

Paying enough taxes already? Testing the acceptability of carbon taxes with survey data

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Outline

- 1 Economic motivation
- 2 Methodology
- 3 Econometric analysis
- 4 Conclusions

Research question

- The rhetoric: stabilizing greenhouse gas concentrations at levels that would prevent dangerous interferences with the climate (e.g. + 2°C)
- The practice: current mitigation efforts insufficient, effective instruments (e.g. carbon taxes) barely implemented
- Explaining the gap: looking at public acceptability
- The focus: Switzerland
 - Semi-direct democracy
 - History of energy & climate policy
 - Energy market



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Determinants of acceptability

Identifying the determinants of acceptability w.r.t. two axis: individual characteristics and policy features

- Individual characteristics
 - Socio-economic characteristics
 - Social preferences
- Policy features
 - Perceived needling
 - Labeling

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1 Individual characteristics

1 Socio-economic characteristics

- ± Income
- + Education
- ± Location: urban (+) vs. rural (-)
- Age
- Carbon footprint (\approx cars)
- ± Gender

2 Social preferences

- ± Trust in other people
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2 Policy features

- ± Revenue recycling
- ± Labelling

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The survey

- Sample ≈300 individuals interviewed in Geneva at the end of 2012
- Sub-samples 'Carbon tax' (CT) label vs. 'climate contribution' (CC) label
- Questions Ecological behavior, policy & socio-economic characteristics
- Composition Roughly representative of Geneva population



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Carbon tax effectiveness

CT/CC of 120 CHF/tCO₂ ⇒ $P_{gasoline}$ ↑15% & $P_{heating-fuels}$ ↑30%

Question and answers				N
10. Do you think that a CT/CC would affect your energy consumption?				
Less consumption	56%			338
No change	37%			338
More consumption	7%			338
11. Do you think that a CT/CC could achieve energy consumption reductions for Switzerland?				
The tax is effective	48%			338
12. What are the advantages of a CT/CC that come to your mind?				
	For the respondent only	Only for the society	For both	
a. Better air quality	10%	26%	20%	320
b. Less congestion	7%	14%	6%	320
c. Health improvement	16%	11%	15%	320
d. Less road accidents	5%	10%	3%	320

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Drawbacks from a carbon tax

Question and answers		N
13. What drawbacks do you see for your household linked with a CT/CC?*		
a. Less purchasing power	67%	338
b. Less comfort	34%	338
c. Fear of losing the job	5%	338
d. No drawbacks	22%	338
14. What drawbacks do you see for the Swiss society linked with a CT/CC?*		
a. Less purchasing power	69%	338
b. Loss of competitiveness	20%	338
c. Distributional effects on poors	46%	338
d. Rise in unemployment	11%	338
e. Inequality city-countryside	25%	338
f. No drawbacks	11%	338

*Multiple answers are possible.

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Carbon tax acceptability

Question and answers				N
15. Despite these drawbacks (from questions 13 and 14), would you accept a CT/CC ?				
Acceptability despite drawbacks	49%			338
17. Rank the following ways of revenue recycling (best to worst)				
	First	Second	Third	
A. Redistribution towards most affected households*	26%	32%	20%	313
B. Tax rebate for households and firms	11%	34%	35%	313
C. Financing environmental projects, renewables	60%	21%	11%	313
18. Would you accept a CT\CC if revenues would be used as chosen in question 17 (and 16)?				
Acceptability conditional on revenue recycling	64%			337

*Defined by question 16.

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Econometric specification

Estimating the determinants of CT acceptability (Q15 & Q17) with Probit:

$$\text{Prob}(\text{Acceptability} = 1|x) = F(x, \beta) \quad (1)$$

Marginal effects (in general):

$$ME = \frac{\partial F(.)}{\partial x} \quad (2)$$

i.e. multiplying β for the normal density: $f(x' \hat{\beta}) \hat{\beta} = \hat{f} \hat{\beta}$

Partial effects for dummies d :

$$ME = \text{Prob}(\text{Acceptability} = 1|\bar{x}_{(d)}, d = 1) - \text{Prob}(\text{Acceptability} = 1|\bar{x}_{(d)}, d = 0) \quad (3)$$

