Yellow Vests, Carbon Tax Aversion, and Biased Beliefs

Thomas Douenne & **Adrien Fabre**

Paris School of Economics, Université Paris 1

February 2020

Are French people ecologist?

Figure: Some Yellow Vests

What happened to the French "carbon tax"?

1. Tax on fossil fuels created in 2014, should have increased progressively until 100€/tCO_2 in 2022
2. Yellow Vests protested against rising fuel prices, for more purchasing power and more democracy
3. The government froze the tax at 50€/tCO_2

Motivations

How to avoid regressivity of carbon tax?

→ **Tax & Dividend**: redistributing equally the revenues. Makes it:

- progressive *(e.g. West & Williams, 2004; Bento et al., 2009; Williams et al., 2015; Douenne, 2020)*.
- supported by 3,354 economists in *The Wall Street Journal (2019)*, "To maximize the fairness and political viability of a rising carbon tax".

Motivations

How to avoid regressivity of carbon tax?

→ **Tax & Dividend**: redistributing equally the revenues. Makes it:

- progressive *(e.g. West & Williams, 2004; Bento et al., 2009; Williams et al., 2015; Douenne, 2020)*.
- supported by 3,354 economists in *The Wall Street Journal (2019)*, "To maximize the fairness and political viability of a rising carbon tax".

With a design ensuring desirable properties, a policy should be supported.

But is it really sufficient?

This paper

Based on a large survey representative of the French population, we show that:

1. Most people oppose a Tax & Dividend
2. They hold biased (pessimistic) beliefs about it
   - e.g. 70% expected to win, only 14% think they would
3. These beliefs are partially formed through motivated reasoning
4. Rejection is driven by biases: correcting them would suffice to generate large majority approval

Contributions

- **Political economy of the carbon tax:**

  Three key motives for acceptance:
  (See review by Carattini et al. (2018) or synthesis by Klenert et al. (2018))
  - self-interest *(Thalmann, 2004)*
  - environmental effectiveness *(Bristow et al 2010; Brannlund & Persson 2012)*
  - progressivity *(Kallbekken & Sælen, 2011; Baranzini & Carattini, 2017)*

  → We are the first to:

  1. Estimate objective net gain from the reform
  2. Acknowledge and quantify biases in perceptions
  3. Estimate causal effects of motives on acceptance

- **Beliefs formation:**

  1. Add new evidence on link between beliefs and preferences for policies *(e.g. Alesina & Angeletos, 2005; Bénabou & Tirole, 2006; Alesina et al., 2018)*
  2. Bi-directional causality identified through directional motivated reasoning *(e.g. Kunda, 1990; Kahan, 2013; Bénabou & Tirole, 2016; Druckman & McGrath, 2019; Little, 2019)*

Survey data collection

- 3002 responses collected on-line in February/March 2019
- Representative along: gender, age, education, profession, size of town, region
- Median duration: 19 min, important questions in the first half
- We exclude: 4% of respondents answering in less than 7 min, 9% who fail test of quality
- We flag 273 inconsistent answers, such as too high fuel economy or incomes: they are not correlated with our main variables of interest

▸ See the questionnaire

Tax & Dividend: *ex ante*

- Description of our Tax & Dividend reform:
  - Tax on fossil fuels: $+50€/tCO_2$
  - $+13\%$ on gas (resp. $+15\%$ on domestic fuel) redistributed
  - $+0.11€$/L on gasoline (resp. $+0.13€$/L on diesel)
  - Revenues from households redistributed lump-sum: 110€/year by adult
  - Tax incidence: borne at 80% by consumers
  - Elasticities: -0.4 for transport, -0.2 for housing

Tax & Dividend: *ex ante*

- Description of our Tax & Dividend reform:
  - Tax on fossil fuels: $+50€/tCO_2$
  - $+13\%$ on gas (resp. $+15\%$ on domestic fuel) redistributed
  - $+0.11€$/L on gasoline (resp. $+0.13€$/L on diesel)
  - Revenues from households redistributed lump-sum: 110€/year by adult
  - Tax incidence: borne at 80% by consumers
  - Elasticities: -0.4 for transport, -0.2 for housing
- Do you think this reform would be effective in reducing pollution and fight climate change?
  - "scientists agree that a carbon tax would be effective in reducing pollution" randomly displayed or not
- Would you lose, win or be unaffected by the reform?
- Expected loss (or gain) among 6 (or 5) intervals?
- Would you approve this reform?

Tax & Dividend: *ex ante*

- Description of our Tax & Dividend reform:
  - Tax on fossil fuels: $+50€/tCO_2$
  - $+13\%$ on gas (resp. $+15\%$ on domestic fuel) redistributed
  - $+0.11€$/L on gasoline (resp. $+0.13€$/L on diesel)
  - Revenues from households redistributed lump-sum: 110€/year by adult
  - Tax incidence: borne at 80% by consumers
  - Elasticities: -0.4 for transport, -0.2 for housing
- Do you think this reform would be effective in reducing pollution and fight climate change?
  - "scientists agree that a carbon tax would be effective in reducing pollution" randomly displayed or not
- Would you lose, win or be unaffected by the reform?
- Expected loss (or gain) among 6 (or 5) intervals?
- Would you approve this reform?
  - 10% 'Yes': approval
  - 19% 'PNR' (I don't know, I don't want to answer): acceptance
  - 70% 'No': disapproval

Insee official expenditures surveys

- Net gains of respondents using an official survey:
  - *Enquête Logement 2013* (EL): 27,000 HH, on housing
  - increase in housing expenditures $= \beta_0 + \beta_f$ fuel $+ \beta_g$ gas $+ \beta_s$ surface See regressions
  - increase in transport energy expenditures computed directly from answers
- Revenues estimating by matching two official surveys:
  - *Budget de Famille 2011* (BdF): 10,000 HH, good on housing, not on transport
  - *Enquête Nationale Transports et Déplacements 2008* (ENTD): 20,000 HH, used for transport
- In 83.4% of cases, we predict correctly the winning category on out-of-sample (BdF) data

Biased perception of net gain (1/2)

PDF of objective vs. subjective net gains from Tax & Dividend (in € per year per c.u.).

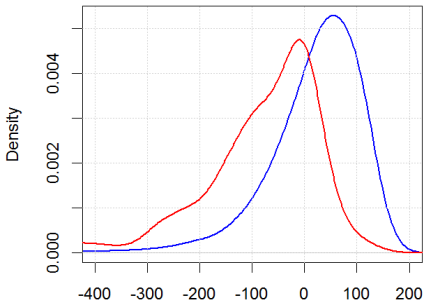


Figure: Net gain. Mean: -89/+24

- Objectively, 70% expected to win, but only 14% think they would (64% think lose, 21% PNR);
- 89% underestimate their gain, 53% by more than 110€;
- in relative terms: 60% think they lose more than average (>35% much more), 10-15%: less.

