Public Support of Environmental Taxes on Transportation Choices

A Laboratory Experiment

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The paper in a nutshell

- Conceptual framework:
  - Transport mode choice with **Pigouvian taxes** aimed at tackling different externalities: a **local** one (air pollution) and a **global** one (GHG emission).
- Research interests:
  - The influence of citizens' **experience with taxation** on tax support,
  - Potential **trade-off** between local and global taxation,
  - The role of **psycho-social** constructs for mode choice and tax support.
- Methodology:
  - A **Laboratory experiment** where residents of two cities interact when making individual transport choices, with three level of externalities: congestion, local pollution and global pollution.
  - Participants vote for different pigouvian taxes addressing these externalities.
- Results:
  - Preliminary tax experience has a positive effect on tax support of all taxes, but experiencing additional taxes brings little or no change in support.
  - Tax support is explained by behaviour: participants who prefer private cars are also the least convinced by Pigouvian taxes.
  - Aversion to inequality and psychosocial constructs, are determinants of behavior an tax support.

A challenge for policy maker

- Context: Between 1990 and 2023, France's greenhouse gas (GHG) emissions decreased by 31% [1]. At the same time the transport sector, accounting for 34% of France's GHG emissions, registered a 3% increase (Baude et al., 2024).
- Paradox of the carbon tax: indispensable, objectively efficient but poorly supported by the public (Stiglitz et al., 2017).
- This raises the following question:
  How may new mechanisms be introduced or the existing ones strengthened without encountering strong public opposition?
- If this question concerns GHG emissions, the consideration of other environmental issues may lead to the need to extend Pigouvian mechanisms to other externalities.

[1] All sectors excluding LULUCF

Two Strands of Experimental Literature

- Social Acceptability of Public Policies:
  - Effect of implementing various regulations on participants' acceptance that interact through an externality market game & voting game (Kallbekken et al., 2011; Cherry et al., 2012, 2014; Janusch et al., 2021; Dupoux and Ouvrard, 2023).
  - Different focuses : presence of asymmetry between taxes and subsidies policies, the consequence of uncertainty regarding outcomes, the redistribution of tax revenues, impact of group communication on participant's support, etc.
- Cooperation Behaviour with Local and Global Public Goods:
  - The possible substitution effect between contributions to local and global public goods has been studied (Blackwell and McKee, 2003; Fellner and Lünser, 2014; Lange et al., 2022; Otten et al., 2024).
  - Different focuses : heterogeneities between participants (e.g., different initial endowment), heterogeneities across the existing public goods (e.g., different Marginal Per Capita Return), specific mechanisms that could be related to contribution behaviour (e.g, punishment).

Our contribution

- We differ from the first strand of literature by considering **multiple externalities**, and from the second strand by considering a **single good** that causes the negative externalities.
- Our experiment, at the intersection of the two strands of literature, allows for **trade-offs** between support for taxes on local or global pollution.
- We also test the role of key determinants of environmental policy acceptance identified in the **social psychology literature**.

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Expressing Public Support for Pigouvian Taxation

- The core game is a sequence where players:
  - 1) Choose between transportation modes, one of these modes triggering negative externalities: The Externality Game,
  - 2) State their support to possible Pigouvian taxes on transportation: The Referendum Game.
- We manipulate the taxation background of participants repeatedly in order to observe the evolution of acceptability for two taxes, a local one and a global one.

A game of two cities

- In this game, we have three externalities arising from transportation choices (between private vehicle and public transportation), 2 local ones (road congestion and local air pollution), and a global one (GHG emissions).

