E4BEL

EQUITY, EFFICIENCY & ACCEPTABILITY OF CARBON PRICING IN BELGIUM

4th E4BEL Steering Committee

Brussels, 4th of February 2026

belspo

Bureau fédéral du Plan
Analyses et prévisions

KU LEUVEN H:VA
RESEARCH INSTITUTE FOR WORK AND SOCIETY

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FACULTEIT ECONOMIE EN BEDRIJFSWETENSCHAPPEN

Introduction

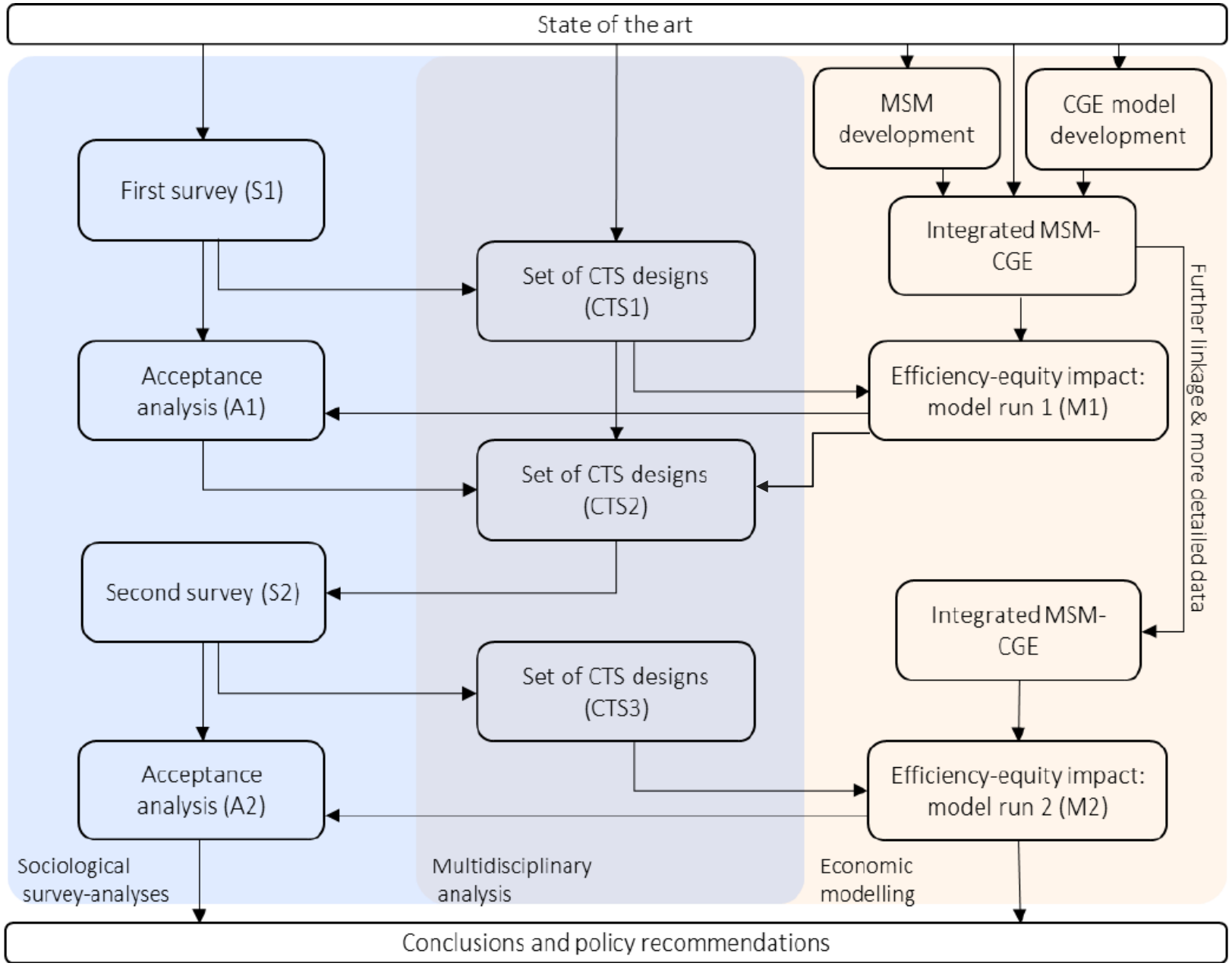
Overview of the E4BEL-project

E4BEL

"Equity, efficiency, and acceptability of carbon pricing in Belgium"

- Federal Planning Bureau (coordinator),
  KU Leuven Department of Economics,
  KU Leuven HIVA

- Equity at the forefront of climate policy debate
  - Combination of carbon pricing/tax and revenue recycling (climate tax shift)
  - Gauging the trade-offs between equity, efficiency and acceptability.
  - Equity impact through prices, wages, labour market opportunities
- Integration of economic impact analysis and surveys on public acceptability


State of the art
First survey (S1)
Set of CTS designs (CTS1)
Acceptance analysis (A1)
Set of CTS designs (CTS2)
Second survey (S2)
Set of CTS designs (CTS3)
Acceptance analysis (A2)
MSM development
CGE model development
Integrated MSM-CGE
Efficiency-equity impact: model run 1 (M1)
Integrated MSM-CGE
Efficiency-equity impact: model run 2 (M2)
Further linkage & more detailed data
Sociological survey-analyses
Multidisciplinary analysis
Economic modelling
Conclusions and policy recommendations

Ranking policy options

climate tax shift	Efficiency			Equity			Acceptability		
revenue recycling design	indicator 1	indicator 2	…	indicator 1	indicator 2	…	indicator 1	indicator 2	…
Policy 1									
Policy 2									
Policy 3									
…									

- For a given carbon tax level, a ranking of revenue recycling options
- Efficiency – Equity – Acceptablity
- Labour market focus

Publications

Reports and policy briefs

- Barrez, J. & Bachus, K. (2023). E4BEL: State of the art on the public acceptability of carbon pricing. Report, BELSPO.
- Capéau, B., Decoster, A., Martiat, J., Van Houtven, S. & Van Steenbergen, A. (2023). E4BEL: State of the art on the economic impacts of carbon pricing. Report, BELSPO.
- Barrez, J. & Bachus, K. (2023). The public acceptability of carbon pricing: a literature review. Report, KU Leuven/HIVA.
- Barrez, J. (2025). The path of least resistance? Enhancing public acceptability of carbon pricing policies in Belgium. *KIES Policy Brief No. 01*. KU Leuven.

Journal papers

- Barrez, J. (2024). Public acceptability of carbon pricing: Unravelling the impact of revenue recycling. *Climate Policy*, *24*(10), 1–23.
- Barrez, J. (2025). Seeking common ground? Heterogeneous support for carbon pricing and climate policies across audience segments. *Energy Research & Social Science*, *122*, 103993.
- Capéau, B., Decoster, A., & Van Houtven, S. (2024). Piecemeal Modeling of the Effects of Joint Direct and Indirect Tax Reforms. *Public Finance Review*, *52*(1), 111-149.
- Ricci, M., Dominguez, I.P., Van Houtven, S., Hristov, J., Vandyck, T. (2026). Pricing GHG emissions in agriculture: Accounting for trade and fairness for effective climate policy. *Ecological Economics*, 239.

Working papers

- Martiat, J., Van Houtven, S. & Van Steenbergen, A. (2025). Does Carbon Pricing Reinforce Job Polarization?. Working Paper 202505, Federal Planning Bureau.

- Forthcoming: Double dividend of carbon taxation of households
- Forthcoming: Different sectors, different jobs? Characterizing job content in polluting and non-polluting sectors
- **Forthcoming: Public preferences for carbon pricing policies**
- **Forthcoming: Wage Polarization and fiscal policy design**

Meeting agenda

- Introduction
- “Public Preferences for Carbon Pricing Policies: a discrete choice experiment” by Jeroen Barrez
- “Wage Polarization and Fiscal Policy Design: A CGE – Micro-Simulation Analysis” by Stijn Van Houtven and Alex Van Steenbergen
- Conclusion and overview of the road ahead

Public preferences for carbon pricing policies

A discrete choice experiment

Survey 2

Survey 1

- Exploring attitudes towards carbon pricing and climate policies among the general population and across subgroups.
- Investigating the drivers of acceptability - with a focus on revenue recycling.

