The Initial Incidence of a Carbon Tax across Income Groups

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• Carbon pricing is widely viewed as the most cost-effective way to reduce greenhouse gas emissions
• Incidence of carbon pricing is important: equity and politics
• Both the efficiency and distributional consequences of carbon pricing depend crucially on how the collected revenue is used
Overview

• Looks at incidence of carbon tax and use of tax revenue, across income groups and geography

• Links an overlapping-generations (OLG) model to a microsimulation model

• Looks at initial incidence: short run effect (but from a fully dynamic model)

• Focuses on cost side: estimates leave out benefits of reducing pollution emissions
Roadmap

- Model structure and data
- Policy changes
- Incidence by income quintile
- Conclusions
- Future work
Model Structure

- OLG model of the U.S. (Carbone et al., 2012) provides price and aggregate quantity changes for consumer goods and sources of income.
- Microsimulation model measures how those changes affect households at different income levels and in different locations.
Incidence Model Data

• State-level income shares: National Income and Product Accounts

• Income shares by income quintile: CBO’s estimates (based on tax returns and CPS)

• Quintile expenditure shares, state expenditure shares for non-energy goods: Consumer Expenditure Survey

• State expenditure shares for energy goods: State Energy Data System
Policy Changes

• We look at three simple cases built around a $30 per ton carbon tax (constant in real terms)
  • Capital Tax Recycling
  • Labor Tax Recycling
  • Lump-Sum Rebate

• All policy changes are immediate, permanent changes

• Real net present value of government services, transfers, and deficits held constant
## Mean Household Welfare Change (2012 dollars)

<table>
<thead>
<tr>
<th>Sources of Income</th>
<th>Capital Recycling</th>
<th>Labor Recycling</th>
<th>Lump-Sum Rebate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Goods</td>
<td>-$530</td>
<td>-$543</td>
<td>-$540</td>
</tr>
<tr>
<td>Other Goods</td>
<td>$529</td>
<td>$543</td>
<td>$539</td>
</tr>
<tr>
<td>Sources of Income</td>
<td>-$290</td>
<td>-$406</td>
<td>-$865</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>-$291</strong></td>
<td><strong>-$407</strong></td>
<td><strong>-$866</strong></td>
</tr>
</tbody>
</table>
## Middle Quintile Household

<table>
<thead>
<tr>
<th>Sources of Income</th>
<th>Capital Recycling</th>
<th>Labor Recycling</th>
<th>Lump-Sum Rebate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Goods</td>
<td>-$521</td>
<td>-$534</td>
<td>-$531</td>
</tr>
<tr>
<td>Other Goods</td>
<td>$479</td>
<td>$490</td>
<td>$481</td>
</tr>
<tr>
<td>Sources of Income</td>
<td>-$489</td>
<td>-$120</td>
<td>$329</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>-$534</strong></td>
<td><strong>-$163</strong></td>
<td><strong>$279</strong></td>
</tr>
</tbody>
</table>
In: Lifecycle of Capital Recycling

- Capital Recycling
- Labor Recycling
- Lump-Sum Rebate

Income Quintiles:
- 1st (Poorest)
- 2nd Quintile
- 3rd Quintile
- 4th Quintile
- 5th (Richest)
- Mean Household
Incidence by Income Quintile (2012 dollars)

- $3,000-
- $2,250-
- $1,500-
- $750-
- $0

Capital Recycling

Labor Recycling

Lump-Sum Rebate

1st (Poorest)  2nd Quintile  3rd Quintile  4th Quintile  5th (Richest)  Mean Household
# Energy Good Price Changes Are Regressive

## Change in Welfare from Energy Good Prices, % of Income

<table>
<thead>
<tr>
<th></th>
<th>1st Quintile (Poorest)</th>
<th>2nd Quintile</th>
<th>3rd Quintile</th>
<th>4th Quintile</th>
<th>5th Quintile (Richest)</th>
<th>Mean Household</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Recycling</td>
<td>-1.04</td>
<td>-0.70</td>
<td>-0.56</td>
<td>-0.46</td>
<td>-0.22</td>
<td>-0.42</td>
</tr>
<tr>
<td>Labor Recycling</td>
<td>-1.06</td>
<td>-0.72</td>
<td>-0.57</td>
<td>-0.47</td>
<td>-0.23</td>
<td>-0.43</td>
</tr>
<tr>
<td>Lump-Sum Rebate</td>
<td>-1.05</td>
<td>-0.71</td>
<td>-0.57</td>
<td>-0.47</td>
<td>-0.23</td>
<td>-0.42</td>
</tr>
</tbody>
</table>
# Use of Revenue Drives Sources-Side Incidence

## Change in Welfare from Income Sources, % of Income

<table>
<thead>
<tr>
<th>Source</th>
<th>1st (Poorest)</th>
<th>2nd Quintile</th>
<th>3rd Quintile</th>
<th>4th Quintile</th>
<th>5th (Richest)</th>
<th>Mean Household</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Recycling</td>
<td>-0.64</td>
<td>-0.63</td>
<td>-0.53</td>
<td>-0.43</td>
<td>0.08</td>
<td>-0.23</td>
</tr>
<tr>
<td>Labor Recycling</td>
<td>-0.03</td>
<td>-0.04</td>
<td>-0.13</td>
<td>-0.21</td>
<td>-0.51</td>
<td>-0.32</td>
</tr>
<tr>
<td>Lump-Sum Rebate</td>
<td>3.57</td>
<td>1.39</td>
<td>0.35</td>
<td>-0.45</td>
<td>-2.00</td>
<td>-0.68</td>
</tr>
</tbody>
</table>
Conclusions and Caveats

- Carbon tax by itself is regressive, but use of revenue has much bigger effect
- Key caveats:
  - Labor not differentiated by skill level
  - National markets for all goods (except electricity)
  - Full employment
  - Immediate incidence only
  - Leaves out benefits of reducing emissions
Next Steps

- Consider longer-term incidence
- Link to other dynamic general-equilibrium models
  - Boulder-Hafstead E3 model (more tax detail)
  - New model that incorporates involuntary unemployment
- Consider policies that change path of deficits