Green Tax Reform:
Labour market impact of carbon pricing and revenue recycling

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OVERVIEW

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INTRODUCTION

- Green tax reform: Carbon pricing + revenue recycling
  - Double dividend due to labor supply effects from revenue recycling
    • But: also increased prices induce behavioral effects
    • But: distributional impact (incl. GE effects)

➢ Heterogeneity in direct and indirect effects -> microsimulation

- Modelling strategy
  • Arithmetic MSM of direct and indirect taxes with
  • “Random Utility – Random Opportunity” job choice model
    • Capéau et al. 2023

➢ Capture wide heterogeneity in
  • Consumption patterns & labor supply responses (detailed budget constraint)
➢ Allow feedback from partial/general equilibrium (e.g. in labor demand)
INTRODUCTION

- Overview paper of carbon taxes
  • Timilsina 2022
- Random Utility Random Opportunity framework
  • E.g. Aaberge and Colombino 2014, Dagsvik et al. 2014
- Few examples of micro-based labor supply simulation of joint reform
  • Bach et al. 2006, Capéau et al. 2009, Pestel and Sommer 2017, Savage 2017
- RURO with (endogenous) labour demand effect
  • Narazani, Colombino and Palma 2021

➢ Tractable strategy for behavioral impact of joint direct and indirect tax reform with two-stage budgetting approach, and
➢ First step toward integrated micro-macro approach to include general equilibrium effects on employment opportunities, (relative prices and wages.)
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Structure on preferences

from: \[ \max_{x, h} \Omega(x, h) \] s.t. \[ q'x \leq f(w, h; M, z), \]
\[ x \geq 0, \]
\[ 0 \leq h \leq T \]

to: \[ \max_{(w, h) \in B} \tilde{\Omega}(q, w, h) = H\left(\frac{f(w, h; M, z)}{Q(q)}, h\right) + \varepsilon \] s.t. ...

- Deterministic part, \( H(\cdot, \cdot) \), and random term, in utility.
- Weak separability assumption: two-stage budgeting: \( H(u(x), h) \)
  - For each level of \( h \) the household optimizes subutility of consumption \( u(x) \)
  - Indirect utility from second stage used in the first stage: \( H(v(q, y), h) \)
  - If we assume Cobb-Douglass \( u(x) \), we have indirect utility:
    \[ v(q, y) = \frac{y}{\prod_i q_i^{\omega_i}} = \frac{y}{Q(q)} \]
- First stage is labor market choice \((w, h)\), dependent on consumer prices \( q \)
- We assume Box Cox utility function \( H(\cdot, \cdot) \) over real consumption and leisure
Structure on labor market alternatives: random opportunities

- Not all alternatives equally available
  - $g_w(w)$ lognormal wage distribution
  - $g_h(h)$ uniform distribution with peaks at 20, 30 and 38 hours per week
  - $\theta$ relative intensity of job offers, dependent on personal characteristics

- “likelihood of being available”

$$\frac{\varphi(w,h)}{\varphi(0,0)} = g_w(w)g_h(h)\theta \quad \text{for } w, h > 0$$

- For each individual a (random) choice set, drawn from individual distribution
  - Allows to model heterogeneous changes in employment opportunities offered on the labor market
  - Exogenous labor demand shock for three types by educational attainment
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  - Carbon tax + revenue recycling
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EMPIRICAL APPLICATION — ESTIMATION AND SIMULATION

- Estimate model on Belgium data
  - Imputation of HBS on SILC: synthetic dataset with $w^*, h^*, \omega$
    - Subsample: those available to the labor market
  - Euromod + Indirect Tax Tool for $f(\cdot)$ and $q = (1 + \tau)p$
  - With maximum likelihood procedure => model parameters

- Simulation on subsample of 2019
  - Draw set of random opportunities from estimated distribution $\theta g_w(w)g_h(h)$
  - Calculate deterministic utility
  - Draw error terms, such that observed choice in baseline gives highest utility
  - Simulate change in
    - indirect taxation ($\tau$) and/or direct tax-and benefit system ($f$) and/or
    - job intensity ($\theta$), i.e. change number of jobs available to individual
  - Repeat 100 times, and calculate expected outcomes
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Introduction of carbon tax for households (change in $\tau$ and thus in $q$)
- Equivalent to carbon price of €150
  - Change in excises on Gas (x 30), Heating oil (x 15), Electricity (x 3)
  - based on Effective Carbon Rates (Cornille et al. 2021)

Budget of +/- €3.3bn recycled in lower income taxes (change in $f(\cdot)$)
- Increase of EITC “werkbonus” & shift upwards of 50% tax rate bracket
  - Lower effective marginal tax rates across distribution of wages
    - Werkbonus phase out ends at €5 000 instead of €2 560 (gross monthly wage)
    - 50% marginal rate starts at €60 000 instead of €40 480 (yrly taxable income)

Illustration of labour demand feedback
- Assume 10% increase in energy price for industry due to carbon tax
- Labour demand elasticities w.r.t. energy prices
  - Educational attainment (low: -0.48, middle: -0.06, high: -0.69) (Cox et al. 2014, DE)
  - Unconditional (i.e. different output level implied)
EMPIRICAL APPLICATION

Frequency (ths.) in RURO-subpopulation

**couple**

**single**

**female**

**male**

Source: Department of Economics - KU Leuven; Simulations with Euromod, SILC and HBS
Mechanical impact: Carbon tax

impact relative to baseline income (%)

couple

single

Source: Department of Economics - KU Leuven; Simulations with Euromod, SILC and HBS
Mechanical impact: carbon tax + decrease EMTR

impact relative to baseline income (%)

couple

single

female

male

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Labour market changes
mean change in hours

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Distributional impact of Carbon tax + Revenue recycling

mean change in real income (% of baseline real income)

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Empirical Application

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mean change in real income (% of baseline real income)

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- Piecemeal modelling strategy:
  - Often overlooked effect of prices on labor supply decisions
  - Two-stage budgeting in RURO framework

- Carbon tax impact on labor supply in Belgium:
  - Negative effect on hours worked
  ➢ Neutral effect after revenue recycling (lowers EMTRs)

- Labor demand shock
  - Much more important than labor supply response

- Net distributional picture: mechanical impact and labor demand effect
CONCLUSION

- Limitations and next steps
  - Labour demand effect exogenous
  - Depends on linkage (education/occupation/sector)
  - Complete pass-through of carbon tax to consumers
  ➢ Link with general equilibrium model for endogenous and granular effects on wages, opportunities and prices

- Cobb-Douglas assumption driving important mechanisms
  • For construction of “real income”
  • For carbon emissions implied by consumption in the model
  ➢ Estimate more flexible demand system with substitution away from carbon-intensive goods.
REFERENCES


