DNA Economics

TIPS
TRADE & INDUSTRIAL POLICY STRATEGIES

Carbon taxes: Motivation and likely impacts

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Development Dialogue Seminar

Carbon Tax – Role in the Macroeconomy & Climate Negotiations

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Carbon pricing: policy imperative

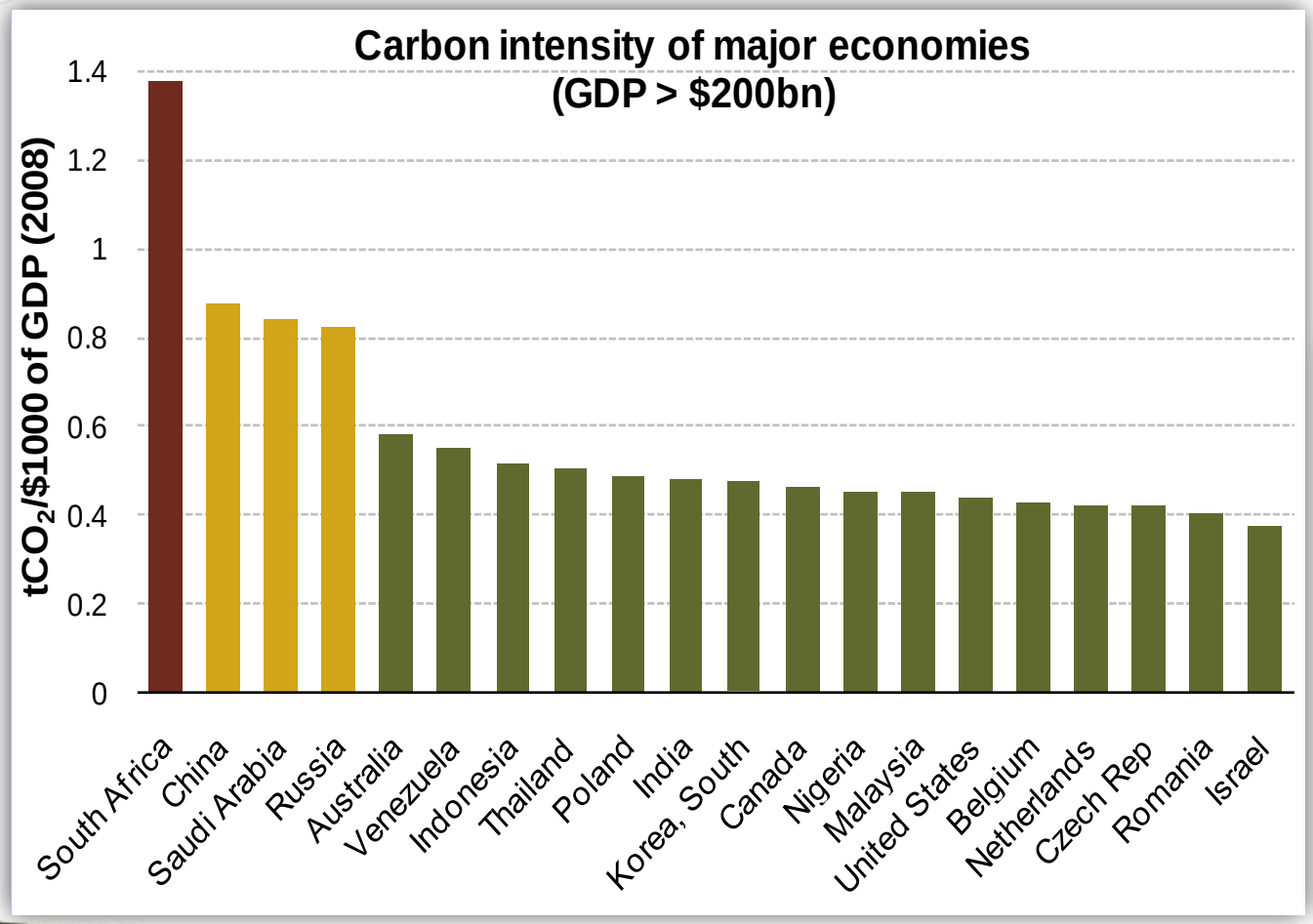
Carbon pricing imperative

Move to economic instruments

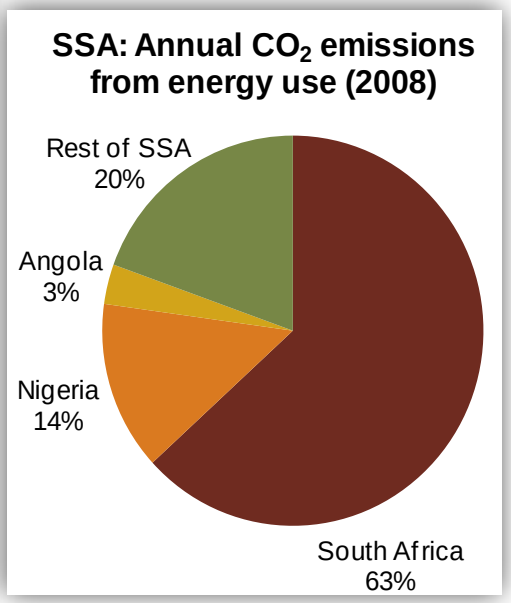
- Mitigation policy in developing countries mostly relied on
  - Renewable energy & energy efficiency
  - Measures to avoid deforestation
- Copenhagen Accord targets
  - Economic instruments will be required to keep climate change below 2^{o}C
- Carbon leakage concerns in developed countries
  - Reliance on economic instruments in middle income developing countries
    - Otherwise trade measures
    - 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



- Source: US Energy Information Administration (2010)

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)

Exports from: \ Imports into:	BRA	CAN	CHN	E15	eit	IND	JPN	liy	MEX	RUS	USA	xhy	xmy	xx1	ZAF	Average
BRA	0.0%	3.4%	3.2%	3.2%	3.1%	2.8%	4.0%	2.8%	2.7%	2.6%	3.0%	3.9%	3.0%	3.7%	2.9%	3.1%