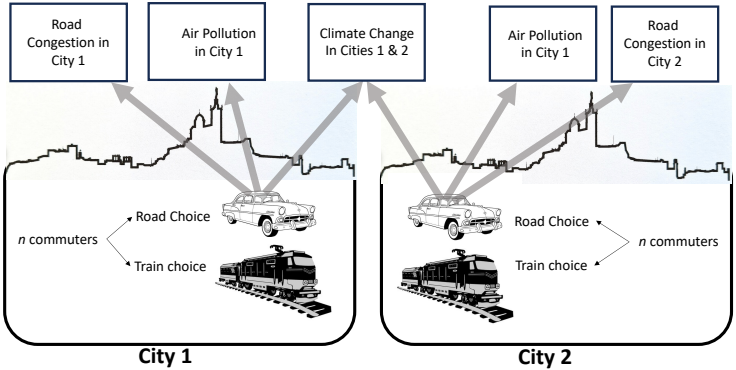

Figure: The Game of Two Cities

Theoretical framework

- Individual cost functions for **private vehicle usage** for each city :

$$c_B^1 = \alpha + \beta q_1 + \gamma q_1 + \delta(q_1 + q_2) \quad (1)$$

$$c_B^2 = \alpha + \beta q_2 + \gamma q_2 + \delta(q_1 + q_2) \quad (2)$$

- Individual cost functions for **public transport usage** for each city :

$$c_H^1 = t_H + \gamma q_1 + \delta(q_1 + q_2) \quad (3)$$

$$c_H^2 = t_H + \gamma q_2 + \delta(q_1 + q_2) \quad (4)$$

Notations

Equilibrium, optimum and Pigouvian taxes

- Equilibrium :

$$\widehat{q_1} = \widehat{q_2} = \frac{t_H - \alpha}{\beta} \tag{5}$$

- Traffic optimum :

$$q_1^* = q_2^* = \frac{t_H - \alpha - n\gamma - 2n\delta}{2\beta} \tag{6}$$

- Pigouvian taxes :

$$p = \frac{t_H - \alpha}{2} + \frac{n\gamma}{2} + n\delta = p_C + p_L + p_G \tag{7}$$

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Experimental treatment

- We have conducted 22 session, each with 20 participants, in September 2024. In each experimental session, the 20 participants are randomly divided into 2 global groups of 10. Within a global group, two local groups of 5 subjects are randomly formed ("Cities"). We consider two treatment orders with 11 sessions for each order.

- Each experimental session is organised in five steps:
  1. Main game
  2. Elicitation of inequity aversion (Blanco et al., 2011)
  3. CRT
  4. Psycho-social questionnaires
  5. Ex post experimental questionnaire

Main game

- We use a 2-step design (Janusch et al., 2021; Kallbekken et al., 2011) : In step 1, participants play the **externality game** and make repeated binary choices between car and train. Then, in step 2, they enter in a **referendum game**, and should state their support to possible taxes on local pollution and global warming.
- The experimental sequence (within-subject design):

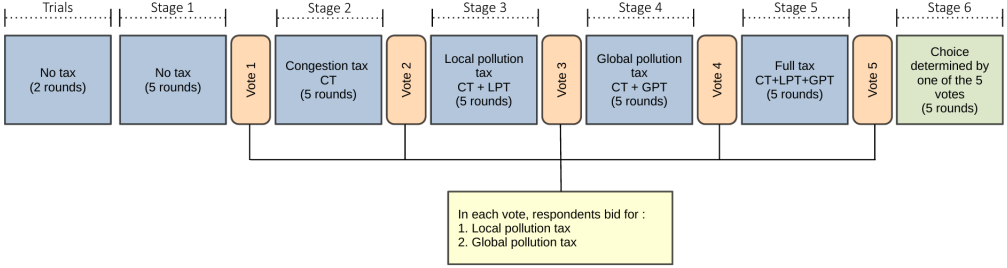

Figure: Sequence (order 1 / order 2: with inverted stage 3 and 4)

The voting procedure

- The voting procedure (**continuous output between 0 and 10**):
  - Bidders, each endowed with E, bid b_i for adopting a given policy,
  - If median bid is more than a computer-generated random number R chosen between 0 and E, policy is adopted, each bidder pays R and wins $E - R$; Otherwise the policy is rejected, and each bidder win E.

