frontiers | Frontiers in Behavioral Economics

TYPE Brief Research Report
PUBLISHED 15 October 2025
DOI 10.3389/frbhe.2025.1612211

OPEN ACCESS

EDITED BY
Vanessa Valero,
Institut Mines-Télécom Business School, France

REVIEWED BY
Chaoqian Wang,
George Mason University, United States
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University of Wismar, Germany
Chowdhury Mohammad Sakib Anwar,
University of Winchester, United Kingdom

*CORRESPONDENCE
Alejandra Vásquez
✉ alejandra.vasquez.a@usach.cl
Vittorio Pelligra
✉ pelligra@unica.it

RECEIVED 15 April 2025
ACCEPTED 15 September 2025
PUBLISHED 15 October 2025

CITATION
Vásquez A, Becchetti L and Pelligra V (2025) The power of the purse: gender, cooperation, and socially responsible consumption. *Front. Behav. Econ.* 4:1612211. doi: 10.3389/frbhe.2025.1612211

The power of the purse: gender, cooperation, and socially responsible consumption

Alejandra Vásquez[1]*, Leonardo Becchetti[2] and Vittorio Pelligra[3]*

[1]Department of Economics, Faculty of Economics and Business Administration, University of Santiago, Santiago de Chile, Chile, [2]Department of Management and Law, Faculty of Economics, University of Rome Tor Vergata, Roma, Italy, [3]Department of Economic and Business Sciences, Faculty of Legal, Economic and Political Sciences, University of Cagliari, Cagliari, Sardinia, Italy

We test for gender effects in the "vote with your wallet" game, a multi-person version of the prisoner's dilemma that models responsible consumption decisions. We find that women cooperate significantly more (have more responsible consumption decisions) than men in the baseline version of the game. This baseline excludes three additional elements tested in companion treatments: i) a legality frame, where the ethical product is labeled as being certified for compliance with anticorruption standards; ii) an ex-post redistribution scheme, where those who buy the less ethical product compensate those who choose the more responsible option; and iii) a conformity treatment, where participants are informed of prior players' choices to simulate social influence. Without these added interventions, women still show significantly greater cooperation, revealing a baseline preference for prosocial behavior in this strategic consumption setting.

KEYWORDS

cooperation, socially responsible consumption behavior, gender, vote with the wallet game, social preferences

1 Introduction

This paper aims to test the significance of the gender effect in the "Vote-with-the-Wallet" game (VWG). This game is a multiperson version of the prisoner's dilemma (PD), with a binary choice that we use to describe the dilemma typically faced by consumers confronted with more or less socially and/or environmentally sustainable consumption options.[1]

In our experiment, players (consumers) choose between a standard product that costs less and a product that costs more and is advertised as "responsible." The purchase of the responsible product creates a monetary externality for all other players, functioning as a public good and making cooperation difficult (i.e., achieving a high share of responsible choices). In this context, we are interested in studying the effect of gender on the dynamics of these choices, which aligns with evidence that consumers need help identifying sustainable options and that gender norms can influence their perception (Thøgersen, 2021; Bloodhart and Swim, 2020).

1 The VWG is at the center of a research program investigating the conditions that facilitate responsible choices. Relevant theoretical and experimental results can be found in Becchetti and Salustri (2015, 2016); Becchetti et al. (2017, 2018a,b, 2020, 2024).

Focusing on gender is particularly relevant because differences are strongly associated with variations in social preferences, ethical sensitivities, and responses to contextual cues. Women, on average, tend to exhibit stronger other-regarding preferences, greater aversion to inequality, and more prosocial behavior in consumption contexts (Croson and Gneezy, 2009; Arnocky and Stroink, 2010; Zelezny et al., 2000; Bloodhart and Swim, 2020). Previous experimental evidence shows that gender differences often emerge in risk attitudes (women tend to be more risk-averse; Costa, 1994), responses to incentives and competition (women are generally less attracted or responsive), and, to a lesser extent, in altruistic and cooperative behavior (Croson and Gneezy, 2009). While meta-analyses suggest that overall cooperation rates are practically indistinguishable across genders globally (Spadaro et al., 2022), women tend to display greater sensitivity to contextual cues, stronger other-regarding preferences, and a higher likelihood of conditional cooperation (Croson and Gneezy, 2009; Furtner et al., 2021). These traits are particularly relevant for ethical consumption dilemmas such as the VWG, where cooperation relies on recognizing and acting upon socially desirable options without external enforcement (Bloodhart and Swim, 2020; Zelezny et al., 2000).

Studying gender-based behavioral patterns in controlled experimental settings enriches the behavioral economics of gender and provides insight for designing effective interventions and policies that promote sustainable and ethical consumption (Croson and Gneezy, 2009). These tendencies are especially relevant in consumption choices with moral or public-good dimensions, such as environmental sustainability or ethical sourcing. Marketing and policy strategies often target "ethical consumption" by appealing to values commonly associated with femininity, such as care, responsibility, and fairness (Bloodhart and Swim, 2020).