CAN	4.5%	0.0%	3.4%	3.4%	3.2%	3.7%	3.2%	3.4%	2.8%	2.8%	2.6%	3.8%	2.9%	3.6%	3.0%	2.9%
CHN	12.1%	10.5%	0.0%	10.5%	11.7%	13.4%	10.4%	11.0%	9.9%	10.0%	10.3%	11.0%	10.9%	11.1%	11.1%	10.7%
E15	1.6%	1.1%	1.1%	0.0%	1.1%	1.3%	1.2%	1.2%	1.1%	1.1%	1.2%	1.3%	1.1%	1.2%	1.2%	1.2%
eit	6.6%	4.1%	4.3%	4.0%	0.0%	5.1%	3.9%	4.5%	4.2%	4.4%	4.2%	5.2%	4.5%	4.6%	4.6%	4.2%
IND	8.3%	7.8%	9.2%	7.7%	8.9%	0.0%	6.8%	8.5%	8.1%	8.7%	7.9%	7.0%	7.9%	8.5%	5.3%	7.8%
JPN	1.4%	1.3%	1.5%	1.4%	1.5%	1.6%	0.0%	1.5%	1.4%	1.4%	1.2%	1.5%	1.4%	1.4%	1.3%	1.4%
liy	8.2%	5.4%	5.7%	5.0%	5.6%	6.1%	4.7%	0.0%	5.1%	4.9%	5.0%	5.3%	5.7%	6.1%	7.0%	5.3%
MEX	3.5%	2.1%	4.2%	4.0%	3.6%	10.8%	4.0%	4.9%	0.0%	4.1%	1.7%	4.6%	3.4%	4.0%	3.5%	2.3%
RUS	18.0%	14.3%	12.4%	11.8%	13.9%	12.8%	11.3%	15.0%	14.7%	0.0%	10.4%	14.5%	13.6%	14.0%	15.9%	12.6%
USA	3.3%	3.0%	3.1%	3.1%	3.4%	3.3%	3.0%	3.3%	2.8%	2.8%	0.0%	3.2%	2.9%	3.5%	3.2%	3.1%
xhy	3.3%	2.3%	2.2%	2.3%	2.6%	2.2%	2.0%	2.3%	2.2%	2.5%	2.0%	0.0%	2.2%	2.4%	2.5%	2.2%
xmy	6.3%	5.6%	5.0%	5.4%	5.8%	4.1%	4.1%	6.1%	5.3%	6.1%	4.5%	4.5%	0.0%	6.2%	5.1%	5.0%
xx1	2.5%	2.1%	2.1%	2.1%	2.1%	3.2%	2.2%	2.3%	1.8%	1.8%	2.0%	2.3%	2.1%	0.0%	2.7%	2.1%
ZAF	15.9%	10.1%	10.6%	9.8%	10.1%	11.5%	11.4%	9.0%	16.6%	7.9%	8.9%	12.4%	8.8%	10.2%	0.0%	9.9%
Average	4.2%	3.0%	2.7%	4.3%	2.9%	4.2%	4.2%	4.2%	3.4%	3.2%	3.1%	4.1%	3.2%	3.1%	3.4%	