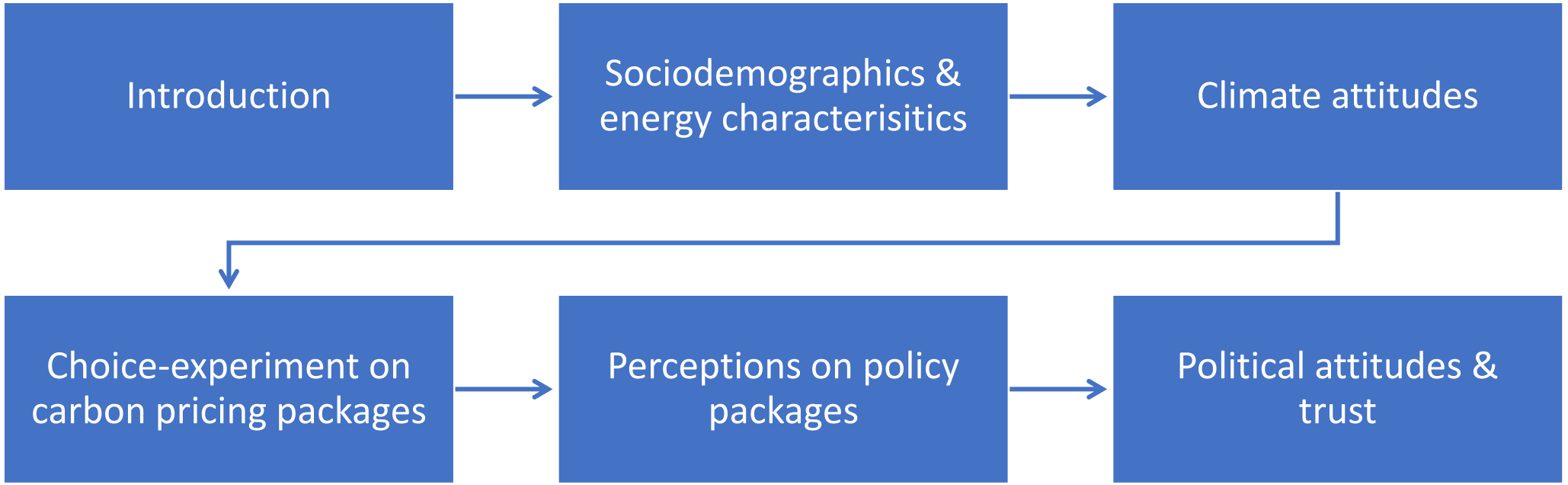
Survey 2 - research questions

- If one of the proposed CO2 pricing packages would be implemented, which package would citizens prefer?
  - How do policy attributes, especially revenue use, affect preferences?
  - What is the effect of providing information on the financial impacts?

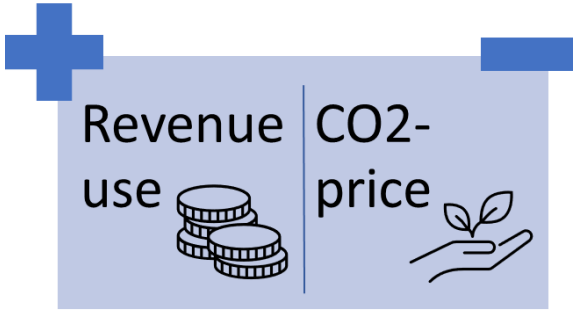
Simulations on economic and distributional impacts of carbon pricing

Survey design

- Adult population in Belgium
- Interlocked quotas for sex, age, and region, non-interlocked quotas for education (high, medium, low).
- N = 1815, conducted in September 2025



Discrete choice experiment



Carbon pricing package = CO2-price + revenue recycling

Carbon price

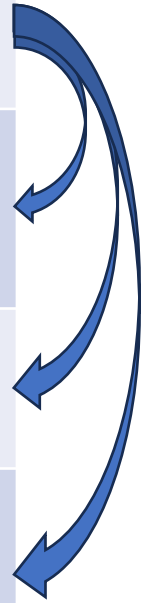
TARGET: 112- 114 euro per tonne for ETS-1 and ETS-2 sector in 2030.
Carbon prices that maximally approach the national Effort Sharing Regulation target, as well as reach net zero in 2050.

Revenue recycling

- Linear labour tax reduction
- Low-wage labour tax reduction
- Lump-sum transfer
- Subsidies for public transport
- Compensation transfers (“theoretical benchmark”)

Discrete choice experiment: policy attributes and levels

Attribute	Levels	#
CO2-price (cost) **(energy price increase of gasoline, diesel, heating fuel)**	Around 112-114 euro per tonne CO2 (0,25- 0,31 euro per litre)	
Revenue use (benefit)	Labour tax reductions, Labour tax reductions for low wages, Lump-sum transfers, Compensation transfers, Public transport subsidies	5
Information on financial impact on own household	No information, Detailed information: X euro/month *(specific to respondents' household based on sociodemographic and energy characteristics)*	2
Information on financial impact on low-income households	No information, Detailed information: X euro/month	2
Information on financial impact on average household	No information, Detailed information: X euro/month	2



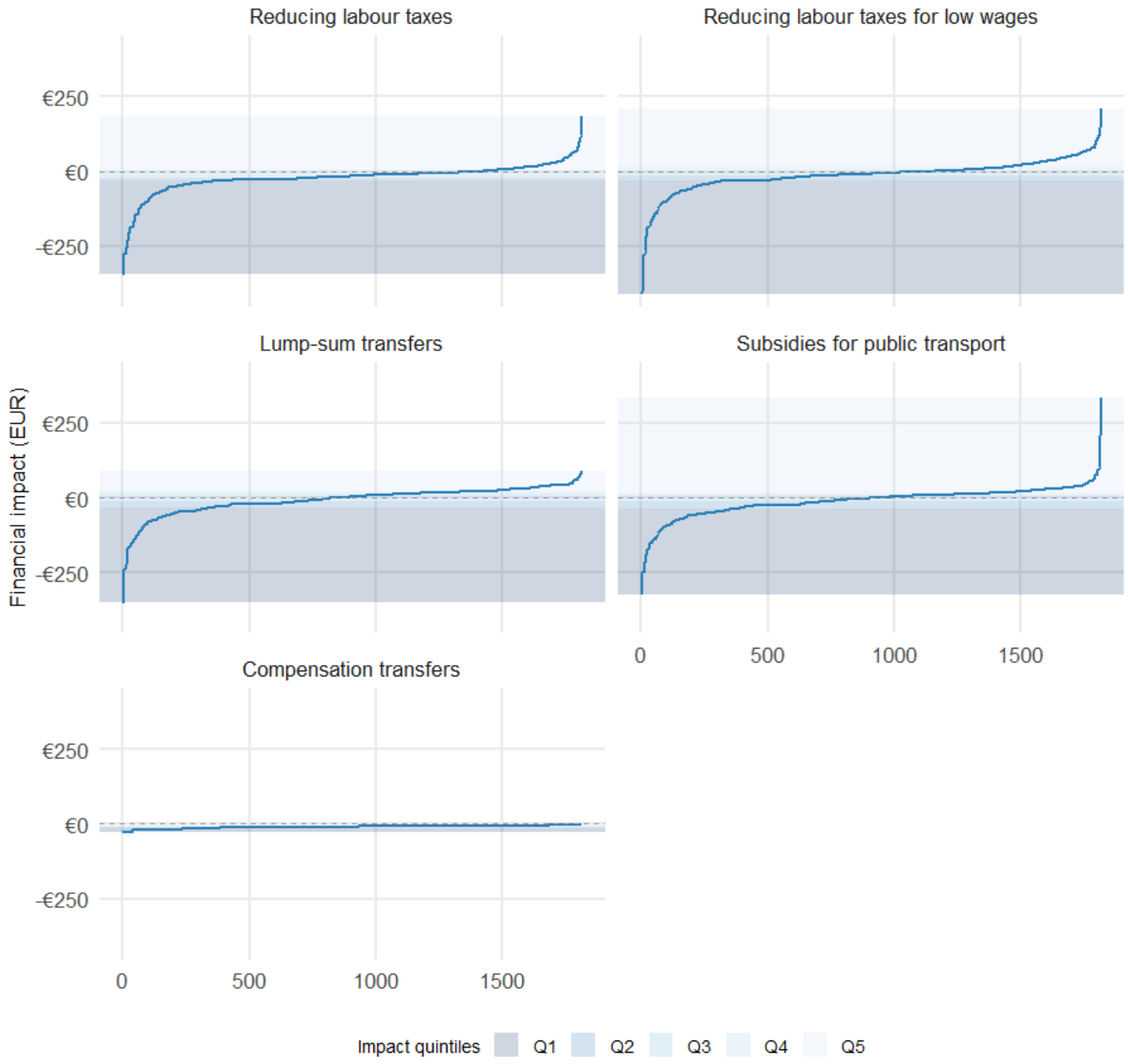
Financial impacts estimates of carbon pricing packages on respondents' own household