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Question 15: CT/CC acceptability

Question 15	Coeff.	(S.E.)	Coeff.	(SE)	Coeff.	(SE)
Number of cars	-0.073**	(0.029)	-0.053*	(0.032)	-0.061*	(0.033)
Green member	0.275***	(0.074)	0.205**	(0.094)	0.191**	(0.094)
Years of education	0.028**	(0.015)	0.014	(0.016)	0.012	(0.017)
Climate: high concern			0.161***	(0.061)	0.136**	(0.067)
Energy consumption: no attention			-0.334***	(0.126)	-0.375***	(0.100)
Trust in other people in country			0.107*	(0.062)	0.077	(0.066)
Trust in the government			0.210*	(0.111)	0.118	(0.134)
Government intervention: information			0.094	(0.070)	0.124*	(0.071)
Government intervention: taxation			0.269***	(0.062)	0.222***	(0.069)
CT: effect on own behavior					0.174**	(0.072)
CT: crowding-out					-0.053	(0.124)
CT: effectiveness					0.284***	(0.068)
CT: co-benefits					0.028*	(0.017)
CT: less purchasing power					-0.165**	(0.076)
CT: fear of losing job					-0.258*	(0.142)
CT: distributional effects on poors					-0.104	(0.065)
<i>Pseudo R²</i>	0.05		0.17		0.27	
<i>Log pseudolikelihood</i>	-214.504		-185.982		-163.533	
<i>N</i>	327		325		325	

Note: Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. In all columns $p > \chi^2 = 0.0000$.

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Empirical findings (1): acceptability (1)

● Individual characteristics

● Socio-economic characteristics

● Personal characteristics

● Family characteristics

● Social preferences

● Attitudes

● Personality

● Ability

● Health

● Education

● Perceived effort

● The Overtax: how is perceived, why pay of being the job?

● Compensation, employment decisions and labor force status

● Labor law

Empirical findings (1): acceptability (1)

1 Individual characteristics

1 Socio-economic characteristics

- + Education ✓
- Carbon footprint ✓
- = Income, age, gender, location ✗

2 Social preferences

- + Trust in other people, in the government ✓
- + Concern for climate change, green
- + For public intervention (information, taxation)

2 Policy

- + Perceived effectiveness
- Drawbacks: loss of purchasing power, fear of losing the job
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- + Education ✓
- Carbon footprint ✓
- = Income, age, gender, location ✗

2 Social preferences

- + Trust in other people, in the government ✓
- + Concern for climate change, green
- + For public intervention (information, taxation)

2 Policy

- + Perceived effectiveness
- Drawbacks: loss of purchasing power, fear of losing the job
- = Competitiveness, employment effects (and distributional effects)
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- ▶ Some individual characteristics affect acceptability (many do not)
- ▶ Perceived effectiveness (including co-benefits) is crucial
- ▶ Concern for income and losing the job, not for competitiveness *per se*

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Questions 17 vs 15: recycling and acceptability

Question 18 Question 15 = 'No'	Coeff.	(S.E.)
Gender (male)	0.096	(0.092)
Unemployed	0.075	(0.264)
Homeowner	-0.061	(0.114)
Number of cars	0.074	(0.053)
Green member	-0.026	(0.175)
Age	0.002	(0.003)
Years of education	0.036	(0.023)
Trust in the government	-0.255*	(0.152)
Government intervention: information	0.201**	(0.085)
Government intervention: taxation	0.104	(0.114)
CT/CC: effectiveness	0.282***	(0.091)
CT/CC: co-benefits	0.039	(0.027)
CT/CC: drawbacks (fear of losing job)	-0.237**	(0.098)
Revenue recycling: social cushioning	0.069	(0.131)
Revenue recycling: environmental projects	0.220*	(0.117)
Labeling (climate contribution)	0.170*	(0.091)
<i>Pseudo R</i> ²	0.17	
<i>Log pseudolikelihood</i>	-86.154	
<i>N</i>	152	

Note: Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
 $p > \chi^2 = 0.0010$.

