



DNA Economics

Carbon Tax Public Seminar

**Seminar 2: Understanding the Carbon
Tax Calculations**

14 March 2016

CAVEAT

A number of issues relating to the detailed design of the carbon tax still need to be clarified by National Treasury – so please view the content of this presentation as work-in-progress and subject to change

The model used to generate the results presented has not been verified by the National Treasury - so please treat results as indicative

Introduction

Presentation builds on NBI Carbon Tax Seminar 1

- So will assume a basic knowledge of the carbon tax in interest of time (35 minute presentation) – but please feel free to raise issues not covered during the Q&A session (20 minutes)
- Presentation covers issues that may complicate carbon tax calculation or lead to unanticipated consequences
 - Many of these issues are open to debate at present – so please feel free to **disagree/raise questions** if you disagree with any of my interpretations
 - Issues will be covered relatively quickly during presentation, but happy to refer back to any slides during Q&A sessions
- I won't be covering calculation of carbon tax in detail
 - That will be covered in the next presentation

Carbon tax coverage

- Coverage determined by Notice in respect of the Declaration of Greenhouse Gases as priority air pollutants under the Air Quality Act
 - So firms that have to prepare Pollution Prevention Plans (PPPs) will have to pay carbon tax
- Carbon tax on all direct (Scope 1) GHG emissions (CO₂, CH₄, N₂O, perfluorocarbons (PFC), etc) based on **emissions factors** provided in Bill from '**stationary sources**', with exception of
 - Waste, AFOLU and residential sectors (during Phase 1)
 - But not clear if these sectors are 'exempt from tax' or if they just receive 100% tax-free allowance – but NT has indicated that emissions reductions in these sectors will be eligible to serve as offsets
 - Diesel and petrol used in stationary applications
 - Transport fuels will be taxed via existing fuel levy regime, so 'carbon tax' will be included in price of these fuels irrespective of their use

Alignment between tax, PPPs and mandatory reporting

- PPPs (Draft Regulations) and Carbon budgets
 - Covers prescribed **list of activities**
 - Companies who emit more than 0.1 Mt CO₂e of emissions covered
 - And companies that undertake a listed activity “**as a primary activity**” when there is at least one firm that emits more than 0.1 Mt CO₂e of emissions
 - Companies can voluntarily elect to get a carbon budget, and will then report against carbon budgets through PPPs
 - Company must report all emissions
- Draft Carbon tax bill
 - **Same list of activities** – firms must report all emissions
 - Anyone involved in these activities (rather than undertaking them as “primary activities”) is liable
 - **But** Draft Explanatory Memorandum states that “only entities with a thermal capacity of around 10 MW will be subject to the tax in the first phase”

Alignment between tax, PPPs and mandatory reporting (2)

- Regulations Prescribing National Greenhouse Gas Emissions Reporting
 - Companies which generate emissions under IPCC list of source categories
 - Reporting only required for some source categories if level of activity exceeds a certain limit (e.g. 10 MWth fuel combustion)
 - Other source categories require reporting regardless of level of activity.
 - For some source categories (including product use), no reporting is required
- So mandatory reporting does not cover all emissions from a company, and reporting thresholds are based on level of emissions from individual activity, not company as a whole
- **Since verification of carbon tax liability is based on mandatory reporting information, firms are liable for carbon tax on emissions that they do not have to report**

Administration of carbon tax

- Administration
 - SARS administers tax
 - MRV done by DEA (National Atmospheric Emissions Inventory System (NAEIS)) and DoE (Central Energy Database, will supply energy combustion data to the NAEIS)
 - Transfer of information from NAIES to SARS will have to be managed carefully
- Tax payer must report emissions and pay tax on six-monthly basis
 - “A taxpayer must submit six-monthly environmental levy accounts and payments as prescribed by rule in terms of the Customs and Excise Act, 1964, for every tax period commencing on 1 January and ending on 30 June and the period commencing on 1 July and ending on 31 December of that year” (DCTB p 20)
- But mandatory reporting of emissions is only required once a year (by 30th of April of the year following the reporting period)

Administration of carbon tax (2)

- Significant admin burden remains with SARS
 - Lots of calculations in tax design (Schedule 2 allowances differ by sector/activity, trade allowance, performance allowance, diesel/petrol emissions, sequestration capped, offsets, etc)
 - Most of these calculations on firm rather than industry basis
 - None of this information is coming from DEA (only emissions by ‘type’)
 - Not clear how additional information from firms are going to be obtained or verified
- Don’t think admin burden has been considered sufficiently (risk of disputes and LOTS more admin for firms)

Schedule 2 allowances

Sector	Basic tax-free allowance for fossil fuel combustion emissions %	Basic tax-free allowance for process emissions %	Fugitive emissions allowance %	Trade exposure allowance %	Z-factor allowance %	Carbon budget allowance %	Offsets allowance %	Maximum total allowances %
Fuel combustion								
Energy Industries								
Main activity electricity and heat production	60	0	0	0	0	5	10	75
Petroleum refining	60	0	0	10	5	5	10	90
Manufacture of solid fuels & other energy industries	60	0	0	10	5	5	10	90
Manufacturing industries and Construction	60	0	0	10	5	5	10	90
Iron and steel	60	0	0	10	5	5	10	90
Non-ferrous metals energy	60	0	0	10	5	5	10	90
Chemicals	60	0	0	10	5	5	10	90