- Based on top-down approach that combines macro-economic modelling (CGE) with household-level microsimulation.
    - Based on from EU-SILC (& HBS) data.
- For each respondent, the carbon price and revenue recycling scheme were linked to these household characteristics to calculate monthly net impacts on disposable income.
- Hierarchical stratified matching approach (*not all possible combinations of characteristics are available or had too few observations (n < 5)).*

Policy scenario	Inkomens cat.	Opleiding & soc.-eco. status	Uitgaven brandstof	Verwarming type	Woningtype	HH grootte cat.	Financial impact
Reducing labour taxes	minder dan 1500	low-skilled	0	Aardgas	Appartement	1	€ 0
Reducing labour taxes - low wages	minder dan 1500	low-skilled	0	Aardgas	Appartement	1	€ 5
Public transport	minder dan 1500	low-skilled	0	Aardgas	Appartement	1	€ 16
Lump-sum tranfers	minder dan 1500	low-skilled	0	Aardgas	Appartement	1	€ 21
Reducing labour taxes	minder dan 1500	low-skilled	0	Aardgas	Appartement	allen	-€ 2
Reducing labour taxes - low wages	minder dan 1500	low-skilled	0	Aardgas	Appartement	allen	€ 1
Public transport	minder dan 1500	low-skilled	0	Aardgas	Appartement	allen	€ 16
Lump-sum transfers	minder dan 1500	low-skilled	0	Aardgas	Appartement	allen	€ 22

Financial impact on households of carbon pricing packages

- Financial impact on monthly net disposable income.
- Most households are shown that the impact is only small, being slightly negative or positive.
- A small minority experience large gains or losses.
- With compensation transfers, impacts remain limited for all households (“*benchmark*”).



Choice experiments as methodology

Assumption: citizens do not prefer carbon pricing policies '*as such*', but their preferences are based on attributes.

Respondents choose between alternatives that vary in policy attributes: revenue use & information on financial impacts.

We assume that respondents derive utility from each policy option *i* as: $U_i = ASC_i + \beta X_i' + \varepsilon_i$

- X_i = **attribute levels of option *i*** — e.g. revenue use = labour tax reductions
- β = **marginal utilities of attributes** — e.g. added utility from using revenues for *labour tax cuts* instead of *public transport subsidies*
- ASC_i = **alternative-specific constant** — captures utility not explained by attributes (e.g., left vs. right option in choice card).

Choice Probabilities

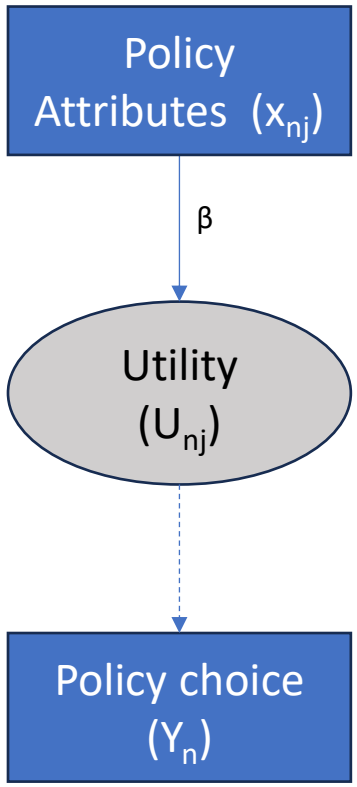
Within a choice set C, a respondent chooses option *i* if its utility is highest : $Pr(i \mid C) = Pr(U_i > U_j \ \forall j \neq i \in C)$

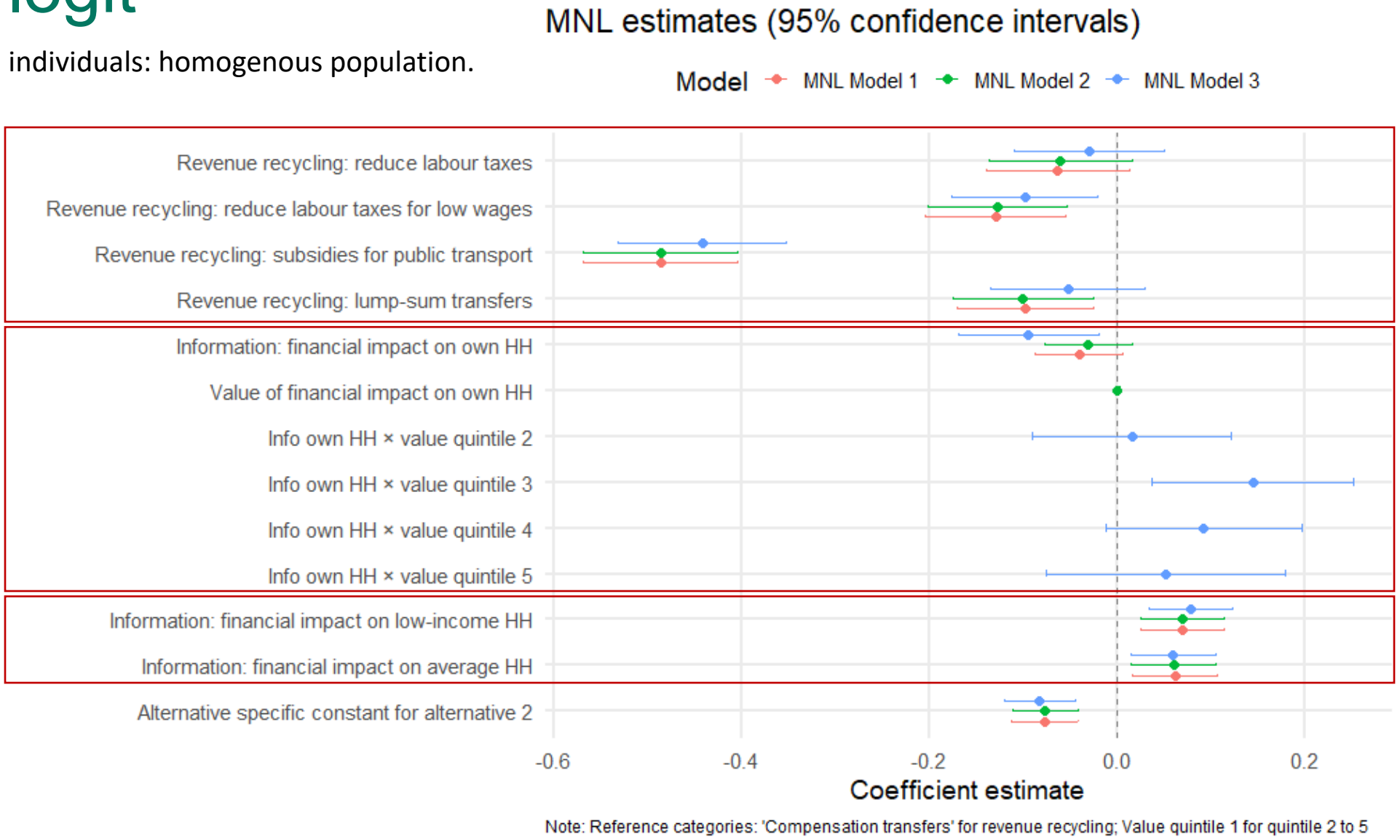
→ The choices made by respondents reveal β

Interpretation: Positive β means that attribute increases utility → increases likelihood of choosing a policy.

Multinomial logit

- All βs are the same for all individuals: homogenous population.