- Source: Atkinson et al (2010)

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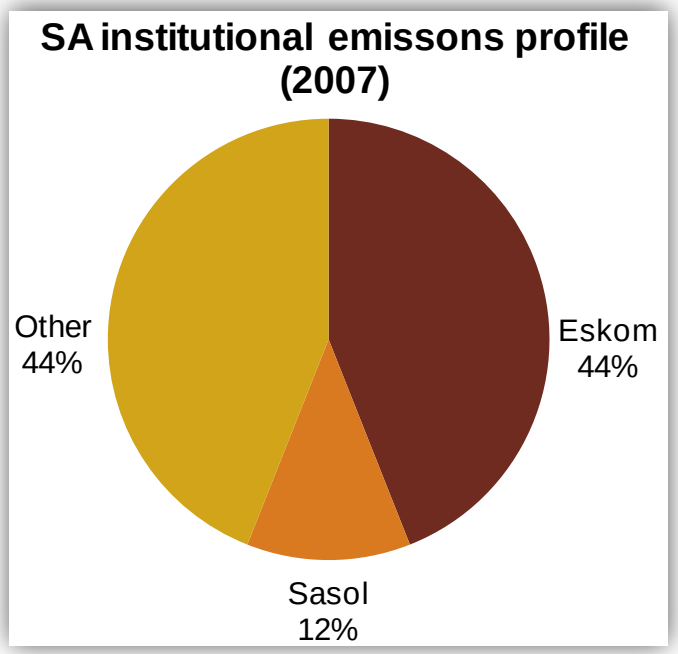
Case for a carbon tax

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



Source: ERC (2008), NBI (2008)

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

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Carbon tax: international experience

Carbon tax: int'l experience

COUNTRY	CAP AND TRADE SCHEME	CARBON TAX
Finland	Yes	Yes
Denmark	Yes	Yes
Sweden	Yes	Yes
France	Yes	Implementation on hold
Norway	Yes	Yes
Switzerland	Yes	Yes
The Netherlands	Yes	Yes
Ireland	Yes	Yes
UK	Yes	Yes
EU	Yes	Under consideration
Japan	Proposed	Proposed (2011)
Australia	Proposed (on hold)	Proposed (on hold)
US	Proposed	Proposed
Canada (British Columbia)	No	Yes
China	No	Proposed (2012)
India	No	Yes

Carbon tax: int'l experience (2)

Country	Year of implementation	Level of tax (€ 2009/ton of CO2)	Tax rate in relation to GDP/ inhabitant (OCDE, 2007) in %	Form of redistribution chosen	Exceptions	Recorded impact on GHG emissions (1990-2007)
United Kingdom – « Climate Change Levy »	2001	GPL : 5.49 Oil: 7.73 Gas :13.09 fixed rate in £ since 2001 mixed carbon-energy tax	Gas : 0.050 O : 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	20 Only $1.45 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: 0.64	+18.7% (between 1990 and 1999)
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)

