# Experimental design and hypotheses

To investigate the interaction between default effects and intrinsic environmental motivation, we designed a 2×2×2 between-subjects experiment manipulating three key factors: default option (bioplastic vs. plastic), externality salience (low vs. high), and default randomness (intentional vs. random).

## 2.1 Experimental Setup

Participants are presented with a choice between two pen types: a conventional plastic pen and a more expensive bioplastic pen. The experimental design creates different choice architectures around this decision while manipulating the salience of environmental consequences and the perceived intentionality of the default.

The **default manipulation** operates through an endowment mechanism. In the plastic default condition, participants receive €2.50 and a voucher for a plastic pen, then indicate their willingness to pay (WTP) between €0.00 and €0.50 to upgrade to a bioplastic pen. In the bioplastic default condition, participants receive €2.00 and a voucher for a bioplastic pen, then indicate their willingness to accept (WTA) between €0.00 and €0.50 to downgrade to a plastic pen. To ensure incentive compatibility, we employ the Becker-DeGroot-Marschak (BDM) mechanism: participants' stated values are compared against a randomly drawn price that is identical for all participants. If a participant's WTP exceeds the drawn price, they pay the drawn price and receive the bioplastic pen; if their WTA is below the drawn price, they accept the drawn price and receive the plastic pen. This mechanism ensures that truthful reporting is the optimal strategy for participants.

The **externality manipulation** varies the information provided about environmental consequences. In the low externality condition, participants receive minimal information about environmental impacts. In the high externality condition, participants receive detailed information about the environmental benefits of bioplastic alternatives, designed to activate environmental self-identity and associated moral obligations.

The **randomness manipulation** affects participants' perception of how the default was selected. In the intentional condition, participants understand that the default option was deliberately chosen by the experimenters. In the random condition, participants are informed that the default was randomly assigned, designed to minimize the informational signal value of the default as described by [McKenzie et al. (2006).](https://doi.org/10.1111/j.1467-9280.2006.01721.x)

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| --- | --- | --- | --- | --- | --- |
|  |  | NOT RANDOM | | RANDOM | |
|  |  | **Externality LOW** | **Externality HIGH** | **Externality LOW** | **Externality HIGH** |
| DEFAULT | BIO | WTANL | WTANH | WTARL | WTARH |
| PLA | WTPNL | WTPNH | WTPRL | WTPRH |

## 2.2 Hypotheses

This experimental design allows us to test four key hypotheses about the relationship between default effects, environmental identity activation, and implicit recommendations:

**H1 (Default Effect)**: building on extensive literature showing that defaults increase uptake of the default option ([Johnson & Goldstein, 2003](https://www.science.org/doi/10.1126/science.1091721); [Madrian & Shea, 2001](https://doi.org/10.1162/003355301753265543)), we predict that participants will make more sustainable choices when bioplastic is the default option. Specifically, we expect:

WTAXY > WTPXY where X = N,R (randomness condition) and Y = L,H (externality condition)

This reflects both status quo bias and the implicit recommendation conveyed by the default choice across all experimental conditions.

**H2 (Externality Effect)**: following [Van der Werff et al.'s (2013)](https://doi.org/10.1016/j.gloenvcha.2013.07.018) demonstration that environmental self-identity operates through moral obligation to increase pro-environmental behavior, and that environmental identity can be experimentally manipulated, we predict that high externality salience will activate environmental self-identity and associated moral concerns, thereby increasing sustainable choices regardless of default condition:

WTAXH > WTAXLWTPXH > WTPXL

where X = N,R

This should manifest as higher willingness to accept compensation to switch away from the bioplastic default and higher willingness to pay to upgrade to bioplastic from the plastic default when environmental consequences are salient.

**H3 (Critical Interaction)**: The most theoretically important hypothesis concerns how activated environmental identity interacts with default effects. We maintain a **two-direction** approach, testing whether:

WTAXH - WTPXH WTAXL - WTPXL

Two competing predictions emerge from existing theory:

* **H3a. Crowd-in scenario**:

WTAXH - WTAXL > WTPXH - WTPXL

If defaults and intrinsic motivation complement each other, the default effect should be stronger when environmental identity is activated. The WTA-WTP gap should be larger in high externality conditions, as the default becomes both a behavioral nudge and a signal that aligns with (or conflicts with) activated moral convictions.

