

# Pessimistic beliefs without majority opposition: Evidence from a carbon dividend survey in South Korea

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## Abstract

Carbon dividends can make carbon pricing progressive, yet public support often remains weak. Douenne and Fabre (2022) link low support in a French survey to pessimistic beliefs about the policy's personal and distributional effects. We examine whether a similar belief pattern appears in South Korea, a country with no carbon tax or history of fuel-tax protests. We combine a microsimulation based on the National Survey of Tax and Benefit with an original survey of 1,397 Korean adults. The policy scenario closely matches the French benchmark: a carbon tax of KRW 60,000/tCO<sub>2</sub> financing an annual per-capita dividend of approximately KRW 110,000. The simulation indicates that 77.6% of households would gain. Yet only 23.6% of respondents expect to gain, and their mean expected impact is KRW -91,000, compared with a simulated mean household gain of KRW 89,000. Most respondents also fail to recognize the policy's progressivity. Respondents who received the information statements reported only modestly different beliefs about progressivity and environmental effectiveness, echoing the limited updating found in the French study. Compared with respondents in the French benchmark study, however, Korean respondents express substantially greater support: 40.1% support the policy and 36.6% oppose it, compared with 10% and 70%, respectively, in the French study. Moreover, 11.9% support the policy despite expecting a loss, and majority non-opposition persists at perceived annual losses of about KRW 200,000. The comparison therefore documents similar incidence pessimism but markedly different patterns of policy support across the two studies.

**Keywords:** Carbon tax; Carbon dividend; Revenue recycling; Public acceptance; Misperceptions; South Korea

**JEL codes:** H23; Q54; Q58; D83

## 1. Introduction

Carbon pricing is widely regarded by economists as one of the most cost-effective instruments for reducing greenhouse gas emissions (Baranzini et al., 2017). Yet it remains politically difficult to implement. Carbon-tax proposals and increases have repeatedly encountered public resistance, as illustrated by the French Yellow Vests movement, the rejection of energy taxes in Swiss referendums, and failed ballot initiatives elsewhere (Carattini et al., 2017, 2019; Maestre-Andrés et al., 2019). Concerns about household costs and distributional fairness are central to this resistance.

A widely proposed response is to return carbon-pricing revenue as equal per-capita transfers — a carbon dividend (Klenert et al., 2018; Carattini et al., 2018). Because lower-income households generally consume less carbon-intensive energy in absolute terms, equal dividends can make the overall policy progressive and leave many households better off. Their political effectiveness, however, depends on whether households recognize these benefits. A policy may be progressive in objective incidence while still being perceived as personally costly or regressive.

Several strands of evidence suggest that objective compensation does not automatically translate into perceived gains or policy support. Dechezleprêtre et al. (2025) survey 40,000 respondents in 20 countries. In high-income countries, only about a third of respondents support a carbon tax with cash transfers, and no more than a quarter expect low-income households — or their own — to benefit. These expectations matter for support: perceived environmental effectiveness, effects on low-income households, and effects on one's own household are the strongest predictors of policy views. Even under operating rebate programs in Canada and Switzerland, households remain largely unaware of the payments they receive and underestimate the amounts (Mildenberger et al., 2022). Laboratory evidence likewise shows that objective benefits do not guarantee support. In Kallbekken et al. (2011), participants voted on Pigouvian tax schemes whose revenues were refunded either as equal lump-sum payments to all or as transfers targeted to specific groups. Some rejected schemes that would have increased their own payoff, and explaining the schemes' aggregate efficiency did not significantly increase voting support.

This evidence links perceived incidence and effectiveness to support, but it does not benchmark beliefs about the net household incidence of a tax-and-dividend package against a household-level microsimulation. Douenne and Fabre (2022) provide the closest such benchmark, and the reference point for our study. They match a microsimulation of a €50/tCO<sub>2</sub> carbon-tax increase, redistributed equally per adult, to a representative survey of 3,002 French households. An estimated 70% of households would gain in purchasing power. Yet only 14% expected to gain, and just 10% approved of the reform. Respondents also tended to view the policy as regressive and environmentally ineffective. Randomized information treatments shifted these beliefs only modestly, particularly among opponents.

The French evidence thus documents a numerically large gap between subjective beliefs and microsimulated household incidence. Two questions follow. First, does a similarly large gap recur beyond France? Cross-country surveys (Dechezleprêtre et al., 2025) provide broader geographic coverage, but their categorical measures do not quantify the household-level gap. Second, if a similar gap recurs, is it accompanied by the same degree of policy opposition? The French survey was fielded shortly after the Yellow Vests protests and the abandonment of a planned fuel-tax increase. A pre-adoption setting in which

household carbon pricing has not become the focus of nationwide protest therefore provides a useful contrast. South Korea is such a setting. It operates an emissions trading scheme for large emitters but has neither a household carbon tax nor a carbon-dividend program. Korean respondents in the cross-country data share the doubts observed elsewhere, yet the household-level magnitude of incidence pessimism has remained unexamined in Korea.

This paper examines these questions by replicating the Douenne and Fabre (2022) framework in South Korea. We combine two data sources. First, using the 13th wave of the National Survey of Tax and Benefit (NaSTaB), we simulate a carbon tax of KRW 60,000 per tCO<sub>2</sub> on four household fuels, with the revenue recycled as an equal per-capita dividend. The scenario closely matches the French benchmark of €50/tCO<sub>2</sub> and €110 per adult; the corresponding Korean dividend is approximately KRW 110,000 per person. Second, we field corresponding belief and support questions in an online survey of Korean adults (N = 1,397). One of the two survey groups also received statements about the policy's progressivity and environmental effectiveness, closely adapted from the French survey. This design quantifies the size of incidence pessimism, rather than merely documenting its presence, and allows us to trace policy support across perceived household gains and losses.

Three results emerge. First, the simulated policy is clearly progressive: 77.6% of households would gain in purchasing power, with an average annual net gain of KRW 89,000 per household, and only the top income decile losing on average. Second, Korean beliefs about personal incidence and progressivity closely resemble those documented in France. Only 23.6% expect to gain and 50.6% expect to lose, while the average subjective net impact is KRW -91,000 per year. The subjective distribution is more pessimistic than even the objective distribution computed under fully inelastic demand. Beliefs about environmental effectiveness are a notable exception: Korean respondents are considerably more likely than French respondents to regard the policy as environmentally effective. Incidence bias is strongly associated with policy support but not with left-right ideology. Differences in progressivity and effectiveness beliefs between the information and no-information survey groups are also modest. This pattern is qualitatively consistent with the limited updating observed in the randomized French experiment.