Biased perception of net gain (2/2)

Objective vs. subjective net gains from Tax & Dividend (in € per year per c.u.):

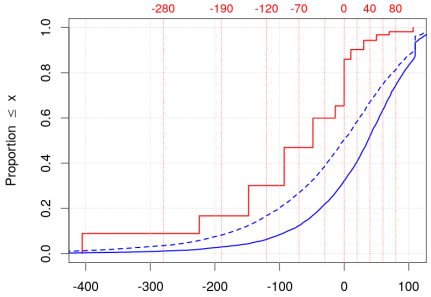


Figure: Net gain. Mean: - - - -: case of inelastic expenditures.

Assuming that everyone's fossils consumption is totally inelastic:

- 77% underestimate their gain, 37% by more than 110€.
- Median gap: 80€.

Heterogeneity in bias

Table: Determinants of a large bias in subjective gains.

	Large bias (bias $>$ 110)		
	OLS	*logit*	*OLS*
Initial tax: PNR (I don't know)			-0.179^{***}
			(0.023)
Initial tax: Approves			**-0.284^{***}**
			(0.031)
Sex: Female	0.036^{*}	0.030	0.042^{**}
	(0.020)	(0.020)	(0.019)
Ecologist	**-0.064^{**}**	-0.061^{**}	-0.025
	(0.026)	(0.026)	(0.026)
Yellow Vests: PNR	0.039	0.035	0.024
	(0.036)	(0.035)	(0.036)
Yellow Vests: understands	0.081^{***}	0.062^{***}	0.041^{*}
	(0.025)	(0.024)	(0.025)
Yellow Vests: supports	0.108^{***}	0.103^{***}	0.051^{*}
	(0.026)	(0.025)	(0.026)
Yellow Vests: is part	**0.202^{***}**	0.193^{***}	**0.147^{***}**
	(0.048)	(0.040)	**(0.047)**
Controls: Socio-demo, political leaning	✓	✓	✓
Observations	3,002	3,002	3,002
R^2	0.061		0.098

*p$<$0.1; **p$<$0.05; ***p$<$0.01

$\rightarrow$ The more opposed to the tax, the more biased? Or opposite direction of causality?

Beliefs over environmental effectiveness

17% 'Yes', 66% 'No' and 18% 'PNR'.

Beliefs over environmental effectiveness

17% 'Yes', 66% 'No' and 18% 'PNR'.

→ Tempting interpretation: people perceive aggregate consumption as inelastic
(Kallbekken & Sælen, 2011; Carattini et al., 2018)

Beliefs over environmental effectiveness

17% 'Yes', 66% 'No' and 18% 'PNR'.

→ Tempting interpretation: people perceive aggregate consumption as inelastic *(Kallbekken & Sælen, 2011; Carattini et al., 2018)*

Ruled out, because people correctly perceive elasticities. See subjective elasticities

Yet maybe, insufficient impact of the reform: –0.8% of *French* GhG emissions.

Beliefs over progressivity

Reform would benefit poorer households? 19% 'Yes', 60% 'No', 21% 'PNR'.

Yet, the tax is progressive:

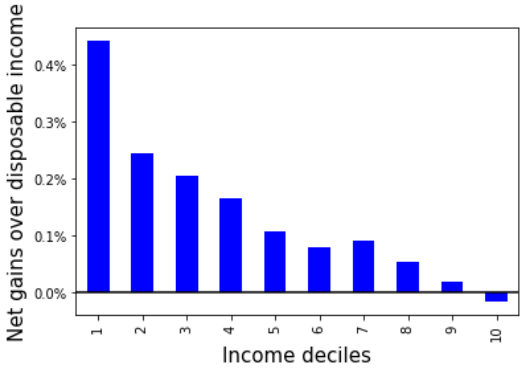


Figure: Average gain of Tax & Dividend by income decile as a share of disposable income.

Tax & Dividend: after knowledge

- Information on the effect of the reform
  - Feedback: "In five cases over six, a household with your characteristics would [win/lose] through the reform. (The characteristics taken into account are: heating using [energy source] for an accommodation of [surface] m^2; [distance] km traveled with an average consumption of [fuel economy] L for 100 km.)" (1/2)
  - Progressivity: "this reform would increase the purchasing power of the poorest households and decrease that of the richest, who consume more energy" (1/3)
  - or both (to 1/6 of respondents)
- Is the reform beneficial to the poorest? (1/2)
- Would you lose, win or be unaffected by the reform?
- Would you approve this reform?

Conservatism and pessimism

Two main results: ▸ See table

1. Losers update correctly (on average): 86% align with feedback
2. Winners do not update enough: only 25% align

▸ See regressions

Possible interpretations:

- Respondents think our feedback is biased (upwards).
- Respondents give too much value to their (biased) private information.
- Respondents are uncertain and loss averse: they don't report a lower-than-expected outcome.

Evidence of motivated reasoning

Table: Asymmetric updating of winning category

	Correct updating (U)			
Winner, before feedback ($\dot{G}$)	**0.695*** **	0.685***	0.646***	0.659***
	(0.078)	(0.080)	(0.080)	(0.080)
Initial tax: PNR (I don't know)			0.163***	0.165**
			(0.031)	(0.067)
Initial tax: Approves			**0.158*** **	−0.056
			(0.046)	(0.115)
Diploma (1 to 4)		0.015	0.016	0.011
		(0.013)	(0.013)	(0.014)
Diploma × Initial tax: PNR				−0.001
				(0.025)
Diploma × Initial tax: Approves				**0.074** **
				(0.037)
Yellow Vests: PNR		−0.048	−0.043	−0.044
		(0.047)	(0.047)	(0.047)
Yellow Vests: understands		−0.090***	−0.063*	−0.064*
		(0.034)	(0.034)	(0.034)
Yellow Vests: supports		−0.101***	−0.059*	−0.060*
		(0.035)	(0.036)	(0.036)
Yellow Vests: is part		−0.172***	**−0.137** **	−0.138**
		(0.062)	**(0.062)**	(0.062)
Among invalidated	✓	✓	✓	✓
Includes controls		✓	✓	✓
Observations	1,365	1,365	1,365	1,365
R^2	0.055	0.111	0.133	0.136

*p<0.1; **p<0.05; ***p<0.01

The more opposed to the tax, the less beliefs are correctly revised. ▸ Robustness

Beliefs over environmental effectiveness

Info randomly displayed about climate change / air pollution / scientific consensus on effectiveness.

