assess beforehand. In our case and based on our set-up, using a rule of thumb formula of $n \geq \frac{500 \cdot c}{ta}$, where n is the sample size, c is the maximum number of levels per attribute, t is the number of rounds and a

is the number of alternatives. In our case, we needed at least 71 participants per group, and as we had four groups, that would mean around 285 participants. We managed to exceed that to reach a total of 655 participants, with at least 163 in each group.

Attribute-level combinations

Furthermore, it is not a trivial question to determine which attribute-level combinations to show in each round and in what order. Based on our set-up, we could in theory generate 54 different combinations of attributes and levels, as we had three levels in country of production, three levels in production methods, three price levels and two recyclability levels ($3 \cdot 3 \cdot 3 \cdot 2 = 54$).

However, in practical terms, such designs (called full-factorial designs) are not feasible because they would either require a large number of alternatives per round or a lot of rounds. Therefore, most studies use a partial factorial design.

To generate a partial factorial design, we followed Pérez-Troncoso (2020) and employed the Modified Fedorov algorithm. After getting a sample design from this algorithm, we improved it by running an internal pilot with ten participants, who performed a trial experiment. Based on their choices and estimated coefficients, we used them again in a Bayesian framework to re-estimate a more optimal design, which we used for our final experiment.

Assigning the nudges

Lastly, the choice of which alternatives to assign a nudge to (in social norm and framing groups), was done based on the following criteria. In the social norm group, we preemptively (subjectively) picked one of the three alternatives as the most sustainable based on the implied utility of each attribute level ranking. A similar approach was employed in the framing group for more and less sustainable alternatives.

We assumed the ranking as follows:

Country of production: 1) Germany, 2) Brazil and 3) China (Xinjiang);
Production method: 1) Fully sustainable, 2) Partially sustainable, 3) Not sustainable;
Price: 1) 10, 2) 20, 3) 30;
Recyclable: 1) Yes, 2) No.

Estimation

We employed the econometric approach based on Eggers et al. (2022) using a multinomial logit model and its assumptions. It is the recommended approach by Hauber et al. (2016). Even though its usual limitation is that it computes the coefficients on a group level, in our case, it was the way to go because we compared different nudge groups.

The data structure of such models requires a long panel data set, where each row contains the data for a given alternative per round and whether it was chosen or not. The main dependent variable was a dummy choice variable: one if the respondent picked this alternative and otherwise zero. Therefore, for each respondent, we had 21 rows as there were seven rounds with three alternatives per round. The variables were effect-coded, therefore, the utility coefficients should sum up to zero.

To estimate the willingness to pay, price was coded as a continuous variable. The model required $I-k$, or in our case, seven dummy variables. The variables that were ranked as having the lowest utility were used as a reference and excluded from the model. Because they were effect-coded their coefficients could be retrieved after estimating the coefficients of the other two dummy variables. The estimated models and their coefficients are given in Appendix 3.

To calculate the willingness to pay, in the models with price as a continuous variable, we divided the respective variable coefficient with the price coefficient. The signs have to be reversed for interpretation, which means that consumers are either willing to accept a given euro discount to not have this attribute-level or are willing to pay a given amount of euros to have this level.

