How does decarbonization change the fiscal equation?

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Discussion by Luis Garicano, Chicago Booth and LSE (From Aug 1st, 2023) in “The Macroeconomic Implications of Climate Action”.

Peterson Institute for International Economics
Question: is a global deal on climate mitigation fiscally feasible?

- What are the consequences for states’ fiscal position of taking global warming seriously?
  - Additional revenue from carbon taxes?
  - Additional cost from investment in decarbonization
  - Additional innovation investment cost
  - Additional redistribution investment
    - Between countries
    - Within countries

- Scenario: hold temperature increase to 2 degrees
  - AEs reduce their emissions by 49 percent below 2019 levels by 2030.
  - EMEs reduce their emissions by 24 percent below 2019 levels by 2030.
  - LICs would still be able to grow emissions (by 14 percent in 2030 compared to 2019) but by less than implied by current mitigation pledges

- Impact on fiscal revenue of measures to achieve this scenario
1: What is the welfare cost of more expensive carbon? ($150/$75?)

- **Scenario:**
  - $150 (high income), $75 (med income), and $30 (LDC) per ton

- **Consider two sides:**
  - Mitigation cost
  - Internalize health/congestion benefits from lower pollution.

- **Results:**
  - Global cost: 0.5% GDP
  - Never over 1% of GDP
  - Net gain for some countries

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**Figure 1. Incremental and Total Mitigation Costs from Equitable Ambition Scenario for 2°C**

- **A. Shadow CO₂ Prices (or Incremental Mitigation Costs)**
- **B. Mitigation Costs and Domestic Environmental Co-Benefits**

Source: Black and others (2022b).

Notes: Prices and costs are measured relative to a baseline with no new, or tightening of existing, mitigation policies. CO₂ prices are truncated at $150 per ton given the rapidly increasing uncertainty associated with ‘large’ policy changes that might ultimately drive non-linear adoption of ‘breakthrough’ technologies, like carbon capture and storage for large stationary emitters and direct air capture.
Revenue: A fiscal dividend?

- Yes, only if price instruments are used
- Assumed price path:
  - Starts at $75, $50, and $25 per ton to 2030
  - Double by 2040
  - My view: heterogeneous costs are correct, as local social cost is very different
- Consider partial equilibrium effect (move to EV/phase out of ICE reduces revenue)
  - Revenue: 0.5%-2%
- Key finding:
  - Fall overtime in revenue in spite of doubling of taxes
  - To 0 in EU/US
  - Note that preexisting taxes on motor fuels are currently significant in many countries and will decline too
Expenditure (1): Infrastructure

• 0.3% GDP on average:
  • 0.4% for clean technologies
  • Minus 0.1% in avoided fossil fuel investments.

• Sectoral breakdown:
  • 50% for renewable
  • 35% for electricity networks/storage and energy efficiency

• Very frontloaded
  • Since these are high FC/low MC technologies

Figure 3. Public Sector Investment in Energy-Related Sectors
(percent of GDP; annual average per decade)

Note: The bars represent the annual average over the decade except for 2020 (the average of 2015-2020); i.e. 2030: the annual average of 2021-2030. NZE = Net Zero Emission scenario. 1/ USA and CAN. 2/ EU, GBR, JPN, KOR, AUS, and NZL; 3/ RUS and middle east countries; 4/ BRA, CHN, IND, IDN, MEX, and ZAF
Expenditure (2): R&D support

• Three basic forms
  • Basic R&D
    • 30 bn globally
  • Support for private R&D
  • Technology deployment
    • Usually at around 0.2% GDP in advanced economies

IRA
$394 billion over a 10-year period in federal funding (around 0.17 percent of GDP) to clean energy mostly through tax credits

• 55 % for corporations, including:
  • $30 per MWH for new zero carbon generation
  • $15 per MWH for new nuclear
  • $1.75 per gallon for of sustainable aviation fuel;
  • $3 per kg for clean hydrogen.

• $43 billion consumer incentives:
  • including tax credits of: $7,500 and $4,000 for new and used EVs;
  • $2,000 for heat pumps;
  • 30% for the costs of energy efficiency upgrades in homes.
Expenditure (3): International Redistribution

• How much would it cost to pay entire abatement cost for LDC?
  • Depends on threshold used
    See Fig
• Cost of 100% of the abatement for all LDCs whose GDP per capita is below $5.500: $30 billion
Must decarbonization hurt the poor? Not really: fiscal dividend can pay for redistribution.