The VWG experiment is particularly suitable for gender analysis because it models a clear moral trade-off in a controlled setting, allowing intrinsic prosocial tendencies to emerge. The absence of social cues in the baseline isolates behavioral differences without external influence. Its repeated, binary structure with a gender-balanced sample enhances internal validity and reveals stable patterns in cooperative behavior, making it an effective tool to study gendered responses in ethical consumption contexts.

The treatments considered beyond the baseline systematically vary institutional cues that may interact with gendered preferences. The redistribution mechanism introduces fairness and punishment, potentially amplifying women's aversion to inequality. The legality frame activates normative expectations and moral signaling, to which women may be more responsive due to social-role internalization. The conformity treatment tests sensitivity to peer behavior, aligning with evidence that women exhibit greater social norm compliance. These manipulations help uncover conditional patterns of cooperation that would remain hidden in a neutral setting.

In this study, we make an original contribution to the debate on gender differences in social preference experiments. In the baseline treatment without redistribution women exhibit a higher propensity to cooperate. Unlike studies suggesting women are "conditional" cooperators (Furtner et al., 2021), our experimental design—lacking group information in the baseline indicates that women start from a higher baseline level of cooperation even without external cues.

We analyze data collected by Becchetti et al. (2024), which includes multiple VWG treatments with and without redistribution, a "legality frame," and a conformity treatment. The companion study investigated an ex-post redistribution mechanism, the impact of a legality frame for the responsible product, and the effect of a conformity information design. The main findings of the complementary study are:

- Both the legality frame and the conformity treatment induce a significant increase in the cooperation rate relative to the baseline.
- The redistributive mechanism significantly increases cooperation.
- The combination of frame, redistribution, and conformity produces an approximately 63% increase in cooperative choices relative to baseline.
- Behavior homogenization under redistribution aligns with evidence that economic incentives can mitigate biases based on social norms (Thøgersen, 2021).

The remainder of the paper is structured as follows: Section 2 details the experimental design, the formulation of the VWG, and the general hypotheses of the study. Section 3 presents the initial empirical findings from the static tests, followed by an in-depth econometric analysis and a Bayesian multilevel probit model to assess the robustness of the gender effect. Section 4 discusses our results, contextualizing them within the existing literature and addressing the study's implications and limitations. Section 5 provides the main conclusions and final remarks.

2 Experimental design and hypotheses

The theoretical benchmark for this experiment is the VWG, a multiperson version of the PD. The PD is one of the most studied games in the social sciences as it formalizes the conflict between what is socially efficient and what is individually optimal, a theme that underlies many interesting interactions, economic and otherwise (Embrey et al., 2017).

The n players choose between the "responsible" product A, which costs more but produces a positive (environmental, social, legal) externality, and the conventional product B, less costly but without externality.

Following the original formulation in Becchetti and Salustri (2015), the game is defined as

$$G = \left[N, \left(S^i\right)_{i\in N}, \left(U_i\right)_{i\in N}\right], \quad N = \{1, \ldots, n\}, \quad S^i = \{A, B\} \quad \forall i \in N, \tag{1}$$

and the ith player payoff function

$$U_i(S^i, S^{-i}) = \begin{cases} \dfrac{x+1}{n}\beta + \alpha - \gamma & \text{if } S^i = A, \\ \dfrac{x}{n}\beta & \text{if } S^i = B, \end{cases} \tag{2}$$

TABLE 1 Experimental design.

Treatment	No. of Sessions	Phase 1 (10 Rounds)	Phase 2 (10 Rounds)	Phase 3	No. of Players
Baseline	1 – 3	Baseline	Redistribution	Questionnaire	30
Baseline	4 – 6	Redistribution	Baseline	Questionnaire	30
Frame	7 – 9	Frame	Frame + Redistribution	Questionnaire	30
Frame	10 – 12	Frame + Redistribution	Frame	Questionnaire	30
Conformity	13 – 15	Frame (conformity)	Frame (conformity) + Redistribution	Questionnaire	30
Conformity	16 – 18	Frame (conformity) + Redistribution	Frame (conformity)	Questionnaire	30

This table describes the experimental design, including the number of sessions, phases, and players per treatment group.

TABLE 2 Percentages of cooperative choices (by treatment and gender).