Third, policy support differs sharply from the French benchmark. In Korea, 40.1% support the policy and 36.6% oppose it, compared with 10% and 70%, respectively, in the French study. In fitted descriptive relationships, strict support crosses 50% at a small positive perceived gain, while non-opposition remains above 50% down to perceived annual losses of about KRW 200,000. Moreover, 11.9% of respondents support the policy despite expecting their household to lose. Similar incidence pessimism therefore coexists with markedly different patterns of policy support across the two studies.

The paper makes three contributions. First, it extends household-level benchmarking of carbon-dividend incidence beliefs to an Asian country at the pre-adoption stage, comparing monetary beliefs with a national microsimulation and with respondent-specific estimates based on reported fuel expenditures. Second, through a closely matched comparison with France, it documents that similar incidence pessimism can coexist with substantially different patterns of policy support. Third, it quantifies the ranges of perceived household gains and losses associated with strict majority support and majority non-opposition. These ranges are descriptive rather than structural willingness-to-pay estimates or predictions under alternative

tax rates. They nevertheless provide an empirical reference point for considering the design and sequencing of household carbon pricing, as discussed in Section 6.

Section 2 describes the policy background and simulated scenario. Section 3 presents the data and methods. Section 4 reports the objective distributional effects, subjective beliefs and support patterns, the correlates of incidence bias, and information-group comparisons. Section 5 compares the Korean and French evidence, and Section 6 discusses policy implications.

## 2. Policy background and the carbon dividend scenario

Korea legislated carbon neutrality by 2050 in 2021 and has operated a national emissions trading scheme (K-ETS) covering large emitters since 2015. Households, however, face no explicit carbon price: transport fuels carry excise taxes introduced for revenue and infrastructure purposes, while heating fuels such as kerosene and natural gas are taxed lightly. Carbon tax bills have been proposed in the National Assembly but none has been adopted, and no revenue-recycling design has been publicly debated in detail. Korea is thus representative of the many economies where carbon pricing for households remains at the design stage — precisely the setting in which the political economy of beliefs matters most. Existing Korean survey evidence shows that support for a prospective carbon tax depends strongly on how its revenue would be used (Kim et al., 2024; Yoon, 2023), but the accuracy of the underlying beliefs has not been examined against household data.

We study the same policy architecture as Douenne and Fabre (2022): a carbon tax levied on household fossil fuels with revenue returned as an equal per-capita lump sum. The tax rate is KRW 60,000 per tCO<sub>2</sub>. Applying fuel-specific emission factors, and assuming full pass-through to consumer prices as in Douenne and Fabre (2022), this raises consumer prices by KRW 126 per liter of gasoline, KRW 156 per liter of diesel, KRW 150 per liter of kerosene, and KRW 180 per Nm<sup>3</sup> of city gas. Simulated revenue supports an annual dividend of about KRW 110,000 per person (Section 4.1), making the scenario almost exactly the Korean counterpart of the French €50/tCO<sub>2</sub>–€110 scheme studied by Douenne and Fabre (2022).

The policy affects a household through two channels: it pays the dividend for each member, and it raises the price of the fuels the household consumes. For household  $h$ , the annual net gain is

$$\Gamma(h) = D \cdot n(h) - \Delta E(h), \quad (1)$$

where  $D$  is the per-capita dividend,  $n(h)$  household size, and  $\Delta E(h)$  the increase in the household's fuel expenditure. All expenditure and revenue terms in the equations are expressed on an annualized basis. The expenditure response allows demand to adjust. For fuel  $i$  with consumer price  $p(i)$ , unit tax  $\tau(i)$ , baseline spending  $E(i, h)$ , and price elasticity  $\varepsilon(i)$ , the tax raises the price by the proportion  $\tau(i)/p(i)$ , consumption falls by  $\varepsilon(i) \cdot \tau(i)/p(i)$ , and expenditure rises, to first order in the price change, by

$$\Delta E(i, h) = E(i, h) \cdot (1 + \varepsilon(i)) \cdot \tau(i)/p(i), \text{ with } \Delta E(h) = \sum_i \Delta E(i, h). \quad (2)$$

To illustrate, at the 2019 reference price of KRW 1,471 per liter (the reference year of the NaSTaB data; Section 3.1), the KRW 126 tax raises the gasoline price by approximately 8.6%. Applying the elasticity of  $-0.251$  in equation (2), monthly expenditure for a household initially spending KRW 100,000 rises by approximately KRW 6,400, rather than KRW 8,600 under zero demand response. The revenue side

aggregates each household's tax payments,  $\tau(i)$  per unit on post-adjustment quantities, and the dividend divides this revenue equally across the covered population:

$$D = \sum_h \Delta T(h) / \sum_h n(h), \text{ where } \Delta T(h) = \sum_i q(i, h) \cdot (1 + \varepsilon(i) \cdot \tau(i) / p(i)) \cdot \tau(i), \quad q(i, h) = E(i, h) / p(i). \quad (3)$$

Because consumers curb consumption when prices rise, the aggregate increase in expenditure falls short of aggregate tax revenue, so aggregate net gains in (1) are positive rather than zero. Note that  $\Gamma(h)$  is a cash-flow measure: it captures changes in expenditure and transfers but abstracts from the utility cost of the induced reduction in consumption. The microsimulation approach follows the energy-tax incidence literature (Douenne, 2020; Cronin et al., 2019).

### 3. Data and methods

Our empirical design combines two data sources. First, a microsimulation using nationally representative household data estimates the policy's household-level incidence under the stated assumptions (Section 3.1). Second, an original survey elicits respondents' beliefs and policy support (Section 3.2). Using respondents' reported fuel expenditures and demand responses, we then construct respondent-specific incidence estimates and compare them with their stated beliefs to measure individual-level incidence bias (Section 3.3). The underlying survey and simulation materials were originally developed for a Korean-language research report of the Korea Institute of Public Finance (Bae et al., 2022); the present paper substantially reanalyzes and extends that earlier work.