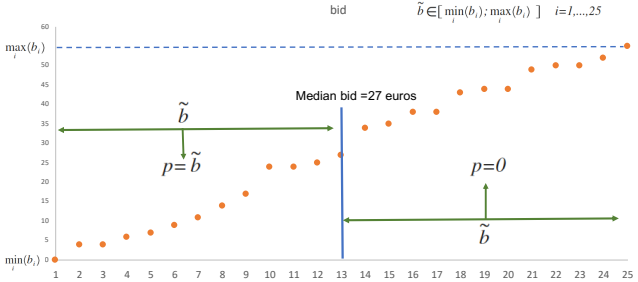

Figure: Bid mechanism

Experimental Calibration

- We propose the following calibration:

Table: Calibration of experimental parameters

n	t	α	β	γ	δ	$\widehat{q}_i$	q_i^*	p_C	p_L	p_G	Full Tax
5	**20**	**10**	**2**	**1**	**0.5**	**5**	**0**	**5**	**2.5**	**2.5**	**10**

Detailed equilibrium

Psycho-social constructs

Psycho-social constructs

- *Environmental self-identity* (van der Werff et al., 2013): Individuals who strongly identify with pro-environmental behaviours are more likely to prefer sustainable modes of transport and demonstrate higher acceptance of environmental taxes. items
- *Environmental concern* (Schwartz, 1977; Prochaska and DiClemente, 1983): The higher the environmental concern, the greater the acceptability of environmental taxes. items
- *Consideration of future consequences (CFC)*(Strathman et al., 1994): Those who consider long-term consequences in their decision-making are more inclined to engage in pro-environmental actions, including choosing public transportation and supporting environmental taxes. items
- *Perceived legitimacy of taxes* (Varet et al., 2024): Perception of tax legitimacy, encompassing dimensions like effectiveness, efficiency, fairness, and moral alignment, is expected to positively correlate with tax acceptance. items

Inequality aversion

Inequality Aversion Model

- We use the method developed by Blanco et al. (2011) to estimate the parameters of the Inequality Aversion model à la Fehr and Schmidt (1999)at the individual level:

$$U_i(x_i, x_j) = \begin{cases} x_i - \alpha_i(x_j - x_i), & \text{if } x_i \leq x_j, \\ x_i - \beta_i(x_i - x_j), & \text{if } x_i > x_j \end{cases} \tag{8}$$

where $U_i(x_i, x_j)$ is the utility function of player i, x_i is the monetary payoff for player i and x_j the monetary payoff of player j. α_i is the coefficient of **envy** whereas β_i is the coefficient of **guilt.**

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Externality game results: taxes are efficient

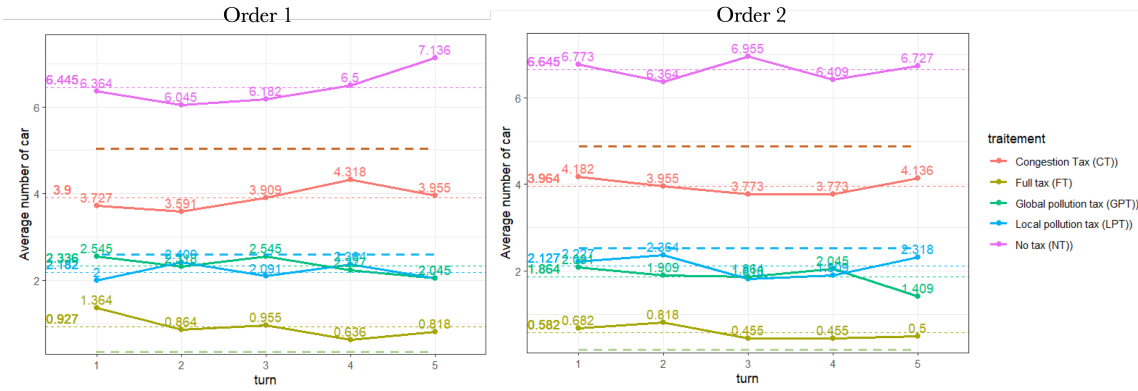

Figure: Mean Number of PV choice per treatment

Referendum game results: Does tax experience increases support?

- **Only the first tax implementation** have a significative effect on support.

