Seven questions

1. What’s at stake?
2. Why carbon pricing?
3. Which carbon pricing instrument?
4. What should I do with the revenues?
5. What about fossil fuel subsidies?
6. Is there a need for international cooperation?
7. What about border carbon adjustments and ‘carbon leakage’?
What’s at stake?
Motivation

Source: GCP 2020

Balance of sources and sinks

- Fossil carbon
  - Includes carbonation sink
- Land-use change
- Ocean sink
- Land sink
- Atmosphere

Global average temperature compared to the middle of the 20th century

Total estimated sources do not match total estimated sinks. This imbalance is an active area of research.

Source: GCP 2020
Motivation

Impact of Unconstrained Warming on Per-Capita Income by 2100
(Impact relative to baseline, 3.5°C average warming)

Source: Burke, Hsiang, and Miguel (2015)
1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
We need cut emissions rapidly in this decade...

Global total net CO₂ emissions

In pathways limiting global warming to 1.5°C with no or limited overshoot as well as in pathways with a higher overshoot, CO₂ emissions are reduced to net zero globally around 2050.

25-50% reduction by 2030

net-zero by ~midcentury

...requiring a global carbon price of $75 per ton by 2030...
...so 62 countries have committed to work towards ‘effective carbon pricing’
Why carbon pricing?
Carbon pricing demystified – an illustrative example

<table>
<thead>
<tr>
<th>Classification (economic):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost to:</td>
</tr>
<tr>
<td>Cost amount:</td>
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<tr>
<td>$0.80</td>
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</table>

<table>
<thead>
<tr>
<th>Classification (generic):</th>
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<tbody>
<tr>
<td>Price at pump (1)</td>
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</table>

<table>
<thead>
<tr>
<th>Classification (fiscal):</th>
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</thead>
<tbody>
<tr>
<td>Subsidized price = $0.80</td>
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<table>
<thead>
<tr>
<th>“Energy price reform, fossil fuel subsidy reform”:</th>
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<table>
<thead>
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<th>“Carbon pricing/taxes/ETSs, environmental tax/fiscal reform”:</th>
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<table>
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<th>Firm or household</th>
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<tbody>
<tr>
<td>$0.80</td>
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<table>
<thead>
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<tbody>
<tr>
<td>$0.10</td>
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<td>$0.25</td>
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<tr>
<td>$0.15</td>
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<td>$0.10</td>
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<table>
<thead>
<tr>
<th>Society</th>
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<tbody>
<tr>
<td>$0.70</td>
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</tbody>
</table>

### Socially Optimum (‘Efficient’) Price

Private costs (social costs) = $1

Social costs (externalities) = $0.70

Socially optimum (‘efficient’) price = $1.70

### Corrective Policies

- "Energy price reform, fossil fuel subsidy reform":
- "Carbon pricing/taxes/ETSs, environmental tax/fiscal reform":

### Explicit and Implicit Subsidy

Explicit + Implicit subsidy = $0.90

- Explicit: $0.10
- Implicit: $0.80

### Costs

- Foregone VAT (2)
- Local air pollution costs (4)
- Road accident costs (5)
- Global warming costs (6)
Global climate change is a serious problem calling for immediate national action. Guided by sound economic principles, we are united in the following policy recommendations.

I. A carbon tax offers the most cost-effective lever to reduce carbon emissions at the scale and speed that is necessary. By correcting a well-known market failure, a carbon tax will send a powerful price signal that harnesses the invisible hand of the marketplace to steer economic actors towards a low-carbon future.
Broad consensus around carbon pricing

Central role in mitigation policy

- Across-the-board incentives, cost-effective price signal to shift private investment
- Raises significant revenue for e.g. health expenditures, investment, labor tax reductions, per-capita transfers
- Reaps domestic environmental co-benefits
- Administratively straightforward

Types of carbon pricing:

- ETS – aka cap-and-trade ‘quantity instrument’
- Carbon taxes generally preferred to ETS – price certainty, revenues to the government, build off fuel tax collection (though trading can be augmented via floors)

Basic design details are critical

- Cover power, industry, transport, buildings
- Predictable and gradually rising price
- Use revenues productively
There is growing momentum for carbon pricing...

...carbon pricing used across all continents...

...but pricing varies dramatically and most are below needed $75 by 2030...

...and even including non-carbon pricing instruments (effective carbon rates) incentives remain weak...