Table: Effect of primings on beliefs about environmental effectiveness

	Environmental effectiveness			
	not "No"			"Yes"
	OLS		*logistic*	*OLS*
	(1)	(2)	(3)	(4)
Info on Environmental Effectiveness (Z_E)	0.043**	0.063***	0.052***	0.059***
	(0.017)	(0.018)	(0.018)	(0.014)
Info on Climate Change (Z_{CC})	0.044*	0.041*	0.043*	0.029
	(0.024)	(0.024)	(0.024)	(0.018)
Info on Particulate Matter (Z_{PM})	0.039	0.029	0.037	0.017
	(0.024)	(0.024)	(0.024)	(0.019)
$Z_{CC} \times Z_{PM}$	−0.040	−0.033	−0.042	−0.005
	(0.035)	(0.034)	(0.033)	(0.027)
Controls: Socio-demographics		✓	✓	✓
Observations	3,002	3,002	3,002	3,002
R^2	0.003	0.047		0.075

*p<0.1; **p<0.05; ***p<0.01

→ *Significant effect, but small (≃ 5 p.p., not significant for air pollution).*

Beliefs over progressivity

Correlation between

- belief that tax is regressive, and
- seeing the information that it is progressive

0.006% !

▸ More on this

Tax & Targeted Dividend

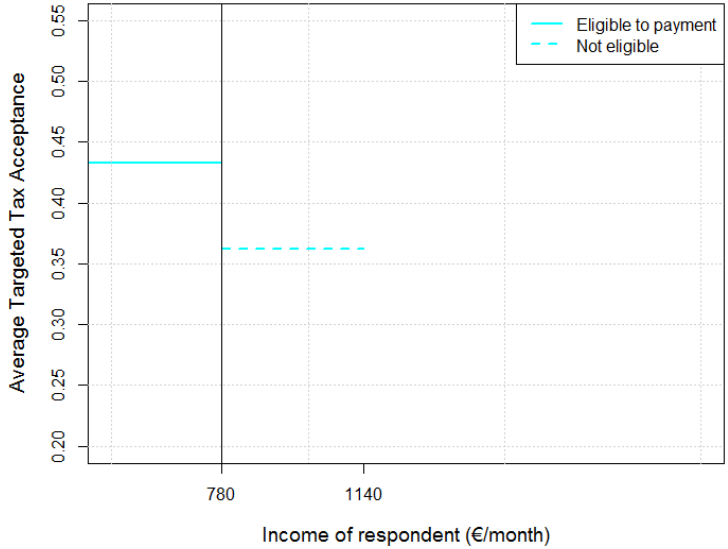
Same policy as before, except that transfers are now targeted to adults below some income threshold:

- Respondents allocated to different thresholds: bottom 20, 30, 40 and 50%
  - Randomly between two thresholds if respondent's income is within them
  - When income close to only one threshold (i.e. percentile < 20 or in $[50; 70]$), allocated to that one
  - When percentile is > 70, threshold determined by spouse's income
  - If no spouse or if both have high incomes, threshold allocated randomly
- Would you lose, win or be unaffected by the reform?
- Would you approve this reform?

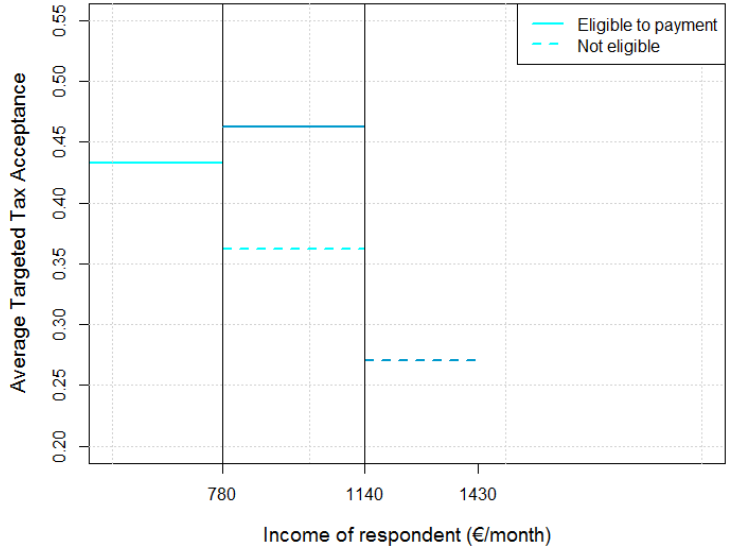
Table: Characteristic of the targeted reform by target of the payment.

Targeted percentiles (c)	≤ 20	≤ 30	≤ 40	≤ 50
Income threshold (€/month)	780	1140	1430	1670
Payment to recipients (€/year)	550	360	270	220
Proportion of respondents	.356	.152	.163	.329
Expected proportion of respondents	*.349*	*.156*	*.156*	*.339*