#### 3.1 Household microsimulation: NaSTaB

The National Survey of Tax and Benefit (NaSTaB) is a nationally representative household panel administered by the Korea Institute of Public Finance. We use wave 13, which records household income, composition, and detailed monthly expenditures on gasoline, diesel, kerosene, and city gas for the 2019 reference year. After excluding households with implausible records and those with four or more workers, the simulation sample contains 8,599 households. Households are ranked into deciles of equivalised income (income divided by the square root of household size) using survey weights. Price elasticities are taken from Korean empirical studies:  $-0.251$  for gasoline and  $-0.5$  for diesel (Cho and Jeong, 2017),  $-0.6744$  for kerosene (Jung et al., 2019), and  $-0.268$  for city gas (Park and Park, 2018). As a bounding case we also simulate the policy under fully inelastic demand (all elasticities zero), which yields a conservative objective benchmark within the simulation model.

#### 3.2 Survey

We fielded the belief and support questions in two rounds of an online survey of Korean adults in 2022. Respondents in the first round received no additional information, whereas those in the second round received the information statements described below. We refer to the first- and second-round samples as the no-information group and the information group, respectively. Across the two rounds, 1,473 respondents participated. We exclude 76 respondents whose reported fuel spending exceeds 80% of their income or whose household has more than six members. The resulting base analysis sample consists of 1,397 respondents: 694 in the first-round no-information sample and 703 in the second-round information

sample. Subsequent analyses impose measure-specific sample restrictions, which are described where relevant and reported in the corresponding table and figure notes.

Respondents were told that Canada and Switzerland operate carbon fee-and-dividend schemes and were then presented with the Korean scenario corresponding to the KRW 60,000 per tCO<sub>2</sub> tax (Section 2): the four fuel-price increases and the KRW 110,000 annual dividend. They reported household fuel expenditures, expected demand reductions under specified price increases, the expected effect of the policy on their own purchasing power (with bracketed magnitudes), perceived distributional winners and losers, perceived progressivity, perceived environmental effectiveness, and policy support. The full questionnaire appears in Appendix D.

Respondents in the information group additionally saw two statements: that the policy is progressive on average and that researchers agree that carbon taxation is effective in reducing environmental pollution. The effectiveness statement adapts the wording used by Douenne and Fabre (2022) (“scientists agree that a carbon tax would be effective in reducing pollution”). Because both statements were administered together in the second-round survey rather than randomized separately across respondents, their individual effects cannot be distinguished, and we read group differences as descriptive (Section 4.5).

Table 1 reports descriptive statistics. The sample skews toward college-educated and capital-region respondents relative to the Korean adult population. Apart from the younger age profile of the information group, the two groups are broadly similar in observed background characteristics (Appendix C).

**Table 1. Sample characteristics by survey group**

|                                             | No-information group | Information group | Pooled |
|---------------------------------------------|----------------------|-------------------|--------|
| Observations                                | 694                  | 703               | 1,397  |
| Female (%)                                  | 43.7                 | 40.4              | 42.0   |
| Age 20–39 (%)                               | 39.6                 | 49.5              | 44.6   |
| Age 40–59 (%)                               | 52.6                 | 43.8              | 48.2   |
| Age 60+ (%)                                 | 7.8                  | 6.7               | 7.2    |
| Capital region (%)                          | 60.2                 | 61.7              | 61.0   |
| College or above (%)                        | 81.7                 | 82.5              | 82.1   |
| Household size (mean)                       | 3.1                  | 3.0               | 3.0    |
| Monthly household income (10,000 KRW, mean) | 487                  | 497               | 492    |

Notes: Income is the midpoint of bracketed responses. The information group saw the two statements described in Section 3.2.

### 3.3 Belief measures

The subjective net gain is constructed from bracketed responses on expected purchasing-power changes, using bracket midpoints (ranging from an annual gain of KRW 550,000 to an annual loss of KRW 750,000).

To assess whether pessimism reflects respondents’ own circumstances, we also compute an estimated net gain for each respondent, applying the formula of the microsimulation to their reported fuel expenditures and self-reported demand reductions. Respondents in the open-ended top bracket of the demand-reduction questions (“more than 30%”) are assigned a value of 35%.

The incidence bias is defined as the estimated net gain minus the subjective net gain, so positive values indicate pessimism. Respondents whose estimated net gain falls outside the response range of the subjective question cannot be compared with the bracketed responses and are excluded from the bias analysis. Sample sizes for each analysis are reported in the table and figure notes.

## 4. Results

### 4.1 Objective incidence: the policy is progressive and benefits three quarters of households

Simulated revenue finances an annual dividend of KRW 110,600 per person (rounded to KRW 110,000 in the survey scenario presented to respondents). Fig. 1 shows average annual net gains by equivalised-income decile, expressed per capita. Deciles 1–9 gain on average; only the top decile loses (about KRW −4,000 per year). Gains are largest at the bottom — roughly KRW 71,000, or 1.5% of disposable income in the first decile — and decline monotonically as a share of income, so the scheme is clearly progressive within the simulation. At the household level, 77.6% of households gain in purchasing power, with a mean net gain of KRW +89,200 per year; the full distribution of these household-level net gains appears as the solid red curve in Fig. 2. The progressivity of tax-and-dividend designs is a robust finding of the distributional literature (Cronin et al., 2019; Goulder et al., 2019; Ohlendorf et al., 2021), and these figures closely parallel the French benchmark, where about 70% of households gain and net gains average +€24 per consumption unit (Douenne and Fabre, 2022).

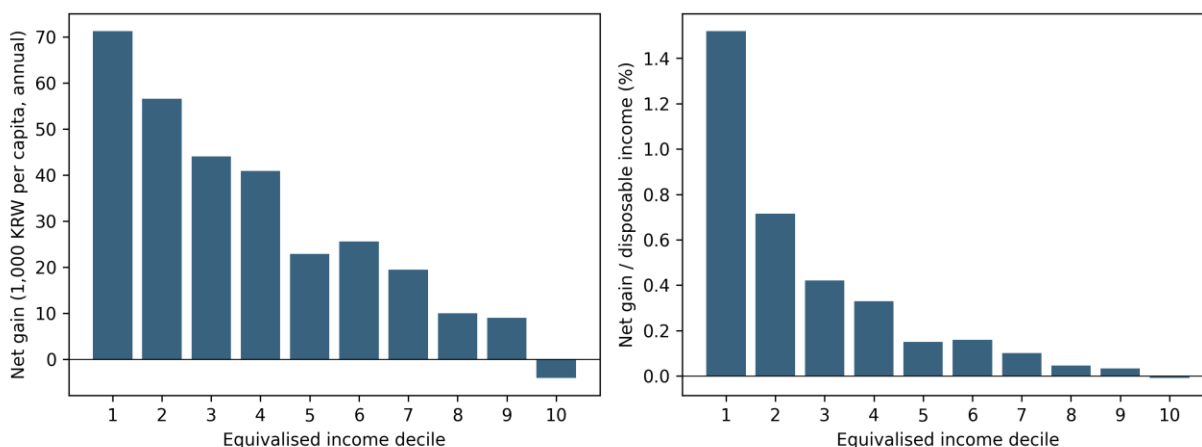


Fig. 1. Average annual net gains from the carbon dividend by equivalised-income decile (NaSTaB simulation). Left: per-capita amounts; right: relative to disposable income.