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Empirical findings (2): earmarking and acceptability (1)

● Individual characteristics

● Socio-economic characteristics

● Social preferences

● Policy

● Proposed effectiveness

● Economic base of public budget

● Revenue recycling and environmental goods social valuation

● Conclusions

Empirical findings (2): earmarking and acceptability (1)

1 Individual characteristics

1 Socio-economic characteristics

- + All variables statistically non-significant

2 Social preferences

- Trust in the government
- + For public intervention (information, taxation)

2 Policy

- + Perceived effectiveness
- Drawbacks: fear of losing the job
- + Revenue recycling: environmental projects, social cushioning ✓
- + Labelling ✓

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Empirical findings (2): earmarking and acceptability (2)

► Policy design does matter

► Earmarking

► Revenue recycling best with environmental projects

► Labeling

Empirical findings (2): earmarking and acceptability (2)

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Concluding remarks

Carbon taxes may be acceptable provided that design is appropriate:

- Earmarking alone improves acceptability
- The "best" way of recycling revenue is through environmental projects
- Trade-off between impacts: environmental effects matter the most
- Little role for competitiveness effects vs. political arguments
- Distributional effects a concern but with little impact on acceptability
- Social cushioning may be delinked to the tax

Caveats and future research 

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The Swiss energy & climate policy at a glance

Milestones:

- 1998 Switzerland signs the Kyoto Protocol
- 2000 The population rejects three energy-tax proposals
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- 2008 The carbon tax on heating fuels is introduced
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The survey

Variable	Mean	(Std. Dev.)	Min.	Max.	N
Gender (male)	0.519	(0.5)	0	1	337
Age	36.801	(14.06)	17	85	337
Years of education	15.779	(1.933)	11	18	331
Categories of income	4.029	(1.816)	1	7	239
Labor market (active)	0.948	(0.220)	0	1	333
Number of adults in the household	2.302	(1.202)	0	6	338
Number of kids in the household	0.339	(0.687)	0	4	292
Homeowner	0.223	(0.417)	0	1	337
Number of cars	1.281	(0.956)	0	4	338



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Selection of questions on energy behavior

Question and answers		N
1. To what extent do you pay attention to your energy consumption?		
In a very large extent	20%	337
In a large extent	53%	337
In a small extent	22%	337
No attention at all	5%	337
3. How much should the price of the following energy vectors change to lead you to reduce your consumption of 10%?		
a. Gasoline	23.40%	292
b. Electricity	27.68%	297
c. Heating fuels	24.59%	288
6. Should the Swiss government intervene to reduce energy consumption?*		
a. Informing and raising awareness	73%	337
b. Subsidizing public transports	61%	338
c. Taxing CO ₂	35%	338

*Multiple answers are possible. Selection of answers.

Selection of questions on energy behavior

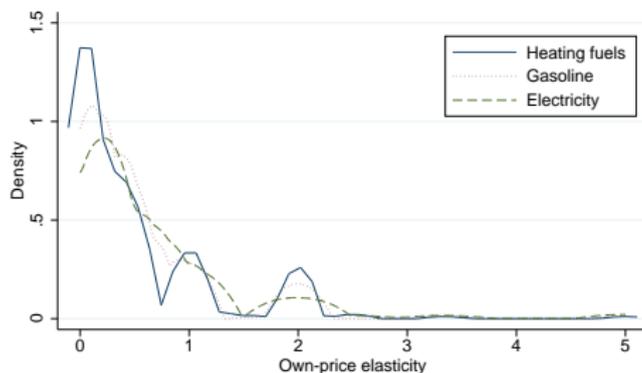
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Estimates of price elasticity

Question: How much should the price of the following energy vectors change to lead you to reduce your energy consumption of 10%?