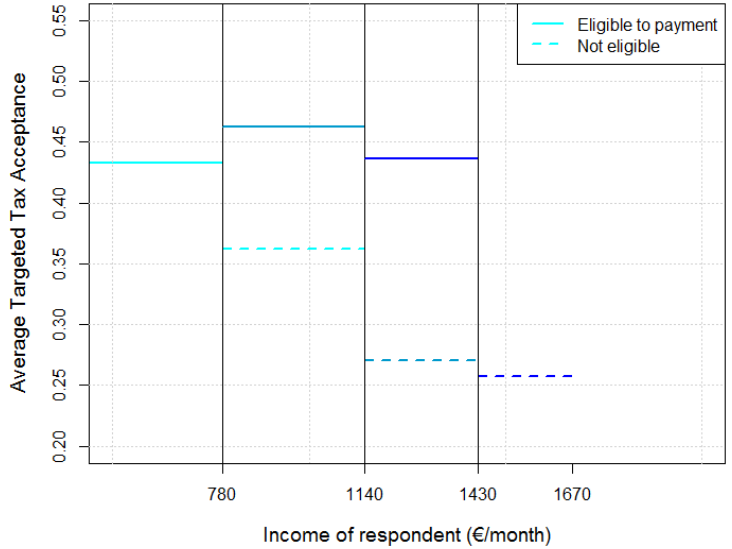
Acceptance of Tax & Targeted Dividend



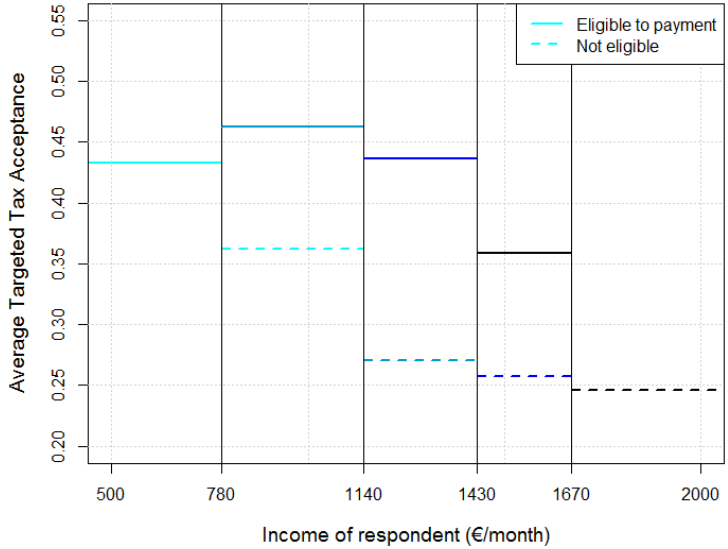
Acceptance of Tax & Targeted Dividend



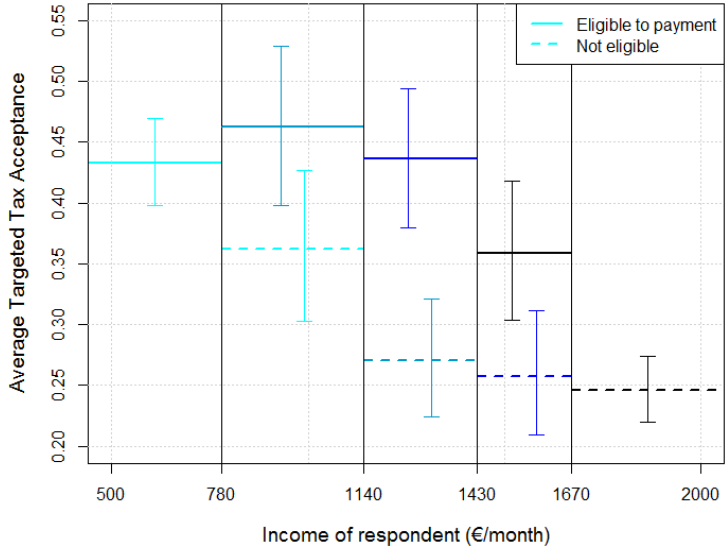
Acceptance of Tax & Targeted Dividend



Acceptance of Tax & Targeted Dividend



Acceptance of Tax & Targeted Dividend



Self-interest – Alternative specifications

To ensure the robustness of our results, we run four other specifications:

- The same 2SLS with relevant control variables
- An OLS regression
- A logit regression
- An alternative 2SLS with RDD on the feedback for the first stage:

$$G_i^F = \alpha_0 + \alpha_1 \widehat{\Gamma}_i + \sum_{j=1}^{J} \alpha_{1,j} \widehat{\gamma}_i^j + \eta_i \tag{1}$$

$$A_i^F = \beta_0 + \beta_1 \widehat{G}_i^F + \sum_{j=1}^{2} \beta_{1,j} \widehat{\gamma}_i^j + \epsilon_i \tag{2}$$

where $\widehat{\gamma}$ is the estimated net gain, and $\widehat{\Gamma}$ the associated binary variable.

Identification assumption: conditional on simulated net gains, being simulated winner affects approval solely through beliefs of winning.

Self-interest – Results

Table: Effect of self-interest on acceptance

	Targeted Acceptance (A^T)				Feedback Acceptance (A^F)	
	IV		*OLS*	*logit*	*IV*	
	(1)	(2)	(3)	(4)	(5)	(6)
Believes does not lose	**0.571*** **	0.567***	**0.443*** **	0.431***	0.517***	0.434***
	(0.092)	(0.092)	**(0.014)**	(0.018)	(0.170)	(0.135)
Initial tax Acceptance (A^I)		0.339***	0.360***	0.342***		0.428***
		(0.033)	(0.026)	(0.034)		(0.055)
Controls: Incomes	✓	✓	✓	✓		✓
Controls: Estimated gain		✓	✓	✓	✓	✓
Controls: Target of the tax	✓	✓	✓	✓		
Controls: Socio-demo, other motives		✓	✓	✓		✓
Observations	3,002	3,002	3,002	3,002	1,968	1,968
R^2	0.033	0.302	0.470		0.044	0.526

*p<0.1; **p<0.05; ***p<0.01

NOTE: (Standard errors). For logit, average marginal effects are reported.

→ LATE around 57 p.p. > ATE around 44 p.p. Very large effect of self-interest!

▸ First stage results

Environmental effectiveness – Main identification strategy

Two types of exogenous information (randomly displayed) may affect respondents' beliefs about environmental effectiveness:

- Information on scientific agreement about carbon tax efficiency (Z_E)
- Information on climate change (Z_{CC})

$\rightarrow$ we can write a 2SLS as follows:

$$E_i = \alpha_0 + \alpha_1 Z_{E,i} + \alpha_2 Z_{CC,i} + \alpha_{\mathbf{C}} \mathbf{C_i} + \eta_i \tag{3}$$

$$A_i^I = \beta_0 + \beta_1 \widehat{E}_i + \beta_{\mathbf{C}} \mathbf{C_i} + \epsilon_i \tag{4}$$

Identification assumption: being displayed information affects approval solely through beliefs over policy's environmental effectiveness.

Environmental effectiveness – Results

Table: Effect of believing in environmental effectiveness on acceptance

	Tax Acceptance (A^I)				Tax Approval ($\dot{A}^I$)	
	IV	*IV*	*OLS*	*logit*	*IV*	*IV*
	(1)	(2)	(3)	(4)	(5)	(6)
Environmental effectiveness: not "No"	**0.479****	0.515	**0.391*****	0.370***		
	(0.230)	(0.344)	**(0.015)**	(0.018)		
Environmental effectiveness: "Yes"					0.505**	0.416**
					(0.242)	(0.168)
Instruments: info E.E. & C.C.	✓	✓			✓	✓
Controls: Socio-demo, other motives	✓		✓	✓	✓	✓
Observations	3,002	3,002	3,002	3,002	3,002	3,002
R^2	0.218	0.001	0.390		0.218	0.161

*p<0.1; **p<0.05; ***p<0.01

NOTE: (Standard errors). For logit, average marginal effects are reported.

→ LATE around 50 p.p. > ATE close to 40 p.p.

▸ First stage results

Progressivity

Table: Effect of beliefs over progressivity on acceptance. Covariates refer either to broad (1-4) or strict (5-6) definitions of the beliefs, where strict dummies do not cover "PNR" or "Unaffected' answers.