Alternative and nudge allocation

Round	Alternative	Country	Production	Recyclable	Price	Social Norm Label	Framing	Framing Outcome	Framing Target
1	1	Brazil	Partly sustainable	Not recyclable	30		40% unsustainable	positive	0
1	2	China (Xinjiang)	Not sustainable	Recyclable	20		Unknow production methods	positive	0
1	3	Brazil	Fully sustainable	Not recyclable	10	Picked by 77% of Pwc colleagues	75% eco-friendly	positive	1
2	1	Germany	Not sustainable	Recyclable	10		80% of workers benefit fair pay	positive	1
2	2	Brazil	Partly sustainable	Recyclable	30	Picked by 83% of PwC colleagues	Unknown wage conditions	positive	0
2	3	China (Xinjiang)	Fully sustainable	Not recyclable	20		75% of workers have unfair pay	positive	0
3	1	Germany	Partly sustainable	Not recyclable	20	Picked by 65% of PwC colleagues	Unknown recyclability	positive	0
3	2	Brazil	Not sustainable	Not recyclable	10		55% non-recyclable materials	positive	0
3	3	China (Xinjiang)	Not sustainable	Recyclable	30		70% recyclable materials	positive	1
4	1	China (Xinjiang)	Fully sustainable	Not recyclable	30		25% of workers benefit from fair pay	negative	0
4	2	Brazil	Not sustainable	Recyclable	20		40% of workers have unfair pay	negative	1
4	3	Germany	Partly sustainable	Recyclable	10	Picked by 72% of PwC colleagues	Unknown wage conditions	negative	0
5	1	Brazil	Partly sustainable	Not recyclable	20		60% eco-friendly	positive	1
5	2	Germany	Fully sustainable	Recyclable	30	Picked by 75% of PwC colleagues	Unknow production methods	positive	0
5	3	Germany	Not sustainable	Recyclable	10		75% unsustainable	positive	0
6	1	Germany	Partly sustainable	Not recyclable	10	Picked by 81% of PwC colleagues	45% recyclable materials	negative	0
6	2	China (Xinjiang)	Fully sustainable	Recyclable	10		30% non-recyclable materials	negative	1
6	3	Brazil	Not sustainable	Recyclable	30		Unknown recyclability	negative	0
7	1	Germany	Not sustainable	Not recyclable	30		20% of workers have unfair pay	negative	1
7	2	Brazil	Partly sustainable	Recyclable	10	Picked by 69% of PwC colleagues	60% of workers benefit from fair pay	negative	0
7	3	China (Xinjiang)	Partly sustainable	Recyclable	30		Unknown wage conditions	negative	0

Appendix 3 - Regression estimates and results

Priming results

Regression coefficient estimates for all groups

Group	Variable	Estimate	Standard error	Z-statistic	P-value	Willingness to Pay
<i>Control</i>	Country: Brazil	-0.06	0,07	-0,79	0,43	-0,7
	Country: China (Xinjiang)	-0.47***	0,09	-5,32	0	-5,5
	Country: Germany	0.53***	0,07	7,98	0	6,2
	Prod: Fully Sustainable	1.17***	0,07	16,31	0	13,7
	Prod: Not Sustainable	-1.49***	0,08	-19,41	0	-17,5
	Prod: Partly Sustainable	0.32***	0,08	4,16	0	3,8
	Not Recyclable	-0.51***	0,05	-9,99	0	-6
	Recyclable	0.51***	0,05	9,99	0	6
	Price	-0.09***	0,01	-13,96	0	NA
<i>Priming</i>	Country: Brazil	0	0,06	-0,02	0,98	0
	Country: China (Xinjiang)	-0.35***	0,08	-4,3	0	-5,4
	Country: Germany	0.35***	0,07	5,2	0	5,4
	Prod: Fully Sustainable	1.13***	0,07	16,59	0	17,5
	Prod: Not Sustainable	-1.41***	0,07	-19,88	0	-21,9
	Prod: Partly Sustainable	0.28***	0,07	3,95	0	4,4
	Not Recyclable	-0.63***	0,01	-113,92	0	-9,9
	Recyclable	0.63***	0,05	12,57	0	9,9
	Price	-0.06***	0,01	-11,56	0	NA

Statistical significance: 0 '****' 0.001 '***' 0.01 '**' 0.05 ''