Figure 1 : Kernel distribution of price elasticity (absolute value)

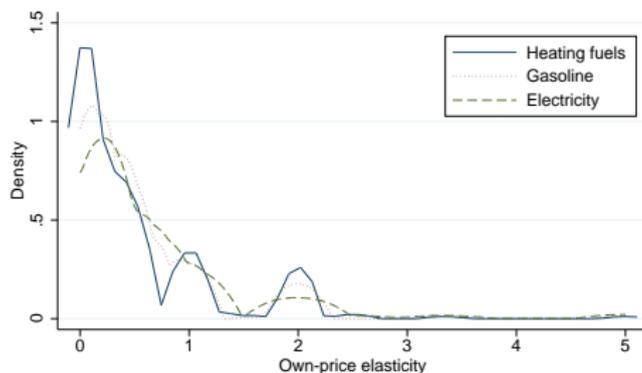


- ▶ Average elasticity for gasoline = 0.5 (≈ Baranzini & Weber 2013)
- ▶ Average elasticity for electricity = 0.6 (≈ Filippini 2011)
- ▶ Average elasticity for heating fuels = 0.6

Estimates of price elasticity

Question: How much should the price of the following energy vectors change to lead you to reduce your energy consumption of 10%?

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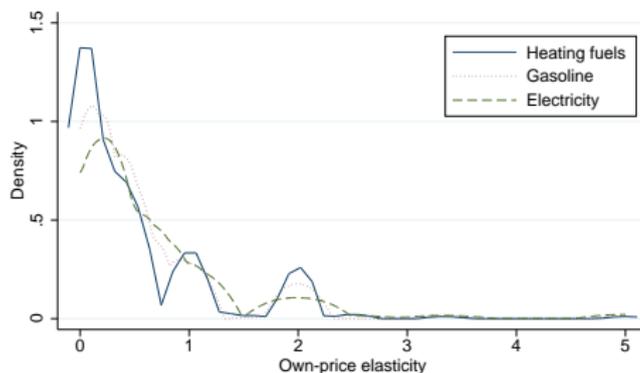


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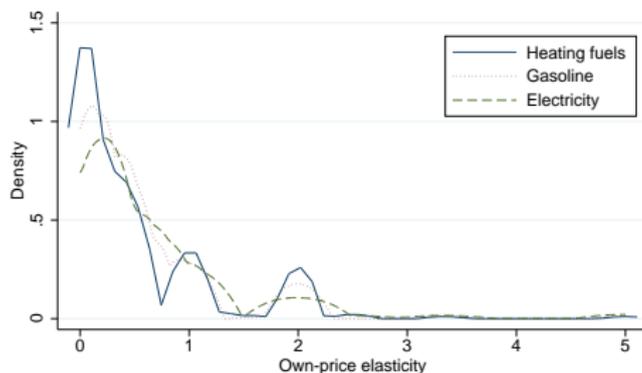


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Questions on future energy prices (1)

Question and answers		N
7. In the next 10 years, do you expect the price of the following energy vectors to change of		
a Gasoline	27%	331
b Electricity	16%	334
c Heating fuels	18%	335
9. What public policies would you like to see implemented to deal with energy price increases, if any?*		
a. Awareness-raising campaigns	63%	338
b. Subsidies for all households	18%	338
c. Subsidies for poor households	38%	338
d. Subsidies for rural households	10%	338
e. Tax rebates for all households	17%	338
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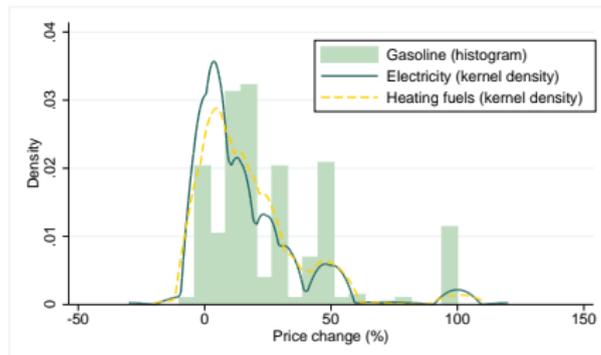
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Questions on future energy prices (2)

Question: In the next 10 years, do you expect the price of the following energy vectors to change of?

