Introduction - Macroeconomics of Carbon Pricing

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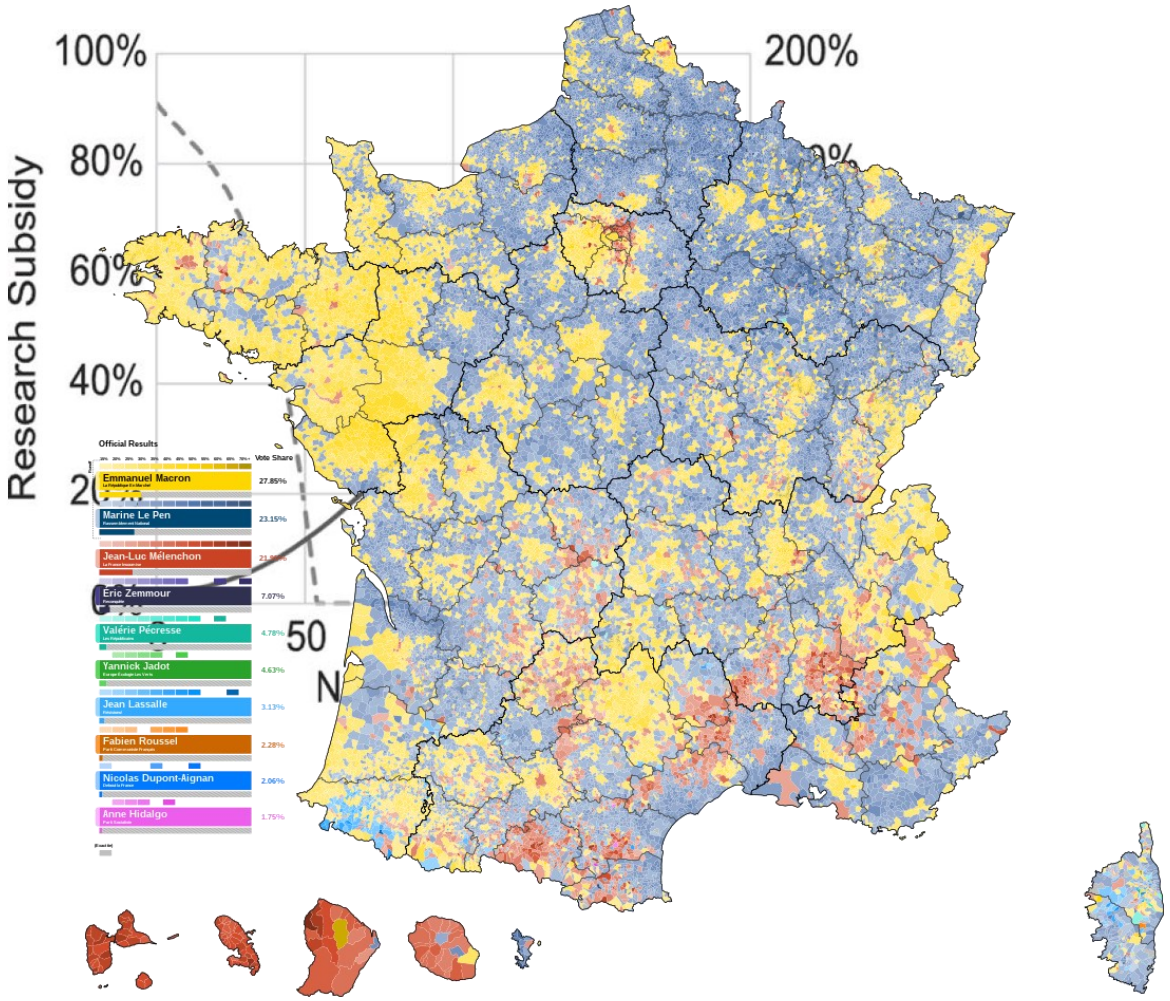
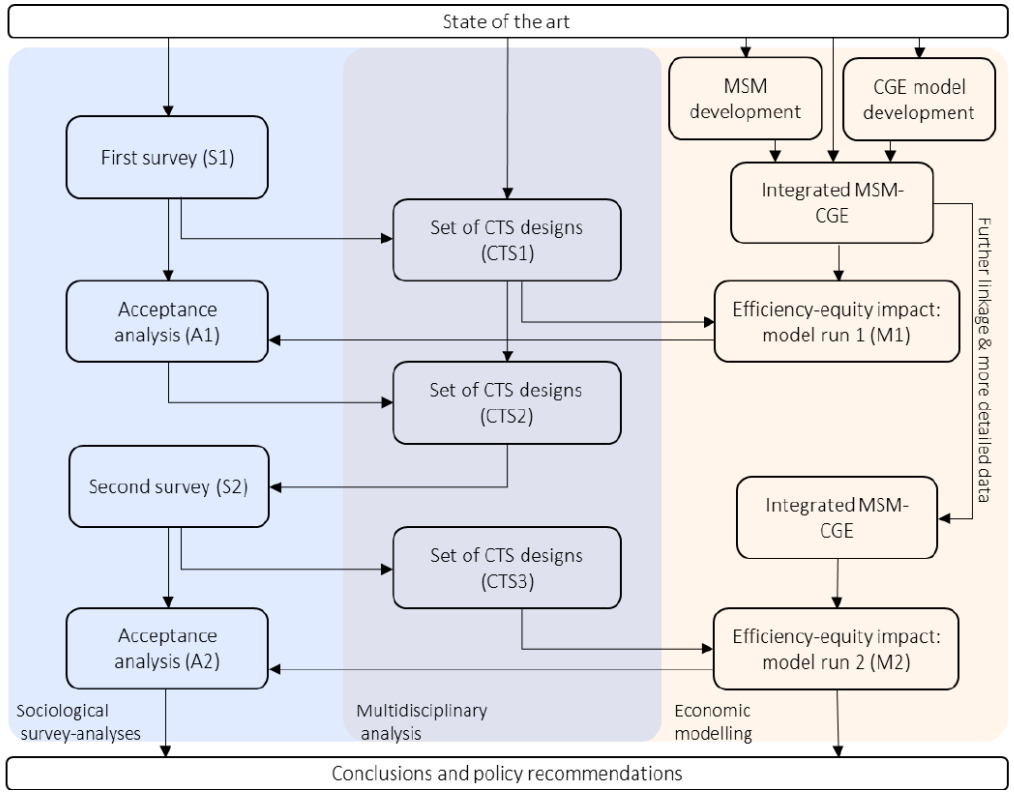
Equity, the 4th “E”