Treatment	Obs	Share of cooperative choices (women vs. men)	χ^2
Base + redistribution	600	31.0 – 24.7	2.9954
Redistribution + base	600	39.7 – 35.3	1.2018
Frame + redistribution	600	35.3 – 37.7	0.3524
Redistribution + frame	600	46.0 – 37.3	4.6354
Frame (conformity) + redistribution	600	43.0 – 36.7	2.5105
Redistribution + frame (conformity)	600	47.3 – 43.3	0.9684
Base before	300	40.7 – 26.7	6.5824
Redistribution base before	300	41.3 – 36.0	0.8996
Frame before	300	42.0 – 38.7	0.3463
Redistribution frame before	300	42.0 – 44.0	0.1224
Frame (conformity) before	300	39.3 – 37.3	0.1269
Redistribution frame (conformity) before	300	54.7 – 40.0	6.4717
Base after	300	21.3 – 22.7	0.0777
Redistribution base after	300	38.0 – 34.7	0.3602
Frame after	300	28.7 – 36.7	2.1823
Frame (conformity) after	300	46.7 – 36.0	3.5191
Redistribution frame after	300	50.0 – 30.7	11.6487
Redistribution frame (conformity) after	300	40.0 – 46.7	1.3575

with U being the player's utility function, S being the chosen strategy, and x the number of players buying product A excluding player i. The crucial parameters of the game are the price differential between the two products ($\gamma \in [0, +\infty)$), the other-regarding preference component ($\alpha \in [0, +\infty)$) satisfied by the purchase of the "responsible" product,[2] , and the positive externality ($\beta \in [0, +\infty)$) accruing to the utility of every player (irrespective of her/his product choice) in proportion to the share of players buying the responsible product A.

The game G_n always has a unique (Nash, 1950) equilibrium (B, B) when $\frac{1}{n}\beta + \alpha < \gamma$, and ($A$, A) otherwise, and we are in the PD area for intermediate values of γ where $\frac{1}{n}\beta + \alpha < \gamma < \beta + \alpha$. This condition implies a large PD region as the number of players increases. The implication is that, in consumer markets where "responsible" products involve a public goods dilemma similar to the VWG, this PD-type problem may be highly relevant. However, this inference is based on data from a specific sample of Italian students, highlighting the need to investigate its generalizability to other markets and cultures.[3]

The design of the experiment is presented in Table 1, which details the number of sessions and the different treatments.

In each experimental session, a group of 10 players chooses between products A and B over 20 rounds. Product A costs 10 Experimental Currency Units (ECUs), while product B costs 5

2 The assumption is grounded in results from the literature on other regarding preferences such as (positive and negative) reciprocity (Rabin, 1993), inequity aversion (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), social welfare preferences (Charness and Rabin, 2002) and various forms of pure and impure (warm glow) altruism (Andreoni, 1990). This other-regarding component is similar in spirit to the warm-glow component in the model developed by Andreoni (1990) .

3 See Becchetti and Salustri (2015) for more details.

ECUs. Each player buying product A generates 3 ECUs for every player in the given round (2 ECUs=1 euro). In each round players are given an endowment of 20 ECUs. The sequence of actions in each round is as follows: i) the *i*th player formulates her/his expectation on the number of players choosing product A; ii) chooses the product to buy; iii) is informed about the number of players choosing product A; iv) is asked about her/his satisfaction about the game, her/his behavior and the behavior of the other players in the game with three different questions on a 0–10 scale. Half of the rounds (the first or the last 10, depending on the session considered (see Table 1 for details), present a redistribution phase in which at the end of each round players choosing product B know that they have to transfer 1 ECU in a pool that will be divided into equal parts among players choosing product A at the end of each round.[4]

This mechanism simulates a redistributive fiscal policy intended to encourage responsible (environmental, social, legal) consumption choices. The above-described baseline game has been played with two variations.

- The "framed game": players are informed that the "responsible" product A is a product awarded with a 3-star legality rating from the Italian Competition Authority (ICA).[5]
- The "conformity treatment" is about giving information to the players in each round, about the choices of the previous session players, with the same characteristics. That is the average of what happened in the corresponding rounds of sessions (7–9) for sessions (10–12), and sessions (13–15) for sessions (16–18).[6]

The experiment was run at the University of Cagliari, Italy, with 180 volunteers (with an exact gender balance in each session) in November 2015. The z-Tree platform (Fischbacher, 2007) was used to program the experiment. Given the payoffs described, the experiment gives the following values to the crucial VWG model parameters: $n = 10$, $\beta = 30$, $\gamma = 5$, $\alpha = 0$. Based on these values, if we assume that the player has no other-regarding preferences (i.e., $\alpha = 0$) the unique (inefficient) Nash Equilibrium (NE) of the multiplayer game in non-redistribution treatments is obtained when all players chose B, since $\frac{1}{n}\beta + \alpha < \gamma < \beta + \alpha$ (i.e., $3 < 5 < 30$). However, in redistribution treatments, buying product B yields a lower payoff when there is only one cooperator and the same payoff as buying product A when there are two cooperators. The redistribution mechanism renders it more convenient to buy product B as the number of "responsible" choices gets larger. However, it is still always better (equilibrium of the game) to keep buying product B.