	Acceptance (A^P) on *not "No"*				Approval ($\dot{A^P}$) on *"Yes"*	
	OLS			*logit*	*OLS*	
	(1)	(2)	(3)	(4)	(5)	(6)
Progressivity (P)	0.223***	0.237***	0.560***	0.544***	0.228***	0.482***
	(0.038)	(0.044)	(0.023)	(0.019)	(0.041)	(0.023)
Winner (G^P)	0.332***	0.332***			0.303***	
	(0.020)	(0.020)			(0.019)	
Effective (E)	0.258***	0.259***			0.244***	
	(0.023)	(0.023)			(0.020)	
($G^P \times E$)	0.127***	0.127***			0.126***	
	(0.034)	(0.034)			(0.037)	
Interaction: winner ($P \times G^P$)	0.183***	0.183***			0.098**	
	(0.050)	(0.050)			(0.048)	
Interaction: effective ($P \times E$)	0.172***	0.172***			0.281***	
	(0.057)	(0.057)			(0.059)	
Income (I, in k€/month)	0.017	0.018			0.037**	
	(0.022)	(0.022)			(0.018)	
Interaction: income ($P \times I$)		−0.008			−0.019	
		(0.013)			(0.014)	
$P \times G^P \times E$	−0.400***	−0.399***			−0.314***	
	(0.072)	(0.072)			(0.083)	
Controls: Socio-demo, incomes, gains	✓	✓			✓	
Observations	3,002	3,002	3,002	3,002	3,002	3,002
R^2	0.460	0.460	0.162		0.391	0.130

*p<0.1; **p<0.05; ***p<0.01

→ Marginal effect of Progressivity at the sample mean: +27 p.p.

Combined effects

Question: do these effects complement or substitute?

Effects of beliefs on approval (strict definitions):

- Three motives: +97 p.p.
- Self-interest & Progressivity: +64 p.p.
- Self-interest & Effectiveness: +69 p.p.
- Effectiveness & Progressivity: +74 p.p.

Altruistic motives matter!

⇒ Correcting all beliefs (accounting for the 30% of objective losers): approval rate would go up to 90%!

Willingness to pay

Our results are also indicative of a WTP for an effective policy:

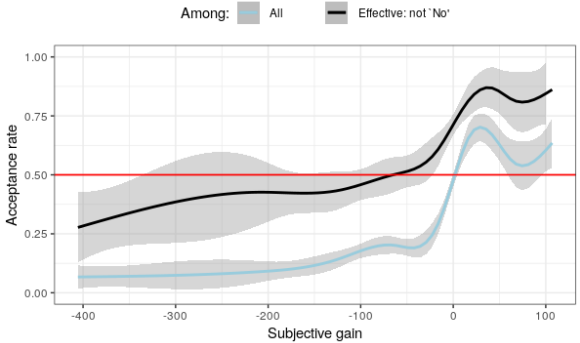


Figure: Acceptance rate by subjective gain, informing on the willingness to pay for climate mitigation.

Results suggest a WTP of 60€ per c.u. (i.e. about 100€ per household) in the typical range of the literature (Jenkins, 2014; Streimikiene et al., 2019).

Key results

1. French people would largely reject a carbon tax policy with uniform lump-sum transfer
2. Their perceptions about the properties of the scheme are biased:
   - they over-estimate the negative impact on their purchasing power;
   - they do not think it is environmentally effective;
   - they wrongly perceive it as regressive.
3. These biases are formed endogenously from their initial attitude:
   - people give little weight to new information;
   - they tend to trust more negative news about the tax than positive ones;
   - the more they oppose, the more likely such a behavior;
   - even more true among more educated people.
4. Nonetheless: if one could convince them, the scheme would reach majority acceptance.
   - High causal effect (LATE) of beliefs about self-interest and environmental effectiveness on acceptance;
   - Considering ATE: high complementarity between motives, especially altruistic ones.

Discussion

Two critical challenges for the future:

- In the short run:
  - Carbon taxation unlikely to be extended
  - Need for alternative policy instruments, trading-off cost-effectiveness for public support

  → Which ones? See our companion paper ▸ Main results
- In the long run:
  - Need to restore trust in governement and institutions
  - Only then can we have a carbon tax

  → How to? More transparency, more redistribution, deliberation?

  More to learn from the Yellow Vests movement! ▸ Who are the Yellow Vests?

Discussion

Two critical challenges for the future:

- In the short run:
  - Carbon taxation unlikely to be extended
  - Need for alternative policy instruments, trading-off cost-effectiveness for public support

  → Which ones? See our companion paper ▸ Main results

- In the long run:
  - Need to restore trust in governement and institutions
  - Only then can we have a carbon tax

  → How to? More transparency, more redistribution, deliberation?

  More to learn from the Yellow Vests movement! ▸ Who are the Yellow Vests?

Thank you!

6 Additional material – Companion paper

7 Additional material – Appendix

Knowledge about climate change

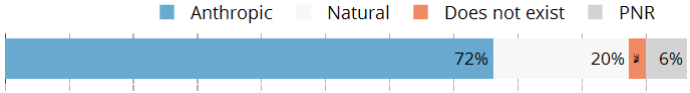


Figure: Perceived cause of climate change.

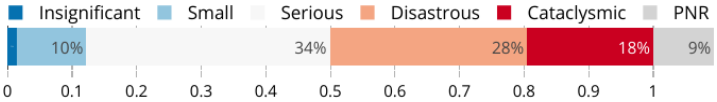


Figure: Perceived gravity of climate change.

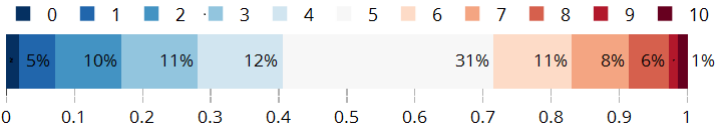
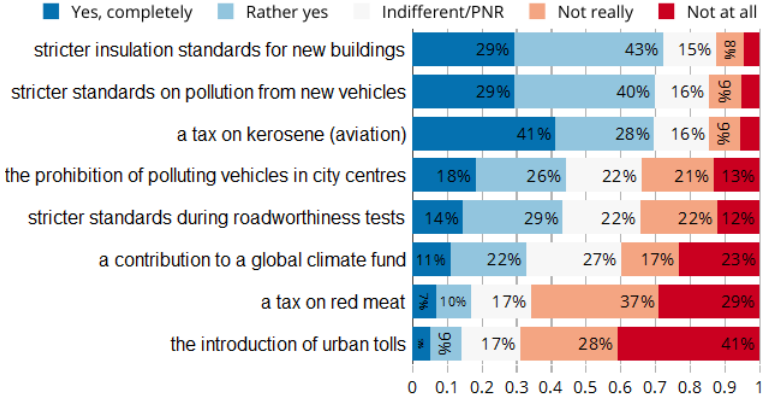


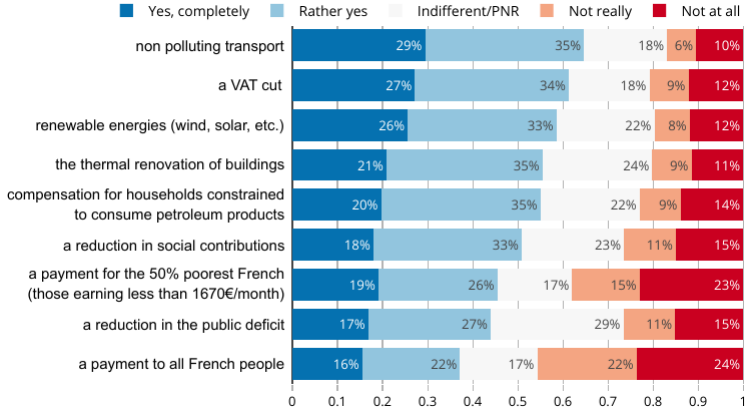
Figure: Perceived GHG emission p.c. required in 2050 to limit global warming to +2°C (in tCO_2eq/yr), given that it is now 10.