### 4.2 Subjective beliefs: pessimistic about incidence, less so about effectiveness

We first compare beliefs about personal incidence with the simulated benchmark, in aggregate and at the individual level, and then turn to beliefs about the policy’s distributional and environmental properties.

#### 4.2.1 Aggregate beliefs about personal incidence

Survey responses paint a very different picture from the simulation. Only 23.6% of respondents expect their household to gain, 50.6% expect to lose, and 25.8% expect no change; the mean subjective net impact is KRW −91,200 per year, against an objective mean of KRW +89,200.<sup>1</sup>

Fig. 2 overlays the cumulative distribution of subjective net gains on the objective distribution from the simulation. The subjective distribution lies everywhere above the objective one: at every gain level, a larger share of respondents report expecting to do worse than the share of households the simulation places below that level. Notably, it also lies above the objective distribution computed under fully inelastic demand (dashed line). Pessimism therefore cannot be explained solely by respondents ignoring their ability to reduce consumption: reported beliefs are more pessimistic than the zero-adjustment benchmark within the simulation. The same pattern appears in the French data (Douenne and Fabre, 2022).

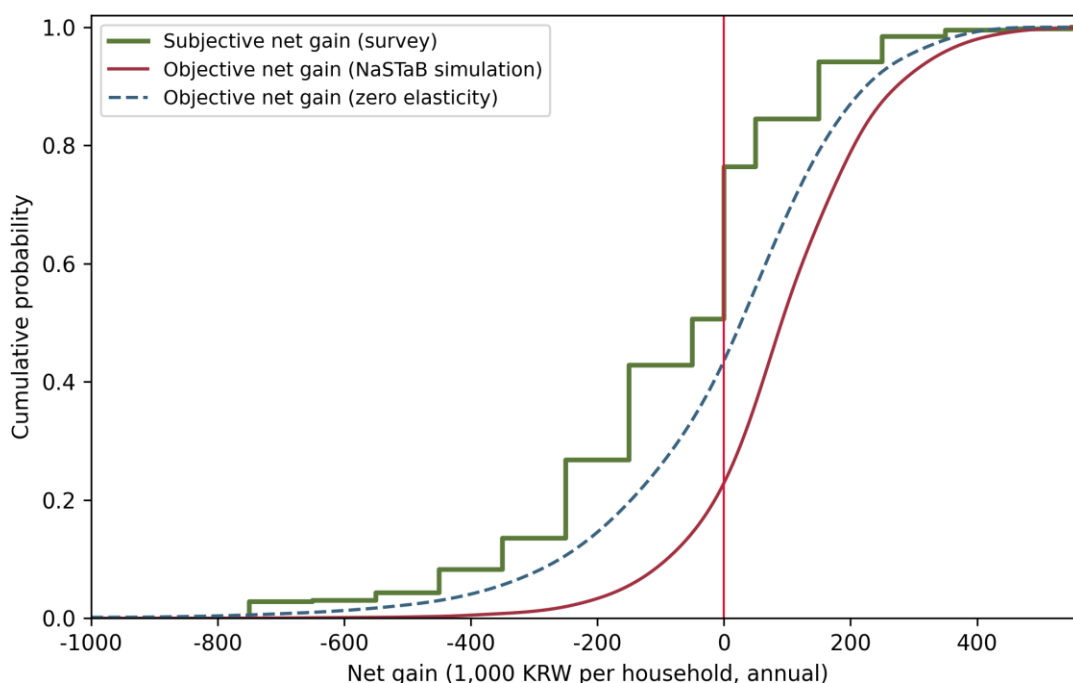


Fig. 2. Cumulative distributions of subjective net gains (survey, pooled sample), objective net gains (NaSTaB simulation), and objective net gains under zero demand elasticity.

This aggregate comparison may, however, partly reflect differences between the national simulation sample and the circumstances of individual survey respondents.

#### 4.2.2 Individual-level incidence bias

To account for respondents' own circumstances, we compare each respondent's estimated net gain — computed from their reported fuel expenditures and self-reported demand reductions (Section 3.3) — with

<sup>1</sup>The headline incidence-belief statistics pool the two survey groups. This pooling cannot be confounded by the information treatment, because the purchasing-power questions were asked before the information statements were shown to the information group. The group-specific figures are close: 22.3% expect to gain, 53.0% to lose, with a mean subjective net gain of KRW −94,900 in the no-information group, against 24.9%, 48.2%, and KRW −87,500 in the information group. Douenne and Fabre (2022) likewise elicited these beliefs before their randomized information treatments.

their subjective one. The incidence bias is defined as the estimated net gain minus the subjective net gain, so that positive values indicate pessimism. If pessimism merely reflected unusual energy-spending circumstances of the survey sample, the estimated net gains should be distributed more adversely than the national simulation. They are not: the estimated distribution lies close to the NaSTaB objective distribution (Appendix A).

The individual-level comparison also suggests that pessimism is unlikely to be driven solely by differences between the two samples: 76.9% of respondents underestimate their net gain (the estimated net gain exceeds the subjective net gain). Fig. 3 shows the distribution of this bias: it is right-skewed, with its mode just above zero and a long tail of large positive (pessimistic) bias, while comparatively few respondents show large negative (optimistic) bias. Both the aggregate and individual-level evidence therefore point to systematic pessimism about personal incidence.