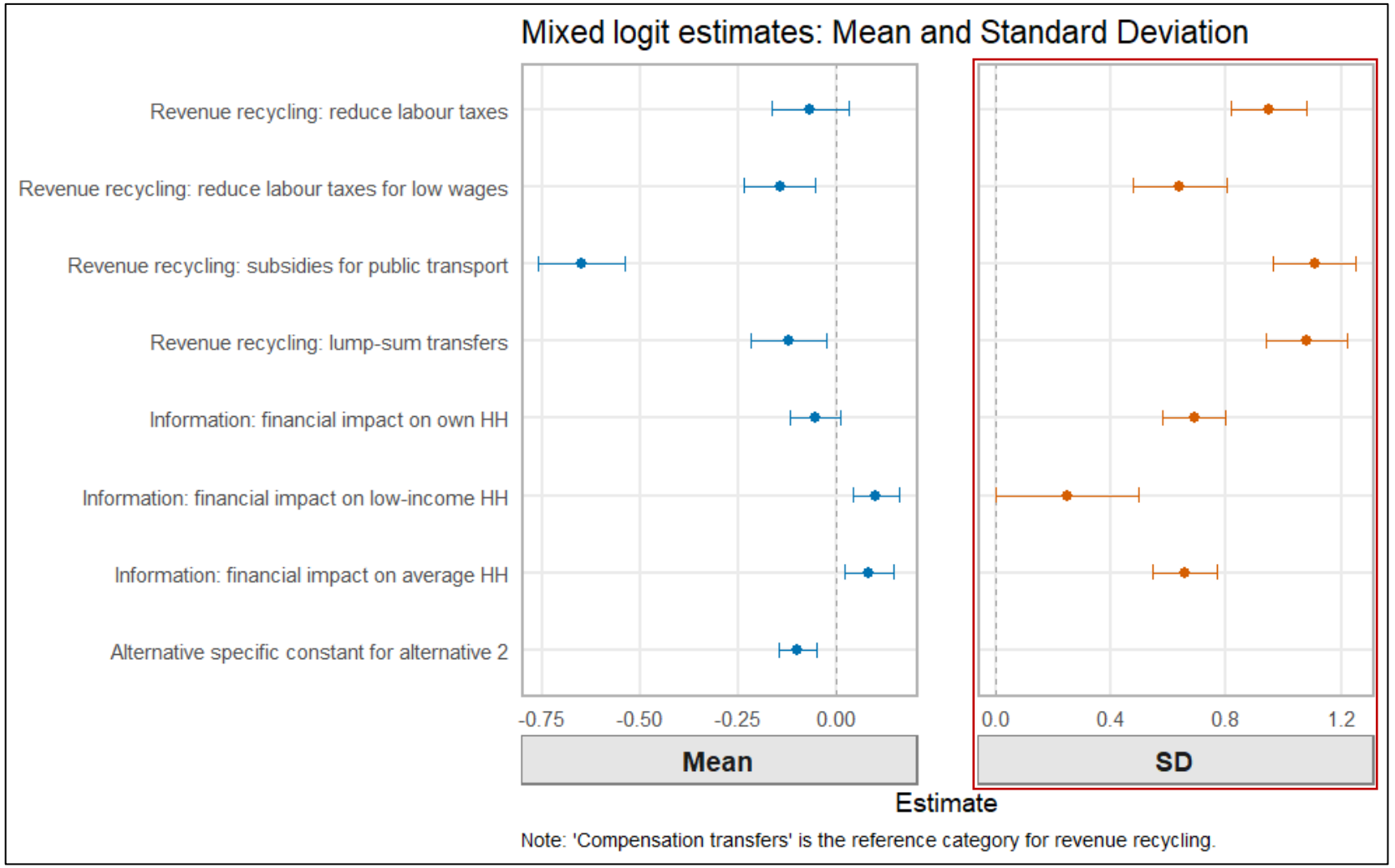




Note: Reference categories: 'Compensation transfers' for revenue recycling; Value quintile 1 for quintile 2 to 5

Mixed logit

- Allows for preference heterogeneity within population: coefficients (βs) vary across individuals.
- Similar results as multinomial logit, but we also observe a lot of **heterogeneity** in how policy attributes affect preferences for policy packages.



Ranking of revenue recycling options

How does revenue use affect preferences for policy packages?

1. Labour tax reduction

   Compensation transfers

3. Lump sum transfer

4. Labour tax reduction for low wages

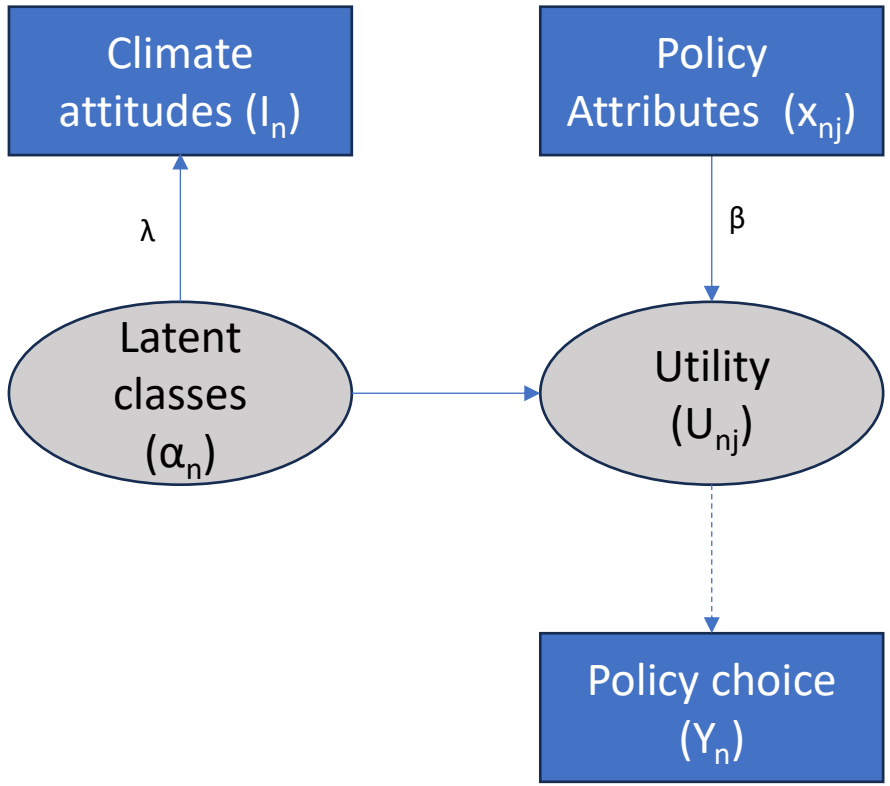
5. Subsidies for public transport

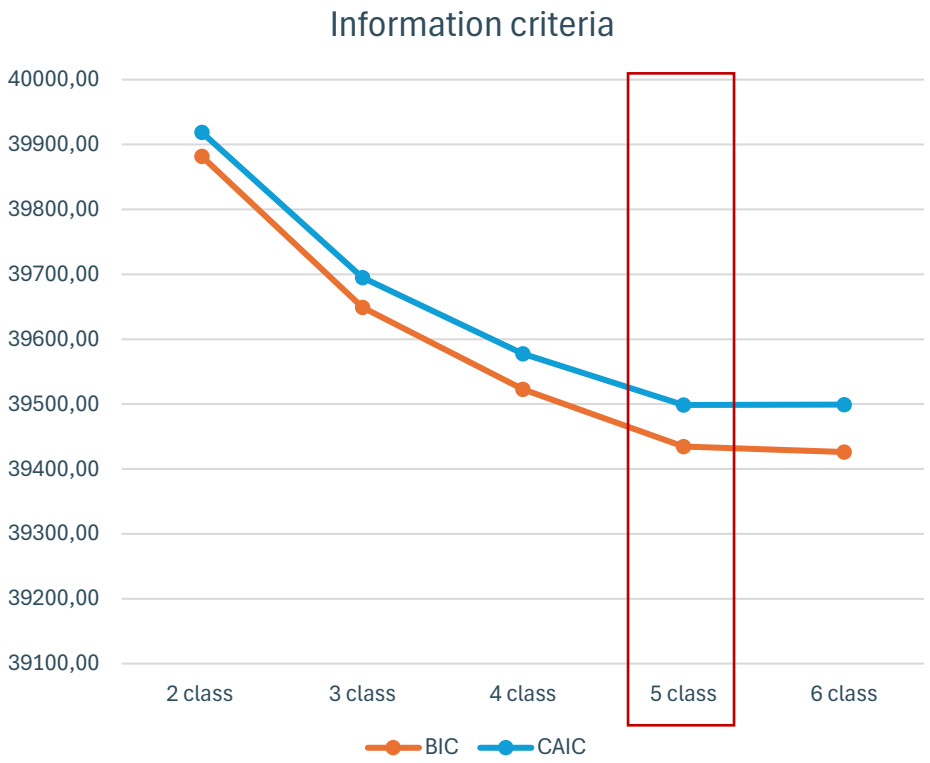
But: these preferences are heterogenous across the population (e.g. subgroup that prefers policies with specific revenue use)