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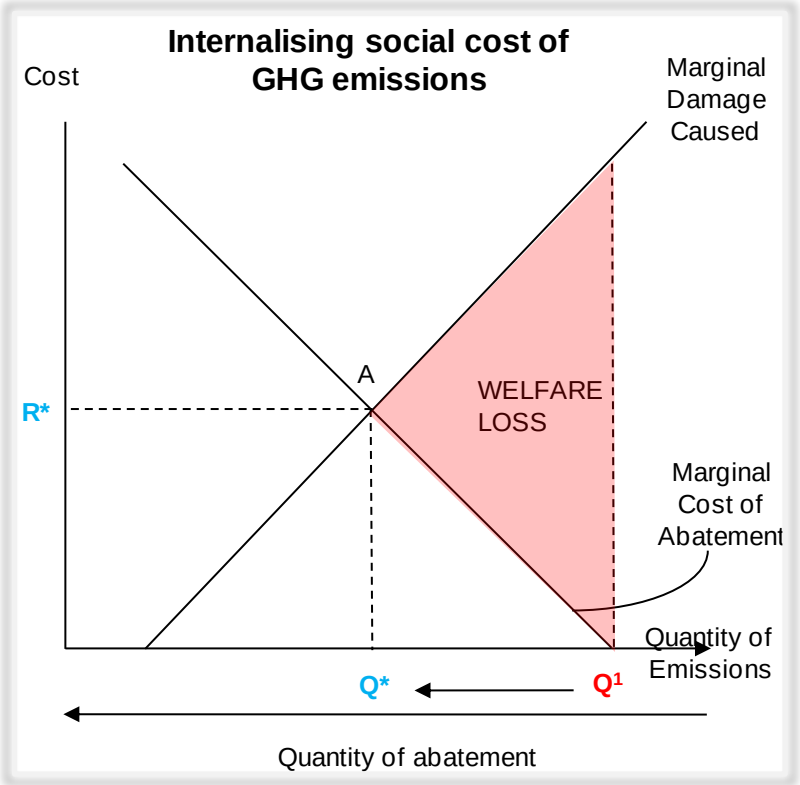
Carbon tax: environmental impact

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

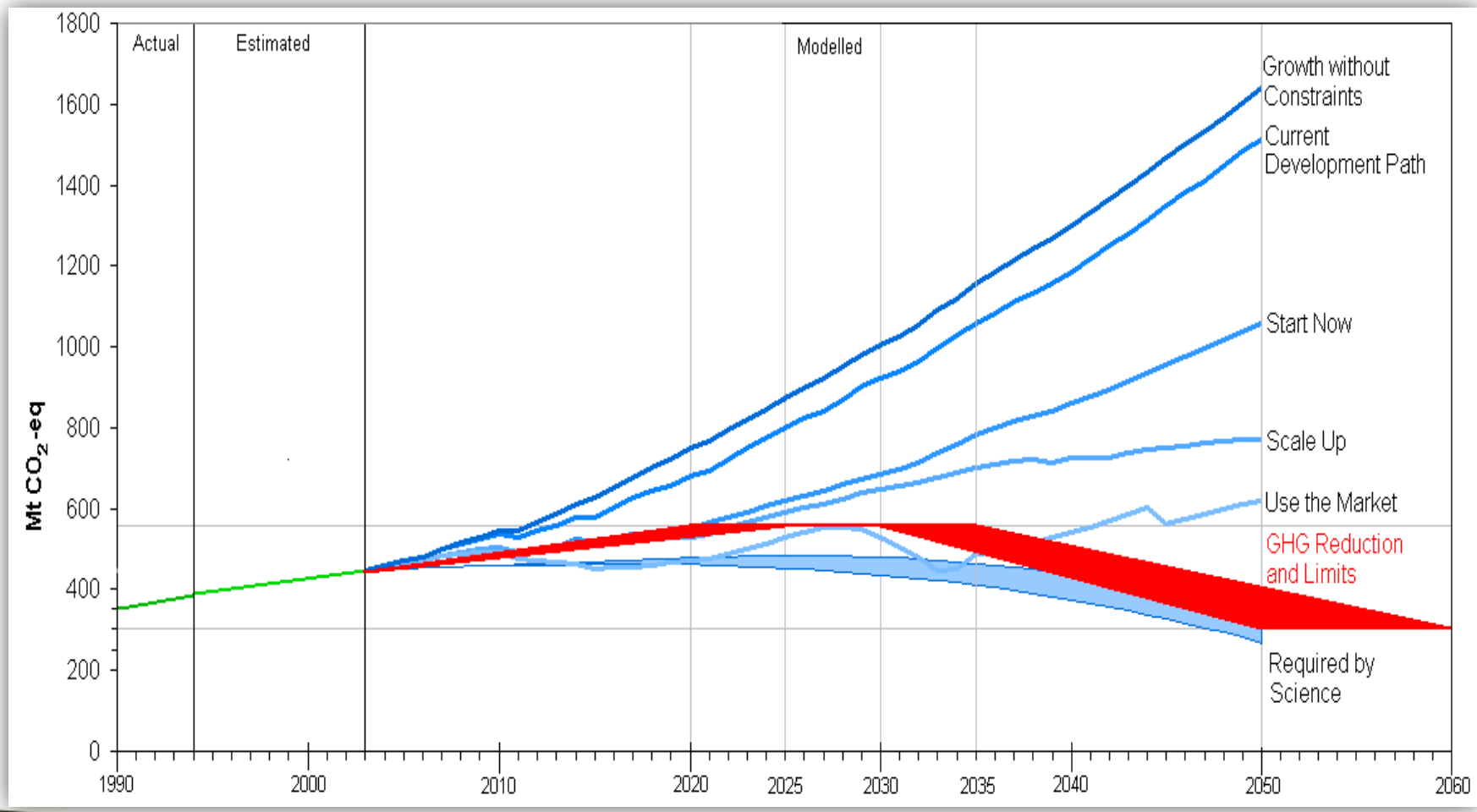
- Economic instruments “put a price on carbon”
  - Level of emissions reduced
  - Demand shifts from carbon-intensive to less carbon- intensive goods/services
  - Over time leads to structural change in economy