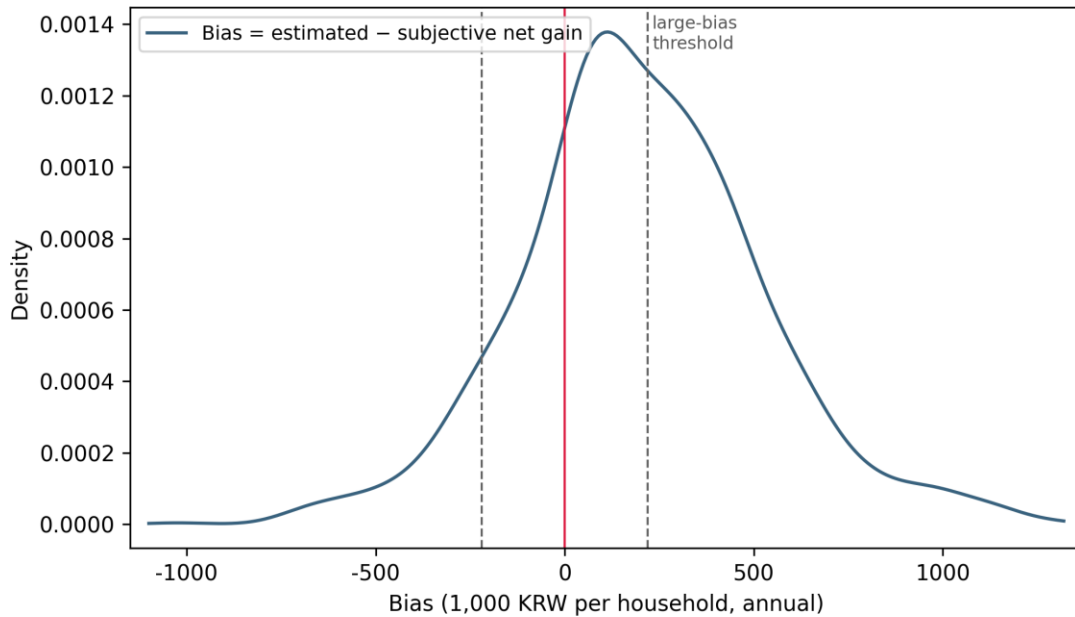


Fig. 3. Distribution of the incidence bias (estimated minus subjective net gain),  $N=1,324$ . Positive values indicate pessimism. Vertical dashed lines mark the large-bias threshold of  $\pm$ KRW 220,000 (defined below). The sample excludes respondents whose estimated net gain falls outside the subjective response range (72 respondents; Section 3.3) and one respondent forming a single-member education category.

For later use in the regressions, we classify a respondent as holding a large bias when the absolute incidence bias exceeds KRW 220,000 — twice the annual per-capita dividend, a threshold anchored to the policy’s own scale.<sup>2</sup> Under this definition, 49.2% of respondents hold a large bias, numerically close to the 55% reported for France, although the thresholds are calibrated differently. The classification is symmetric by construction but nearly one-sided in practice: 92.6% of respondents classified as having a large bias err on

<sup>2</sup>Douenne and Fabre (2022) calibrated their threshold of €110 per year per consumption unit using an out-of-sample validation of their respondent-level gain estimator against French expenditure microdata, in which objective gains could be calculated directly from observed energy bills. The absolute estimation error exceeded €110 in only 5% of cases. We lack an equivalent external validation for the Korean survey estimates and therefore anchor our threshold to twice the annual per-capita dividend. Because this calibration is not tied to prediction error, Section 4.4 assesses robustness to alternative thresholds.

the pessimistic side, corresponding to 45.5% of the sample, compared with 3.6% on the optimistic side. We return to this classification in Section 4.4.

#### **4.2.3 Beliefs about progressivity and environmental effectiveness**

Belief distortions extend beyond respondents' own purchasing power to the distribution of gains. Although the microsimulation shows that the policy is progressive, only 31.4% of respondents in the no-information group believe that it benefits lower-income households, whereas 50.7% deny that it does. The corresponding shares in the information group are 30.9% and 47.2%, with the difference arising mainly from a larger share choosing "don't know."

Beliefs about environmental effectiveness are considerably more favorable. In the no-information group, 49.3% consider the policy helpful for the environment and climate and 32.4% deny its effectiveness, compared with 53.6% and 27.6% in the information group. The raw distributions therefore suggest that Korean respondents are less skeptical about environmental effectiveness than about the policy's personal and distributional incidence. The between-group differences reported above are descriptive because information status coincides with survey round (Section 3.2); Section 4.5 reports regression-adjusted comparisons.

The comparison with France reveals both similarity and divergence. Distributional beliefs are pessimistic in both survey samples, although less severely so in Korea: among French respondents who received no progressivity information, only 19% believed the policy would benefit the poorest households and 60% denied it (Douenne and Fabre, 2022). The difference is sharper for environmental effectiveness: only 15% of untreated French respondents considered the policy effective, while 68% denied its effectiveness — substantially greater environmental skepticism than in Korea. The Korean sample thus resembles the French benchmark in the misperception of distributional incidence but differs in the perceived environmental value of the policy, a contrast that may help explain the two countries' divergent support patterns (Section 5).

### **4.3 Pessimistic beliefs without majority opposition**

Policy support is considerably less negative than the incidence beliefs just documented. In the pooled sample, 40.1% of respondents support the policy, 36.6% oppose it, and 23.3% are undecided; support and opposition are 39.3% and 37.2% in the no-information group and 40.8% and 36.0% in the information group.<sup>3</sup>

If support were purely self-interested and beliefs taken at face value, majority support would require the median respondent to expect a personal gain. We distinguish two outcomes, following Douenne and Fabre's (2022) own distinction between approval and acceptance: strict support (answering yes to the support question) and non-opposition (not answering no). Fig. 4 plots both outcomes against subjective net gains; the crossing points quoted below are read from these fits. For the full sample, strict majority support is reached at a small positive perceived gain of about +KRW 41,000 per year. The share not opposing the policy remains above one half down to perceived losses of about KRW 220,000, roughly 0.4% of average

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<sup>3</sup>Support was elicited after the effectiveness statement in the information group. Douenne and Fabre (2022) used the same question ordering and report pooled support across randomized exposure conditions; pooled Korean support is therefore the closest design-matched benchmark, while within-Korea group differences should be read non-causally.

annual household income. The raw responses provide a complementary indication that perceived losses do not preclude strict support: 11.9% of respondents support the policy despite expecting to lose from it, with a mean expected loss of KRW 227,000. Taken together, these patterns provide descriptive evidence of tolerance for perceived personal losses, though not a structural willingness-to-pay estimate.