Hybrid latent class choice model

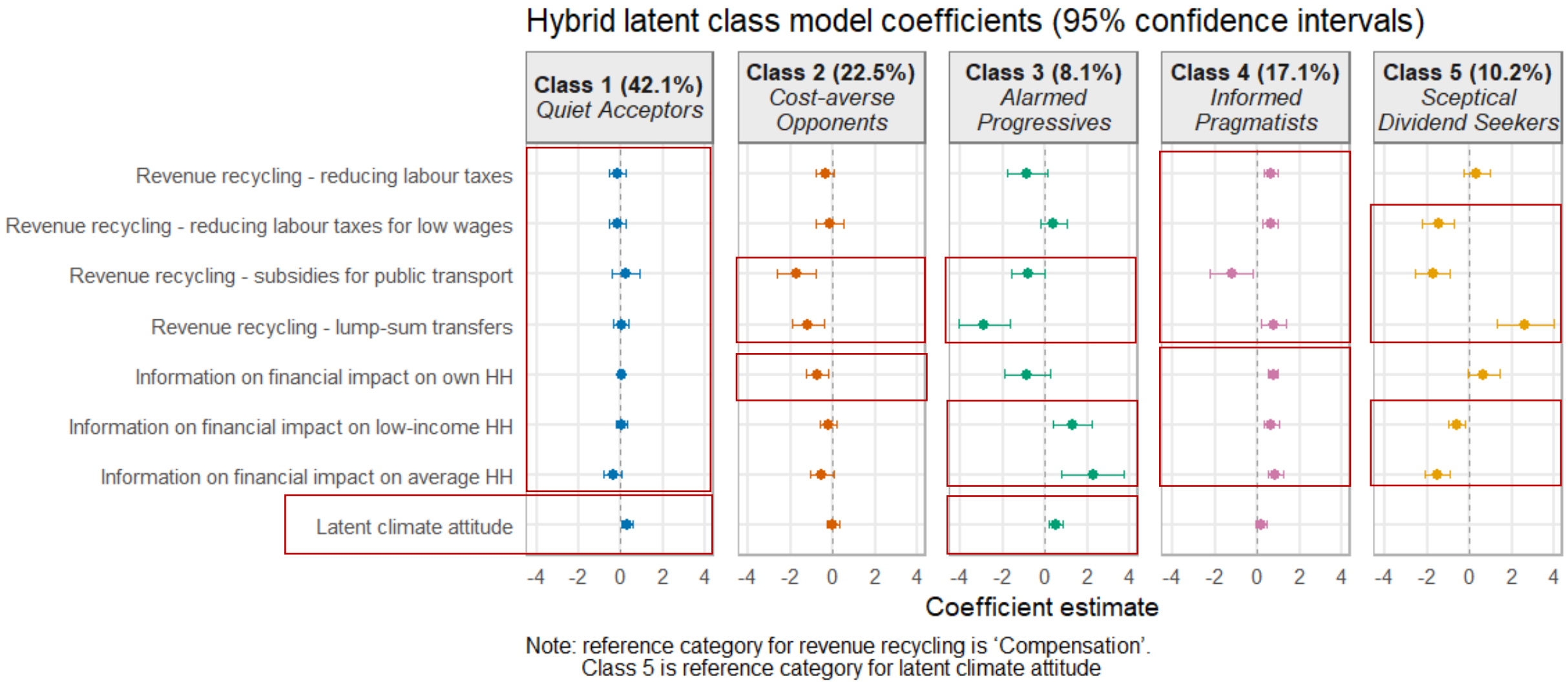
- Identify subgroups with distinct policy preferences and climate attitudes
- Heterogeneity across classes

Source: https://www.umass.edu/family/events/latent-class-analysis-part-1



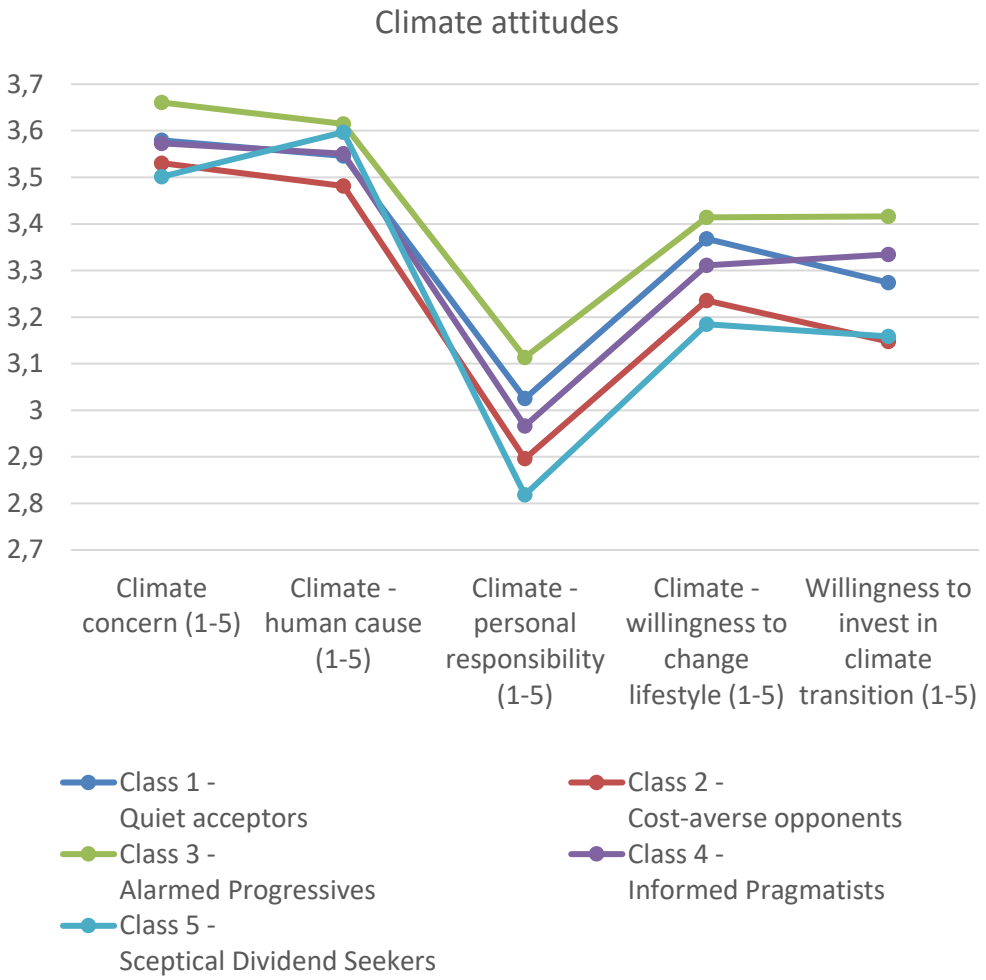


Hybrid latent class model



Note: reference category for revenue recycling is 'Compensation'.
Class 5 is reference category for latent climate attitude