- Traditional Integrated Assessment
  - Energy, Environment, Economy
  - Prescription: Carbon Price is ‘efficient’
  - Holds with clean technology and when innovation subsidies are instruments
- Quid equity?
  - Saying equity is ignored would be unfair
  - Summarizing the literature would take more than 15 minutes
  - But one cannot help feeling a disconnect between science/policy and society
  - Is it the economic models? Are they merely incomplete?
  - Or do we need to go beyond narrow economics to explain (and eventually remedy) opposition to carbon taxation?
  - Is there an efficiency/equity/acceptability trade-off in carbon pricing?



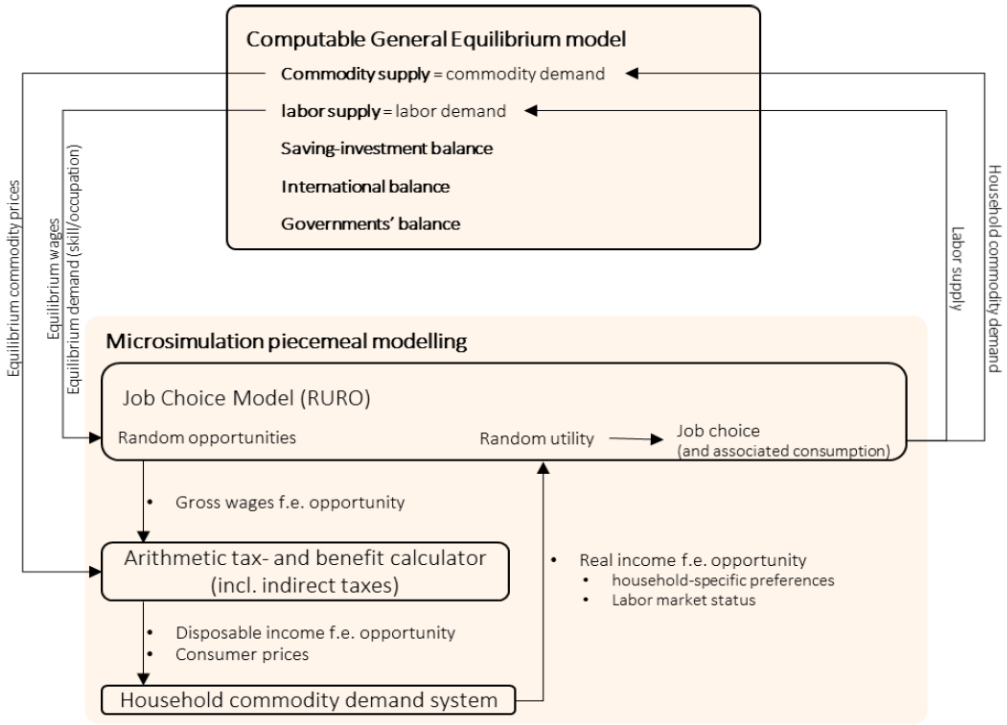
Three approaches

- Intense cross-fertilization between
  - ‘Macro-economics’ (general equilibrium modelling) - FPB
  - Micro-simulation modelling – KULeuven, Dept of Economics
  - Sociology – KULeuven, HIVA
- With the objective to
  - Estimate the effect of energy prices on firms’ decisions
  - Enhance our modelling capacity on the distributive effects of Climate Tax Shifts (CTS)
  - Gauge society’s attitudes to CTS
  - At the end of the process, arrive at a policy package reconciling acceptability, equity and efficiency
- Using survey results to inform economic modelling choices and CTS design
- And use model results in a choice experiment



