Economic Implications of the Climate Provisions of the Inflation Reduction Act

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Introduction
The Inflation Reduction Act is the largest US Federal commitment to climate change to date.

Early models yielded different estimates of:

- emissions impacts
- fiscal costs
- impact on new investments
Key questions and approach

Key questions:

1. What are the implications of IRA for energy markets?

2. What are the macroeconomic implications of the climate provisions of IRA?

3. How does IRA’s subsidies approach compare to a carbon tax?

Approach:

- Implications for energy markets using US-REGEN model
- Macro impact via analytical model and FRB/US
IRA subsidizes clean energy investment

**Major categories:**

- **Clean electric power generation:**
  - Investment tax credit (ITC) and production tax credit (PTC)
  - Uncapped, expiring only after emissions targets are reached
  - Bonuses for meeting labor and domestic sourcing req.

- **Electric vehicles and residential appliances:**
  - $7500 EV tax credit subject to sourcing/income req.

- **Carbon capture and clean fuels:**
  - Larger financial incentives allowing for fossil fuel CCS (45Q)
  - Tax credit for clean hydrogen (45V)

*Joint Committee on Taxation and Congressional Budget Office scored climate provisions at $392 bn over 10 years*
IRA tax credits relative to previous credits

Production tax credit

Historical

IRA technology-neutral credits starting in 2025
IRA tax credits relative to previous credits

Investment tax credit

Historical

IRA technology-neutral credits starting in 2025
Micro Impacts
Overview of US-REGEN

Electric Generation

Integrated Hourly Load, Renewables, and Prices

Energy Use

Detailed representation of:
- Energy and capacity requirements
- Renewable integration, transmission, storage
- State-level policies and constraints

Modeling Approach:
- Intertemporal cost minimizing for electricity sector
- Individual utility-maximization (logit models) for end-use energy

Detailed representation of:
- Customer differences across end-use sectors
- End-use technology trade-offs (logit models)
- Electrification and efficiency opportunities

Documentation, articles, and reports available at https://esca.epri.com

Science IRA multi-model comparison available at: https://www.science.org/stoken/author-tokens/ST-1277/full
Increase in clean electricity investment due to IRA

- US-REGEN projects 50% increase in clean electricity investment relative to 2021
- US-REGEN central projection is moderate relative to some other modeling
Projections of range of fiscal costs
Comparison of REGEN and JCT/CBO score
EIA estimates of EV sales lower than other models

- Biden 2030 Target
- Historical
- US-REGEN IRA
- US-REGEN Reference
- EIA AEO 2022
- Goldman Sachs (2023)
- Cole, et al. (2023), High
- Slowik, et al. (2023), High
- Larsen, et al. (2022), High
- BNEF (2022)
- Slowik, et al. (2023), Low
- Cole, et al. (2023), Low
- Zhao, et al. (2022)
- Larsen, et al. (2022), Low
IRA lowers carbon emissions by 7 pp in central case

Emissions relative to 2005 levels

![Graph showing CO₂ emissions (% Below 2005 Levels) from 2005 to 2040 for different scenarios: Historical, Power Sector, Economy, Reference, IRA, and IRA CBO Budget. The graph indicates a significant reduction in emissions with the IRA scenario showing near complete emissions reduction by 2035.](image-url)
IRA raises possibility of negative electricity prices

- Projections for Southwest Power Pool in 2050
- Wholesale price could be zero or negative for almost 50% of hours
IRA decreases retail electricity prices
Macro Impacts
Climate provisions expand potential in the long run...

