Carbon taxes: Motivation and likely impacts

Development Dialogue Seminar
Carbon Tax – Role in the Macroeconomy & Climate Negotiations

Brent Cloete
Carbon pricing: policy imperative
Move to economic instruments

• Mitigation policy in developing countries mostly relied on
  – Renewable energy & energy efficiency
  – Measures to avoid deforestation

• Copenhagen Accord targets
  – Economic instruments will be required to keep climate change below 2°C

• Carbon leakage concerns in developed countries
  – Reliance on economic instruments in middle income developing countries
    o Otherwise trade measures
    o Other defensive measures (carbon labelling + product specification)

• SA is a case in point...
Carbon pricing imperative (2)

**SA emissions in global perspective**

- SA 13th largest emitter (30th largest economy) in 2008

### Carbon intensity of major economies (GDP > $200bn)

- **South Africa** 63%
- **Nigeria** 14%
- **Angola** 3%
- **Rest of SSA** 20%

**SSA: Annual CO₂ emissions from energy use (2008)**

- South Africa 63%
- Rest of SSA 20%
- Angola 3%
- Nigeria 14%

Trade impact

**Border Adjustment Measures (BAMs/BTAs)**

- BAMs remove carbon-cost advantage of imports
  - Import tariff equal to difference in carbon price

- Discretion in implementation
  - Host governments define sectors + measurement methodology
  - US considering economy-wide BAMs
  - EU favours sectoral BAMs
  - Fear of protectionism

- If BAMs implemented – export taxes likely

- BAMs could significantly affect market access
## Trade impact (2)

**Average tariff on imports if virtual-C is taxed at $50/ton CO2 (2004)**

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<tr>
<th>Exports from:</th>
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Source: Atkinson et al (2010)
Case for a carbon tax
Case for a carbon tax

**Rationale for carbon tax**

- Need for early action
- Price certainty important to incentivise innovation + investment
- Emissions profile & market structure not conducive to ETS
  - More than 60% of permits held by 2 institutions
- Detailed information to implement ETS lacking
  - Detailed sector level data on emissions, mitigation potential + abatement costs
- Simplicity + ease of administration of tax
  - Relative few data requirement for level tax
  - Institutional infrastructure + skills exist

Case for a carbon tax (2)

**Economic instruments choice in future**

- Tax and ETS compatible (tax does not close off ETS option)
  - Tax and ETS easily combined
  - Tax will generate information that will support ETS development
  - Voluntary local scheme can generate information

- Link SA ETS to international scheme
  - Sectoral approaches (sector “no lose targets”) fit with carbon tax

- Tax easy to replace with ETS
  - Tax easily removed in budget process
  - No sunk cost – institutions already exist
  - Monitoring infrastructure can be applied to ETS
Carbon tax: international experience
## Carbon tax: int’l experience