Table: Wilcoxon test p-values

	Local pollution tax			Glocal pollution tax		
	Stat	P-value	P-value (TwoSide)	Stat	P-value	P-value (TwoSide)
No tax vs congestion tax	22803.5	4.97×10^{-4}***	9.94×10^{-4}***	23513.5	4.31×10^{-3}***	8.63×10^{-3}**
congestion tax vs local pollution tax	17962	0.83	0.33	19140	0.22	0.44
congestion tax vs global pollution tax	15113.5	0.87	0.26	18836	0.11	0.23
congestion tax vs full tax	22352.5	0.25	0.50	21762	0.44	0.88
local pollution tax vs full tax	15599	0.12	0.24	15180.5	0.63	0.74
global pollution tax vs full tax	16993	0.05*	0.11	14904.5	0.82	0.37

Determinants of policy support

	Bid for local pollution tax		Bid for global pollution tax	
	Estimate	Marginal effects	Estimate	Marginal effects
Intercept	3.19***		3.74***	
	(0.62)		(0.62)	
treatment CT	0.45**	0.34**	0.36*	0.27*
(Congestion Tax)	(0.20)	(0.15)	(0.20)	(0.15)
treatment LPT	0.25	0.19	0.38*	0.29*
(CT + Local pollution tax)	(0.20)	(0.15)	(0.20)	(0.15)
treatment GPT	0.27	0.20	0.56***	0.43***
(CT + Glocal pollution tax)	(0.20)	(0.15)	(0.20)	(0.15)
treatment FT	0.53***	0.40***	0.31 0.24	
(Full tax: CT+LPT+GPT)	(0.20)	(0.15)	(0.20)	(0.15)
Environmental cluster	1.01***	0.77***	1.25***	0.96***
	(0.34)	(0.26)	(0.34)	(0.26)
α	0.24**	0.18**	0.19**	0.15**
	(0.10)	(0.07)	(0.10)	(0.07)
β	-0.05	-0.04	-0.86	-0.66
	(0.78)	(0.59)	(0.78)	(0.59)
Driving License	0.18	0.14	0.18	0.14
	(0.35)	(0.27)	(0.35)	(0.27)
$\log(\sigma_\mu)$	1.14***		1.14***	
	(0.04)		(0.04)	
$\log(\sigma_\nu)$	1.05***		1.04***	
	(0.02)		(0.02)	
AIC	9374.628		9337.104	
BIC	9437.287		9399.762	

Note: For each variables, the first line concerns the estimated coefficient and the second one gives the standard error (in brackets)
*: significance at 10% level **: significance at 5% level ***: significance at 1% level

Table: Bid modelling using tobit models with panel data – without treatments interactions

Policy support determinants

	Bid for local pollution tax		Bid for global pollution tax	
	Estimate	Marginal effects	Estimate	Marginal effects
Intercept	3.19***		3.74***	
	(0.62)		(0.62)	
treatment CT	0.45**	0.34**	0.36*	0.27*
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(CT + Glocal pollution tax)	(0.20)	(0.15)	(0.20)	(0.15)
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Table: Bid modelling using tobit models with panel data – without treatments interactions

	Local pollution bid		Global pollution bid	
	Estimate	Marginal effects	Estimate	Marginal effects
Environmental cluster	1.01***	0.77***	1.25***	0.96***
	(0.34)	(0.26)	(0.34)	(0.26)
α	0.24**	0.18**	0.19**	0.15**
	(0.10)	(0.07)	(0.10)	(0.07)
β	-0.05	-0.04	-0.86	-0.66
	(0.78)	(0.59)	(0.78)	(0.59)

Note: For each variables, the first line concerns the estimated coefficient and the second one gives the standard error (in brackets)
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- Participants with high disadvantageous inequality aversion are willing to bid more: they are willing to sacrifice gains in order to prevent others from having higher gains than them.
- The members of the environmental cluster have a significant flat higher bid for both taxes.

Additional results

- The *environmental concern* and *perceived legitimacy of taxes* both have a positive impact on policy support. model
- Interactions with the treatments tends to minimise this effect, with a weakly significative effect for the interaction between the full tax treatment and the cluster: model
  - **Bids increase in the non-environmental friendly cluster**, less in the environmental one.
  - **Comforting an already positive view has a much smaller effect on bids**