Preferred climate policies



Go back

Preferred revenue-recycling



Go back

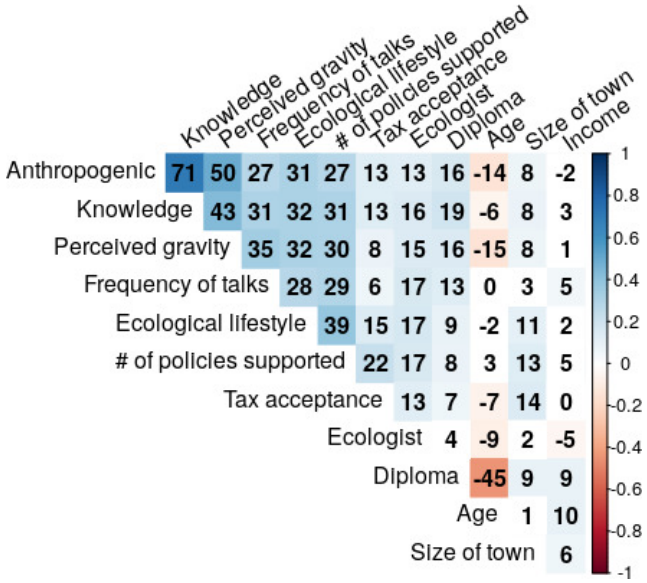
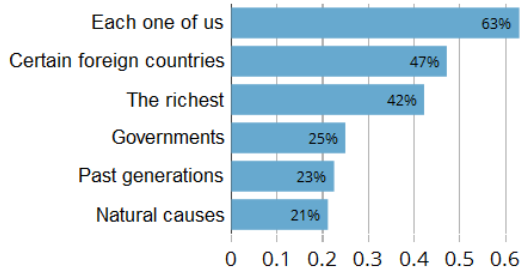


Figure: Correlations between attitudes over climate change, climate policies and socio-demographics (in %).

Attitudes over Climate Change

Figure: Entities perceived responsible for climate change.



- 65% are "willing to adopt an ecological lifestyle (i.e. eat little red meat and make sure to use almost no gasoline, diesel nor kerosene)", assuming that "all states in the world agree to firmly fight climate change, notably through a transition to renewable energy, by making the richest contribute, and imagining that France would expand the supply of non-polluting transport very widely" (17% "No")
- 82% would be willing to change their lifestyle under at least one of the three conditions proposed: sufficient financial resources, an alignment of policies to this goal, or an adjustment of others' behavior (about 45% each)

Perceptions on Tax & Dividend

Figure: Winners

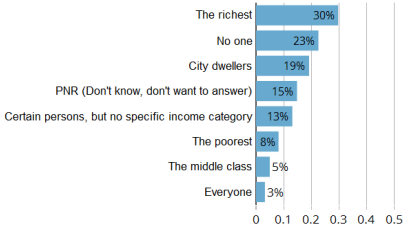


Figure: Benefits

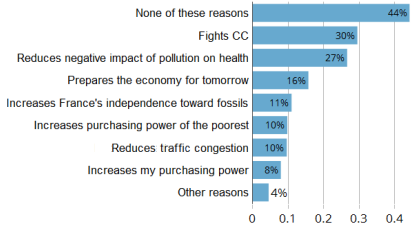


Figure: Losers

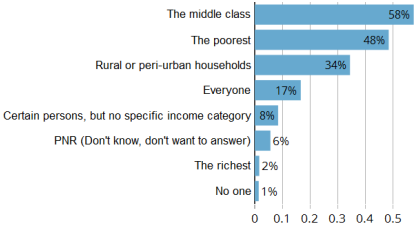


Figure: Problems

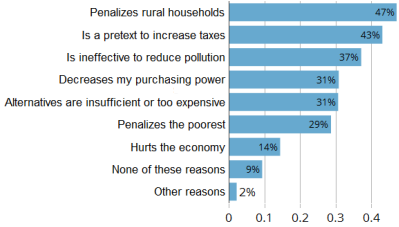


Table: Positioning towards Yellow Vests, per category (1/2)

	Opposed	Understands	Supports	Is part	PNR
Extreme-left (2%)	6%	26%	51%	12%	5%
Left (20%)	17%	36%	36%	5%	7%
Center (13%)	49%	30%	15%	2%	6%
Right (16%)	40%	32%	20%	3%	6%
Extreme-right (9%)	11%	28%	47%	10%	5%
Indeterminate (40%)	19%	32%	30%	4%	13%
Liberal (5%)	48%	26%	18%	2%	6%
Conservative (2%)	22%	28%	30%	10%	11%
Humanist (11%)	21%	35%	29%	5%	10%
Patriot (8%)	21%	27%	39%	7%	6%
Apolitical (21%)	21%	31%	32%	4%	12%
Ecologist (15%)	17%	39%	27%	5%	12%
Rural (21%)	20%	31%	34%	6%	9%
<20k (17%)	24%	28%	34%	6%	9%
20-100k (14%)	22%	33%	32%	4%	9%
>100k (31%)	29%	34%	26%	3%	8%
Paris (17%)	28%	33%	25%	4%	11%
No diploma or *Brevet* (30%)	21%	29%	34%	5%	10%
CAP or *BEP* (24%)	23%	28%	36%	6%	7%
Baccalauréat (17%)	22%	35%	29%	4%	11%
Higher (29%)	32%	8%	36%	21%	3%
Average	*25%*	*32%*	*30%*	*5%*	*9%*

Go back

Table: Positioning towards Yellow Vests, per category (2/2)