Figure 2 : Estimates of expected future energy prices

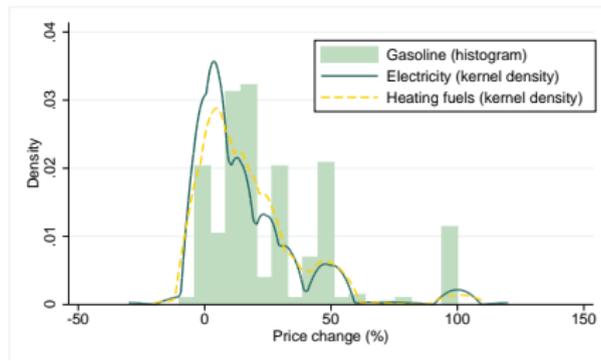


- ▶ Larger for gasoline because of outliers, less zeroes (scarcity)
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- ▶ Roughly in line with the literature (10), but nominal prices (10)

Questions on future energy prices (2)

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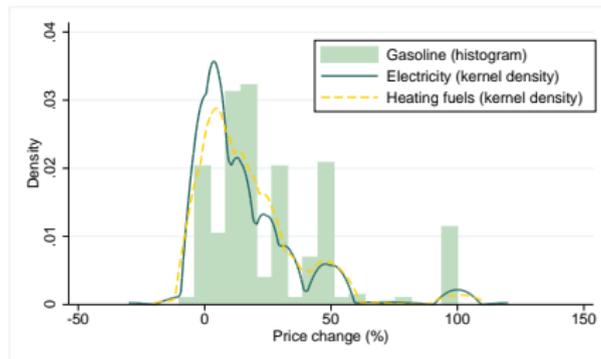


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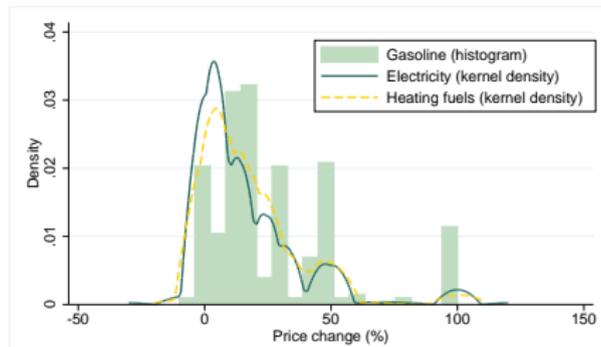


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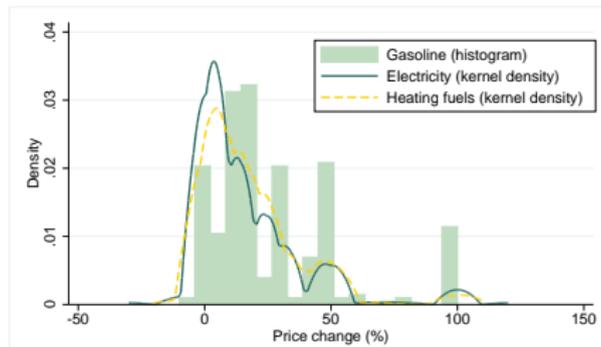


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Future energy prices: a literature comparison

Estimates of expected heating oil price increases with a horizon of 20 years from Alberini et al. (2013):

Decrease	0.42
Increase by 0–10%	3.37
Increase by 10–50%	40.21
Increase by 50–100%	25.26
Increase by 100–200%	12.63
Increase by over 200%	6.32
Don't know/no idea	11.79

Figure 3 : From Alberini, Banfi and Ramseier (2013): 'Energy Efficiency Investments in the Home: Swiss Homeowners and Expectations about Future Energy Prices', *The Energy Journal*



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Future energy prices: real vs. nominal

Do consumers really expect a price increase in real energy prices?