Source: Cloete, Tyler and Robb (FRIDGE) (2010)

Environmental impact (2)

Peak, Plateau, Decline (PPD) trajectory



- Source: DEAT (2008)

Environmental impact (3)

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?)**

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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

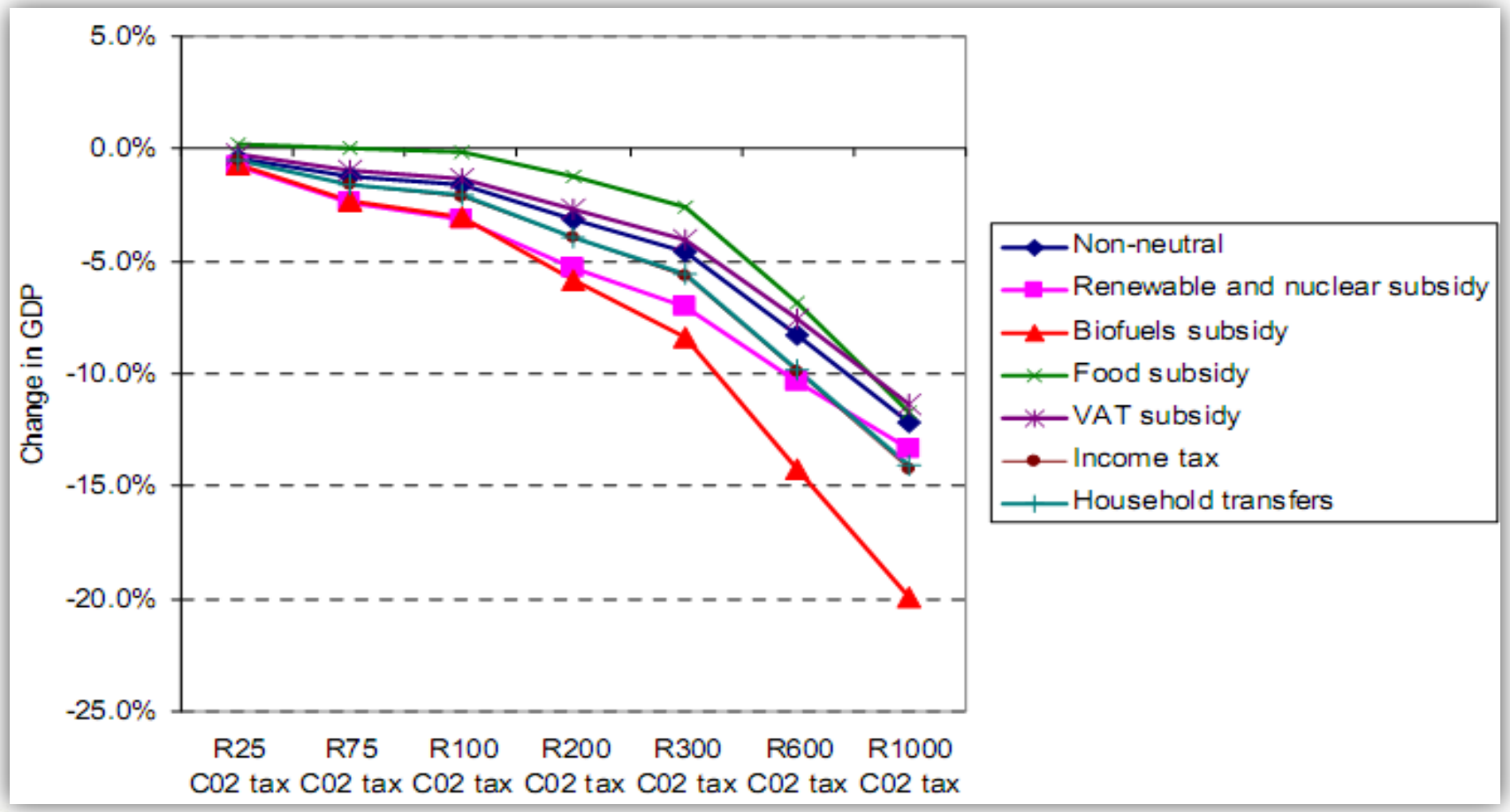
- Pauw/LTMS (2007)
  - Up to carbon tax of R75/tCO_2 revenue recycling can undo negative impact on GDP growth
  - Above R75/tCO_2 negative impact on growth