Effective carbon rates (ECR) across countries and time (95 countries)

- gasoline and diesel (~$140)
- average ECR (~$20 per ton CO2)
- coal, natural gas & other (~$5)

Additional ~$75 per ton CO2 needed by 2030 for 2°C (total of $95)

Source: IMF staff estimates, forthcoming; covers countries accounting for 95% emissions
...and distorted...

Effective carbon rates (ECR) on emissions across countries (2020)

- Priced emissions (mostly motor fuels)
- Unpriced emissions (mostly coal & gas)
- Negative emissions prices (explicit fossil fuel subsidies)

Source: forthcoming
...and the picture is even worse from an efficient pricing perspective (preliminary)

Fossil Fuel Pricing and Consumption Relative to Efficient Prices

Source: forthcoming
...so we need to get carbon pricing instruments into the 2C endzone (75 per ton by 2030)
**Co-benefits of Carbon Pricing**

1. **Raise prices of fossil fuels**
   - Reduced fossil fuel consumption
   - Lower global air pollution (CO2 & other GHGs)
   - Lower local air pollution (PM2.5, NOx, SO2, SOx, etc)
   - Lower local water pollution (NOx, coal ash, acid mine drainage, etc)
   - Reduced road accidents & congestion

2. **Raise revenues**
   - Revenues used to reduce labor taxes (revenue-neutral tax shift)
   - Reduced shadow economy, increased formal employment
   - Increased spending on infrastructure, health, education, welfare, etc.
   - Revenues used for development (Domestic Resource Mobilization – DRM)

**Co-benefits:**
- **Climate Action**
- ** Responsible Consumption and Production**
- **Good Health and Well-Being**
- **Life on Land**
- **Clean Water and Sanitation**
- **Life Below Water**
- **Industry Innovation and Infrastructure**
- **Inequality**
- **Sustainable Cities and Communities**
- **Decent Work and Economic Growth**
- **Education**
- **Health**
- **Welfare**
- **Sustainable Development Goals**
And if we did, countries would reap substantial welfare co-benefits

Channels that impact estimated welfare effects of ETR: Range of estimates from studies and possible effects for developing countries

1. Improved air quality and health
2. Informal sector
3. Taxing Ricardian rents
4. Reduced congestion and accidents
5. Tax evasion effects
6. Involuntary unemployment
7. Labor skills composition
8. Induced technological change
9. Imperfect goods competition


Co-benefits of carbon pricing

- Energy independence
- Preserve rainforests
- Sustainability
- Green jobs
- Livable cities
- Renewables
- Clean water, air
- Healthy children
- Etc., etc.
Which carbon pricing instrument?
Carbon taxes generally preferred to ETSs: an example

(2008 → 2017)
Change in share of electricity from coal

EU ETS members with a carbon tax/price floor

Source: Drax. 2018

EU ETS members
...but do whatever works!

- Some governments may prefer ETSs for greenwashing reasons (‘Potempkin markets’ and ‘isomorphic mimicry’)
- But some governments favor ETSs for good reasons:
  - EU ETS – lack of fiscal union
  - Germany – constitutional limits on implementing carbon taxes
  - UK – constitutional issue with carbon taxes (devolution)
  - Canada – different regional systems, with a federal backstop
- ETS can mimic carbon taxes (price floors, full auctioning)
- Sectoral approaches to pricing are available
  - e.g. transportation feebates: sliding scales of fees and rebates on cars based on efficiency; countries with strongest feebates (Norway/Netherlands) diffusing EVs fastest
- Key thing is to focus on adding an additional and certain price

![Figure 10. CO2-Based Components of Vehicle Taxes, Selected Countries](image)

Source. ACEA (2018) and IMF staff calculations.
Note. Feebates assume fleet average emission rate of 100 g CO₂/km and discounted lifetime driving of 100,000 km.
What about the revenues?
Revenue – in 2018 carbon pricing instruments raised about $44.6bn

**CARBON PRICING**
($44.6bn in 2018, global)

- Emissions trading systems (ETS) ($20.9bn)
- Carbon taxes ($23.7bn)

*Notes: ETS raised $6.57bn in public revenue and carbon tax systems raised $21.7bn in 2016 (Source: Carl, Jeremy, and David Fedor, 2016)*
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But this is a tiny fraction of global tax revenues