Introduction of transport mode in bid modelling

	Bid for local pollution tax		Bid for global pollution tax	
	Estimate	Marginal effects	Estimate	Marginal effects
Intercept	7.05***		7.71***	
	(0.95)		(0.93)	
treatment CT	0.45**	0.35**	0.36*	0.28*
	(0.20)	(0.15)	(0.20)	(0.15)
treatment LPT	0.25	0.19	0.38*	0.30*
	(0.20)	(0.16)	(0.20)	(0.15)
treatment GPT	0.27	0.21	0.56***	0.44***
	(0.20)	(0.16)	(0.20)	(0.15)
treatment FT	0.53***	0.41***	0.31	0.25
	(0.20)	0.16	(0.20)	(0.156
Environmental cluster	0.85***	0.66***	1.11***	0.87***
	(0.32)	(0.25)	(0.32)	(0.26)
α	0.18*	0.14*	0.13	0.10
	(0.09)	(0.07)	(0.09)	(0.07)
β	-0.61	-0.47	-1.46**	-1.14**
	(0.74)	(0.58)	(0.73)	(0.58)
Driving License	0.36	0.28	0.38	0.30
	(0.33)	(0.26)	(0.33)	(0.26)
Car usage: 1	-2.96***	-2.30***	-3.20***	-2.51***
	(0.88)	(0.68)	(0.87)	(0.68)
Car usage: 2	-2.62***	-2.03***	-2.77***	-2.18***
	(0.84)	(0.66)	(0.84)	(0.66)
Car usage: 3	-3.04***	-2.36***	-3.03***	-2.38***
	(0.79)	(0.61)	(0.78)	(0.61)
Car usage: 4	-3.58***	-2.78***	-3.57***	-2.80***
	(0.79)	(0.61)	(0.78)	(0.61)
Car usage: 5	-5.02***	-3.91***	-5.36***	-4.20***
	(0.79)	(0.61)	(0.78)	(0.62)
$\log(\sigma_\mu)$	1.07***		1.06***	
	(0.04)		(0.04)	
$\log(\sigma_\nu)$	1.05***		1.03***	
	(0.02)		(0.02)	
AIC	9334.289		9287.525	
BIC	9425.429		9378.664	

Note: For each variables, the first line is the estimated coefficient and the second one the standard error (in brackets)
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Car usage: 5	-5.02***	-3.91***	-5.36***	-4.20***
	(0.79)	(0.61)	(0.78)	(0.62)

- The more a participant chose private car in the no tax treatment, the less he bids for tax implementation.

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Discussion

- **Taxes are effective** for solving the social dilemma raised in our experiment.
- Taxation has a significant impact on modal choice. The first tax (congestion) introduction **has an effect** on tax acceptance. However, additional tax implementations **don't show an additional significant effect**, and therefore trade-off effect doesn't appear.

Just because individuals adapt to the taxes in the externality game, it does not necessarily follow that they validate these taxes in the referendum game.

Discussion

- Some Policy Comments:
  - Making the benefits of taxation **less uncertain or more salient** to improve acceptability can increase support for taxation. But it **may not be enough** to move citizens away from the status quo or to change their minds about what they consider acceptable,
  - No or little substitution effect regarding the support of the public between environmental taxes, at least when comparing carbon taxes to local air pollution ones.

- Further studies should be conducted to strengthen these results and to explore the effect of other factors that may determine the acceptance of a Pigouvian tax. We propose in the second chapter a framework to explore the effect of **redistribution schemes**.

Thank you for your attention !

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Notation

- c_H^i: transportation costs arising from the use of public transport in the city i,
- c_B^i: transportation costs arising from private vehicle use in the city i,
- q_1, q_2: PV traffic in city 1 and city 2 respectively, x_1, x_2: public transport traffic in city 1 and city 2 respectively,
- n_1, n_2: total number of transport users in cities 1 and 2 respectively,
- t_H: temporal cost (constant) of using public transport for a user,
- α : private fixed cost of private vehicle use,
- β: marginal cost of congestion externality linked to PV traffic,
- γ: marginal cost of local pollution externality linked to PV traffic,
- δ: marginal cost of global warming externality linked to PV traffic.

return

Environmental self identity

Vous trouverez ci-dessous une liste d'affirmation. Pour chacune d'elles, veuillez indiquer votre degré d'accord en cochant la case qui correspond le mieux à votre opinion, sur une échelle allant de 1 = "Pas du tout d'accord" à 7 = "Tout à fait d'accord". Les chiffres intermédiaires permettent de nuancer votre réponse.