To test the gender effect, we formulate the following general hypothesis:

$$\begin{aligned} H_0 &: S(f)_{t,s} = S(m)_{t,s} \\ H_A &: S(f)_{t,s} \neq S(m)_{t,s} \end{aligned} \tag{3}$$

where $S(f)_{t,s}[S(m)_{t,s}]$ is the share of cooperative choices (buy product A) selected by female [male] participants in round t of treatment s. The six considered treatments are those shown in Table 1. Each treatment is considered in full and separately when it occurs in the first 10 or the last 10 rounds (i.e., baseline before in sessions 1–3 and baseline after in sessions 4–6). Under the null, the share of cooperating females is not significantly different from that of cooperating males.

2.1 Empirical findings from static tests

Table 2 reports the results in terms of shares of cooperative choices by gender in each treatment. It shows that the gender effect is significant in the baseline treatment. When we decompose the latter, we find that the effect is concentrated in the baseline before treatment where the share of cooperators is significantly higher for women than for men (40.6 against 26.7 with $\chi^2 6.58$ p-value 0.01).

Women also cooperate more when framed redistribution treatments are in the first 10 rounds and when framed treatments with conformist information and redistribution treatment with frame are in the second 20 rounds. This aligns with studies that observe higher female cooperation in one-shot dilemmas (Ortmann and Tichy, 1999), yet contrasts with meta-analyses that report no global differences (Spadaro et al., 2022).

Figure 1 shows the proportions of cooperative choices by gender exclusively in the baseline condition, breaking down the results by round, prior to any treatment.

3 Econometric analysis on the gender difference

We estimate the following logit specification for baseline "before" treatments in sessions 1–3, where the dependent variable (VWGChoice) is a 0/1 dummy taking value 1 if the player chooses product A contributing to the production of the public good, Male is a (0/1) dummy for the male gender, Age is the player's age, DIncome is five income dummies picking up different income brackets and Round is the experiment round testing for dynamic effects in our game:

$$\text{VWGChoice}_{i,t,s} = \beta_0 + \beta_1 \text{Male}_i + \beta_2 \text{Age}_i + \beta_3 \text{Round}_t + \epsilon_{i,t,s} \tag{4}$$

To estimate the statistical power of the fixed-effects logit model under different effect sizes for the gender variable, we conducted a Monte Carlo simulation that replicates the structure of our panel dataset. Specifically, we examined the ability of the model to detect small, medium, and large effects by simulating datasets with hypothetical true coefficients of $\beta = 0.2$, 0.5, and 0.8, respectively.

4 See Appendix B for details about the instructions and the payoffs' parametrization.

5 Full details of the legality rating system are provided in the online Appendix A.

6 In conformity treatments the information provided does not affect directly a player's payoff and therefore is intended to measure conformity, usually defined as the degree to which individuals in a group modify their behavior to fit the views of the society (Moscovici, 1985; Cialdini and Trost, 1998).

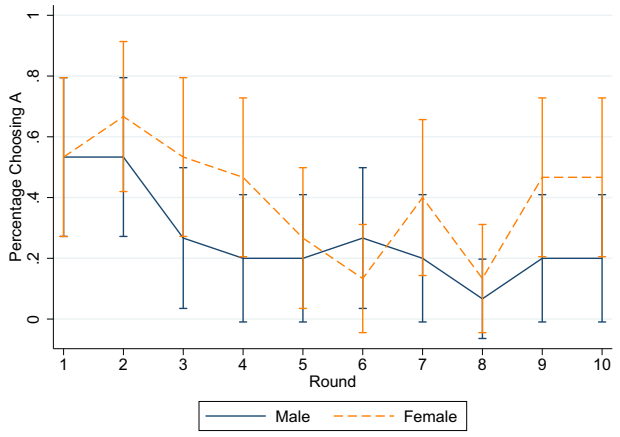

FIGURE 1
Cooperative choice rates in the baseline treatment: analysis by round and gender.

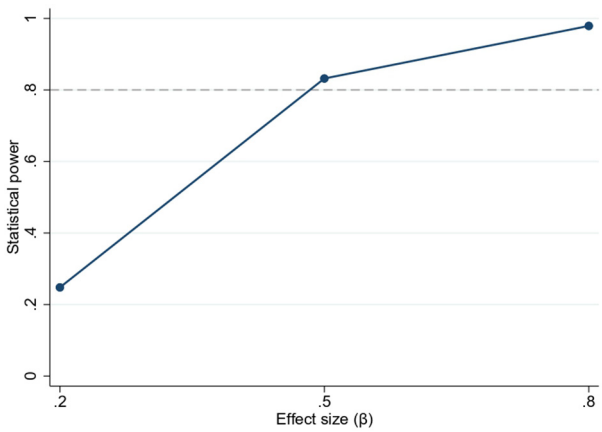

FIGURE 2
Statistical power curve for the fixed-effects logit model estimating the gender effect . Estimated statistical power of detecting a gender effect in the fixed-effects logit model. Power analysis was conducted using a Monte Carlo simulation with 1,000 replications, based on the experimental panel structure (30 individuals observed over 10 rounds, for a total of 300 observations). Simulated datasets were generated under three assumed true values of the male coefficient ($\beta = 0.2, 0.5, 0.8$), corresponding, respectively, to small, medium, and large effect sizes. For each scenario, the model was re-estimated, and the proportion of simulations where the male coefficient was statistically significant at the 5% level was recorded.