Regression coefficient estimates for all gender groups

Group	Variable	Estimate	Standard error	Z-statistic	P-value	Willingness to Pay
<i>Control men</i>	Country: Brazil	0.05	0,11	0,43	0,67	0,6
	Country: China (Xinjiang)	-0.71***	0,14	-5,17	0	-8,4
	Country: Germany	0.67***	0,1	6,68	0	7,8
	Prod: Fully Sustainable	1.24***	0,12	10,71	0	14,5
	Prod: Not Sustainable	-1.37***	0,11	-12,39	0	-16
	Prod: Partly Sustainable	0.13	0,11	1,14	0,26	1,5
	Not Recyclable	-0.5***	0,08	-6,33	0	-5,8
	Recyclable	0.5***	0,08	6,33	0	5,8
Price	-0.09***	0,01	-9,45	0	NA	
<i>Control women</i>	Country: Brazil	-0.14	0,1	-1,44	0,15	-1,6
	Country: China (Xinjiang)	-0.29*	0,12	-2,45	0,01	-3,3
	Country: Germany	0.44***	0,09	4,88	0	4,9
	Prod: Fully Sustainable	1.15***	0,1	12,05	0	12,7
	Prod: Not Sustainable	-1.64***	0,11	-14,52	0	-18,2
	Prod: Partly Sustainable	0.5***	0,11	4,45	0	5,5
	Not Recyclable	-0.52***	0,07	-7,32	0	-5,7
	Recyclable	0.52***	0,07	7,32	0	5,7
Price	-0.09***	0,01	-10,37	0	NA	
<i>Priming men</i>	Country: Brazil	0.04	0,09	0,4	0,69	0,5
	Country: China (Xinjiang)	-0.36**	0,12	-3,02	0	-5,2
	Country: Germany	0.32***	0,1	3,24	0	4,7
	Prod: Fully Sustainable	1.27***	0,1	12,34	0	18,5
	Prod: Not Sustainable	-1.41***	0,1	-13,82	0	-20,5
	Prod: Partly Sustainable	0.14	0,1	1,32	0,19	2
	Not Recyclable	-0.64***	0,07	-8,63	0	-9,3
	Recyclable	0.64***	0,07	8,63	0	9,3
Price	-0.07***	0,01	-8,44	0	NA	
<i>Priming women</i>	Country: Brazil	-0.07	0,09	-0,83	0,41	-1,3
	Country: China (Xinjiang)	-0.31**	0,11	-2,69	0,01	-5,1
	Country: Germany	0.38***	0,1	4,01	0	6,4
	Prod: Fully Sustainable	1***	0,09	10,73	0	16,8
	Prod: Not Sustainable	-1.4***	0,1	-13,66	0	-23,4
	Prod: Partly Sustainable	0.39***	0,1	3,82	0	6,6
	Not Recyclable	-0.63***	0,07	-8,84	0	-10,6
	Recyclable	0.63***	0,07	8,84	0	10,6
Price	-0.06***	0,01	-7,6	0	NA	

Statistical significance: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.'

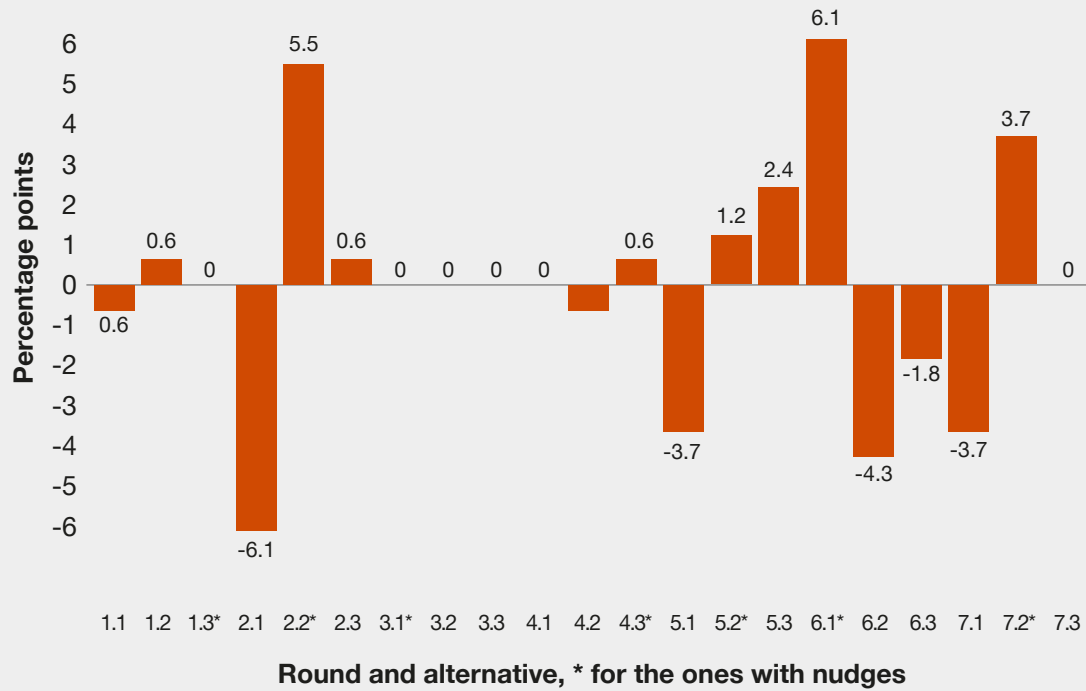
Regression coefficient estimates for all age groups