Notes: ETS raised $6.57bn in public revenue and carbon tax systems raised $21.7bn in 2016 (Source: Carl, Jeremy, and David Fedor, 2016); total environmental taxes + charges for OECD and non-OECD countries raised $539.1bn that year, other taxes included on: gasoline ($55.6bn), diesel ($40.7bn), oil ($149.5bn – OECD PINE database & data)
Potential revenues from carbon pricing are significant

- Raises significant revenue for e.g. health expenditures, investment, labor tax reductions, per-capita transfers

- Tradeoffs among objectives:
  - Efficiency – labor tax & capital tax reductions
  - Equity & political support – cash transfers (targeted & untargeted), social assistance
  - Environmental effectiveness & political support – green public expenditures

- Recommend mixing revenues based on goals:
  - Efficiency/equity – raise labor tax thresholds (mostly developed countries)
  - Equity & political support – targeted transfers & pro-poor expenditures (developing countries)
  - Environmental effectiveness – some for green public expenditures (all countries)

Source: author
What about fossil fuel subsidies?
One drag on decarbonization is negative carbon prices i.e. explicit subsidies...

Source: IMF staff estimates, forthcoming; covers countries accounting for 95% emissions
...but there are also implicit subsidies...

socially optimum (‘efficient’) price = $1.70
private costs = $1
social costs (externalities) = $0.70

classification (economic):

classification (generic):

classification (fiscal):

corrective policies:

firm or household

classification:

cost to:

cost amount:

price at pump (1)

subsidized price = $0.80

explicit fuel subsidy (2)

explicit
government

society

foregone VAT (3)
local air pollution costs (4)
road accident costs (5)
global warming costs (5)

+ implicit subsidy = $0.90

"energy price reform, fossil fuel subsidy reform":

"carbon pricing/taxes/ETSS, environmental tax/fiscal reform":

or

or

or

or
...hence total fossil fuel subsidies are very large (~$350bn explicit, ~$5tn implicit)

...they are mostly externalities, especially costs of air pollution and climate ...

...a lot of regional variation, high in ECA (preliminary)

Source: IMF staff estimates, forthcoming
...meaning large environmental tax gaps

Sources: Created using data from Coady et al. 2017.

Note: Map shows that gaps exist between consumer prices and lower-bounds estimates for efficient energy prices implied by external costs (including local pollution, traffic congestion and road accidents, and climate change). It shows only countries where consumer prices were below efficient prices in 2015. Countries not shown had either negative price gaps (for example, much of Europe with diesel) or missing data (parts of Africa on diesel and coal). Price gaps on gasoline and diesel are expressed in US$/liter, with the dark red (1.5) group including all countries with gaps greater than US$ 1.5/liter. Gaps for natural gas and coal are expressed in US$ per Gigajoule (GJ) energy produced, with the dark red (10) group including all countries with gaps greater than US$ 10/GJ.
Recommendations

Start by estimating explicit subsidies
- Retail prices < supply costs for fuels

Then estimate implicit subsidies
- Foregone consumption tax
- Externalities

Remove all pre- and post-tax subsidies
- Remove fossil fuel subsidies
- Implement carbon taxes & other environmental taxes

Fully close the gap to get energy prices right!
Is there a need for international cooperation?
IMF International Carbon Price Floor Proposal (forthcoming)

- Need to accelerate decarbonization this decade
- Carbon pricing as central decarbonization instrument
- ICPF as complement to Paris Agreement – Paris Agreement vital for global ambition, but near-term pledges fall short
- Pragmatic carbon price floor agreement among smaller group of large emitters would supplement Paris and kick-start near-term emissions reductions
- Without ICPF, environmental/competitiveness concerns raise pressure for border carbon adjustments (far less effective than ICPF, though “devil is in the detail”: design choices make all the difference)
The need to complement the Paris Agreement

Paris Agreement is working to catalyze global ambition...