Merci de répondre à toutes les questions, le plus spontanément possible et dans l'ordre dans lequel elles vous sont posées. Il n'y a ni bonne ni mauvaise réponse, seul votre avis personnel nous intéresse.

	Pas du tout d'accord	Pas d'accord	Un point de désaccord	Ni d'accord, ni pas d'accord	Un peu d'accord	D'accord	Tout à fait d'accord
Adopter des comportements favorables à l'environnement me définit bien	○	○	○	○	○	○	○
Je suis le genre de personne qui agit en faveur de l'environnement	○	○	○	○	○	○	○
Je me considère comme une personne respectueuse de l'environnement.	○	○	○	○	○	○	○

Suivant

return

Consideration of future consequences

- J'envisage comment pourraient être les choses dans le futur et j'essaie de les influencer par mon comportement quotidien.
- Souvent, j'adopte un comportement particulier pour atteindre des objectifs qui ne se réaliseront peut-être pas avant des années.
- Je n'agis que pour répondre à des préoccupations immédiates, en pensant que le futur s'arrangera de lui-même.
- Mon comportement n'est influencé que par les conséquences immédiates de mes actes (dans les jours ou semaines qui suivent).
- Mon confort est un facteur important dans les décisions que je prends ou dans les actions que je réalise.
- Je suis prêt(e) à sacrifier mon bonheur ou mon bien-être immédiat afin d'atteindre des objectifs futurs.

return

Perceived legitimacy of taxes

- Les taxes sur la pollution de l'air locale sont un moyen efficace pour lutter contre la pollution locale.
- Les taxes sur la pollution de l'air locale touchent tout le monde de la même façon.
- Les recettes fiscales issues des taxes sur la pollution de l'air locale profitent à tout le monde de la même façon.
- Sur le plan moral, les taxes sur la pollution de l'air locale me semblent contestables.
- Les taxes sur la pollution de l'air locale sont top contraignantes (mise en place, contrôle,...) pour ce qu'elles rapportent en termes de recette fiscales. (*)
- Les taxes sur le changement climatique sont un moyen efficace pour lutter contre le dérèglement climatique.
- Les taxes sur le changement climatique touchent tout le monde de la même façon.
- Le produit des taxes sur le changement climatique profite à tout le monde de la même façon.
- Sur le plan moral, les taxes sur le changement climatique me semblent contestables.
- Les taxes sur le changement climatique sont top contraignantes (mise en place, contrôle,...) pour ce qu'elles rapportent en termes de recette fiscales. (*)

return

Environmental concern

- Je me sens préoccupé par les conséquences négatives de la pollution de l'air locale.
- Il est urgent de lutter contre les conséquences négatives la pollution de l'air locale.
- Les déplacements seul(e) en voiture affectent la pollution de l'air locale.
- Ma décision de me déplacer seul(e) en voiture affecte la pollution de l'air locale.
- Je me sens préoccupé par les conséquences négatives du dérèglement climatique.
- Il est urgent de lutter contre les conséquences négatives du dérèglement climatique.
- Les déplacements seul(e) en voiture affectent le dérèglement climatique.
- Ma décision de me déplacer seul(e) en voiture affecte le dérèglement climatique.