As shown in Figure 2 the results indicate that the current sample provides limited power to detect small effects (24.8%) but sufficient power for medium (83.2%) and large effects (97.9%).

Additionally, we evaluated the empirical power to detect the specific effect size estimated from the real data ($\hat{\beta} = -0.839$). We generated 1,000 simulated datasets using this coefficient as the true value and re-estimated the model in each case, recording the proportion of statistically significant results at the 5% level. This analysis yielded a power estimate of 98.7%, suggesting that the study design is highly capable of detecting effects of the magnitude observed.

After controlling for round and age, we find that the gender effect in the reference treatment remains significant. It is also observed that being male significantly reduces the probability of choosing product A by ~ 0.145 percentage points (Table 3). To verify the robustness of our econometric findings, we test whether gender significantly affects satisfaction with the game in the "before" baseline treatment. The selected ordered probit estimated specification is

$$\begin{aligned}\text{SatGame}_{i,t,s} &= \beta_0 + \beta_1 \text{VWGChoice}_{i,t,s} + \beta_2 \text{VWGChoice} \\ &\times \text{Male}_{i,t,s} + \beta_3 \text{AvgGroup} \times \text{VWGChoice}_{t,s} + \beta_4 \text{Male}_i \\ &+ \beta_5 \text{Age} + \sum_j \delta_i \text{DIncome}_j + \beta_6 \text{Round}_t + \epsilon_{i,t,s} \end{aligned} \quad (5)$$

where $\text{SatGame}_{i,t,s}$ is the satisfaction of the ith player about her/his behavior in round t of treatment s, VWGChoice × Male is the interaction between the choice of product A and male gender, and AvgGroup × VWGChoice is the share of players choosing good A in the given round. Other regressors are as in Equation 4.

Our findings show that β_2 is negative and significant, indicating a negative interaction between choosing VWGChoice and being male. In other words, men are significantly less satisfied than women when choosing the more expensive product that contributes to the public good. Specifically, choosing VWGChoice = 1 reduces the probability of men reporting the highest level of satisfaction (level 10) by ~ 0.144 percentage points.

TABLE 3 Econometric findings.

Variables	(1)	(2)
VWGChoice		−0.311**
		(0.157)
Male	−0.839**	0.782
	(0.364)	(1.145)
VWGChoice× male		−0.687*
		(0.368)
AvgGroup× VWGChoice		0.582**
		(0.273)
Age	−0.047	0.030
	(0.058)	(0.048)
Round dummies	Yes	Yes
Income dummies	No	Yes
Observations	300	300
Wald χ^2	25.81	38.26

Dependent variable: (1) choice of product A; (2) satisfaction about one's behavior in the game; standard errors (in parentheses) clustered at the session level. $***p < 0.01$, $**p < 0.05$, $*p < 0.1$.

None of the other treatments significant in static hypothesis testing are robust to the econometric checks of this section (results omitted for reasons of space).

Figure 3 presents the marginal effects on the probability of VWGChoice being equal to 1. It can be seen that being male significantly reduces this probability by ~ 0.145 percentage points

compared to being female. Starting in period 3, and particularly in periods 5, 6, and 10, there is a statistically significant decrease in the probability of VWGChoice being equal to 1 compared to the base period. The most pronounced effect is observed in period 6. Periods 4, 7, 8, and 9 also show a negative trend, albeit with marginal significance. Conversely, the age variable does not have a statistically significant effect on the probability of VWGChoice.

To assess the robustness of the effect of gender on the probability of making a given choice, we estimated a series of xtlogit models with different combinations of controls. Figure 4 shows the specification curve corresponding to the coefficient of the male variable, together with its 95th percentile confidence intervals. As can be seen, the estimated coefficient is consistent in direction (negative) and reaches statistical significance in the most saturated models. This suggests that the gender effect is robust to reasonable model specifications.

Figure 5 shows the marginal effects of a discrete change in VWGChoice from 0 to 1 on the probability of observing each of the 10 satisfaction levels. It is observed that VWGChoice = 1 is associated with a statistically significant increase in the probability of being in the lowest satisfaction categories (1, 2, 4, 5, and 6). Conversely, it is associated with a statistically significant decrease in the probability of being in the highest satisfaction categories (8, 9, and 10). The effects in categories 3 and 7 are not statistically significant. This suggests that VWGChoice = 1 shifts the satisfaction distribution toward lower value categories.