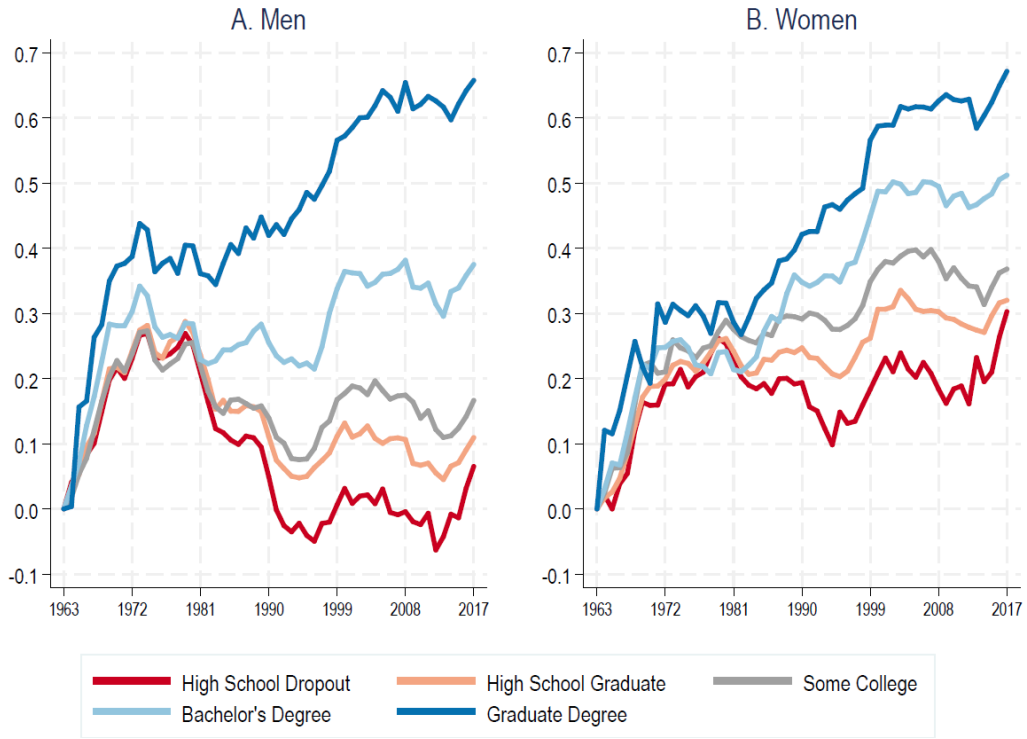
Charting real incomes

- Micro-simulation models are instruments of choice
- Powerful tools to analyse horizontal, next to vertical equity
- Traditionally, take wages and prices *before* taxes as given
- General equilibrium models are natural complements
- Reason: give changes in *relative prices* from policy reforms
- And what is 'real' income other than a relative price (if one considers wages as the price for labour)?



Inequality as a relative price

- Let's put the general equilibrium contribution in a wider perspective
- Modern macro-economics uses growth theory written as GE models
- To tackle long-run trends in e.g. wage inequality, which is really just one more relative price
- See the task approach to labour markets, à la Acemoglu and Autor
- Impact of automation, outsourcing on changes in demand for heterogenous labour
- And so, on relative wages



A labour market polycrisis brewing?

- We mentioned Autor and Acemoglu for good reason
- Outsourcing, automation, geography, immigration … and the green transition?
- Evidence so far points to heterogenous effects of energy prices on labour demand
- Occupation/tasks good indicator
- Same assymmetric losers/winners pattern as identified in the task literature?
- i.e. routine tasks disappearing in favour of (new) non-routine professions?
- In itself no big effects, but…

Table 5 – Profiling of green occupations: skill measures

	(1) NR cognitive	(2) NR interactive	(3) R cognitive	(4) R manual	(5) NR manual	(6) RTI index
Green emerging	0.0293	-0.00737	-0.0320*	-0.0152	-0.00291	-0.0692
	(0.0187)	(0.0205)	(0.0192)	(0.0149)	(0.0364)	(0.0476)
Green enhanced skills	0.0297**	0.00404	-0.0198*	-0.00508	0.0152	-0.0583**
	(0.0130)	(0.0145)	(0.0108)	(0.0155)	(0.0162)	(0.0269)
Joint sign. green occ dummies (F)	3.309**	0.120	2.489*	0.519	0.456	2.996*
N	465	465	465	465	465	465

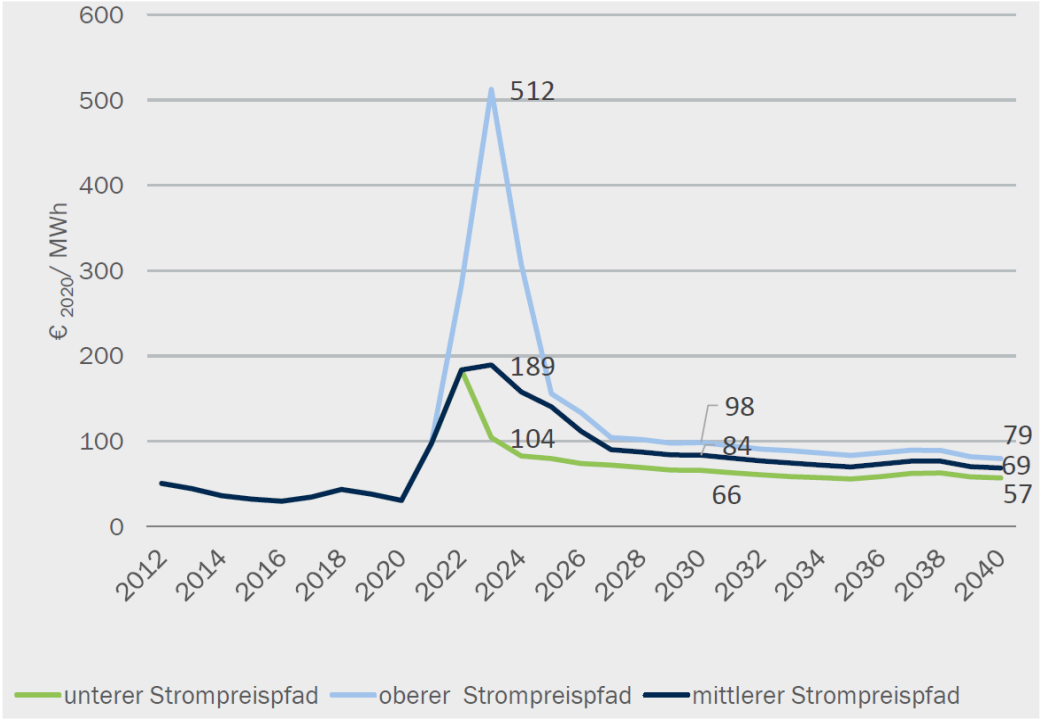
OLS estimates weighted by employment share. Robust standard errors in parenthesis. * p<0.1, ** p<0.05, *** p<0.01. SOC 3-digit dummies included. Occupations in SOC 3-digit categories with no green occupation have been excluded.