* **H3b. Crowd-out scenario**:

WTAXH - WTAXL < WTPXH - WTPXL

If strong intrinsic motivation reduces sensitivity to external signals, the default effect should be weaker when environmental identity is activated. The WTA-WTP gap should be smaller in high externality conditions, as moral convictions override the influence of choice architecture.

Given the theoretical uncertainty, we contemplate in our preregistration the possibility that this result could emerge in either direction.

**Potential Issue**: we use an additional factor (externality) that increases intrinsic motivation. If the default intervenes on intrinsic motivation and WTP increases substantially, it might indicate that the intrinsic motivation given by externality is stronger than that given by the default. Could setting the default be counterproductive? This represents a potential concern if this effect grows very large.

**H4 (Intentionality Effect)**: based on [McKenzie et al.'s (2006)](https://doi.org/10.1111/j.1467-9280.2006.01721.x) information leakage framework, we predict that the expressive role of defaults should be stronger when defaults are perceived as intentional rather than random. If the expressive role of the default is activated, this should increase the gap:

WTANH – WTPNH > WTARH - WTPRH

We test whether setting the default as random versus non-random affects its expressive power. When the default is non-random, it should carry greater weight as an implicit recommendation about appropriate behavior, particularly when environmental identity is activated through high externality salience.

**H5 (Intentionality × Environmental Information Interaction):** building on the information leakage framework (McKenzie et al., 2006) and extending hypotheses H3 and H4, we predict that the effect of environmental information systematically interacts with the perceived intentionality of defaults. This interaction occurs through the alignment or conflict between activated intrinsic motivation and the implicit signal conveyed by the default.

When environmental self-identity is activated through high externality salience, the directional alignment between intrinsic motivation and the default's implicit recommendation should modulate behavior in predictable ways:

* **WTPRH > WTPNH**: starting from a plastic default, high environmental salience creates greater willingness to pay when the default is random because it eliminates the anti-environmental implicit signal that would otherwise conflict with activated intrinsic motivation.
* **WTANH > WTARH**: starting from a bioplastic default, high environmental salience creates greater willingness to accept when the default is intentional because the pro-environmental implicit signal aligns with and reinforces activated intrinsic motivation.

This hypothesis refines our understanding of the crowd-in versus crowd-out mechanisms explored in H3: intentional defaults facilitate crowd-in when aligned with activated values but may produce crowd-out when they create cognitive conflict. Similarly, it extends H4 by specifying that the expressive power of intentional defaults can be either beneficial or detrimental depending on motivational alignment, suggesting that the effectiveness of environmental choice architecture depends not only on default content but also on how defaults are perceived relative to activated environmental identity.

**H5 (Random-Externality Interaction)**: The interaction between default randomness and externality salience represents a theoretically important but underexplored mechanism in choice architecture. We maintain a **two-direction** approach, testing whether:

WTANH – WTANL WTARH - WTARLWTPNH – WTPNL WTPRH - WTPRL

* **H5a. Institutional Legitimation scenario**:

WTANH – WTANL WTARH - WTARLWTPNH – WTPNL WTPRH - WTPRL

If intentional defaults signal institutional endorsement of environmental considerations, externality information should have stronger effects when defaults are perceived as deliberate choices. Intentional defaults communicate that the choice architect has considered relevant information (including environmental externalities), thereby amplifying the impact of externality salience. Random defaults, conversely, suggest arbitrary assignment independent of environmental considerations, weakening the influence of externality information due to lack of institutional legitimation.

* **H5b. Pure Information Processing scenario**:

If intentional defaults create cognitive anchoring that divides attention between the default signal and other information, externality salience should have stronger effects when defaults are random. Random defaults liberate cognitive resources from processing implicit recommendations, allowing participants to focus more directly on externality information. This predicts that environmental consequences become more salient when defaults are perceived as arbitrary rather than deliberate.