3.1 Bayesian hierarchical modeling

To control for false positives due to multiple hypothesis testing, we applied Laplace (Lasso-type) priors on the fixed effects. These shrinkage priors regularize coefficient estimates, penalizing non-informative predictors. This Bayesian approach offers simultaneous estimation and implicit multiplicity correction by favoring sparsity. The approach is more sophisticated and tailored than a raw conservative Bonferroni correction. Our main finding–that women are significantly more cooperative in the baseline treatment–remains robust under this procedure.

We estimate a Bayesian multilevel probit regression model to assess the probability of choosing the responsible product (VWGChoice = 1). The dependent variable is binary and indicates whether individual i, in session s, selected the responsible option in the task. The model incorporates both individual-level covariates and session-level random effects to account for unobserved heterogeneity across sessions.

Formally, the model is specified as

$$y_{is}^{*} = X_{is}\beta + u_s + \varepsilon_{is}, \quad \varepsilon_{is} \sim \mathcal{N}(0,1)$$

$$y_{is} = \begin{cases} 1 & \text{if } y_{is}^{*} > 0 \\ 0 & \text{otherwise} \end{cases}$$

where y_{is} is the observed binary outcome, X_{is} includes the individual-level predictors (gender, age, income dummies, and round fixed effects), $u_s \sim \mathcal{N}(0, \sigma_u^2)$ is a random intercept for session s, and ε_{is} is the standard normal error term.

We place a Laplace prior with mean 0 and scale parameter $\lambda = 1$ on all fixed-effect coefficients:

$$\beta_j \sim \text{Laplace}(0,1), \quad \text{for all } j \in \text{covariates}.$$

This prior induces a Lasso-type shrinkage that helps regularize the estimates and perform implicit variable selection, particularly useful in settings with many control variables.

The prior on the session-level random intercept is

$$u_s \sim \mathcal{N}(0, \sigma_u^2), \quad \sigma_u^2 \sim \text{Inverse-Gamma}(0.01, 0.01).$$

Posterior inference is conducted using Metropolis–Hastings Markov Chain Monte Carlo (MCMC), with 12,500 total iterations, discarding the first 2,500 as burn-in. We report posterior means, posterior standard deviations, Monte Carlo standard errors (MCSE), posterior medians, and 95% equal-tailed credible intervals. The magnitude of the male coefficient in Table 4 (−0.122) is slightly smaller than the maximum likelihood estimate in Table 3 (−0.839), also due to the different estimation method (Bayesian multilevel probit in Table 4 vs. fixed effects logit in Table 3).

Nonetheless, the direction and significance remain consistent, strengthening the claim that gender (specifically, being male) is associated with a lower propensity for cooperative behavior in the experimental setting. The estimate in Table 4 confirms the robustness of this effect even under stricter regularization and model uncertainty.

4 Discussion

Our results reveal that in our experimental study with Italian students, women cooperate significantly more than men in the baseline treatment of the "Vote with the Wallet Game" (VWG), a finding that contributes to the ongoing debate regarding gender differences in social preferences. Unlike studies suggesting that women are "conditional" cooperators (Furtner et al., 2021), our experimental design—which lacks group information in the baseline—suggests that, without external cues, women start from a higher baseline level of cooperation. This may reflect internalized prosocial preferences linked to gender norms that associate femininity with caregiving and collective responsibility (Xiao et al., 2019; Bloodhart and Swim, 2020).

This result contrasts with meta-analyses that do not identify significant differences between genders (Spadaro et al., 2022), underscoring the crucial role of the specific experimental context. The VWG is not only an abstract social dilemma; it simulates a consumption decision with explicit moral implications. In our study, the choice of the "responsible" product (A), especially in a cultural context like Italy's, which includes the "Legality Rating" system, could activate culturally rooted gender identities. In contexts like ours, where relative gender equality might be assumed (Falk and Hermle, 2018), women are able to express their prosocial preferences with fewer restrictions from traditional norms, which could explain the differences observed in our baseline treatment. Thus, we challenge the notion that gender gaps in cooperation arise solely from external factors (Croson and Gneezy, 2009), proposing that in morally charged contexts, women emerge as key agents in promoting the voluntary provision of public goods.