Scenario:
- Targeted assistance to compensate the bottom two- or three-income deciles
- Rest is used for labor tax reductions, public investments and other measures,
- Impact is progressive:
  - Lower income households would be better off on net (by around 3 to 8 percent of consumption)
  - Median income households unaffected
  - Higher income households would face burdens at around 0.5–1.5 percent of consumption

Source: Black and others (2021).
Expenditure/revenue (5): Protecting domestic firms

Instead of subsidies, most efficient device to avoid race to the bottom: CBAM

- Mitigate carbon leakage effects
- Allows for larger ETC/carbon tax ambition
- Provide incentives for other countries to impose similar carbon prices

Fiscal impact:

- Potential revenues from CBAMs on imports:
  - Around 0.1-0.2 percent of GDP for a $50 per ton charge—for China, India, the EU, and the US
  - With export rebates:
    - net revenues negative for China and India

Figure 6. Revenues effects from a $50 per ton BCA

Note: based on 2015 embodied carbon data
Source: Keen and others (2021).
Overall: not a free lunch... but not far

Figure 7. Impact of decarbonization scenario on the primary fiscal balance in selected countries, 2030 and 2040

Note: Based on Figures 2 and 3 for carbon tax, erosion of fuel tax base and infrastructure spending. Household compensation for the first three deciles. Transfers to LICs based on average abatement costs.
Comments

1. General equilibrium effects
2. Mitigation
3. Heterogeneity of climate impact
Comment (1): General equilibrium

• Model takes as given the output path
• Must consider feedback/GE effects:
  • Affects GDP/welfare
  • And through that the Fiscal Position
• On average not large effect- but not for all
• Airaudo et al. (2023) calibrate Hassler et al, 2021 for Chile:
  • Quantitatively: to get a 40% increase in the usage of green relatively to brown energy in steady state (a 60 year path toward 30% increase in brown price):
    • inflation increases at maximum in the second year from 4 to 8.6 percent
    • and the maximum output fall is considerable (7.8% in the third year) and persistent
  • Are these reasonable?
    • Imply significant recession, significant drop in fiscal expenditures, much larger than any of the numbers included.
Comment (2): Winners and losers

Cruz and Rossi-Hansberg (REStud, 2023)

• Large heterogeneity in climate damages over space
  • From welfare losses of 20% to gains of 11%
  • On average, welfare losses of 6%

• Large role of adaptation, particularly migration

• Large disagreement across regions
Welfare losses concentrated in global south
Local Social Cost of Carbon
The Canada/Russia question

Do they really care up North

Assuming they do

Figure 1. Incremental and Total Mitigation Costs from Equitable Ambition Scenario for 2°C

A. Shadow CO₂ Prices (or Incremental Mitigation Costs)

<table>
<thead>
<tr>
<th>Country</th>
<th>USD per ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>50</td>
</tr>
<tr>
<td>EU</td>
<td>75</td>
</tr>
<tr>
<td>China</td>
<td>100</td>
</tr>
<tr>
<td>Russia</td>
<td>150</td>
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<td>Australia</td>
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<td>India</td>
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<td>Brazil</td>
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<tr>
<td>China</td>
<td>150</td>
</tr>
<tr>
<td>Russia</td>
<td>200</td>
</tr>
</tbody>
</table>

B. Mitigation Costs and Domestic Environmental Co-Benefits

Source: Black and others (2022b).
Notes: Prices and costs are measured relative to a baseline with no new, or tightening of existing, mitigation policies. CO₂ prices are truncated at $150 per ton given the rapidly increasing uncertainty associated with large policy changes that might ultimately drive non-linear adoption of ‘breakthrough’ technologies, like carbon capture and storage for large stationary emitters and direct air capture.
Comment (3): Political Economy

Figure 3: Carbon pricing score

Source: OECD, dataset on effective carbon rates. The indicator in this figure is the Carbon Pricing Score and reflects the distance between the price of carbon and its cost.

Source: Airaudo et al. 2023
Figure 1: Renewable versus Non-renewable energy consumption
Note: Primary energy consumption in terawatt-hours (TWh). Source: BP Statistical Review of World Energy. ‘Renewables’ includes Solar, Wind, Hydropower, Nuclear, Biofuels, geothermal, biomass, and waste energy. ‘Non renewables’ includes oil, coal and gas.

Figure 2: Installed renewable energy capacity.
Conclusions

• A really useful exercise
  • We have now order of magnitude for the fiscal impact
  • And it appears totally doable
    • Surprisingly cheap to help the global south decarbonize

• With some robustness worth thinking about
  • GE effects
  • Take asymmetries seriously
    • Which countries are really interested in fighting climate change?
  • Study more deeply impact of heterogeneity on the politics