- 60 countries have committed ‘net-zero’ emission pledges for midcentury (more expected)

...but needs reinforcing to achieve required emissions reductions for 2030

- Current pledges for 2030 fall short of needed reductions for 2°C
- No mechanism for ensuring pledges achieved or link to policies

Under Paris approach two key obstacles to scaling up global mitigation

- *Ambition*: Too many parties (195) and parameters (one pledge per party)
- *Unilateral policy action*: competitiveness, uncertainty about whether others will act

The reinforcing mechanism should:

- *Facilitate negotiation* (i.e., small number of countries/transparent parameters)
- *Be effective* (i.e., contain a concrete plan to deliver emissions reductions)
IMF Carbon Price Floor proposal – two key elements

1. Focus on key emitters
   - e.g. China, US, India, EU, Canada, UK

2. Focus on minimum carbon price
   - Efficient and easily understood parameter
   - Joint action addresses competitiveness concerns and policy uncertainty
   - Countries can set higher prices if needed

But pragmatic design needed
   - **Equity**: differentiated price floors/simple transfer mechanism
   - **Flexibility**: allow alternative policies with equivalent outcomes
   - Other issues include emissions sources, monitoring

Baseline CO₂ Emissions, 2030

- China 34%
- United States 14%
- India 9%
- EU 7%
- Other G20 21%
- Rest of world 15%
- Other G20 21%
- Rest of world 15%

Source: IMF staff estimates.
Effectiveness of an ICPF: example with six countries

### G20 CO₂ Outcomes Under Alternative ICPF

Percent reduction in G20 CO₂ emissions below baseline, 2030

<table>
<thead>
<tr>
<th>Temperature Goal</th>
<th>20.8</th>
<th>32.8</th>
<th>46.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum emissions reductions required for temperature goals¹:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.8°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5°C</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th>China, US, India, EU, Canada, UK</th>
<th>All G20 Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDCs Only</td>
<td>10.8</td>
<td>14.0</td>
</tr>
<tr>
<td>NDCs + $50 Floor</td>
<td>23.4</td>
<td>25.3</td>
</tr>
<tr>
<td>NDCs + Differentiated Floor $75/50/25²</td>
<td>22.6</td>
<td>24.6</td>
</tr>
</tbody>
</table>

Source: NDCs from June 2, 2021; and IMF staff calculations.
Note: G20 - Group of Twenty; GHGs - greenhouse gases; NDC - nationally determined contributions.

¹ Assumes energy-related national CO₂ emissions need to reduce in proportion to total GHGs.
² Higher/middle/low price for advanced/high income emerging market/low income emerging market economies.
What about border carbon adjustments and carbon leakage?
What about border carbon adjustments (BCAs)?

Some policymakers fear that higher carbon prices than in trading partners create a trade distortion, leading to:

1. **Concerns about jobs and growth**
   - Production and investment could shift to lower carbon tax jurisdictions
   - Especially relevant for energy-intensive, trade-exposed (EITE) industries

2. **Environmental** concerns
   - “Carbon leakage” is when production shifting abroad raises foreign emissions, offsetting the domestic emissions reduction from carbon pricing

- BCAs could help address both concerns – charging for the CO\(_2\) “embodied” in imports (and probably rebating for exports). Provides an alternative to existing EITE industry support mechanisms such as free allowances.

- BCAs may also encourage carbon pricing abroad

- **But international cooperation on carbon pricing is superior to BCAs, notably in cutting global emissions**
ICPFs compared with BCA and existing domestic alternatives

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>International cooperation</th>
<th>Domestic policy instruments for defending competitiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in global emissions</td>
<td>Potentially large reduction</td>
<td>Always small reduction</td>
</tr>
<tr>
<td>Preserve EITE competitiveness</td>
<td>Yes (extent depends on design)</td>
<td>Yes (extent depends on design)</td>
</tr>
<tr>
<td>Limit carbon leakage</td>
<td>Yes (extent depends on design)</td>
<td>Yes (extent depends on design)</td>
</tr>
<tr>
<td>Revenue implications</td>
<td>Preserves carbon pricing revenue</td>
<td>Preserves carbon pricing revenue</td>
</tr>
<tr>
<td>Administrative burden</td>
<td>Low</td>
<td>Depends on design</td>
</tr>
<tr>
<td>Risk of WTO challenge</td>
<td>No</td>
<td>Depends on design</td>
</tr>
</tbody>
</table>
Conclusion

➢ We are in a climate emergency
➢ Need to cut emissions rapidly in this decade
➢ Carbon pricing is a central decarbonization instrument
➢ ICPF can complement Paris Agreement – ratcheting up ambition with direct link to policy
➢ Pragmatic carbon price floor agreement among smaller group of large emitters would supplement Paris and kick-start near-term emissions reductions
➢ ICPFs are superior to BCAs

_The race to net-zero will be fueled by carbon pricing. An international carbon price floor could fire the starting gun!”_
Thank you.
sblack@imf.org