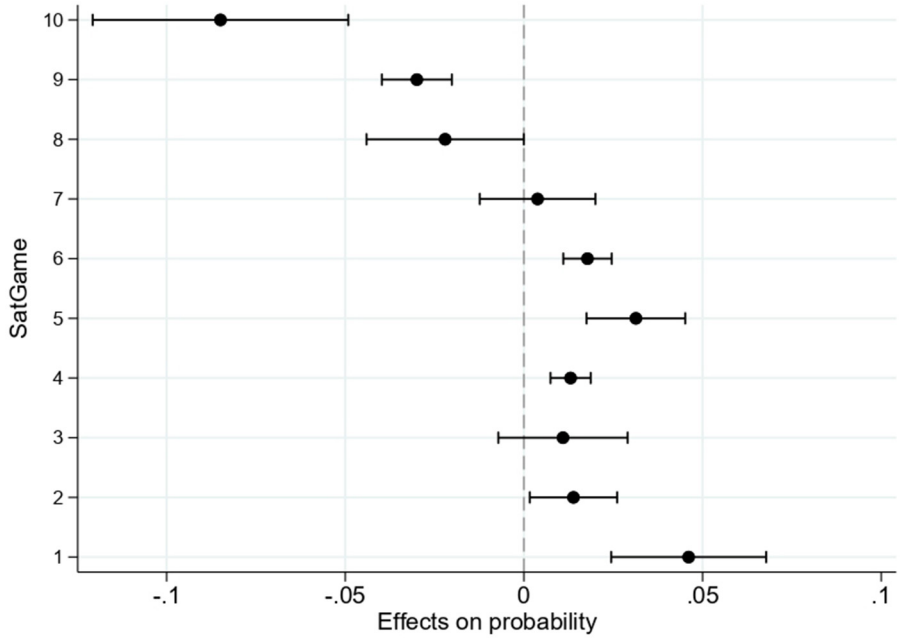

FIGURE 3
Marginal effects—fixed-effects logit model.

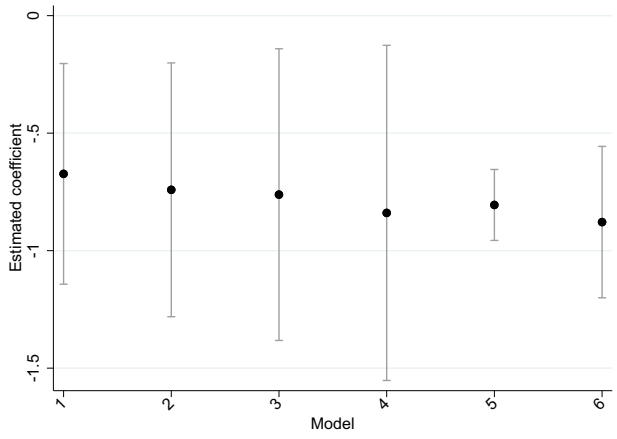

FIGURE 4
Specification curve for the effect of being male on choice. Each point represents the estimated coefficient under a different combination of controls.

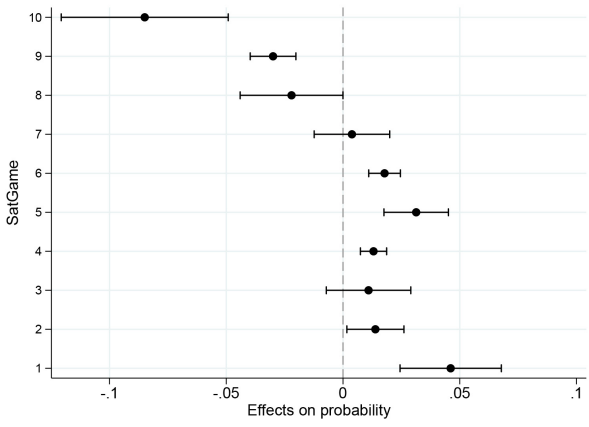

FIGURE 5
Marginal effects—random-effects ordered probit model—VWGChoice.

We are also aware that specific characteristics of our game can crucially affect outcomes. We model the VWG with positive externality. A different pay-off structure based on a negative externality from the conventional product could have made the gender effect stronger due to the existing evidence on higher women's loss aversion (Wang et al., 2017; Dawson, 2023).

Along the same lines, we also acknowledge that the decision to act cooperatively can be affected by the weight of the positive externality on the total players' payoffs. Changes in the payoff-structure of the vote with the wallet game can be fruitful directions for future research to test whether our main findings are robust or change according to them.

An additional finding is how the redistribution of resources reduces gender disparities. The asymmetry between men and women is mitigated by penalizing free riding - similar to policies that internalize social costs (Thøgersen, 2021). This does not imply an innate female altruism, but rather distinct logics of cooperation: men seem to prioritize individual efficiency in the face of ambiguous incentives (Burnham, 2018), while women seek to

TABLE 4 Bayesian hierarchical modeling estimates.

Variable	Mean	SD	MCSE	Median	95% Cred. Interval
Male	−0.122**	0.040	0.003	−0.121	[−0.198, −0.051]
Age	0.019**	0.005	0.001	0.019	[0.011, 0.028]
Intercept	−0.781**	0.131	0.025	−0.772	[−1.026, −0.544]
Random effects (session)					
Intercept	0.444	9.755	0.213	0.577	[−18.490, 19.337]
σ^2	0.035**	0.017	0.0008	0.013	[0.013, 0.080]
Round dummies	Yes	Yes	Yes	Yes	Yes
Income dummies	No	No	No	No	No

Dependent variable: choice of the responsible product A. Coefficients are posterior means from a Bayesian multilevel probit model estimated via Metropolis–Hastings sampler. Laplace priors ($\lambda = 1$) are used for fixed effects, and normal priors for random intercepts. Standard deviations (SD), Monte Carlo standard errors (MCSE), medians, and 95% credible intervals are reported.
** Credible interval does not include zero (95% significance).

avoid moral costs tied to irresponsible consumption, even without a guarantee of reciprocity. This behavior aligns with their greater aversion to violating social norms perceived as fair (Bloodhart and Swim, 2020).