Impact of carbon tax with no revenue recycling on economic growth							
Tax level (R/tCO_2)	25	75	100	200	300	600	1000
Impact on GDP	-0.3%	-0.8%	-1.0%	-1.8%	-2.4%	-4.1%	-5.7%

Source: Pauw (2007)

Economic impact (2)

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/tCO_2 (flexible economy) or R165.22/tCO_2 (Rigid economy)
  - Both scenarios lead to 0.2% reduction in GDP

- Kearney (2010): Models 'Use the market' LTMS scenario using dynamic CGE model
  - R250/tCO_2 in 2008 increasing to R750/tCO_2
  - Net positive impact on GDP over entire period of 0.73% due to increased investment
  - Result holds with and without revenue recycling

Impact on GDP (percentage deviation from GWC)								
Period	2000-2004	2005-2009	2010-2014	2015-2019	2020-2024	2025-2029	2030-2039	2040-2050
Impact on GDP	0.05	0.02	0.62	01.89	1.67	1.40	0.35	0.51

- Source: Kearney (2010)

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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'):
    - Reduction in emissions
    - Reduction in poverty
    - 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
    - R100/tCO_2 for semi-skilled workers
    - R200/tCO_2 for unskilled workers

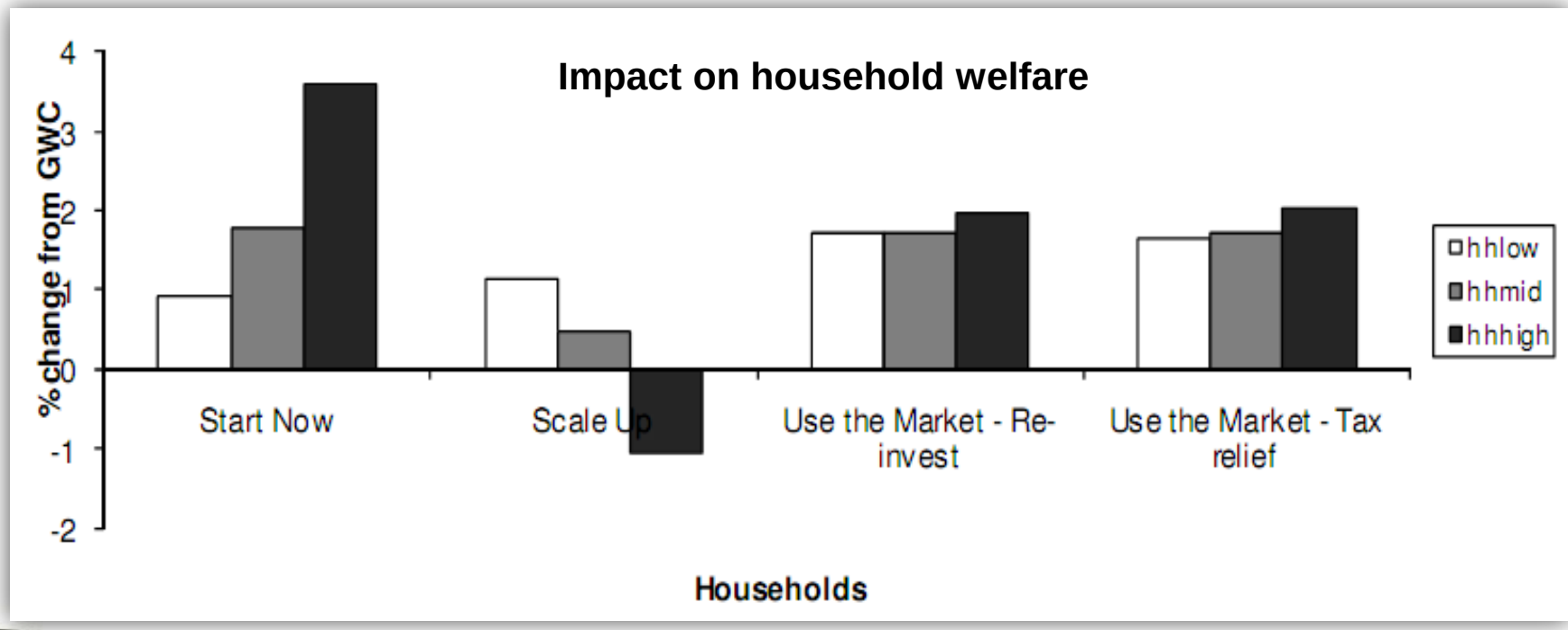
Social impact (2)