	Opposed	Understands	Supports	Is part	PNR
Age: 18–24 (12%)	23%	34%	27%	4%	12%
Age: 25–34 (15%)	21%	33%	28%	7%	11%
Age: 35–49 (24%)	25%	32%	29%	5%	9%
Age: 50–64 (24%)	21%	32%	36%	4%	7%
Age: $\geq$ 65 (25%)	32%	30%	28%	3%	7%
Income decile: 1	25%	33%	26%	3%	14%
Income decile: 2	18%	31%	35%	5%	11%
Income decile: 3	17%	31%	32%	7%	12%
Income decile: 4	15%	33%	37%	6%	9%
Income decile: 5	21%	29%	36%	5%	8%
Income decile: 6	26%	33%	29%	6%	7%
Income decile: 7	25%	36%	28%	4%	7%
Income decile: 8	31%	31%	28%	3%	8%
Income decile: 9	39%	32%	20%	3%	6%
Income decile: 10	47%	29%	15%	3%	6%
Female (52%)	21%	34%	29%	5%	12%
Male (48%)	29%	30%	31%	5%	6%
Average	*25%*	*32%*	*30%*	*5%*	*9%*

Go back

Willingness to pay

Our results are also indicative of a WTP for an effective policy:

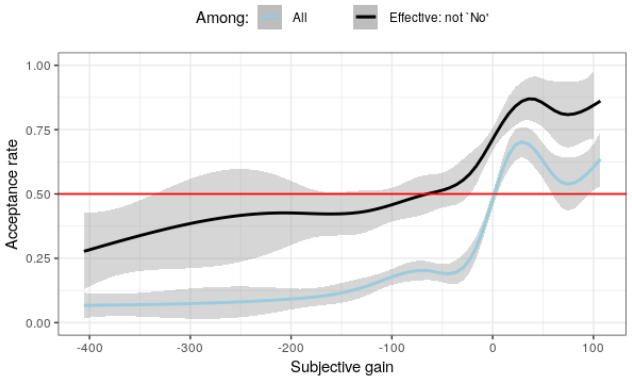


Figure: Acceptance rate by subjective gain, informing on the willingness to pay for climate mitigation.

Results suggest a WTP of 60€ per c.u. (i.e. about 100€ per household) in the typical range of the literature (Jenkins, 2014; Streimikiene et al., 2019).

Sample characteristics: quotas stratas

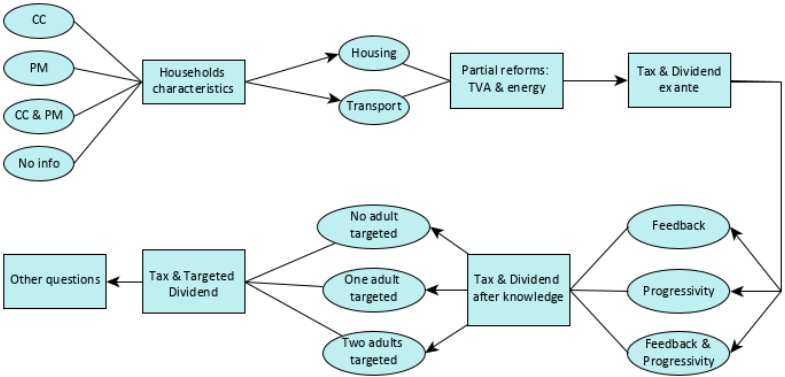
	Population	Sample
gender		
woman	*0.52*	0.53
man	*0.48*	0.47
age		
18-24	*0.12*	0.11
25-34	*0.15*	0.11
35-49	*0.24*	0.24
50-64	*0.24*	0.26
>65	*0.25*	0.27
profession		
farmer	*0.01*	0.01
independent	*0.03*	0.04
executive	*0.09*	0.09
intermediate	*0.14*	0.14
employee	*0.15*	0.16
worker	*0.12*	0.13
retired	*0.33*	0.33
inactive	*0.12*	0.11

	Population	Sample
education		
No diploma or *Brevet*	*0.30*	0.24
CAP or *BEP*	*0.25*	0.26
Bac	*0.17*	0.18
Higher	*0.29*	0.31
size of town		
rural	*0.22*	0.24
<20k	*0.17*	0.18
20-99k	*0.14*	0.13
>100k	*0.31*	0.29
Paris area	*0.16*	0.15
region		
IDF	*0.19*	0.17
Nord	*0.09*	0.10
Est	*0.13*	0.12
SO	*0.09*	0.09
Centre	*0.10*	0.12
Ouest	*0.10*	0.10
Occ	*0.09*	0.09
ARA	*0.12*	0.13
PACA	*0.09*	0.09

Sample characteristics: households' characteristics

	Population	Sample
Household composition (mean)		
Household size	*2.36*	2.38
Number of adults	*2.03*	1.93
c.u.	*1.60*	1.61
Energy source (share)		
Gas	*0.42*	0.36
Fuel	*0.12*	0.09
Accomodation surface (m^2)		
mean	*97*	96
p25	*69*	66
p50	*90*	90
p75	*120*	115
Distance travelled by car (km/year)		
mean	*13,735*	15,328
p25	*4,000*	4,000
p50	*10,899*	10,000
p75	*20,000*	20,000
Fuel economy (L/100 km)		
mean	*6.39*	7.25
p25	*6*	5
p50	*6.5*	6
p75	*7.5*	7

Survey diagram



Go back

Estimation of increase in housing energy expenditures

Table: Determinants of housing energy expenditures

	Increase in housing energy expenditures (€/year)		
	(1)	(2)	(3)
Constant	-55.51^{***}		-0.634
	(1.237)		(1.489)
Housing energy: Gas	124.6^{***}		1.173
	(1.037)		(2.323)
Housing energy: Fuel oil	221.1^{***}	129.8^{***}	130.4^{***}
	(1.719)	(3.752)	(4.002)
Accommodation size (m^2)	0.652^{***}		0.024
	(0.012)		(0.015)
Accommodation size × Gas		1.425^{***}	1.397^{***}
		(0.007)	(0.024)
Accommodation size × Fuel oil		0.945^{***}	0.922^{***}
		(0.029)	(0.032)
Observations	26,729	26,729	26,729
R^2	0.545	0.716	0.599
Error rate	0.166	0.155	0.155
Note:			$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Go back

Prediction's precision

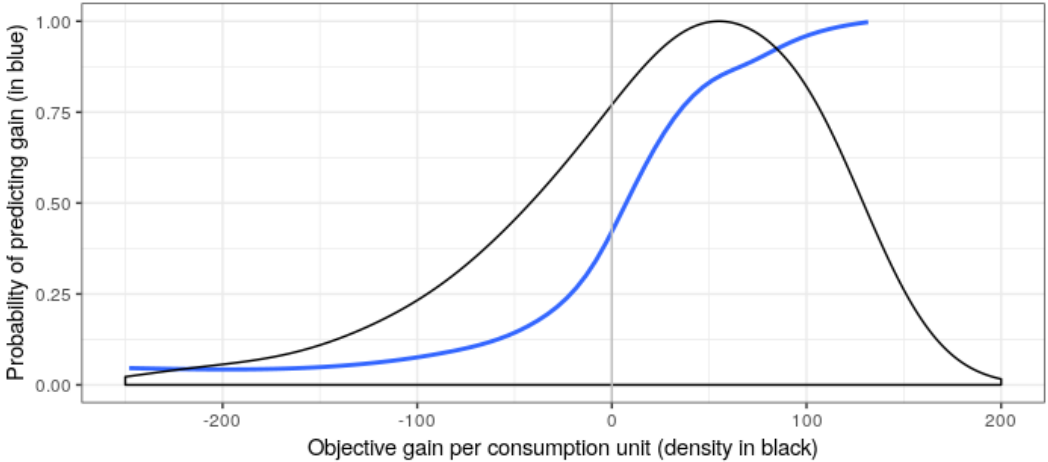


Figure: Probability that our estimation of net gains correctly predicts the winning category.