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<thead>
<tr>
<th>COUNTRY</th>
<th>CAP AND TRADE SCHEME</th>
<th>CARBON TAX</th>
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<td>Proposed (2011)</td>
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| United Kingdom | 2001 | GPL: 5.49  
Oil: 7.73  
Gas: 13.09  
Fixed rate in £ since 2001  
Mixed carbon-energy tax | Gas: 0.050  
Oil: 0.030  
GPL: 0.021 | Reduction of employer social charges, subsidies to environmental projects via the Carbon Trust | Does not concern households. Only on coal, natural gas, GPL and electricity.  
80% under conditions (objectives of energy efficiency) | -17.4% |
| Netherlands | 1990 | 12  
Combination of two carbon-energy mixed taxes | 0.036 | Initially reduction of income tax, then lowered employer charges | 3.40€/t for sectors of high energy intensity  
50% for non-profit organisations  
Conditional exemption for gas and electricity for electricity production  
Coverage rate for all emissions: 0.3 | -2.1% |
| Denmark | 1992 | 12.09  
13.43 in 1992 (reduction due to parallel introduction of energy tax in 2005)  
Increases by 1.8%/yr until 2015 | 0.044 | Reduction of employer social charges, family allowances, reduced income taxes on low incomes,  
20% of revenue allocated to programmes to improve energy efficiency | 1992: exemption for all businesses.  
1993 to 1995: 50% (or more, up to 90% for energy-intensive activities)  
Since 1996: discrimination according to use (heating, lighting, etc.).  
Exemption for electricity production | -3.5% |
| Finland | 1990 | Only 51.45 in 1990  
Increases from 2011 | 0.071 | Mostly reduced income tax (since 1996). Since 2009, abolition of social contributions by employers, financed by future rise in green taxes | - Use as industrial material  
- Fuel for trains, aircraft and boats  
- Electricity for greenhouses  
- No tax for electricity production  
- 50% for natural gas | +10.6% |
| Norway | 1991 | 34.4 | 0.062 | Support for projects of research and development, allowances for households | Exemptions for heavy industry, fishing, air and maritime transport  
Coverage for all emissions: 0.66 (between 1990 and 1999) | +18.7% |
| Sweden | 1991 | 108  
100 in 2007  
43 in 1991 (indexed for inflation) | 0.40 | Reduction of income tax, extension of VAT base, lowering of social charges on employers since 2001, R&D | Originally no allowance for industry, but all green taxes capped at 1.2% of sales.  
Since 1997, limited to 0.8% for certain activities | -9.1% |

Source: Laurent and Le Cacheux (2009)
Carbon tax: environmental impact
Environmental impact

Theoretical impact

• Greenhouse gas emissions (GHGs) an externality
  – Market fails to price environmental costs
  – Cost to society not considered
  – More than socially optimal level produced

• Economic instruments “put a price on carbon”
  – Level of emissions reduced
  – Demand shifts from carbon-intensive to less carbon-intensive goods/services
  – Over time leads to structural change in economy

Source: Cloete, Tyler and Robb (FRIDGE) (2010)
Environmental impact (2)

Peak, Plateau, Decline (PPD) trajectory

Source: DEAT (2008)
**SA policy**

- **Copenhagen Accord targets based on PPD trajectory**
  - 2020 + 2025 targets correspond to “Peak”
    - 34% below Business as Usual by 2020
    - 42% below Business as Usual by 2025
  - Targets met through:
    - Energy efficiency
    - Electricity supply (renewables, nuclear, clean coal)
    - Improvement in public transport
    - Improvement in vehicle efficiency
  - But after 2020-2025 not enough
  - Carbon pricing required to say on PPD trajectory

**Carbon price in place by 2015 – 2020 (2011?)**
Carbon tax: Economic impact
Economic impact

**Likely impact: current research**

- Van Heerden et al (2005)
  - R35/tCO$_2$ carbon tax leads to decrease in GDP without revenue recycling
  - With revenue recycling (reduction in food tax) GDP increases

- Pauw/LTMS (2007)
  - Up to carbon tax of R75/tCO$_2$ revenue recycling can undo negative impact on GDP growth
  - Above R75/tCO$_2$ negative impact on growth

<table>
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<th>Impact of carbon tax with no revenue recycling on economic growth</th>
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<td><strong>Tax level (R/tCO$_2$)</strong></td>
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<td>Impact on GDP</td>
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Source: Pauw (2007)
Impact of carbon tax with revenue recycling on economic growth

Source: Pauw (2007)
Economic impact (3)

• Devarajan et al (2009): 15% reduction in emissions will require carbon tax of:
  – R96.25/tCO₂ (flexible economy) or R165.22/tCO₂ (Rigid economy)
  – Both scenarios lead to 0.2% reduction in GDP

• Kearney (2010): Models ‘Use the market’ LTMS scenario using dynamic CGE model
  – R250/tCO₂ in 2008 increasing to R750/tCO₂
  – Net positive impact on GDP over entire period of 0.73% due to increased investment
  – Result holds with and without revenue recycling

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<th>Impact on GDP (percentage deviation from GWC)</th>
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Source: Kearney (2010)
Carbon tax: social impact
Social impact