- 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)

Employment and wage impact (Use the market)	
	Average percentage deviation from GWC
High-skilled labour	8.4
Skilled labour	8.8
Semi-skilled and unskilled labour	13.7



- Source: Kearney (2010)

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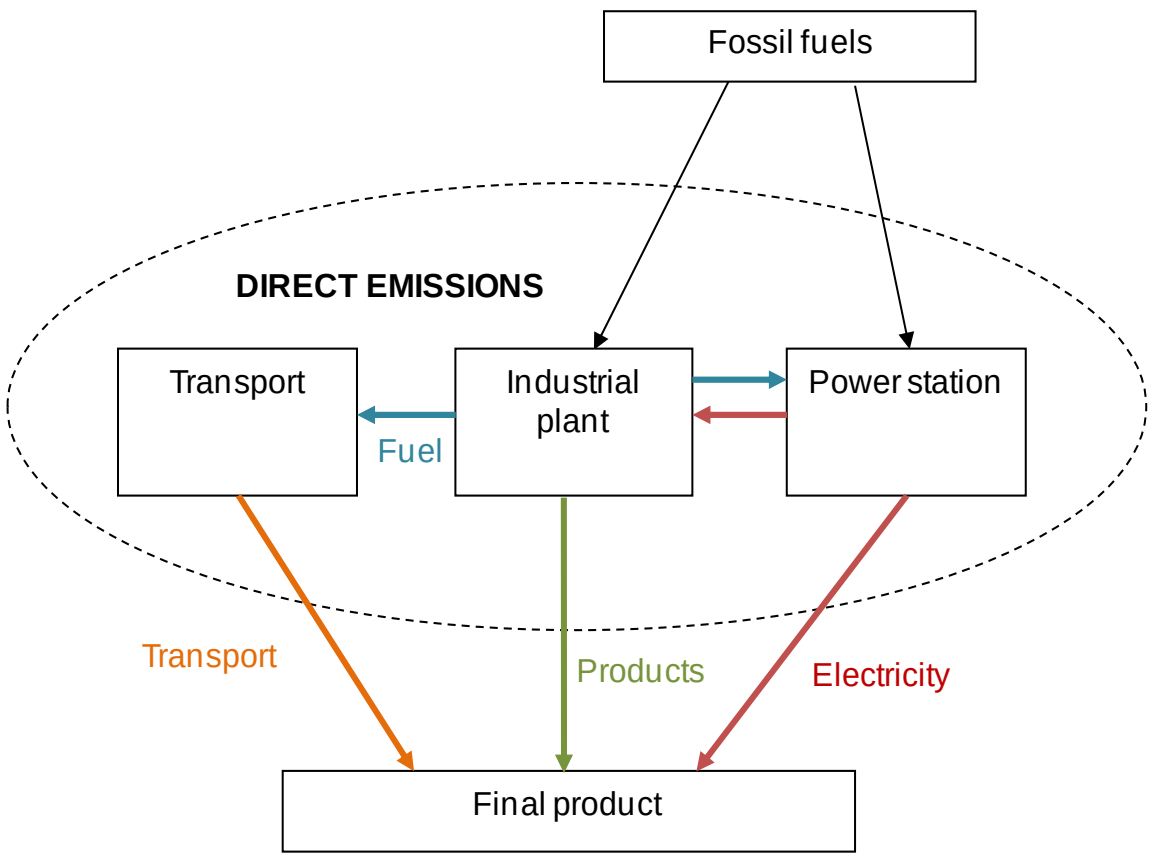
Carbon tax: design considerations