Table 22 – Impact of environmental regulation on skills – manufacturing industries only (v NAICS dummies)

	Greenness	Engineering & Technical	Science	Operation Management	Monitoring
log(SO2/L)	-0.000910	-0.00506*	-0.00420**	-0.0113***	-0.00413***
	(0.00144)	(0.00259)	(0.00165)	(0.00239)	(0.00160)
Hansen test (p-value)	0.879	0.185	0.732	0.900	0.643
	Non-green specific tasks	RTI	NR tasks	R manual	R cognitive
log(SO2/L)	-0.0394	0.0424***	-0.00852***	0.0200***	0.00278***
	(0.226)	(0.00739)	(0.00163)	(0.00353)	(0.000899)
Hansen test (p-value)	0.742	0.740	0.746	0.871	0.573

Our approach

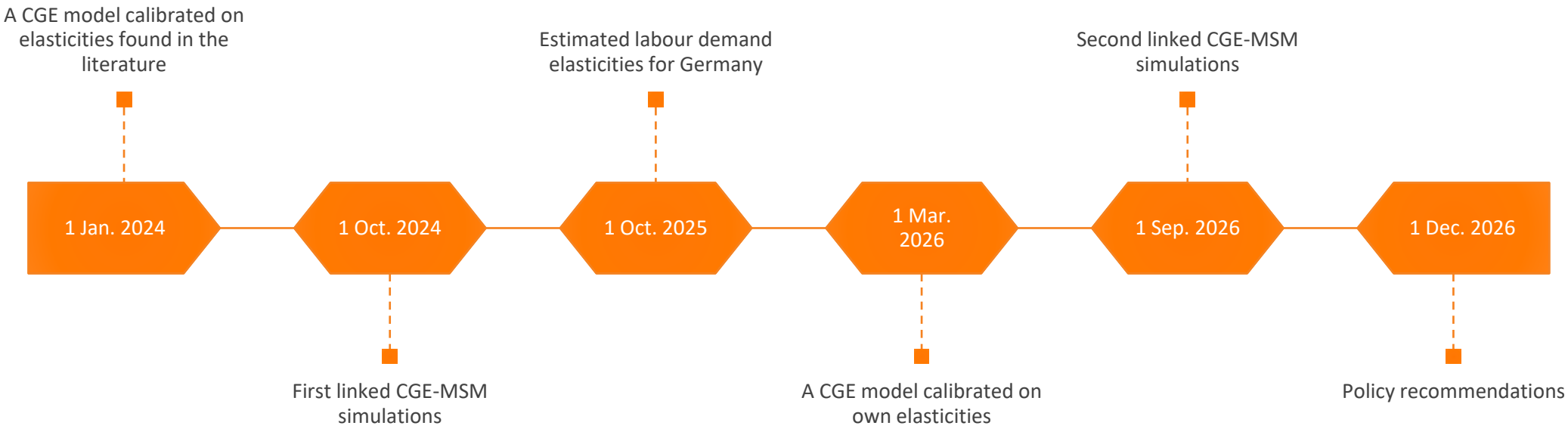
- We won't construct a full dynamic growth model in the Autor – Acemoglu tradition
- We'll use a classic static CGE model, with a strong focus on heterogenous labour demand
  - Note: suitable for labour taxation recycling, less for investment
- Calibrated as a medium run equilibrium
  - Likely on GEM-E3 and/or a PRIMES reference scenario
- Able to present impacts on wage distribution
  - Assumption: competitive labour market
- And above all look to a strong empirical underpinning
  - At first in the literature
  - Then, using own empirical estimates
  - Germany: at the forefront of labour market research, and uniquely vulnerable to geopolitical shocks