The association between perceived gains and policy support differs sharply by perceived environmental effectiveness. Among respondents who deny environmental effectiveness, the fitted support and non-opposition rates exceed 50% only at perceived gains of roughly KRW 150,000–200,000. Among the rest, strict majority support extends to perceived losses of about KRW 51,000, and majority non-opposition to several hundred thousand won. These patterns accord with prior evidence that perceived environmental effectiveness is strongly associated with policy acceptability (Kallbekken and Sælen, 2011; Baranzini and Carattini, 2017; Bergquist et al., 2022) and that perceived personal costs shape carbon-tax attitudes (Umit and Schaffer, 2020).

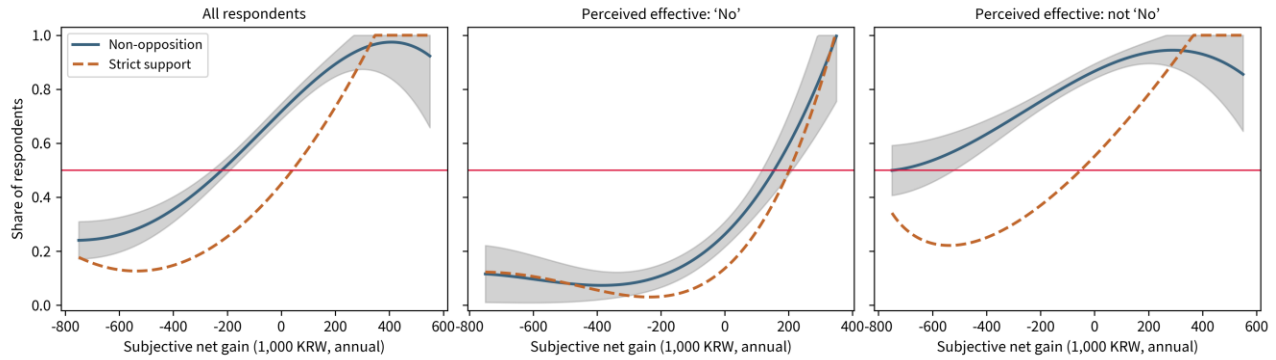


Fig. 4. Non-opposition (solid, with 95% confidence band) and strict support (dashed) rates by subjective net gain: full sample, respondents denying environmental effectiveness, and others. Fractional polynomial fits (Royston and Altman, 1994); horizontal line marks 50%.

#### 4.4 Large bias correlates with policy attitudes, not with ideology

Having established the prevalence and direction of the incidence bias, we now examine which respondents are most likely to hold strongly distorted beliefs. Table 2 regresses the large-bias indicator of Section 4.2.2 on policy attitudes, ideology, and sociodemographic characteristics.

Two results stand out. First, policy attitudes are the strongest correlate: respondents who support the policy are 21 percentage points less likely to exhibit a large bias than opponents, and even non-respondents on support are 10 points less likely.<sup>4</sup> Second, political ideology plays essentially no role: the left–right scale is small and insignificant, and self-described political identities are jointly insignificant (Wald test,  $p = 0.69$ ), with only the politically indifferent showing marginally lower bias. Professionals are 14 percentage points less likely than employees to hold a large bias ( $p < 0.01$ ), and higher-income respondents are slightly more likely. The regression explains little of the variation ( $R^2 = 0.066$ , close to the 0.061 reported for the French

<sup>4</sup>Results are unchanged for thresholds between KRW 110,000 and 300,000: the policy-support coefficient in Table 2 ranges from  $-0.18$  to  $-0.21$ , all significant at the 1% level. Direction-specific estimates confirm that the support gradient stems entirely from pessimistic bias: replacing the absolute indicator with side-specific indicators yields  $-0.224$  ( $p < 0.01$ ) for a large pessimistic bias and  $+0.012$  (not significant) for a large optimistic bias.

counterpart), indicating — in Douenne and Fabre’s (2022) phrase — that holding a large bias is largely idiosyncratic. All three findings — the support gradient, the irrelevance of left–right ideology, and the low explanatory power — closely parallel the French evidence, where environmentalist identity and Yellow Vest participation, rather than left–right position, predicted bias. Because policy attitudes and incidence beliefs are measured contemporaneously, these estimates do not establish the direction of causality: biased beliefs may reduce support, but prior opposition may also shape reported beliefs. More broadly, this heterogeneity accords with evidence that tax-policy views reflect multiple perceptions of distribution, fairness, and government (Stantcheva, 2021).

**Table 2. Determinants of large incidence bias ( $|\text{bias}| > \text{KRW } 220,000$ )**

|                                          | OLS                | Logit (MEM)        | OLS (excl. support) |
|------------------------------------------|--------------------|--------------------|---------------------|
| Ideology (0 conservative–10 progressive) | –0.007 (0.011)     | –0.008 (0.012)     | –0.010 (0.011)      |
| Supports policy (ref.: opposes)          | –0.212*** (0.034)  | –0.219*** (0.034)  |                     |
| No answer on support                     | –0.100*** (0.038)  | –0.105*** (0.039)  |                     |
| Conservative (ref.: centrist)            | –0.046 (0.055)     | –0.050 (0.058)     | –0.065 (0.056)      |
| Progressive                              | 0.001 (0.050)      | 0.003 (0.052)      | –0.003 (0.050)      |
| Humanist                                 | –0.011 (0.063)     | –0.013 (0.067)     | –0.026 (0.064)      |
| Patriot                                  | –0.043 (0.078)     | –0.047 (0.081)     | –0.062 (0.078)      |
| Environmentalist                         | 0.034 (0.067)      | 0.035 (0.072)      | 0.013 (0.069)       |
| Politically indifferent                  | –0.087* (0.051)    | –0.090* (0.052)    | –0.057 (0.051)      |
| Professional (ref.: employee)            | –0.145*** (0.051)  | –0.154*** (0.051)  | –0.142*** (0.051)   |
| Self-employed                            | –0.047 (0.049)     | –0.050 (0.050)     | –0.054 (0.050)      |
| Student                                  | 0.113 (0.086)      | 0.121 (0.087)      | 0.155* (0.085)      |
| Homemaker                                | –0.033 (0.057)     | –0.034 (0.058)     | –0.038 (0.057)      |
| Not employed                             | 0.106 (0.067)      | 0.111 (0.069)      | 0.118* (0.069)      |
| Household income (10,000 KRW)            | 0.0003*** (0.0001) | 0.0003*** (0.0001) | 0.0003*** (0.0001)  |
| Constant                                 | 0.451*** (0.089)   |                    | 0.363*** (0.087)    |
| Sociodemographic controls                | Yes                | Yes                | Yes                 |
| Observations                             | 1,190              | 1,190              | 1,190               |
| R <sup>2</sup>                           | 0.066              |                    | 0.035               |

Notes: Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Sociodemographic controls comprise age group, gender, education, and capital-region residence. The logit column reports marginal effects at the means.  $N=1,190$ : the bias sample of Fig. 3 trimmed at the 5th and 95th percentiles of the bias distribution.