Group	Variable	Estimate	Standard error	Z-statistic	P-value	Willingness to Pay
<i>Control older</i>	Country: Brazil	0	0,11	0,43	0,67	0,6
	Country: China (Xinjiang)	-0.69***	0,14	-5,17	0	-8,4
	Country: Germany	0.68***	0,1	6,68	0	7,8
	Prod: Fully Sustainable	1.33***	0,12	10,71	0	14,5
	Prod: Not Sustainable	-1.54***	0,11	-12,39	0	-16
	Prod: Partly Sustainable*	0.21.	0,11	1,14	0,26	1,5
	Not Recyclable	-0.57***	0,08	-6,33	0	-5,8
	Recyclable	0.57***	0,08	6,33	0	5,8
	Price	-0.07***	0,01	-9,45	0	NA
<i>Control younger</i>	Country: Brazil	-0.12	0,1	-1,44	0,15	-1,6
	Country: China (Xinjiang)	-0.26*	0,12	-2,45	0,01	-3,3
	Country: Germany	0.38***	0,09	4,88	0	4,9
	Prod: Fully Sustainable	1.03***	0,1	12,05	0	12,7
	Prod: Not Sustainable	-1.46***	0,11	-14,52	0	-18,2
	Prod: Partly Sustainable	0.43***	0,11	4,45	0	5,5
	Not Recyclable	-0.46***	0,07	-7,32	0	-5,7
	Recyclable	0.46***	0,07	7,32	0	5,7
	Price	-0.1***	0,01	-10,37	0	NA
<i>Priming older</i>	Country: Brazil	-0.05	0,09	0,4	0,69	0,5
	Country: China (Xinjiang)	-0.29*	0,12	-3,02	0	-5,2
	Country: Germany	0.35***	0,1	3,24	0	4,7
	Prod: Fully Sustainable	1.2***	0,1	12,34	0	18,5
	Prod: Not Sustainable	-1.59***	0,1	-13,82	0	-20,5
	Prod: Partly Sustainable	0.39***	0,1	1,32	0,19	2
	Not Recyclable	-0.76***	0,07	-8,63	0	-9,3
	Recyclable	0.76***	0,07	8,63	0	9,3
	Price	-0.07***	0,01	-8,44	0	NA
<i>Priming younger</i>	Country: Brazil	0.04	0,09	-0,83	0,41	-1,3
	Country: China (Xinjiang)	-0.39***	0,11	-2,69	0,01	-5,1
	Country: Germany	0.35***	0,1	4,01	0	6,4
	Prod: Fully Sustainable	1.06***	0,09	10,73	0	16,8
	Prod: Not Sustainable	-1.25***	0,1	-13,66	0	-23,4
	Prod: Partly Sustainable	0.19*	0,1	3,82	0	6,6
	Not Recyclable	-0.52***	0,07	-8,84	0	-10,6
	Recyclable	0.52***	0,07	8,84	0	10,6
	Price	-0.06***	0,01	-7,6	0	NA

Statistical significance: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.'