return

Cluster characteristics

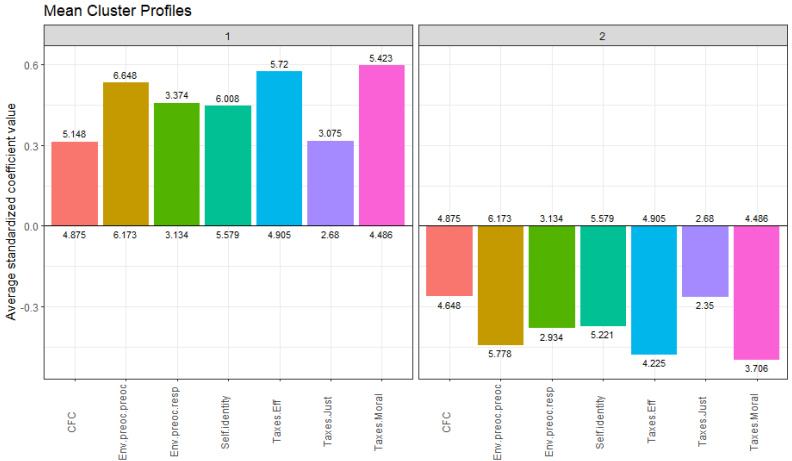

Figure: Variables mean value by cluster

return

Mean bid by cluster and treatment

	NT	CT	CT + LPT	CT + GPT	FT
Local pollution					
Non env. cluster	3.71	4.11	4.04	4.19	4.54
Env. cluster	4.61	4.98	4.80	4.70	4.90
Global pollution					
Non env. cluster	3.75	4.08	4.00	4.47	4.43
Env. cluster	4.74	5.02	5.17	5.10	4.88

Table: Mean bid by cluster and treatment

return

Tobit modelling

- For a given individual $i \in [\![1, 440]\!]$ and for a given treatment $t \in \{NT, CT, LPT, GPT, FT\}$, the bid amount $\text{Bid}^*_{t,i}$ corresponds to the following equation:

$$\begin{aligned}\text{Bid}^*_{t,i} = b_0 + b_1 * \mathbb{1}_{\{t=CT\}} + b_2 * \mathbb{1}_{\{t=LPT\}} + b_3 * \mathbb{1}_{\{t=GPT\}} + b_4 * \mathbb{1}_{\{t=FT\}} + \\ b_{5,6,7,8} * \text{Psycho-social variables}_i + b_9 * \alpha_i + b_{10} * \beta_i + b_{11} * \text{Driving license}_i + \mu * \epsilon_i + \nu * \epsilon_{t,i}\end{aligned} \tag{9}$$

$$\text{Bid}_{t,i} = \begin{cases} 0 & \text{if } \text{Bid}^*_{t,i} < 0 \\ \text{Bid}^*_{t,i} & \text{if } 0 \leq \text{Bid}^*_{t,i} \leq 10 \\ 10 & \text{if } \text{Bid}^*_{t,i} > 10 \end{cases}$$

- We consider two different way to implement psycho-social variables:
  1. with the four **untouched variables**,
  2. with a binary variable resulting from a **clustering** process. more details

Bid modelling using tobit models with panel data – without treatments interactions

	Bid for local pollution tax				Bid for global pollution tax			
	Complete		Cluster		Complete		Cluster	
	Estimate	Marginal effects	Estimate	Marginal effects	Estimate	Marginal effects	Estimate	Marginal effects
Intercept	-0.71		3.19***		-1.14		3.74***	
	(1.42)		(0.62)		(1.42)		(0.62)	
treatment CT	0.45**	0.34**	0.45**	0.34**	0.36*	0.27*	0.36*	0.27*
(Congestion Tax)	(0.20)	(0.15)	(0.20)	(0.15)	(0.20)	(0.15)	(0.20)	(0.15)
treatment LPT	0.25	0.19	0.25	0.19	0.38*	0.29*	0.38*	0.29*
(CT + Local pollution tax)	(0.20)	(0.15)	(0.20)	(0.15)	(0.20)	(0.15)	(0.20)	(0.15)
treatment GPT	0.27	0.21	0.27	0.20	0.57***	0.43***	0.56***	0.43***
(CT + Glocal pollution tax)	(0.20)	(0.15)	(0.20)	(0.15)	(0.20)	(0.15)	(0.20)	(0.15)
treatment FT	0.53***	0.41***	0.53***	0.40***	0.32	0.24	0.31 0.24	
(Full tax: CT+LPT+GPT)	(0.20)	0.15	(0.20)	(0.15)	(0.20)	(0.15)	(0.20)	(0.15)
Self identity	-0.24	-0.19	-	-	0.005	0.004	-	-
	(0.20)	(0.16)	-	-	(0.20)	(0.16)	-	-
Cons. of future cons.	0.28	0.21	-	-	0.24	0.18	-	-
	(0.21)	(0.16)	-	-	(0.21)	(0.16)	-	-
Environmental concerns	0.56**	0.43**	-	-	0.51**	0.39**	-	-
	(0.20)	(0.17)	-	-	(0.22)	(0.17)	-	-
Perc. legit. of taxes	0.33*	0.25*	-	-	0.39**	0.30**	-	-
	(0.17)	(0.13)	-	-	(0.20)	(0.13)	-	-
Environmental cluster	-	-	1.01***	0.77***	-	-	1.25***	0.96***
	-	-	(0.34)	(0.26)	-	-	(0.34)	(0.26)
α	0.23**	0.17**	0.24**	0.18**	0.19**	0.15**	0.19**	0.15**
	(0.10)	(0.07)	(0.10)	(0.07)	(0.10)	(0.07)	(0.10)	(0.07)
β	-0.21	-0.16	-0.05	-0.04	-1.03	-0.79	-0.86	-0.66
	(0.78)	(0.59)	(0.78)	(0.59)	(0.78)	(0.60)	(0.78)	(0.59)
Driving License	0.16	0.12	0.18	0.14	0.19	0.14	0.18	0.14
	(0.35)	(0.27)	(0.35)	(0.27)	(0.35)	(0.27)	(0.35)	(0.27)
$\log(\sigma_\mu)$	1.13***		1.14***		1.13***		1.14***	
	(0.04)		(0.04)		(0.04)		(0.04)	
$\log(\sigma_\nu)$	1.05***		1.05***		1.04***		1.04***	
	(0.02)		(0.02)		(0.02)		(0.02)	
AIC	9372.931		9374.628		9336.27		9337.104	
BIC	9452.678		9437.287		9416.017		9399.762	

