Supply-side climate policies for the international steam coal market: Can they curb coal consumption?

This presentation is based on two research articles currently under review in Climatic Change:

Richter, Philipp M., Roman Mendelevitch, and Frank Jotzo. “Coal Taxes as Supply-Side Climate Policy: A Rationale for Major Exporters?” (link to WP)

Mendelevitch, Roman. “Testing Supply-Side Climate Policies for the Global Steam Coal Market – Can They Curb Coal Consumption?” (link to WP)

Modell results are obtained with COALMOD-World (see Data Doc for a detailed model description)
Motivation and Intro
Demand-side vs. supply-side fossil fuel policies

• What currently favors demand-side policies
  • Less opposition with promoting new industries e.g. renewables energies, that with closing old ones
  • GHG accounting at the national level
  • Capturing of climate rents at the demand-side

• Why supply-side policies are good complements
  • Might be less prone to leakage, depending on demand-side vs. supply-side elasticity
  • Could deal with „green paradox“ if properly designed (target high-cost supply)
  • Outcomes are easier to predict, and transaction costs may be lower, due to lower number of actors
  • Prevent stranded assets and lock-in effects
  • Scarcity rents can offset lost profits (Eisenack, Edenhofer, and Kalkuhl 2012; Kalkuhl and Brecha 2013; Asheim 2013)
  • No need for overall compensation, only compensation payments between producers to alleviate internal distributional effects (Asheim 2013)
Currently proposed supply-side climate policies

- A coalition purchases and retires high-cost coal deposits (Harstad, 2012)
- Sequential closure of the entire coal industry (compensated via ring-fenced cap-and-trade scheme for fossil fuel extraction) (Collier and Venables, 2014)
- Export-licensing regime for coal (Martin, 2014)
- A coalition of major coal exporters levies a tax on the energy content of steam coal exports (Richter et al., in review)
- Fuel subsidy reform (Schwanitz et al., 2014; Burniaux and Chateau, 2014)
- Moratorium on new coal mines (Australia Institute, Denniss, 2015)
Selected Supply-Side Climate Policies for the International Steam Coal Market

Coal taxes
Supply-side policy: coal tax

<table>
<thead>
<tr>
<th>Tax setter</th>
<th>Australia</th>
<th>AUS+ZAF+IDN+COL</th>
<th>exporters grand coal.</th>
<th>prod. grand coal.</th>
<th>WEO 450ppm (implemented as demand-side policy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typ of tax</td>
<td>prod. tax</td>
<td>prod. tax</td>
<td>export tax</td>
<td>prod. tax</td>
<td></td>
</tr>
<tr>
<td>Avg. emis. red. [GtCO₂/a]*</td>
<td>0.1</td>
<td>0.4</td>
<td>1.2</td>
<td>2.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Red. in exports [%]*</td>
<td>4</td>
<td>22.4</td>
<td>74.9</td>
<td>55.1</td>
<td>50.1</td>
</tr>
<tr>
<td>Red. in global consump. [%]*</td>
<td>0.4</td>
<td>3.0</td>
<td>8.7</td>
<td>28.5</td>
<td>52.3</td>
</tr>
<tr>
<td>Avg. price change [%]*</td>
<td>1.5</td>
<td>6.4</td>
<td>15.8</td>
<td>34.4</td>
<td>111.6</td>
</tr>
<tr>
<td>Optimal tax level [USD/tCO₂]</td>
<td>8.8</td>
<td>12.2</td>
<td>42.6</td>
<td>26.0</td>
<td>40.5</td>
</tr>
<tr>
<td>Avg. welfare gain for tax setters [USD/tCO₂]**</td>
<td>2.9</td>
<td>5.0</td>
<td>10.6</td>
<td>12.5</td>
<td>9.2</td>
</tr>
</tbody>
</table>

*where applicable value are given for the tax revenue maximizing tax level

**Welfare is defined here as the sum of producer surplus, consumer surplus and tax revenue

- Consumption pattern consistent with a 2° target cannot be achieve via an export tax, only, nor by a production tax levied by a coalition of coal exporting countries
- Only a global regime of taxing CO₂ from steam coal undercuts the required level
- Supply-side policies lead to strong price increase, while with demand-side policies prices decrease by on average 17%
Selected Supply-Side Climate Policies for the International Steam Coal Market