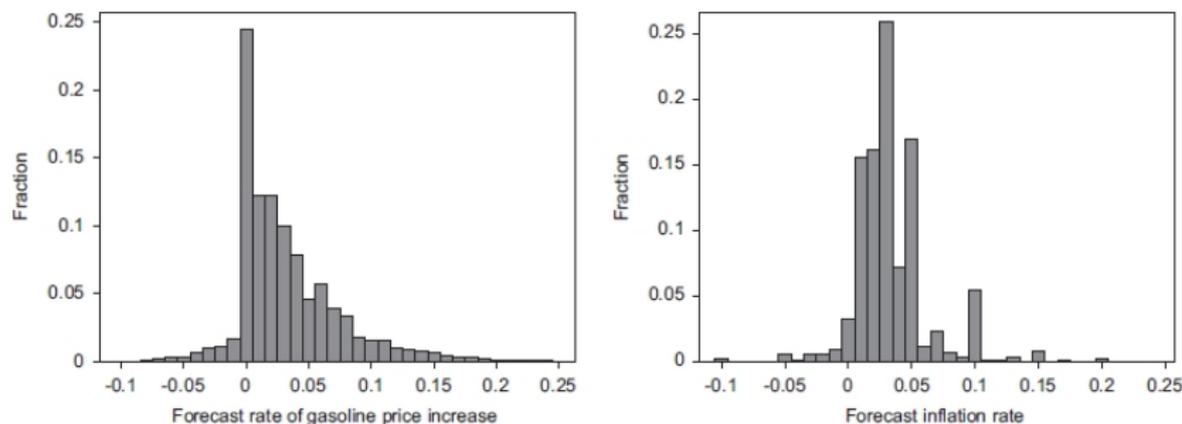


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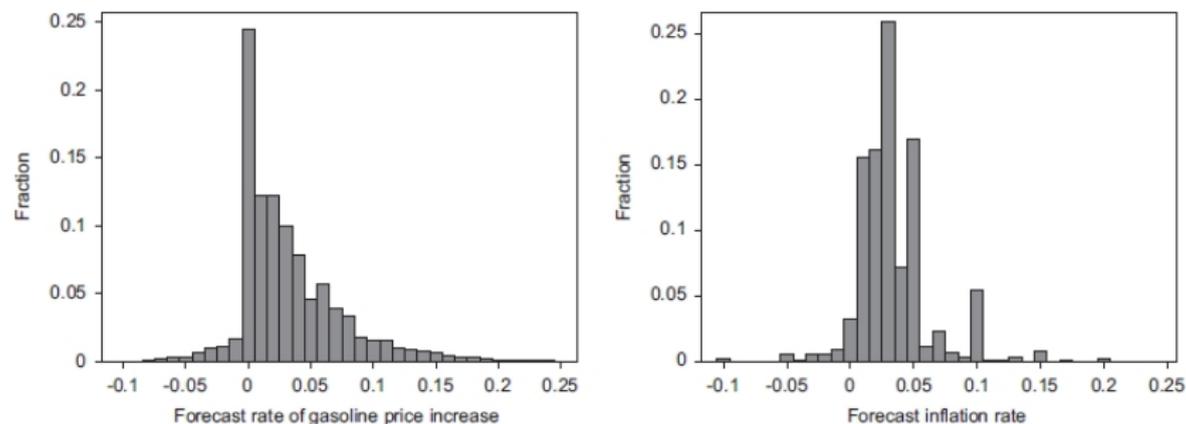


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Carbon tax acceptability

Question and answers (frequency in percentage)								N
15. Despite these drawbacks (from questions 13 and 14), would you accept a CT/CC ?								
Acceptability despite drawbacks							49%	338
17. Rank the following ways of revenue recycling (best to worst)								
				First	Second	Third		
A. Redistribution towards most affected households*				26%	32%	20%	313	
B. Tax rebate for households and firms				11%	34%	35%	313	
C. Financing environmental projects, renewables				60%	21%	11%	313	
18. Would you accept a CT\CC if revenues would be used as chosen in question 17 (and 16)?								
Acceptability conditional on revenue recycling							64%	337
19. If you would be asked to vote on the CT\CC, what energy price increase would you be willing to accept?								
	0%	0%-5%	5%-10%	10%-15%	15%-20%	20%-25%	25%-30%	
Tax rate	13%	30%	31%	16%	5%	2%	2%	330

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Revenue recycling and acceptability

Revenue recycling (Q17)	Q15	%	% (total)	Q18	%	% (total)
A. Redistribution towards most affected households	35/88	40%	11%	49/88	56%	16%
B. Tax rebate to households and firms	9/36	25%	3%	19/36	53%	6%
C. Financing environmental projects, renewables	103/187	55%	33%	135/187	72%	43%
Total	311	-	47%	311	-	65%