Finally, the legality frame enhances cooperation but does not eliminate gender differences. This indicates that institutional frameworks influence prosocial preferences but do not nullify them. By labeling product A as "legal," the decision shifts from the individual moral domain to the institutional realm, thereby reducing the weight of gender identity. This outcome aligns with studies linking institutional legitimacy (such as ethical certifications) to promoting prosocial behaviors and mitigating gender gaps (Bolderdijk et al., 2018).

While our findings point to a significant gender difference in cooperative behavior in the baseline condition, we emphasize that this analysis is post-hoc and exploratory. The sample consists exclusively of university students in Italy, which limits external validity and the generalizability of our results. Cultural context, socioeconomic background, and demographic homogeneity may all shape observed behaviors. As such, our results should be interpreted as suggestive rather than definitive, and they call for replication in more diverse and representative samples.

5 Conclusions

The original (Becchetti et al., 2024) experiment was designed to test the impact of corporate legality ratings on consumer choices and their willingness to pay for legality, testing whether consumers are willing to pay for this public good when properly informed about it or when a redistribution mechanism is introduced that makes the sustainable choice more convenient.

In this paper, we focus on the existence of gender differences in the VWG. The hypothesis of such an effect is grounded on a large literature that stresses a generalized higher sensitivity of women to contextual elements, such as frames (for a review, see Croson and Gneezy, 2009) and also on previous results with the VWG (Becchetti et al., 2018b).

Our findings document that women are inherently more cooperative - specifically, they are significantly more likely to choose the cooperative option in the baseline treatment, thereby deviating from the Nash equilibrium prediction of universal defection. This departure from the individually rational but socially inefficient equilibrium moves outcomes closer to the socially optimal scenario in which all players choose the responsible product and collectively benefit. This result may reflect differences in internalized prosocial preferences, as observed in studies on altruism and gender roles (Xiao et al., 2019), and it may be amplified in contexts characterized by greater gender equality (Falk and Hermle, 2018). This finding adds new evidence to the debate on gender differences in prosocial behavior with special reference to the VWG.

Our results seem to strengthen the position of those who consider women to be naturally more cooperative. From the policy-maker standpoint, these conclusions are good news since the same policy (legality frame and/or redistribution) does not have a differential impact depending on the gender of the consumer.

As a final caveat it is important to remark that the gender-based analyses emerged in the course of exploratory analysis rather than from a pre-registered hypothesis. This, along with the use of a student sample in a specific cultural setting, limits the broader applicability of our conclusions. Future studies with more heterogeneous populations and pre-registered designs would be essential to validate and extend these insights.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: https://osf.io/ryu3v/files/osfstorage/67e46b3addc363adfa6b4247.

Ethics statement

Ethical approval was not required for the studies involving humans because research context, the research presented in this manuscript was originally conducted in 2015, predating the current comprehensive ethical review protocols. We recognize the evolving standards of research ethics and are committed to transparency regarding our research methodology and participant

protections. A. Participant engagement, at the time of data collection, our research team implemented rigorous participant management protocols: i) Informed consent: all participants provided either verbal. ii) Research transparency: participants received comprehensive briefings about research objectives. iii) Voluntary participation: clear communication of the right to withdraw was established. B. Data handling, Our data management approach prioritized participant privacy and confidentiality: i) Complete anonymization of individual participant data, ii) Secure and confidential data storage systems, iii) Strict protocols preventing retention of identifiable personal information. C. Methodological integrity, the research methodology aligned with the ethical standards prevalent during the period of data collection, with an unwavering commitment to: i) Participant welfare, research integrity, minimizing potential harm D. Request for consideration, we kindly request the journal's review and guidance regarding this retrospective ethical statement. We are fully prepared to provide any additional documentation or clarification needed to support our submission. 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

AV: Data curation, Methodology, Supervision, Investigation, Software, Writing – review & editing, Formal analysis, Writing – original draft. LB: Writing – review & editing, Formal analysis, Investigation, Writing – original draft, Data curation, Conceptualization. VP: Writing – original draft, Funding acquisition, Supervision, Writing – review & editing, Resources, Project administration, Data curation, Methodology, Conceptualization.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. This work was funded by "Department of Economics and Business, University of Cagliari, Project Code. RICDIP_2017_PELLIGRA-Analisi sperimentale del vote-with-the-wallet game e degli effetti redistributive."

Acknowledgments

We thank Airoon Torrealba and Carolina Carrillo for their research assistance. Financial support from the University of Cagliari, Italy, is kindly acknowledged.

Conflict of interest

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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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/frbhe.2025.1612211/full#supplementary-material

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