Hybrid latent class choice model



Variable	Class 1 - *Quiet acceptors*	Class 2 - *Cost-averse opponents*	Class 3 - *Alarmed Progressives*	Class 4 - *Informed Pragmatists*	Class 5 - *Sceptical Dividend Seekers*
Class size	42.1%	22.5%	8.1%	17.1%	10.2%
Female (%)	50%	50%	51%	54%	51%
Age	46,2	48,8	46,7	48,6	50,4
Income - low (%)	38%	35%	36%	35%	31%
Income - middle (%)	41%	42%	46%	44%	50%
Income - high (%)	13%	14%	12%	11%	11%
Education - low (%)	27%	30%	25%	23%	26%
Education - middle (%)	41%	41%	36%	43%	34%
Education - high (%)	32%	29%	39%	34%	40%
Living in urban area (%)	36%	34%	36%	33%	34%
Living in rural area (%)	35%	38%	32%	38%	39%
Acceptability of carbon pricing	2,93	2,78	3,07	2,81	2,72
Political orientation (left - right, 0-10)	5,45	5,46	5,05	5,47	5,58
Trust in political parties (1-5)	2,13	1,96	2,06	1,95	1,97
Trust in federal government (1-5)	2,31	2,18	2,24	2,15	2,15
Trust in scientists (1-5)	3,43	3,34	3,69	3,44	3,44
Trust in traditional media (1-5)	2,67	2,53	2,71	2,64	2,53

Conclusions

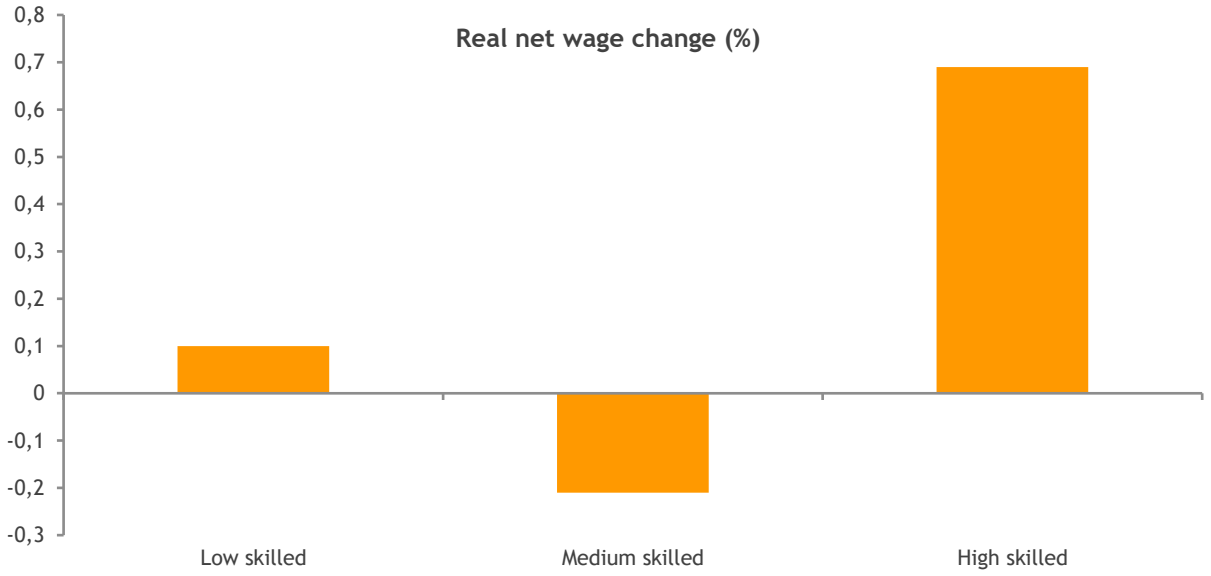
- Public preferences for carbon pricing depend strongly on revenue recycling, and to a lesser extent on information-based interventions.
- Compensation transfers and labour tax reductions are most preferred; public transport subsidies are least supported.
- Information on distributional impacts for low-income and average households can increase support; personalised financial impact information has limited effect.
- Policy design should account for preference heterogeneity to strengthen support under stringent climate goals.
- No inherent trade-off between efficiency, equity, and acceptability? E.g. combining labour tax cuts with targeted transfers can address all three?
- *Note: Green investments as revenue recycling are not included in E4BEL project (given model set-up), despite their popularity.*

Wage polarization and fiscal policy design

A CGE – MicroSimulation Analysis

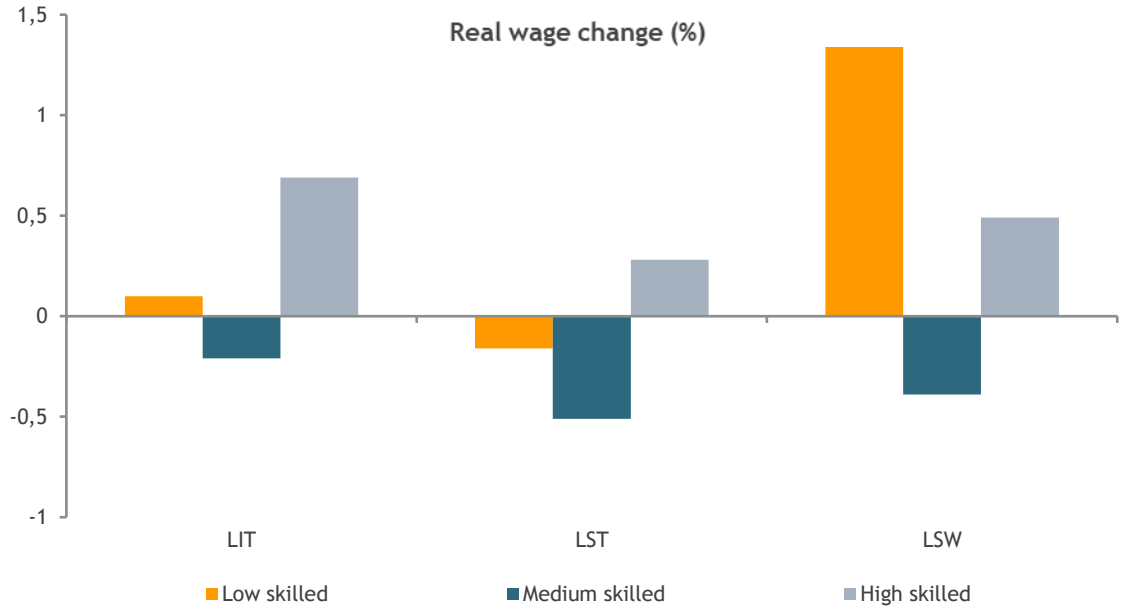
Pro memoria – the main E4BEL effect (1)

- CGE model in stand-alone role
- A simple 25 euro per tonne carbon tax
  - Recycled by a linear labour income tax (LIT) cut
- Wage – polarisation (WP), reproduced
  - Large job cuts in manufacturing, agriculture for medium skilled labour
  - Relatively less demand for ‘medium’ in ‘clean’ sectors
  - Negative wage pressure for medium skilled – beyond the capacity of LIT to compensate