Current evidence

• Van Heerden et al (2005):
  – With suitable recycling mechanism (food tax break) net positive impact on the economy (‘Triple-dividend’):
    o Reduction in emissions
    o Reduction in poverty
    o Increase in GDP

• Pauw (2007)/ LTMS:
  – Similar result to Van Heerden et al (2005) at relatively low tax levels (below R200/tCO$_2$)
  – Recycling of revenues through a subsidisation of basic food prices - employment changes positive up to
    o R100/tCO$_2$ for semi-skilled workers
    o R200/tCO$_2$ for unskilled workers
Social impact (2)

- **Devarajan et al (2009):**
  - Carbon tax of R96.25/tCO$_2$ (flexible economy)
    - 0.33% reduction in welfare (no revenue recycling)
    - 0.27% reduction in welfare (revenue recycling)
  - Carbon tax of R165.22/tCO$_2$ (rigid economy)
    - 0.35% reduction in welfare (no revenue recycling)
    - 0.26% reduction in welfare (revenue recycling)
  - Loss in welfare due to rigidities in SA labour market

- **Kearny (2010)**
  - Use the market LTMS scenario leads to
    - Increase in household welfare
    - Increase in employment across skill levels
Social impact (3)

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<th>Employment and wage impact (Use the market)</th>
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<td>Semi-skilled and unskilled labour</td>
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Impact on household welfare

Source: Kearney (2010)
Carbon tax: design considerations
Design considerations

Options for levying a carbon tax

- Source: Cloete, Tyler and Robb (FRIDGE) (2010)
Implementing a carbon tax (1)

**Tax design guidelines**

- Implementation of carbon tax should be clearly signalled
  - Announce 12-24 months before implementation to give firms time to prepare
- Emphasis should be on generating data and setting right tax level over time
  - Start off with low-level tax to minimise competitiveness concerns and generate data
- Provide as much price certainty as possible
  - Announce future path of carbon tax
  - Announce bands for next 24-36 months
  - Position within band will depend on emissions data
- Tax should be revenue neutral (but NOT earmarked)
Implementing a carbon tax (2)

**Tax design guidelines**

- Policy coherence is important (i.e. energy policy)
- Create special dispensations for “difficult to measure” sectors
  - Transport, agriculture and residential sector
- Implement tax on emissions at source (inputs good proxy in SA)
  - Potentially high monitoring and compliance cost addressed
  - Focus tax on largest emitters first and expand coverage over time
- Valid competitiveness concerns should be addressed
  - Emphasis should be on technical solutions
    - i.e. subsidies and soft loans for investment in new technologies
  - Partial/full exemption only in exceptional circumstances
  - Exemptions should include sunset clause
- Create broad-based carbon price in economy
Implementing a carbon tax (3)

**Supporting measures**

- Availability of low-carbon alternatives will increase effectiveness of tax & reduce competitiveness impact
  - Regulatory measures to overcome non-price barriers to uptake of low-carbon alternatives (i.e. energy sector)
  - Incentives for development of low-carbon technologies
    - Increase public sector support of basic research
    - No direct incentives for R&D in low-carbon technology in SA
    - General incentives cover low emissions R&D only indirectly
  - Potential focus for new incentives
    - Target the creation of competitive advantage in particular technologies via competition for funding (NOT directed funding)
    - Adapt existing low-carbon technology for South African environment
Design considerations

**Carbon tax in SA**

- National Treasury considering broad-based carbon tax
  - Current indications:
    - Tax at source
    - R100/t on CO₂ embodied in coal
  - Likely impact (Winkler and Marquard, 2009):
    - Cost of electricity increases roughly 10c/kWh
    - Cost of liquid fuels increases roughly 22c/l

- R100/t at lower end of cost estimates in literature
  - Expected to increase significantly in future

- Suite of instruments will also include specific taxes
  - i.e. CO₂ tax on vehicle emissions
SA greenhouse gas emissions profile 2000

Source: DEAT (2009)
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