#### 4.5 Beliefs differ modestly across information groups

We now compare the beliefs reported by the information and no-information groups (Section 4.2.3). Table 3 uses the same interaction structure as Douenne and Fabre’s (2022) belief-updating analysis, although information-group status is not randomized here. On the common analysis sample, the unconditional difference in not denying progressivity is 5.5 percentage points and is significant only at the 10% level. In the controlled specification, the estimated between-group difference is +8.7 points among respondents without a large bias. The interaction coefficient of –5.5 points implies a smaller difference of +3.2 points

among respondents with a large bias, but the interaction is imprecisely estimated. We therefore find no clear evidence that the between-group difference varies with bias. In the randomized French experiment, by contrast, progressivity information made large-bias respondents 13 percentage points more likely to perceive the policy as regressive (Douenne and Fabre, 2022). Our negative interaction is directionally consistent with a weaker difference among large-bias respondents, but it does not establish a comparable backfire. Within the no-information group, respondents with a large bias are about 10 percentage points more likely to deny progressivity, linking distributional misperceptions to the predominantly pessimistic personal-incidence bias documented in Section 4.2. Because perceived fairness is strongly associated with carbon-tax support (Maestre-Andrés et al., 2019; Sommer et al., 2022), the prevalence of regressivity beliefs may be consequential for acceptability.

**Table 3. Information and perceived progressivity (dependent: does not deny progressivity)**

|                           | (1)              | (2)              | (3)               |
|---------------------------|------------------|------------------|-------------------|
| Progressivity information | 0.055* (0.029)   | 0.075* (0.040)   | 0.087** (0.040)   |
| Large bias                |                  | −0.104** (0.041) | −0.105*** (0.041) |
| Information × large bias  |                  | −0.049 (0.057)   | −0.055 (0.057)    |
| Constant                  | 0.500*** (0.021) | 0.553*** (0.029) | 0.536*** (0.062)  |
| Sociodemographic controls | No               | No               | Yes               |
| Observations              | 1,190            | 1,190            | 1,190             |
| R <sup>2</sup>            | 0.003            | 0.020            | 0.044             |

Notes: OLS estimates; standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. All columns use the common sample for which the bias measure is defined (N=1,190; see Table 2 notes). Information was administered between subjects (Section 3.2).

Table 4 relates perceived environmental effectiveness to respondents' own stated demand elasticities and to the effectiveness information. The elasticity regressors probe a possible extrapolation channel: respondents who expect little demand response of their own may also doubt that the tax would reduce aggregate emissions. We find no statistically detectable association between stated elasticities and perceived effectiveness. Douenne and Fabre (2022) reach the same conclusion for France, where skepticism is not explained by respondents' anticipated demand responses. Respondents in the information group show a similarly modest 4–6 percentage-point higher probability of not denying environmental effectiveness, significant at the 5–10% level. Ex-post evidence from Sweden indicates that carbon taxation can reduce transport emissions (Andersson, 2019), so the outright skepticism of roughly three in ten respondents (Section 4.2.3) contrasts with evidence from an implemented policy. Because the two statements were not randomized separately (Section 3.2), we read Tables 3–4 as suggestive.<sup>5</sup>

**Table 4. Perceived environmental effectiveness (dependent: does not deny effectiveness)**

|                               | (1)               | (2) | (3)               | (4) | (5)               | (6) |
|-------------------------------|-------------------|-----|-------------------|-----|-------------------|-----|
| Stated elasticity (transport) | −0.044<br>(0.045) |     | −0.038<br>(0.045) |     | −0.042<br>(0.047) |     |

<sup>5</sup>Both statements were shown to the same group, so their separate effects are not identified. Given question order, the effectiveness estimate is unaffected by the progressivity statement, while the progressivity estimate may partly reflect the earlier effectiveness statement.

|                             | (1)                 | (2)                 | (3)                 | (4)                 | (5)                | (6)               |
|-----------------------------|---------------------|---------------------|---------------------|---------------------|--------------------|-------------------|
| Stated elasticity (heating) |                     | −0.058<br>(0.045)   |                     | −0.056<br>(0.045)   |                    | −0.057<br>(0.045) |
| Effectiveness information   |                     |                     | 0.051*<br>(0.026)   | 0.044*<br>(0.026)   | 0.057**<br>(0.026) | 0.049*<br>(0.026) |
| Constant                    | 0.697***<br>(0.019) | 0.691***<br>(0.021) | 0.674***<br>(0.023) | 0.671***<br>(0.024) | 0.740<br>(0.454)   | 0.681<br>(0.455)  |
| Sociodemographic controls   | No                  | No                  | No                  | No                  | Yes                | Yes               |
| Observations                | 1,180               | 1,203               | 1,180               | 1,203               | 1,180              | 1,203             |
| R <sup>2</sup>              | 0.001               | 0.001               | 0.004               | 0.004               | 0.039              | 0.040             |

Notes: OLS estimates; standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Odd columns use the transport-elasticity sample, even columns the heating-elasticity sample; respondents in the open-ended top bracket of stated demand reductions are excluded (see Appendix B for robustness). Information was administered between subjects (Section 3.2).

## 5. Korea and the French benchmark: similar incidence beliefs, divergent support

Table 5 summarizes the comparison. The Korean results closely resemble the French findings on personal incidence and progressivity, while Korean respondents are considerably more positive about environmental effectiveness. Large majorities are estimated to gain, yet only small minorities expect to. Average subjective impacts are negative where estimated ones are positive, and subjective distributions are more pessimistic than even zero-elasticity benchmarks. Bias is orthogonal to left–right ideology but tightly linked to policy attitudes. Progressivity is disbelieved, and information achieves little. The two countries differ in language, energy systems, fiscal institutions, protest history, and survey timing — and the incidence-belief structure is nonetheless strikingly similar. Together with the Canadian and Swiss rebate evidence (Mildenberger et al., 2022), this is consistent with pessimistic priors about carbon pricing being a robust feature across very different contexts, plausibly rooted in how citizens reason about taxes and government transfers rather than in any particular national experience.