Design considerations

Options for levying a carbon tax



INCIDENCE

* Carbon content of fossil fuels

* Tonnage of GHGs emitted

* Volume of fuel bought/sold

* KWh of electricity bought/sold

* Transport emissions or fuel-efficiency of vehicle

* Embodied emissions in other final products sold

- 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

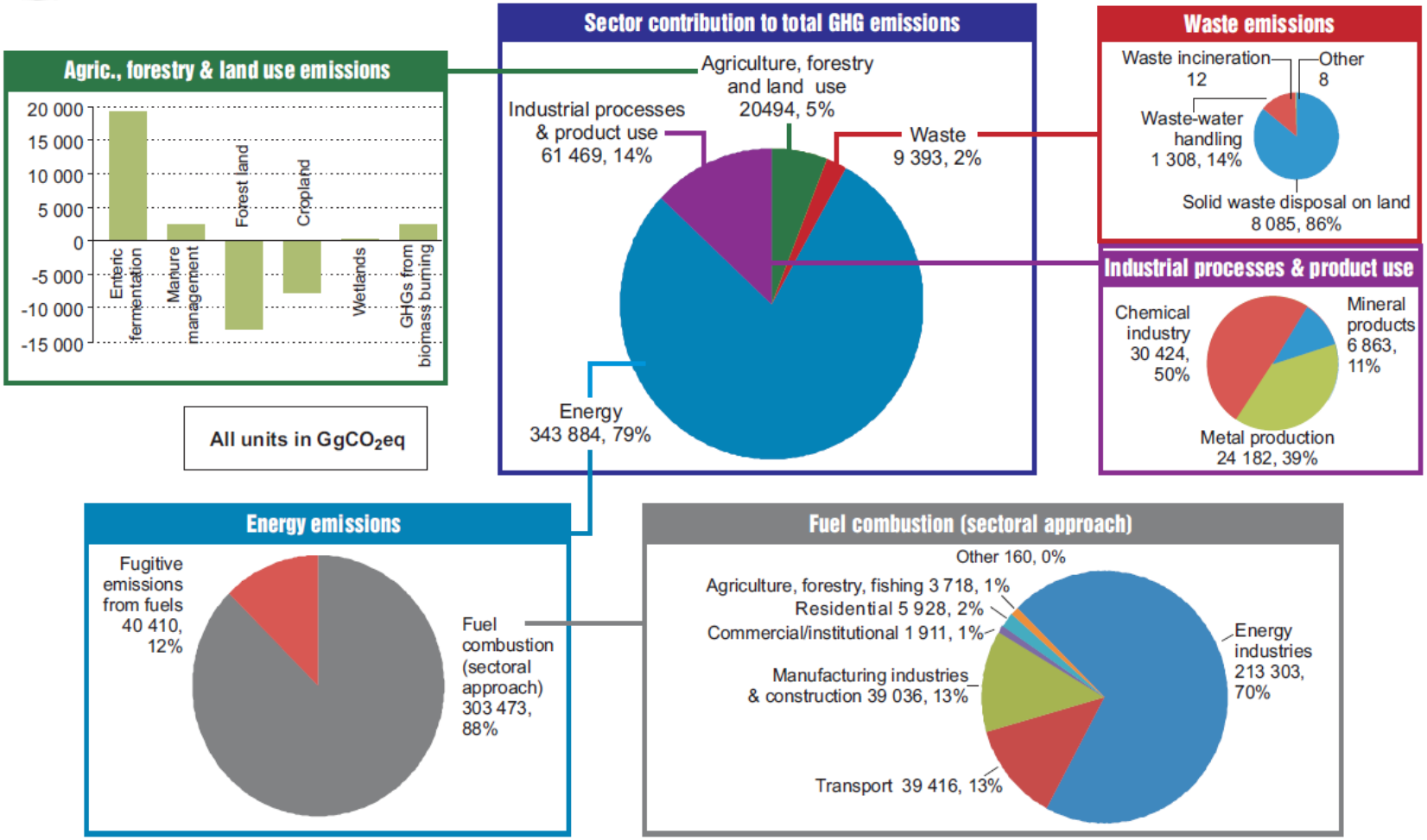
Carbon tax in SA

- National Treasury considering broad-based carbon tax
  - Current indications:
    - Tax at source
    - R100/t on CO_2 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. CO_2 tax on vehicle emissions

SA greenhouse gas emissions profile 2000



- Source: DEAT (2009)

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