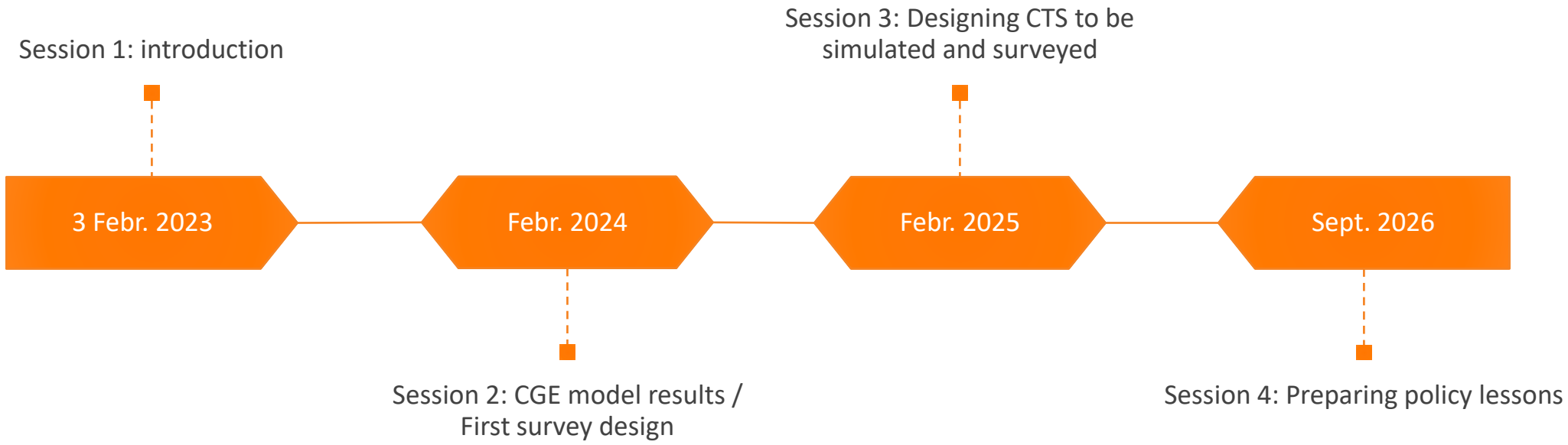
Other topics on our radar

- Quid unemployment? Mixed evidence on importance of skill mismatch between green-brown jobs so far
- Quid forecasting? Are general equilibrium models suitable to project labour demand into the future?
- Quid innovation? Our model will be defined as a medium-run equilibrium, but energy prices have LR effects via innovation and (re)training
- Quid the Capital-Labour tension? The green transition will require substantial (incentives towards) investment. Are these neutral towards wage/rental rate inequality?

Timing


A CGE model calibrated on elasticities found in the literature
1 Jan. 2024
1 Oct. 2024
First linked CGE-MSM simulations
Estimated labour demand elasticities for Germany
1 Oct. 2025
1 Mar. 2026
A CGE model calibrated on own elasticities
Second linked CGE-MSM simulations
1 Sep. 2026
1 Dec. 2026
Policy recommendations

Upcoming meetings



Equity – Acceptibility trade-off

Direct and indirect distributional impacts of carbon pricing.

Department of Economics, KU Leuven

André Decoster, Stijn Van Houtven, Bart Capéau

OVERVIEW

1. Our primary research objective
2. The micro-modelling infrastructure
3. Embedded in research strategy E4BEL
4. Timing

Map economic and distributional effects of climate tax shift (CTS)

- Direct effects on individual welfare:
  - Price increase of commodities
  - Revenue recycling through income support, lower labor income taxes, …
- Behavioral responses:
  - Firms: supply of commodities and labor demand
  - Households: demand for commodities and labor supply
- Which leads to (indirect) effects on individual welfare:
  - Commodity price developments
  - Wages and opportunities on the labor market
  - Environmental and climate impact
- Outcome of interest:
  - Equity: distribution of individual welfare
  - Efficiency: level of average individual welfare
  - For specific CTS-scenarios in 2nd half of the project.

Modelling of household side, asks for:

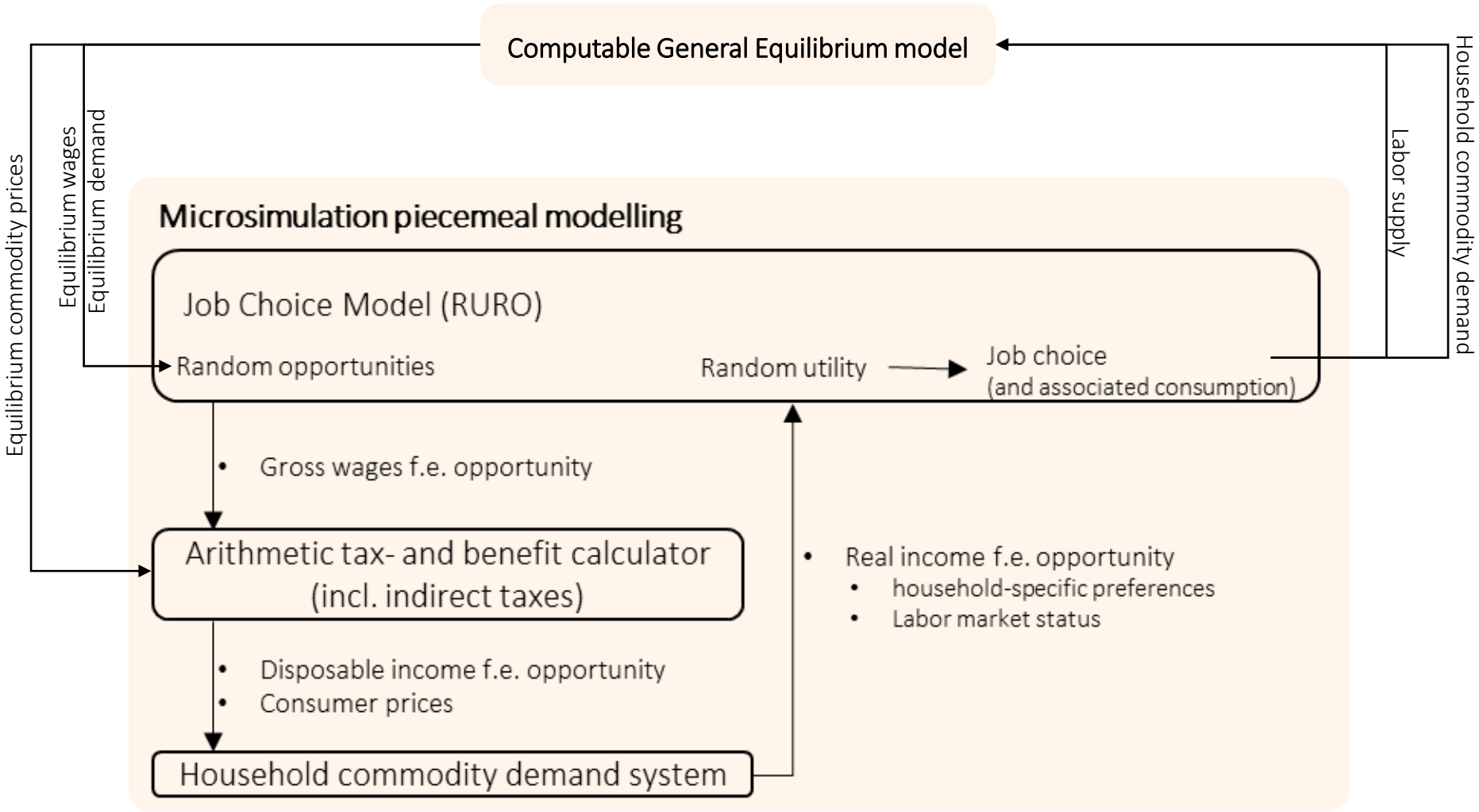
- Tax-benefit calculator + expenditures
- Labor market module
- Demand system to model commodity demand

- Labor supply: Random Utility – Random Opportunity
  - Job choice between several opportunities
  - Detailed modelling of disposable income for each opportunity
  - Household chooses the jobs with highest utility
    - Random component of utility from unobservable characteristics of the job
  - Heterogeneous shocks in labor demand and wage can be integrated in the model

- Commodity demand: quadratic almost ideal demand system
  - Relative prices and disposable income determine allocation of household budget

- Piecemeal modelling strategy
  - Consumer price changes have heterogeneous impact on real income, dependent on consumption pattern
  - Taken into account in labor supply decision by linking RURO with household consumption
  - By statistical match between data on incomes and data on expenditures

MICRO-MODELLING INFRASTRUCTURE



- Different stages on two dimensions
  1. Data
     1. Household budget survey (HBS) & Statistics on Income and Living Conditions (SILC)
     2. Household budget survey & administrative data DWH LM&SP
        - Mostly relevant for estimation/simulation RURO:
          - Observed hourly wages (issues in SILC)
          - Take into account more detailed tax-benefit system
          - Larger sample: focus on subpopulation possible
          - More observed characteristics of the job