**Table 5. Korea (this paper) versus France (Douenne and Fabre, 2022)**

|                                                              | Korea, 2022                                          | France, 2019                          |
|--------------------------------------------------------------|------------------------------------------------------|---------------------------------------|
| Policy scenario                                              | KRW 60,000/tCO <sub>2</sub> ; KRW 110,000 per capita | €50/tCO <sub>2</sub> ; €110 per adult |
| Households objectively gaining                               | 77.6%                                                | ≈70%                                  |
| Respondents expecting to gain                                | 23.6%                                                | 14%                                   |
| Mean objective net gain                                      | +KRW 89,000 (household, year)                        | +€24 (consumption unit)               |
| Mean subjective net gain                                     | −KRW 91,000                                          | −€89                                  |
| Subjective CDF above zero-elasticity CDF                     | Yes                                                  | Yes                                   |
| Large bias prevalence                                        | 49.2%                                                | 55%                                   |
| Bias predicted by left–right ideology                        | No                                                   | No                                    |
| Bias linked to policy support                                | Yes (−21 pp)                                         | Yes                                   |
| Believe policy helps the poor (uninformed group)             | 31.4%                                                | 19%                                   |
| Consider policy environmentally effective (uninformed group) | 49.3%                                                | 15%                                   |

|                                                     | Korea, 2022                             | France, 2019                         |
|-----------------------------------------------------|-----------------------------------------|--------------------------------------|
| Information corrects beliefs                        | Modest group differences                | Weakly; can backfire                 |
| Policy support                                      | 40.1% support / 36.6% oppose            | 10% support / 70% oppose             |
| Strict majority-support threshold (subjective gain) | +KRW 41,000 (small positive gain)       | not reported (overall approval: 10%) |
| Majority-acceptance threshold (subjective gain)     | $\approx$ -KRW 220,000 (non-opposition) | $\geq$ €0 (acceptance)               |

Notes: French figures from Douenne and Fabre (2022). Korean figures are pooled across survey groups; the belief questions preceded the information statements (Section 3.2). Douenne and Fabre distinguish approval (answering yes) from acceptance (not answering no); their reported French threshold refers to acceptance, which corresponds to our non-opposition measure. Large-bias threshold definitions differ across studies: KRW 220,000 (twice the per-capita dividend) here versus €110 (the 95th percentile of estimation error) in France.

Where the countries part ways is in what pessimistic citizens do with their beliefs. French respondents opposed the policy seven to one and displayed low support at every level of perceived gains; Korean respondents split evenly, reach strict majority support near break-even, and largely refrain from opposing the policy even at meaningful perceived losses. Several non-exclusive explanations fit this contrast. First, protest legacy: the French survey followed the Yellow Vests movement, which had politicized fuel taxation and plausibly converted pessimism into active aversion — Swedish fuel-tax protesters likewise display particularly strong resistance to carbon taxation (Ewald et al., 2022) — whereas the issue carries no comparable political charge in Korea. Second, policy status: French respondents evaluated an increase to an existing, contested tax, while Korean respondents evaluated a hypothetical scheme at the design stage, before positions hardened. Third, timing: 2022 saw carbon neutrality legislated across major economies and intense climate coverage, potentially raising the perceived legitimacy of carbon pricing despite the energy-price surge. Our design cannot adjudicate among these channels; doing so would require harmonized, repeated surveys across countries at different stages of carbon-price adoption and political contestation. What our comparison does document is that similar incidence pessimism can coexist with markedly different levels of policy support across the two survey samples.

## 6. Conclusions and policy implications

Replicating the Douenne and Fabre (2022) framework in South Korea, we find that the pessimistic belief patterns documented in France also appear in a country with no carbon tax, no dividend experience, and no fuel-tax protest history. Respondents systematically overestimate the personal cost of a carbon dividend and disbelieve its progressivity, and information-group differences in beliefs are modest. The political consequence, however, differs sharply. Fitted majority support is reached at a small positive perceived gain; majority non-opposition persists at perceived losses of roughly KRW 200,000 per year; and one in eight respondents supports the policy while expecting to lose. In France, by contrast, majority acceptance — the counterpart of our non-opposition measure — required non-negative perceived gains. Similar incidence pessimism thus coexists with substantially different levels of policy support.

Three implications follow. First, one-shot information is unlikely to be sufficient on its own. The modest differences in our comparison, together with mixed experimental evidence elsewhere, point toward designs that make compensation salient and upfront. Fixed, equal payments are one promising example (Woerner

et al., 2024), although evidence from Canada and Switzerland cautions that dividend experience alone does not guarantee belief correction (Mildenberger et al., 2022). Second, the loss thresholds documented here define candidate ranges for future policy experiments, though not rules for setting the initial tax rate. Such experiments could test whether introductory prices within these ranges preserve support and how attitudes change as rates rise. Third, because support is closely associated with perceived environmental effectiveness, distributional claims should be paired with credible and observable evidence of emission reductions.

Several limitations warrant caution. Information effects rest on a between-subject comparison across survey rounds, not within-survey randomization. The online panel over-represents the college-educated. The analysis considers a single tax rate and a single recycling design. And the 2022 fielding coincided with exceptional energy prices, which may have shifted both beliefs and support in ways our design cannot identify. Randomized information experiments and harmonized cross-country replications — particularly in other pre-adoption countries — would sharpen the distinction this paper draws between general belief distortions and context-dependent opposition.

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## **Declaration of generative AI and AI-assisted technologies in the manuscript preparation process**

During the preparation of this work, the author used Anthropic's Claude and OpenAI's ChatGPT for English-language editing and to translate the replication code from Stata to Python to facilitate reproducibility using open-source software. The author reviewed and edited the text, validated the translated code against the original results, and takes full responsibility for the content of the published article.

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## **Appendix (for online publication)**

- Appendix A. Validation of survey-based net gain estimates against the NaSTaB objective distribution.
- Appendix B. Robustness of the effectiveness regressions to the treatment of open-ended demand-reduction brackets (exclusion, inclusion, capping at  $-1$ ).
- Appendix C. Balance of observables across survey groups.
- Appendix D. Questionnaire (English translation).