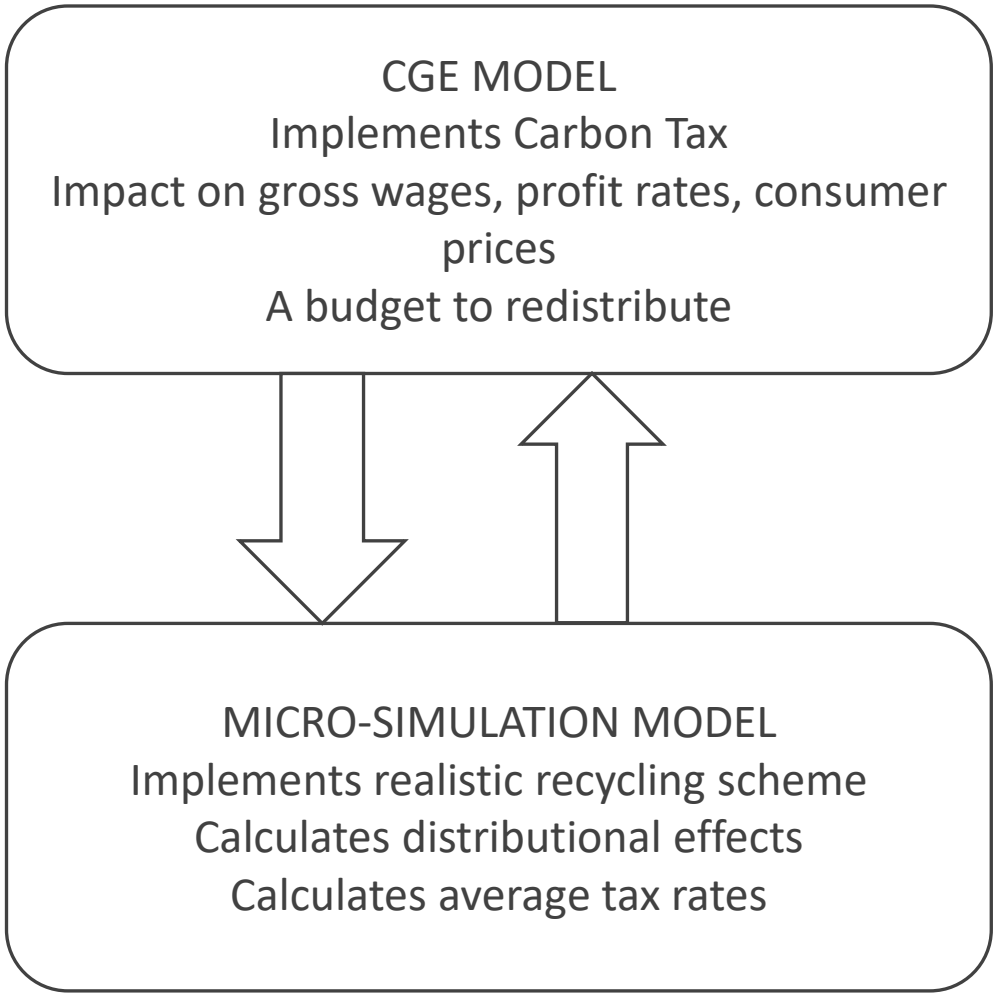
Pro memoria – the main E4BEL effect (2)

- Some other theoretical recycling mechanisms
- Linear income tax cut + a lump sum transfer (LST)
- Linear income tax cut + a tax credit for low skilled workers (LSW)
- Suggest risk of exacerbating the medium skill wage drop
- Main research question: does realistic recycling policy counter WP?



Model setup up (1)

- For realistic recycling schemes: use Euromod Micro-Simulation Model (MSM)
- Soft linked – iterative link
- CGE model without labour supply
- MSM static – no behavioural effects



Model setup up (2) – First iteration

- 1st iteration
  - CGE -> MSM
  - Commodity and factor prices
    - Note CPI is numéraire
    - Note the drop in wage rates
  - A budget to distribute

Consumption prices - after tax	
	%
durables	-0,32
electricity	2,68
food	-0,3
heating	8,41
housing	-0,44
other	-0,35
services	-0,5
transport_private	0,84
transport_services	-0,55

Factor prices - before tax	
	%
low educ wages	-1,26
medium educ wages	-2,14
high educ wages	-0,23
rate of return	-0,35
public finance	
	mio2019
Budget to distribute	2000

Model setup up (3) – second iteration

- CGE model uses flat average tax rates by skill type – but not realistic!
- In reality – and in MSM – tax rates are endogenous due to progressive taxation
- Due to falling wages, workers in MSM get an automatic tax cut
- Tax rates in models CGE model needs correction
- And budget to distribute needs re-calculation

Tax rates by education type in CGE		
	Before	After correction
low educ	37,9%	37,5%
medium educ	42,4%	41,9%
high educ	50,3%	50,3%
Public finance		
	mio	
Budget (before correction)	2000	
Budget (after correction)	1300	

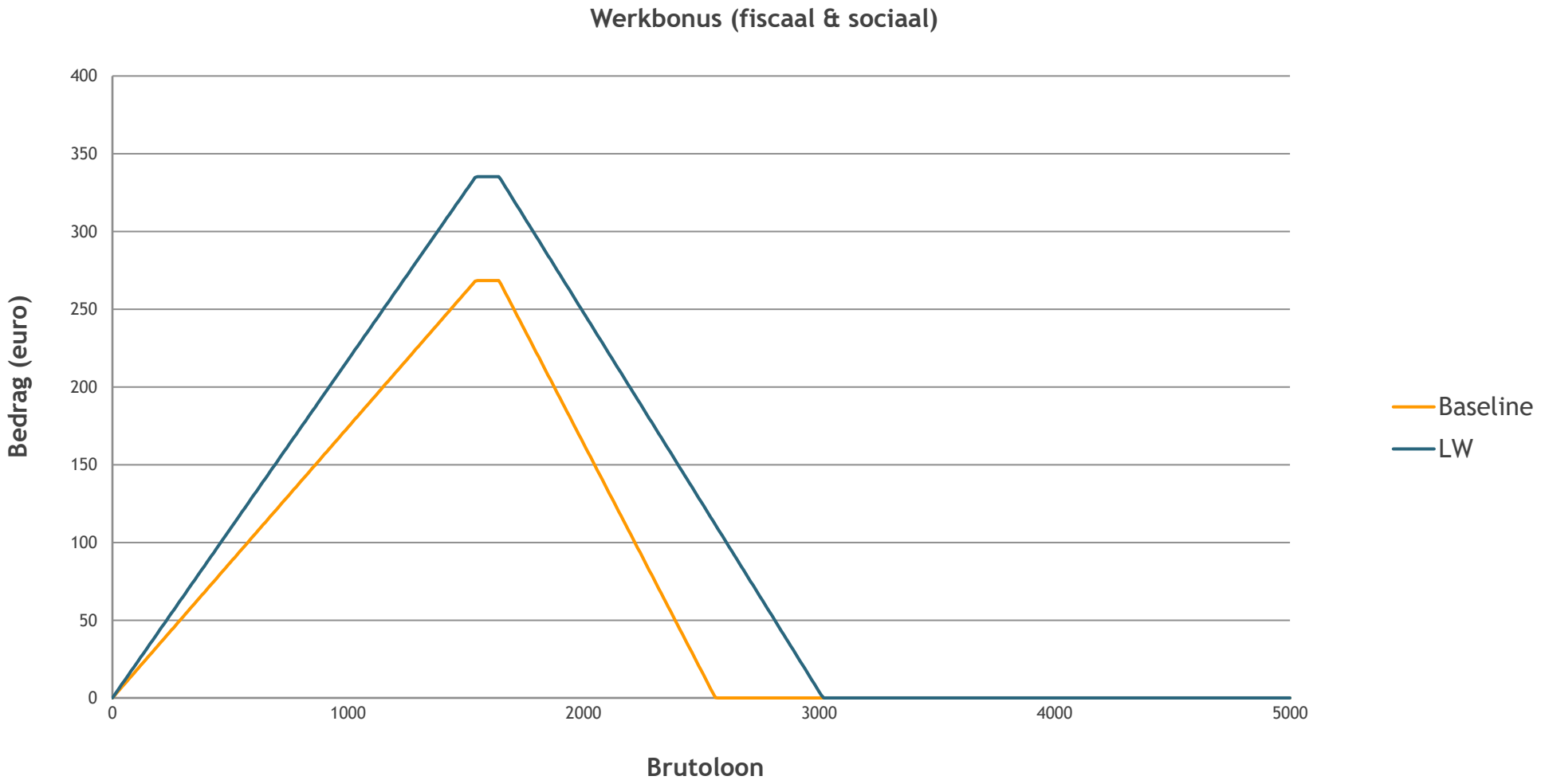
Recycling schemes tested (1)

- A linear employer's payroll tax cut (LIT) – 0,59 pp on entire wage cost

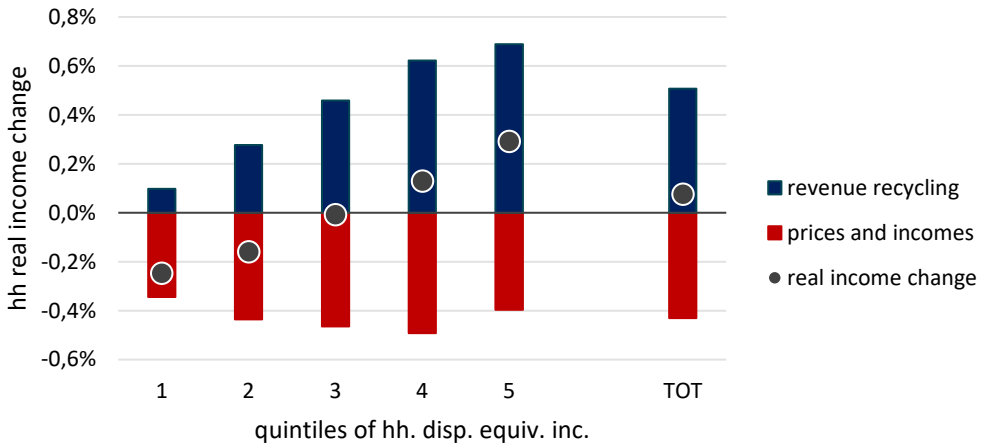
- An increase in the tax free allowance for all taxpayers by + 681 (TA)
  - An increase in the tax free allowance for employed persones only by + 962 (TE)