Note: For each variables, the first line concerns the estimated coefficient and the second one gives the standard error (in brackets)

***: significance at 10% level **: significance at 5% level ***: significance at 1% level**

return

Bid modelling using tobit models with panel data – with interactions

	Local pollution bid		Global pollution bid	
	Estimate	Marginal effects	Estimate	Marginal effects
Intercept	3.00 ***		3.62***	
	(0.64)		(0.64)	
treatment NT	reference	reference	reference	reference
	-	-	-	-
treatment CT	0.51	0.39	0.38	0.29
	(0.33)	(0.25)	(0.33)	(0.25)
treatment LPT	0.31	0.23	0.18	0.14
	(0.34)	(0.26)	(0.33)	(0.25)
treatment GPT	0.64 *	0.49 *	0.86***	0.66***
	(0.33)	(0.25)	(0.33)	(0.25)
treatment FT	1.01 ***	0.77 ***	0.79**	0.60**
	(0.34)	(0.26)	(0.33)	(0.25)
Env. cluster	1.32 ***	1.00 ***	1.44***	1.10***
	(0.43)	(0.33)	(0.43)	(0.33)
treatment NT	reference	reference	reference	reference
* Env. cluster	-	-	-	-
treatment CT	-0.08	-0.06	-0.04	-0.03
* Env. cluster	(0.41)	(0.31)	(0.41)	(0.31)
treatment LPT	-0.10	-0.07	0.31	0.24
* Env. cluster	(0.42)	(0.32)	(0.41)	(0.32)
treatment GPT	-0.58	-0.44	-0.46	-0.35
* Env. cluster	(0.42)	(0.32)	(0.41)	(0.31)
treatment FT	-0.75 *	-0.57 *	-0.74*	-0.57*
* Env. cluster	(0.42)	(0.32)	(0.41)	(0.32)
α	0.24**	0.18**	0.19**	0.15**
	(0.10)	(0.07)	(0.10)	(0.07)
β	-0.04	-0.03	-0.86	-0.66
	(0.78)	(0.59)	(0.78)	(0.59)
Driving License	0.18	0.14	0.18	0.15
	(0.35)	(0.27)	(0.35)	(0.27)
$\log(\sigma_\mu)$	1.14 ***		1.14***	
	(0.04)		(0.04)	
$\log(\sigma_\nu)$	1.05 ***		1.03***	
	(0.02)		(0.02)	

Note: For each variables, the first line concerns the estimated coefficient and the second one gives the standard error (in brackets)
*: significance at 10% level **: significance at 5% level ***: significance at 1% level return