Social norm results

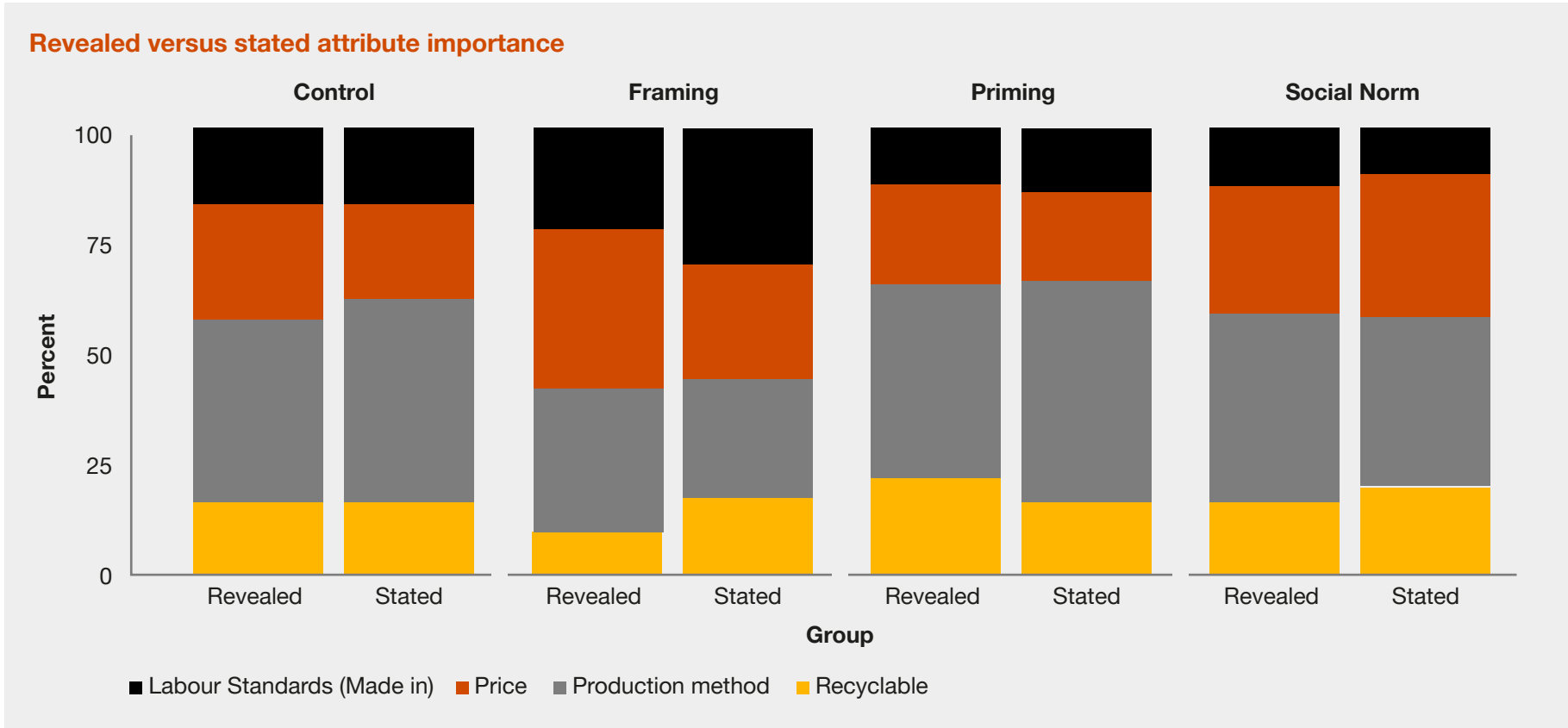
Difference in alternatives picked in social norm v control group



Number of times each alternative was picked per round

Round	Alternative Number	Control	Priming	Social Norm	Framing
1	1	6	17	5	11
1	2	12	18	13	12
1	3	146	128	146	141
2	1	62	53	52	127
2	2	46	60	55	18
2	3	56	50	57	19
3	1	132	122	132	103
3	2	21	20	21	33
3	3	11	21	11	28
4	1	10	22	10	27
4	2	4	5	3	18
4	3	150	136	151	119
5	1	22	17	16	67
5	2	100	108	102	56
5	3	42	38	46	41
6	1	46	28	56	74
6	2	114	129	107	86
6	3	4	6	1	4
7	1	6	4	0	12
7	2	149	148	155	146
7	3	9	11	9	6