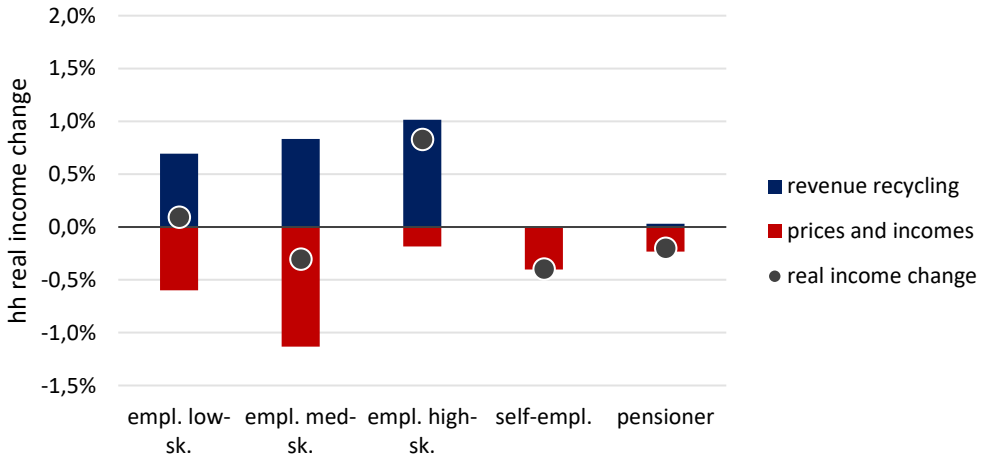
- An increase in the 'werkbonus' (LW)
  - An increase in the 'werkbonus' + a cheque for people using oil heating (LW - CO)

Recycling schemes tested (2)



Results – focus on LIT

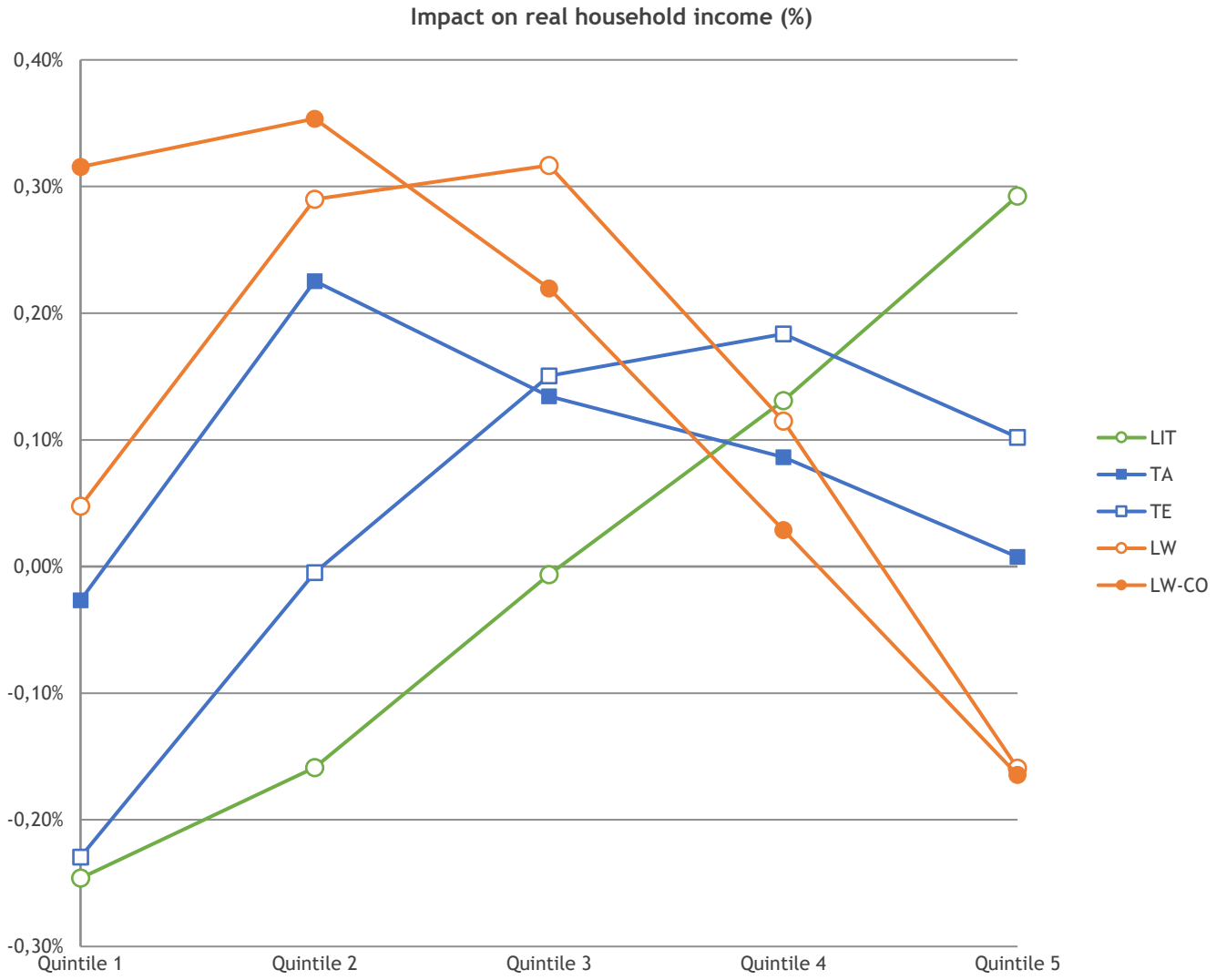




- By quintile – classic regressive impacts
  - Broad losses through price and income before taxes
  - Only third quintile and beyond compensated
- By employment status highly nonlinear
  - Self – employed and pensioners lose due to rate of return drop
  - U shape of impact by skill type for workers – as predicted by the CGE model

Comparing impacts - quintiles

- Low wage credit variants (LW and LW – CO) progressive, to varying degrees
- Impact tax free allowance depends on target group



Comparing impacts – labour market status

- Tax allowance variants do not overturn wage polarization
- Low wage credit overturns wage polarisation on average
- A low wage variant, significantly diluted by a transfer loses its potential

Conclusion

- Only 'werkbonus' can overturn the wage-polarisation result
  - Provided it’s not overly diluted by other possible considerations

- Tax free allowance insufficiently targeted, even for active persons

- Further research
  - Does the job (wage) polarization result stand in a non-competitive labour market
  - Can tax policy undercut polarization when unemployment is present

Towards an efficiency – equity – acceptability scoring

Programme for the last year

Goal: scoring of CTS-designs

Climate tax shift		Efficiency		Equity			Acceptability	
carbon price	revenue recycling design	GDP	Employment	income inequality	Wage polarization	…	Support/opposition	…
€25/tonne	lump sum transfer							
	linear SSC reduction							
	tax free allowance increase							
	only for active individuals							
	werkbonus/EITC							
	cheque for specific households							
	…							
	Combinations							
ETS1/ETS2								
"TARGET"								

Going forward

- Efficiency:
  - GDP
  - Employment: need to endogenize labour supply response
    - Fully integrated CGE-MSM model
    - Unemployment/decrease in labour market opportunities
- Equity:
  - Inequality measures based on disposable income
  - Polarization in the labor market
    - Skill vs. occupation
  - Comprehensive well-being measure
    - Account for heterogeneous preferences and changes in consumption/labour time
    - Account for environmental gains
- Acceptability:
  - Quantitative measures limited to scenarios in survey
    - Qualitative extrapolation of findings from survey towards more CTS-scenarios
  - Population as a whole & societal subgroups