Steady state effects:

- Decrease in electricity prices raises production
- Increase in output, wages, consumption, and labor productivity
- Long-run crowding in of capital and increases in employment
... but raise demand in the short-run

**Transition path:**
- Energy investment increases immediately, while output is fixed
- Consumption falls and real interest rates rise
- Crowding out extends to fossil fuel and non-energy capital

**Bottlenecks:**
- Bottlenecks constrain initial investment, slow transition
- Bottlenecks may raise fiscal cost under ITC
  - PTC proportional to *real* investment but ITC proportional to *nominal* investment
- Increases in price of capital but lower path for real interest rate
Transition impacts are likely modest

<table>
<thead>
<tr>
<th>Nominal, 2018-2022 averages</th>
<th>REGEN IRA impact, 10-year avg</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$ billions</td>
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<tr>
<td>Electric power structures</td>
<td>79</td>
</tr>
<tr>
<td>Electrical transmission and distribution</td>
<td>52</td>
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</tbody>
</table>

- Substantial structures investment but modest in aggregate
- FRB/US finds demand effects result in very small increases in output, employment, core inflation initially
  - Headline inflation falls due to lower retail electricity prices
- Important limitations to FRB/US modeling:
  - Lack of detailed electricity or energy market in FRB/US
  - Not modeling effects of IIJA and CHIPS Act
Higher interest rates negatively impact clean energy generation.
Policy Considerations
Carbon tax delivers lower abatement costs

<table>
<thead>
<tr>
<th>Metric (units)</th>
<th>2021</th>
<th>IRA Scenario 2030</th>
<th>2035</th>
<th>Carbon Tax 2030</th>
<th>2035</th>
<th>Difference (p.p.) 2030</th>
<th>2035</th>
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</thead>
<tbody>
<tr>
<td><strong>Generation Share (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Coal</td>
<td>22%</td>
<td>11%</td>
<td>8%</td>
<td>7%</td>
<td>4%</td>
<td>-4%</td>
<td>-5%</td>
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<tr>
<td>Coal CCS</td>
<td>0%</td>
<td>3%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>-3%</td>
<td>-3%</td>
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<tr>
<td>Gas</td>
<td>39%</td>
<td>20%</td>
<td>18%</td>
<td>35%</td>
<td>34%</td>
<td>15%</td>
<td>17%</td>
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<tr>
<td>Gas CCS</td>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>Other</td>
<td>2%</td>
<td>9%</td>
<td>11%</td>
<td>7%</td>
<td>8%</td>
<td>-2%</td>
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<tr>
<td>Nuclear</td>
<td>19%</td>
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<td>14%</td>
<td>17%</td>
<td>16%</td>
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<tr>
<td>Wind and Solar</td>
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<td>33%</td>
<td>41%</td>
<td>28%</td>
<td>32%</td>
<td>-6%</td>
<td>-9%</td>
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<tr>
<td>CO₂ (% Drop from 2005)</td>
<td>35%</td>
<td>64%</td>
<td>68%</td>
<td>64%</td>
<td>68%</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>Generation Price ($/MWh)</td>
<td>$64</td>
<td>$56</td>
<td>$52</td>
<td>$65</td>
<td>$62</td>
<td>16%</td>
<td>20%</td>
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<td>Abatement Cost ($/t-CO₂)</td>
<td>N/A</td>
<td>$45-61</td>
<td>$45-61</td>
<td>$10</td>
<td>$10</td>
<td>-85%</td>
<td>-82%</td>
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</tbody>
</table>

- Only modeling the power sector
- Carbon tax leads to more gas generation, less coal and renewables
IRA highly cost-effective relative to estimates of the social cost of carbon

- Again, only modeling the power sector
- Compare IRA to alternative, not to Almighty
Conclusion
Key takeaways

1. What are the implications of IRA for energy markets?
   • 50% increase in renewable power generation with $900 bn in fiscal expenditures over 10 years
   • Possibility of very low or negative wholesale electricity prices; retail rate impacts are more limited

2. What are the macroeconomic implications of the climate provisions of IRA?
   • Long-run supply side benefits from lower electricity prices
   • Higher interest rates and upstream costs could negatively impact clean energy investment

3. What are the merits of IRA’s subsidy approach relative to a carbon tax?
   • Optimal policy favors carbon tax over subsidy approach
   • IRA subsidies highly cost-effective relative to SCC
Several follow-on questions

1. **What are the distributional implications of IRA?**
   - By income
   - By geography
   - By demographic characteristics

2. **What are the best complementary policies to drive additional emission reductions?**
   - Fiscal impacts likely a key consideration in 2025 (end of TCJA (2017) tax cuts, growing concerns about deficit)
   - Coordination with other large emitters also a key consideration