Other results



Endnotes

- 1 This refers to the phenomenon where consumers who are aware of and motivated by environmental issues struggle to act accordingly and trade sustainability for price, speed, performance, or convenience. Such situations are a subset of the more commonly known 'intention-action gap' in psychology.
 - Forrester: The Green Consumer Paradox (2021)
 - The Decision Lab: Intention-Action Gap
- 2 Harvard Business Review: The Elusive Green Consumer (2019)
- 3 Fashion United: Global Fashion Industry Statistics (2022)
- 4 Projectcece: How Many Times Do We Wear Our Clothes? (Not Enough!) (2022)
- 5 European Commission: EU Strategy for Sustainable and Circular Textiles (2022)
- 6 ACE: Fast Fashion and Climate Change 101 (2022)
- 7 Fast fashion companies are increasingly recognizing more ethical consumption patterns as a key business risk. Bloomberg: Where Is the Fast Fashion Backlash? (2020)
- 8 The European Green Deal and the Circular Economy Action Plan include a textile strategy.
- 9 The European Commission recently pointed out this issue, European Commission: Consumer protection: enabling sustainable choices and ending greenwashing (2023)
- 10 Harvard Business Review: The Myth of Sustainable Fashion (2022)
- 11 Ibid.
- 12 Harvard Business Review: The Elusive Green Consumer (2019)
- 13 Vox: Gen Z doesn't know a world without fast fashion (2021)
- 14 IDH and True Price: The True Price of Cotton from India (2014)
- 15 Sustainably Chic, True Cost Series: Why Does A Sustainable T-Shirt Cost \$36? (2023)
- 16 Kearney: Why today's pricing is sabotaging sustainability (2020)
- 17 For more details see Breidert et al. (2015): A Review of Methods for Measuring Willingness-to-Pay
- 18 The academic literature on measuring willingness to pay started with McFadden's (1974) study: The Measurement of Urban Travel Demand, which was used to measure the willingness to pay for different options for Bay Area commuters.
- 19 IDH and True Price: The True Price of Cotton from India (2014)
- 20 Ibid.
- 21 ITUC: Global Rights Index, the world's worst countries for workers (2022)
- 22 The Observatory of Economic Complexity trade data
- 23 Centre for Strategic & International Studies: The Uyghur Forced Labor Prevention Act Goes into Effect
- 24 MMI: An Overview of the Various Types of Nudges (2022)
- 25 Bott et al. (2017): You've Got Mail: A Randomized Field Experiment on Tax Evasion.
Hallsworth et al. (2017): The Behavioralist as Tax Collector: Using Natural Field Experiments to Enhance Tax Compliance.
- 26 Thaler and Sunstein (2008): Nudge: Improving Decisions About Health, Wealth, and Happiness.
- 27 Cialdini (2005): Don't Throw in the Towel: Use Social Influence Research.
- 28 Willingness to pay is the maximum price a customer is willing to pay for a product or service. Harvard Business School: Willingness to Pay: What it is & How to Calculate (2020)
- 29 See Eggers et al. (2022): Choice-Based Conjoint Analysis
- 30 Ibid.
- 31 Because our sample had very few observations of non-binary gender, we focused on comparing only results for men and women.
- 32 We split our sample into two groups with a similar number of participants: younger (32 years and younger) and older participants (33 and older).
- 33 We compared the willingness to pay for a 'fair' T-shirt - made in Germany, fully sustainable and recyclable - in both groups.
- 34 See Appendix for more details on choosing the social norm label.
- 35 Glaeser (2006): Researcher incentives and empirical methods
Rebonato (2012): Taking liberties: A critical examination of libertarian paternalism
Schnellenbach (2012): Nudges and norms: On the political economy of soft paternalism
Schnellenbach (2019): Evolving hierarchical preferences and behavioural economic policies
- 36 Hossain and List (2012): The behavioralist visits the factory: Increasing productivity using simple framing manipulations
- 37 European Commission: Consumer protection: enabling sustainable choices and ending greenwashing (2023)
- 38 Pérez-Troncoso (2020): A step-by-step guide to design, implement, and analyze a discrete choice experiment
- 39 Eggers et al. (2022): Choice-Based Conjoint Analysis
- 40 Hauber et al. (2016): Statistical Methods for the Analysis of Discrete Choice Experiments: A Report of the ISPOR Conjoint Analysis Good Research Practices Task Force

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