Subsidy Reform
Findings from literature on coal subsidies

• G20 (2009), APEC (2010), Friends of Fossil Fuel Subsidy Reform (GSI 2011), UN Secretary General’s High-Level Panel on Global Sustainability (2012), UN Sustainable Development Goals (2015)
• range and magnitude of fossil fuel subsidies
  • OECD 2015: total 160-200 bnUSD annually, coal subsidies 12 bnUSD.
  • Ecofys 2014: 10 bnEUR coal subsidies in the EU-28, in 2012
  • IMF (Coady et al., 2015) 2,530 bn USD coal subsidies (globally)
• Effects on production subsidy removal in literature
  • Anderson and McKibbin (2000) CGE framework C-Cubed: 5%-8% global average emission reduction
  • Fulton et al. (2015) supply-demand partial equilibrium framework: removing subsidies for U.S Powder River Basin reduces annual emissions by 21-55 MtCO₂ per year
### Complex definition of Subsidies

<table>
<thead>
<tr>
<th>Consumer fossil-fuel subsidies</th>
<th>Producer fossil-fuel subsidies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fossil fuels exempt from social cost of externalities (non-internalized externalities).</td>
<td>Government tax and regulation levels below regional or international levels.</td>
</tr>
<tr>
<td>Fossil fuels taxed below regional or international tax levels.</td>
<td>Government revenue foregone (reduced an exempt tax rates).</td>
</tr>
<tr>
<td>Fossil fuels exempt from VAT, GST, and carbon taxes.</td>
<td>Direct transfers or potential direct transfers of funds to producers</td>
</tr>
<tr>
<td>Fossil fuel sold below cost of production, imports and international benchmark price to consumers.</td>
<td>Income or price support (above market rate prices for producers).</td>
</tr>
</tbody>
</table>


“The term “subsidy” can be visualized as a nesting doll - at the center of the definition are ideas that everyone agrees on, but as the definition expands to include other layers, it becomes more complicated and more controversial.
Supply-side policy: production subsidy removal has negligible effect on emissions

Markets reaction
- Price effect: 1% average increase compared to business-as-usual

Emissions reductions:
- 82 MtCO₂/a (equal to emissions from 15-16 large in coal-fired power plants)

Subsidy definition based on Gerasimchuk et al. 2012
Selected Supply-Side Climate Policies for the International Steam Coal Market

Moratorium on new coal mines
Coal reserves vs. reserves in operating mines
Moratorium on new coal mines

High reserves: 208Gt with 85Gt in China and 48Gt in India
- 33% price increase
- Very strong reduction in seaborne trade

Low reserves: 135Gt with 41Gt in China and 20Gt in India
- Still not all reserves are mined
- 93% price increase relative to WEO NPS
- Seaborne trade concentrates on China and India
Main findings

• Supply-side policies do not provide a one-fits-all solution to curb coal consumption
• Removing producer subsidies can come with co-benefits of additional government funds but does not substantially reduce coal consumption
• A moratorium on new coal mines can be an important step to restrict future consumption but may be not enough. Moreover, it favors incumbents raises equity concerns
• Coal export/production taxes come with co-benefits of additional government funds but global coverage is required to achieve 2°C consistent consumption path
Selected References


Findings from literature on coal production subsidies

<table>
<thead>
<tr>
<th>Country</th>
<th>Total subsidies to coal production in 2013/14 [bn USD]</th>
<th>Subsidy per unit of production and by region [USD/t]</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>2.1</td>
<td>Powder River Basin 3.4</td>
<td>Forgone profits due to preferential tax treatment account for 50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appalachia 1.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>others 1.0</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>4.4</td>
<td>Shanxi, Shaanxi, Inner Mongolia 1.3</td>
<td>Direct payments and investments, and the provision of services below market value account for 54%, and 39%, respectively.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>others 0.9</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>0.8</td>
<td>all 0.9</td>
<td>Investment by SOE Coal India Limited</td>
</tr>
</tbody>
</table>

Source: various sources, mainly Global Subsidy Initiative (GSI), and International Institute for Sustainable Development (IISD)
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<tbody>
<tr>
<td>Australia</td>
<td>1.0</td>
<td>New South Wales 2.5</td>
<td>Lax treatment of rehabilitation liabilities constitutes major subsidy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Queensland 2.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>others 1.8</td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>0.04</td>
<td>transport to export terminal 0.5</td>
<td>Rail transport subsidy, below market value sales to preferential consumers already disregarded in base case data</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.9</td>
<td>all 1.8</td>
<td>Policies targeting to remove subsidies are not enforced</td>
</tr>
<tr>
<td>Russia</td>
<td>0.07</td>
<td>0.4</td>
<td>Extreme divergence between sources on subsidy levels</td>
</tr>
<tr>
<td>Poland</td>
<td>0.01</td>
<td>0.1</td>
<td>Free energy supply for mine workers</td>
</tr>
</tbody>
</table>

Source: various sources, mainly Global Subsidy Initiative (GSI), and International Institute for Sustainable Development (IISD)