Go back

First stage self-interest

Table: First stage regressions results for self-interest

	Believes does not lose			
	Targeted tax (G^T)		After feedback (G^F)	
	(1)	(2)	(5)	(6)
Transfer to respondent (T_1)	0.268***	0.227***		
	(0.028)	(0.027)		
Transfer to spouse (T_2)	0.180***	0.174***		
	(0.031)	(0.030)		
$T_1 \times T_2$	−0.190***	−0.161***		
	(0.038)	(0.037)		
Initial tax Acceptance (A^I)		0.163***		0.333***
		(0.033)		(0.038)
Simulated winner ($\widehat{\Gamma}$)			0.217***	0.210***
			(0.036)	(0.035)
Controls: Incomes	✓	✓		✓
Controls: Estimated gain		✓	✓	✓
Controls: Target of the tax, single	✓	✓		
Controls: Socio-demo, other motives		✓		✓
Effective F-Statistic (Montiel & Pflueger, 2013)	44.093	40.834	37.966	57.866
Observations	3,002	3,002	1,968	1,968
R^2	0.082	0.177	0.131	0.319

* p<0.1; ** p<0.05; *** p<0.01

Go back

First stage environmental effectiveness

Table: First stage regressions results for environmental effectiveness

	Environmental effectiveness		
	not "No"		"Yes"
	(1)	(2)	(5,6)
Info on Environmental Effectiveness (Z_E)	0.062^{***}	0.043^{**}	0.059^{***}
	(0.017)	(0.017)	(0.014)
Info on Climate Change (Z_{CC})	0.030^{*}	0.024	0.028^{**}
	(0.017)	(0.017)	(0.013)
Controls: Socio-demo, other motives, incomes, estimated gains	✓		✓
Effective F-Statistic (Montiel & Pflueger, 2013)	5.866	2.523	11.145
Observations	3,002	3,002	3,002
R^2	0.121	0.003	0.123

*p<0.1; **p<0.05; ***p<0.01

▸ Go back

Evidence of motivated reasoning – robustness heterogeneous priors

Table: Asymmetric updating of winning category (complementary results). Go back

	Correct updating (U)	
Winner, before feedback ($\dot{G}$)	0.646***	0.551***
	(0.080)	(0.083)
Initial tax: PNR (I don't know)	0.163***	0.179***
	(0.031)	(0.032)
Initial tax: Approves	0.158***	**0.176*** **
	(0.046)	**(0.046)**
Subjective gain (g)		**0.0004** **
		(0.0002)
Subjective gain: unaffected ($g = 0$)		−0.127***
		(0.033)
Bias about gain ($g - \hat{\gamma}$)		−0.00005
		(0.0001)
Diploma (1 to 4)	0.016	0.014
	(0.013)	(0.013)
Retired	0.146*	0.130*
	(0.079)	(0.079)
Active	0.175***	0.166***
	(0.054)	(0.054)
Student	0.234***	0.224***
	(0.075)	(0.075)
Yellow Vests: PNR	−0.043	−0.045
	(0.047)	(0.047)
Yellow Vests: understands	−0.063*	−0.065*
	(0.034)	(0.034)
Yellow Vests: supports	−0.059*	−0.063*
	(0.036)	(0.036)
Yellow Vests: is part	−0.137**	**−0.141** **
	(0.062)	**(0.061)**
Among invalidated	✓	✓
Includes controls	✓	✓
Observations	1,365	1,365

Bias persistence over progressivity

It seems we do not convince people at all here ! How come?

$\Rightarrow$ Evidences of psychological reactance from biased people (boomerang effect, see Hovland 1953):

Table: Effect of information on perceived progressivity

	Progressivity: not No (P)		
	(1)	(2)	(3)
Constant	0.419***	0.435***	0.386**
	(0.022)	(0.033)	(0.186)
Information on progressivity (Z_P)	−0.021	0.050	0.014
	(0.027)	(0.040)	(0.239)
Large bias ($\left\|\widehat{\gamma} - g\right\| > 110$)		−0.028	−0.019
		(0.045)	(0.045)
Interaction $Z_P \times (\left\|\widehat{\gamma} - g\right\| > 110)$		−0.130**	−0.126**
		(0.055)	(0.055)
Controls: Socio-demo, politics			✓
Observations	1,444	1,444	1,444
R^2	0.0004	0.018	0.100

*p<0.1; **p<0.05; ***p<0.01

go back

Subjective elasticities

→ Tempting interpretation: people perceive aggregate consumption as inelastic (Kallbekken & Sælen, 2011; Carattini et al, 2018)

Table: Effect of subjective elasticities on perceived environmental effectiveness

	Environmental effectiveness: not 'No'			
	(1)	(2)	(3)	(4)
Price elasticity: Housing	−0.062*		−0.055*	
	(0.032)		(0.032)	
Price elasticity: Transports		−0.056*		−0.060**
		(0.030)		(0.030)
Controls: Socio-demographics, energy			✓	✓
Observations	1,501	1,501	1,501	1,501
R^2	0.003	0.002	0.089	0.090
Note:				*p<0.1; **p<0.05; ***p<0.01

Effect too small to explain the beliefs.

Go back

Asymmetric beliefs' revision

Go back

Table: Share of respondents with new beliefs aligned with feedback

	Aligned with feedback	
	winners (75.8%)	losers (24.2%)
Initial belief: win (14.0%)	78.8% [73.2% ; 83.4%]	81.5% [65.0% ; 91.3%]
Initial belief: unaffected (21.7%)	21.6% [17.6% ; 26.2%]	44.9% [33.5% ; 56.8%]
Initial belief: lose (64.3%)	12.2% [10.3% ; 14.5%]	93.9% [90.9% ; 96.0%]
All (100%)	25.1% [23.0% ; 27.3%]	85.7% [82.2% ; 88.7%]

NOTE: The 95% confidence intervals for binomial probabilities is given in brackets.