Measuring and comparing carbon pricing and the pricing of embodied and transport emissions

Dirk Heine
Senior Economist
World Bank Chief Economist Office for Equitable Growth, Finance & Institutions
Measuring Carbon Pricing
Many ways to price carbon. Not just carbon taxes/ETS.

<table>
<thead>
<tr>
<th>Implicit carbon pricing</th>
<th>... accommodating different country priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel and commodity taxes / subsidies</strong>: implicitly pricing carbon-intensive products</td>
<td><strong>Priority on revenues</strong>: taxes, auctioned ETS permits</td>
</tr>
<tr>
<td>→ all countries</td>
<td><strong>Priority on industrial policy</strong>: feebates, tradeable performance standards</td>
</tr>
<tr>
<td><strong>Tradeable performance standards</strong>: introducing trading into existing environmental</td>
<td><strong>Priority on reusing existing systems</strong>: taxes, tradeable performance standards</td>
</tr>
<tr>
<td>regulations</td>
<td><strong>Priority on simple governance</strong>: carbon taxes administratively simple; politically</td>
</tr>
<tr>
<td><strong>Shadow carbon pricing</strong>: private entities accounting for social costs, portfolio</td>
<td>difficult – ETS reverse</td>
</tr>
<tr>
<td>construction and stress-testing</td>
<td><strong>Priority on cross-sector/international transfers</strong>:</td>
</tr>
<tr>
<td></td>
<td>ETS or carbon tax with policy crediting or traded offsets</td>
</tr>
<tr>
<td>Explicit carbon pricing</td>
<td><strong>Combining carbon price with other mitigation instruments</strong>:</td>
</tr>
<tr>
<td><strong>Carbon taxes</strong>: taxing emissions directly, or explicitly varying fuel/commodity</td>
<td>Taxes (with their fixed price) have simple, positive interaction effects with green</td>
</tr>
<tr>
<td>taxes by carbon content → 32 jurisdictions</td>
<td>bonds, public investments, sectoral regulations. ETS require managing price</td>
</tr>
<tr>
<td><strong>Emissions Trading Systems</strong>: fixing total emissions through tradeable emissions</td>
<td>reductions caused by other mitigation instruments.</td>
</tr>
<tr>
<td>permits, incl. with offsets → 28 markets, often covering several jurisdictions</td>
<td></td>
</tr>
<tr>
<td><strong>Feebates (fee &amp; rebate)</strong>: price carbon and rebate the revenues back to the industry</td>
<td></td>
</tr>
<tr>
<td>per unit of output</td>
<td></td>
</tr>
</tbody>
</table>
Fuel taxes and subsidies greatly shape emission outcomes.
Accounting for fuel taxes is essential to avoid discrimination.
Evolution of direct and indirect carbon prices

Simple average of treatment group

Emissions-weighted global average of all countries

Instrument
- Excise taxes
- ETS
- Carbon tax
- Subsidies (cons.)
The world has not raised carbon prices much since it started debating climate change. But countries which did significantly price carbon were successful reducing emissions intensity.
Measuring Carbon Content
Seemingly complicated, but we have been here before!

- Personal Income Taxation: widely accepted method for taxing an uncertain tax base
  1. Default values based on typification
  2. Refunds upon provision of tax declaration

- Private sustainability certificates: widely used instrument for proving better-than-average production standards

- Health & Safety regulation: governments using private certification companies for cross-border rule enforcement

- Imported deforestation rules: use of private FSC certificates in showing compliance with EU ban on illegal timber, and UK public procurement system

World Bank Group
Equitable Growth, Finance & Institutions
We can reuse the same systems. No need to await public MRV.

- Carbon pricing based on default values with typification
- Correction through system of rebates using accredited certification companies as clearing houses

- Need to add: use of carbon revenues to subsidize certification in developing countries
• Sustainability certificates often include more than low-carbon production
  ➔ Can simultaneously address other sustainability/social issues plaguing GVCs

• For those wider, non-carbon issues, sustainability certificates are wanted anyway
  ➔ Sink that cost once
Embodied emissions: example of steel

Carbon price charged to first entity purchasing the steel for average emissions per tonne of that steel type

Rebate or subsidy to steel producer upon proof that emissions for producing that steel were lower than assumed
Embodied emissions: example of steel

Steel tax calculated using default values
Excise tax for purchaser $i = \text{Tons of steel purchased} \times \text{Average tons of } CO_2 \text{ per tonne of that steel class} \times \text{Social cost per ton of carbon}$

Subsidy for the steel producer on proof of lower emissions
Subsidy for steel producer $j = \text{Tons of steel sold to domestic users} \times \text{Amount by which steel producer outperformed assumed emissions per ton of that steel class} \times \text{Social cost per ton of carbon}$
**Embodied emissions: example of timber**

Carbon price applied to imported timber based on default value for external cost of wood production

Rebate/subsidy/discount if an accredited agency certifies that the timber is more sustainable than the default value

Further information: [World Bank (2021, ch. 6-10)](#)
Transport emissions: example of maritime sector

Carbon price charged to cargo consignee based on default value for average emissions associated with cargo’s transport

Subsidy to ship upon proof that emissions for that cargo were lower than the default value

Further information: Dominioni, Heine & Martinez Romera (2018), Heine & Gäde (2018)
Transport emissions: example of maritime sector

<table>
<thead>
<tr>
<th>Consignee/consignor-based tax calculated using default values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax bill = assumed distance * tonnage * assumed efficiency * assumed emissions factor * carbon price * 1/2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subsidy for the shipping company on proof of lower emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidy for unit of cargo transported = tax bill – actual distance * actual efficiency * assumed emissions factor * carbon price * 1/2</td>
</tr>
</tbody>
</table>
Transport emissions: example of aviation sector

Ticket tax charged to the passengers based on default value for average pollution per passenger-mile

Potential subsidy to airline upon proof that emissions for transporting that passenger were lower than assumed
Transport emissions: example of aviation sector

**Ticket tax calculated using default values**
Ticket tax for passenger $i = \frac{1}{2} \times \text{Miles flown by passenger } i \times \text{Average plane tons of } CO_2 \text{ per passenger mile} \times \text{Social cost per ton of carbon}

**Subsidy for the airline on proof of lower emissions**
Subsidy for airline $j = \frac{1}{2} \times \text{Miles that } j \text{ transported } i \times \text{Amount by which } j \text{ outperformed assumed emissions per passenger mile} \times \text{Social cost per ton of carbon}
Conclusion

• Most countries, especially in the developing world, price carbon implicitly through fuel/commodity taxes/subsidies, not CT/ETS
  ➔ Need to include in accounting for CPF/BCA

• Can price carbon based on default values, with rebates when lower emissions are proven via sustainability certificate.
  ➔ No need for global public MRV system. Work with, not against, existing private sector systems.
  ➔ Use share of carbon revenues to support certification in developing countries.