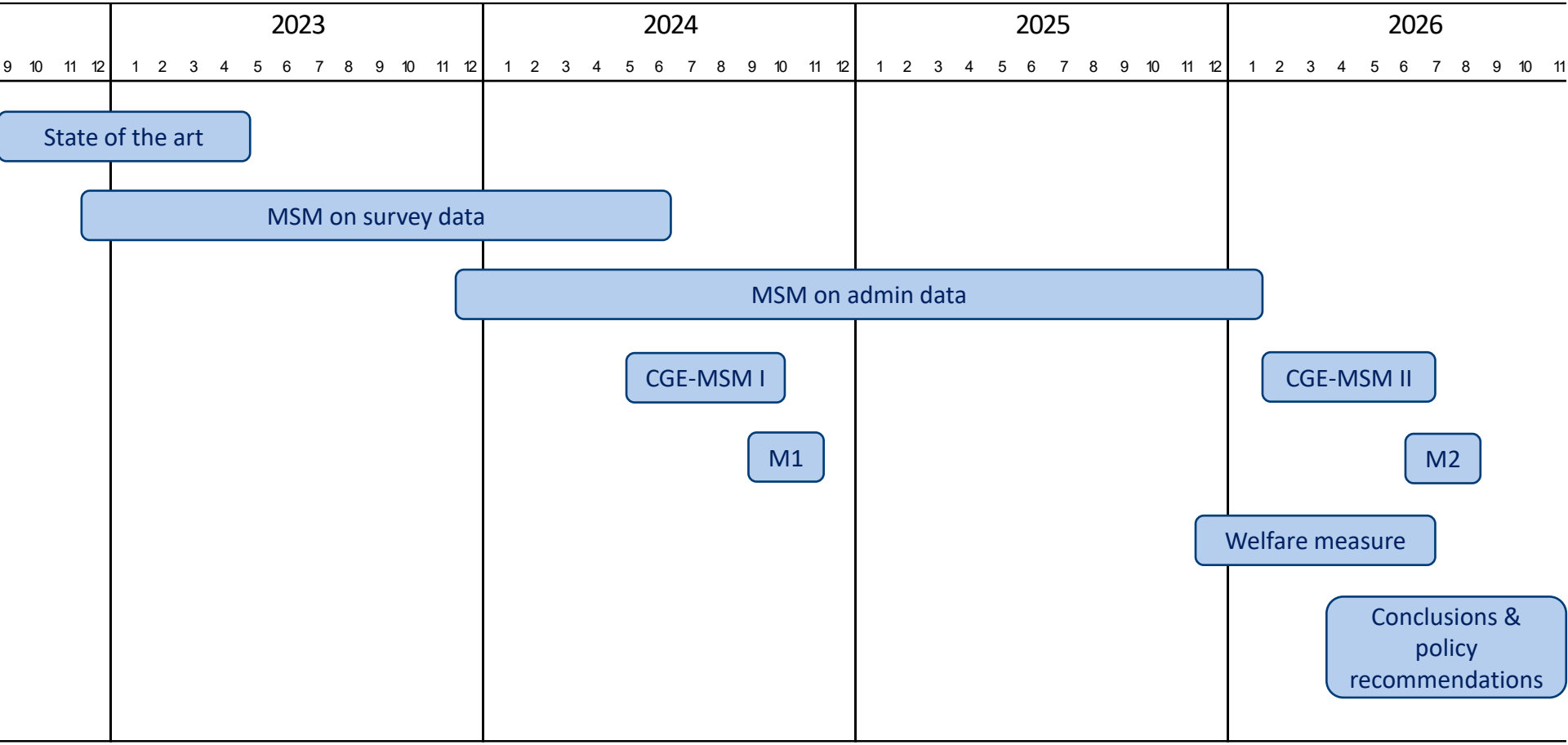
  2. Complexity of model
     - Starting point:
       - Heterogeneity in opportunities/preferences over standard socio-demographic variables
       - Weak separability in utility over leisure and consumption
         - (consumption pattern does not depend on labor market choice)
     - Further develop model by:
       - Including more observable characteristics in the job choice (e.g. occupation, distance work-home)
         - More detailed linkages between MSM and CGE
       - Relaxing separability assumption

- Linkage with CGE
  - Development of micromodel flexible, depend on first macro results.
  - Not only operationalizing the linkages,
  - But also describing theoretical consistency of assumptions in both models.

- Embedded in survey-analyses on acceptability of Climate Tax Shift (CTS)
  - Distributional impact of first set of CTS used in
    - Acceptance analysis after first survey
    - Construction of second survey with discrete choice experiments, and impact on choices of providing distributional information.
  - Distributional impact of second set of CTS used, together with acceptability analysis, to formulate conclusions and policy recommendations.

- Explorative research tracks
  - Welfare measure that accounts for climate/environmental gains
  - Impact of retraining from brown to green jobs
  - Spatial analysis (depends on data availability)

TIMING


2023
2024
2025
2026
9 10 11 12
1 2 3 4 5 6 7 8 9 10 11 12
1 2 3 4 5 6 7 8 9 10 11 12
1 2 3 4 5 6 7 8 9 10 11 12
1 2 3 4 5 6 7 8 9 10 11
State of the art
MSM on survey data
MSM on admin data
CGE-MSM I
CGE-MSM II
M1
M2
Welfare measure
Conclusions & policy recommendations

KU LEUVEN
HIVA
RESEARCH INSTITUTE FOR
WORK AND SOCIETY

Public acceptability of carbon pricing

Kris Bachus & Jeroen Barrez

Public acceptability of carbon pricing

- Why public acceptability matters?
- State of the art
- Survey 1 – general
- Survey 2 – discrete choice experiments
- Carbon pricing and the trade-offs between efficiency, equity and public acceptability
- Planning

Why public acceptability matters?

On top of economic and environmental performance & equity

- The use of carbon pricing is rather low (in number of countries and price level)
- Policies with low public acceptability will receive low support of politicians
- Perceptions can be more important than actual policy impacts

→ Making carbon pricing acceptable is key for a successful policy implementation

State of the art

State of the art of the public acceptability of carbon pricing

- international research
- Belgian context

Overview of the drivers of public acceptability of carbon pricing:

- Individual sociodemographic factors & personal values, believes and norms
- Context e.g. trust in the government, social norms, media coverage, …
- Perceived policy design and cognitive biases
    - Use of the revenues (climate tax shift): reduce labour and other distortive taxes, redistribution, green investments, reduce public debt, …
    - Communication and information

→ Input for 1st survey

Survey 1 – general

- Based on review of state of the art (launching in January 2024)

- General public attitudes towards carbon pricing
- Explore the (potential) objections, perceptions and fears (purchasing power, job loss, effectiveness of carbon pricing,…)
- Study the role of trust in the government and explore cognitive biases:
  - fiscal illusion, (carbon) tax aversion, role of salience, role of framing and labelling, …
- Update and refine the 'Ladder of Acceptability of Revenue Recycling options' (LARRO)

→ Acceptance analysis based on survey together with efficiency-equity impact of a set of climate tax shift designs

Survey 2 – discrete choice experiments

Based on set of policy packages of climate tax shifts (launching in June 2025)