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- ▶ Acceptability increases with earmarking
- ▶ Type of revenue recycling not neutral
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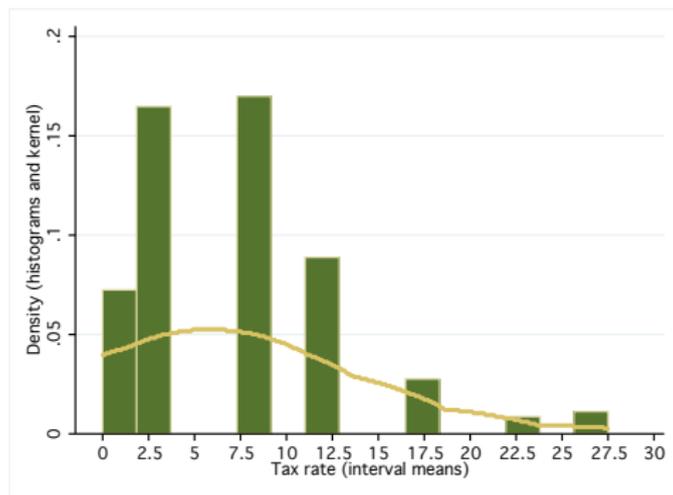
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Tax rate: willingness-to-pay

Figure 5 : Distribution of answers

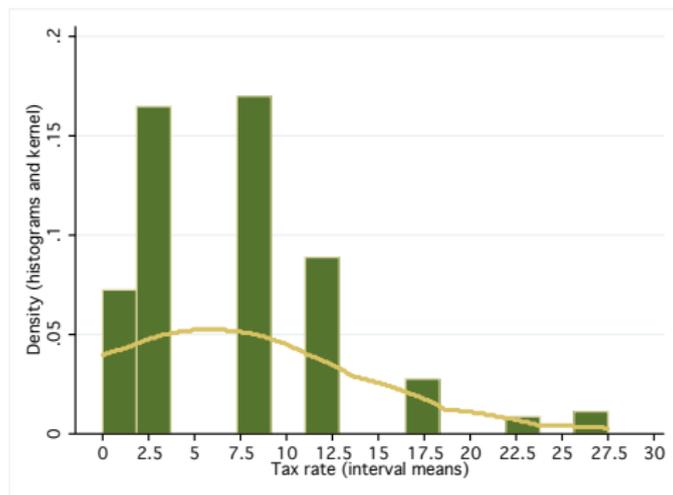


- ▶ Mean and median are positive
- ▶ Skewed distribution
- ▶ Consistent with acceptability?



Tax rate: willingness-to-pay

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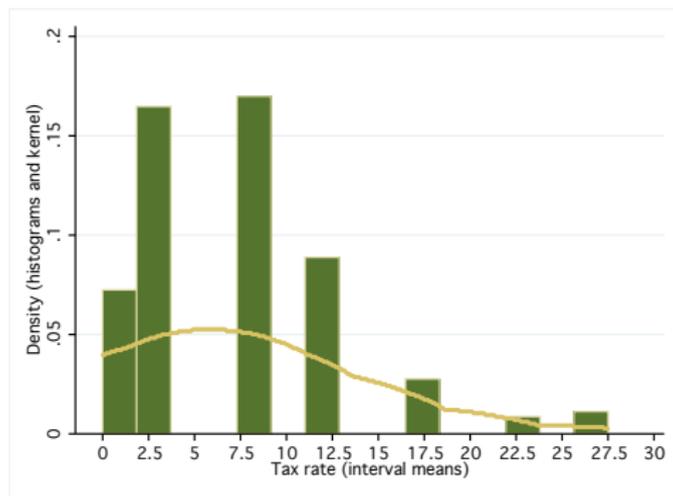


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Caveats and avenues for future research

Caveats Survey data subject to bias

- ⊗ Individuals not taking a real decision (ex. lab and poll evidence)
- ⊗ Sample selection (external validity)
- ⊗ Timing (ex. referendum-type situation)

Future research Comparing with other data sources

- ⊗ Target surveys
- ⊗ Lab experiments
- ⊗ Poll data



Caveats and avenues for future research

Caveats Survey data subject to bias

- 1 Individuals not taking a real decision (vs. lab and poll evidence)
- 2 Sample selection (external validity)
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