- Methodology: discrete choice experiments (DCE) to test public acceptability of specific policy packages
- Test the relative importance that respondents attach to different attributes of the climate policy packages
- Testing whether providing information on the effects of policies might affect acceptability

→ Acceptance analysis based on survey together with efficiency-equity impact

Hypothetical example of a choice card

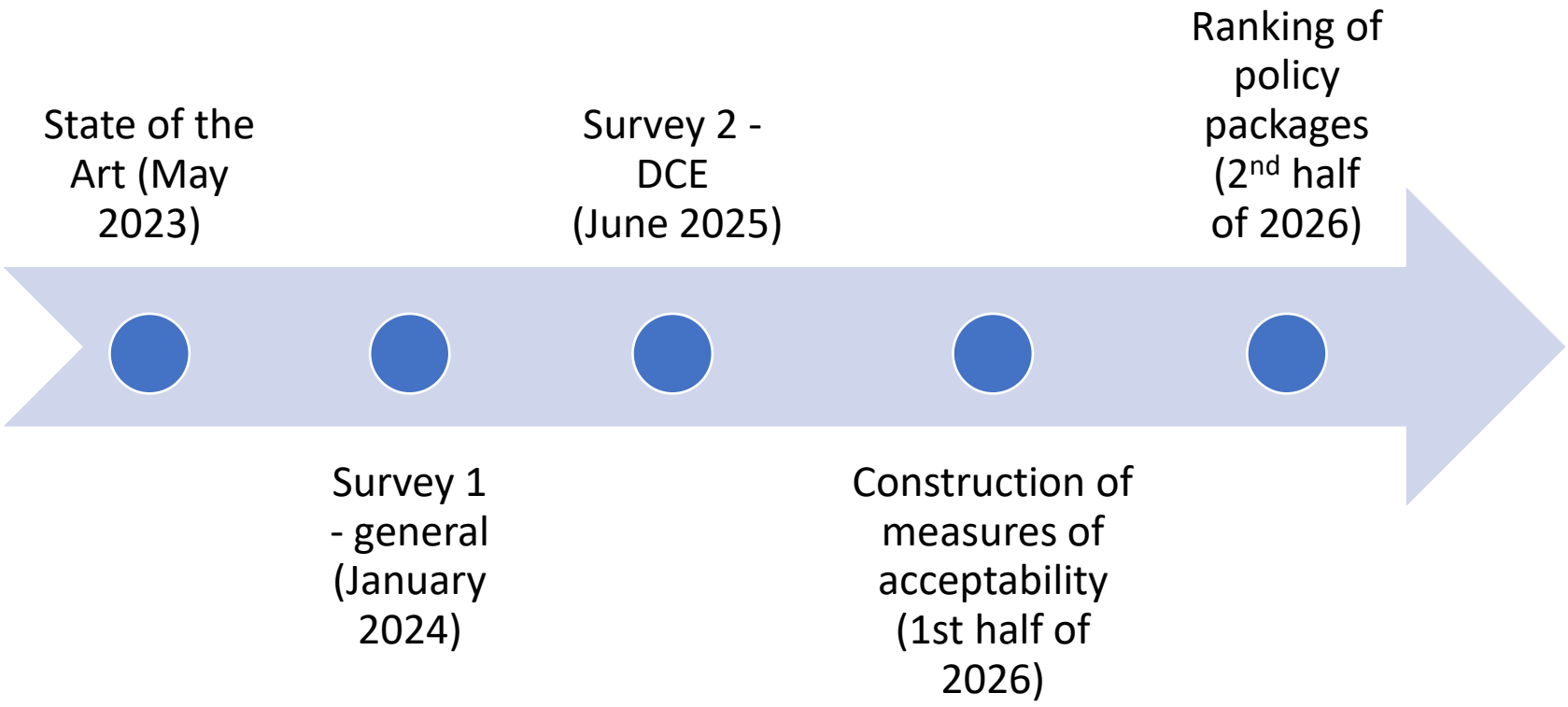
Choice card 1	Option 1	Option 2
Tax rate Use of revenues	70 euro/ton CO_2 Green investments	100 euro/ton CO2 Reducing labour taxes & redistribution
Impacts on:		
Increase in energy price	11 cent per liter	15 cent per liter
CO_2 emissions	- 7 %	- 8%
GDP	+ 1,1%	- 0,3 %
Real income	- 0,5%	+1,2%
Poverty	+1,1%	-2,1%
Employment	+1,2%	+1,4%

Fictional example inspired by: Carattini, S., Baranzini, A., Thalmann, P., Varone, F., & Vöhringer, F. (2017). Green Taxes in a Post-Paris World: Are Millions of Nays Inevitable? *Environmental and Resource Economics*, *68*(1), 97–128. https://doi.org/10.1007/s10640-017-0133-8

Carbon pricing and the trade-offs between efficiency, equity and public acceptability

- Construction of measures of acceptability (number of respondents approving, degree of acceptability)
- Ranking policy packages on trade-offs ('*economy meets sociology*'):
  → scoring climate tax shift options with indicators of acceptability, equity, economic and environmental performance

Planning


State of the Art (May 2023)
Survey 1 - general (January 2024)
Survey 2 - DCE (June 2025)
Construction of measures of acceptability (1st half of 2026)
Ranking of policy packages (2nd half of 2026)

THANK YOU

KU LEUVEN HIVA