Calculation of carbon tax

- Carbon tax on all direct (Scope 1) GHG emissions (CO₂, CH₄, N₂O, perfluorocarbons (PFC), etc) based on **emissions factors** provided in Bill
 - Mandatory reporting regulations allow Tier 1 (IPCC emissions factors), Tier 2 (country-specific emissions factors) or Tier 3 (carbon balance approach) methodology to be used for reporting
 - Draft Bill presents fixed emission factors in Schedule 1 (Tier 1 and 2)
 - One of the carbon tax calculation examples provided in the EM (example 9) uses a carbon balance approach (Tier 3), but there is no indication Draft Bill that carbon balance approach is allowed to calculate taxable GHG emissions
- Uncertainty regarding some emissions factors in Table 1 (Energy Combustion Emission Factors)
 - Not all emissions factors align with IPCC 2006 guidelines

Calculation of carbon tax (2)

- **Schedule 2 of Draft Carbon Tax Bill**
 - Heading in first column (“sector”) is misleading → should be activities. Only words in bold are sectors
 - In some places sectors have been allocated allowances rather than being bolded as sector headings
 - Second column label “Basic tax-free allowance for fossil fuel combustion emissions” is incorrect – also applies to fugitive emissions
- **Inconsistencies between Schedule 2 and EM**
 - Offsets in Schedule 2 does not align with “maximum allowable” mentioned in EM examples

Carbon tax calculation

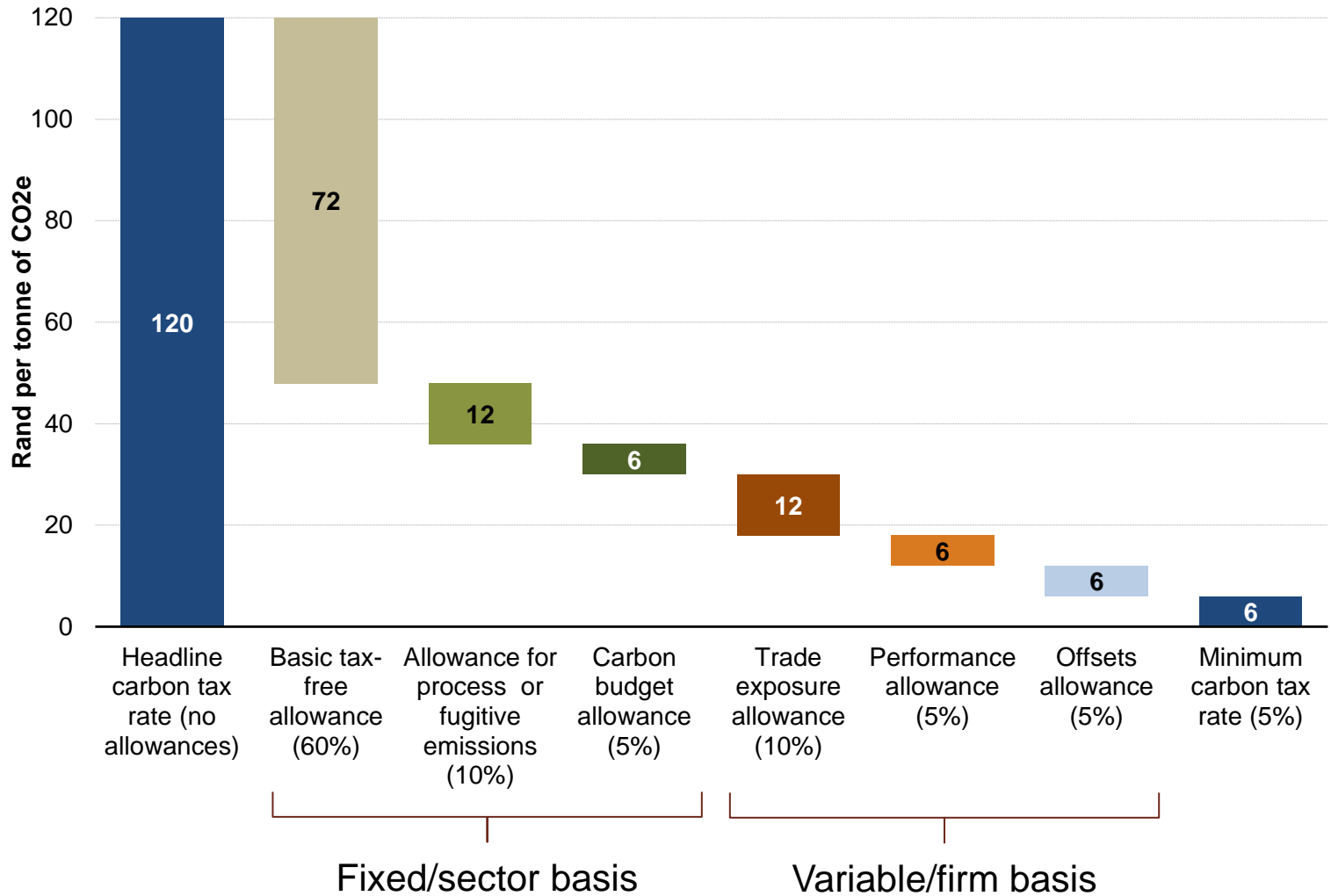
Amount of carbon tax payable is equal to

- Carbon tax on **Combustion emissions**: (Total GHG emissions from fossil fuel combustion minus sequestered emissions) X R120 X (1 - sum of all relevant tax-free allowances)
Plus
- Carbon tax on **industrial processes and product use emissions**: Total GHG emissions from process activities X R120 X (1- sum of all relevant tax-free allowances)
Plus
- Carbon tax on **fugitive emissions**: Total GHG emissions from fugitive emissions X R120 X (1 - sum of all relevant tax-free allowances)

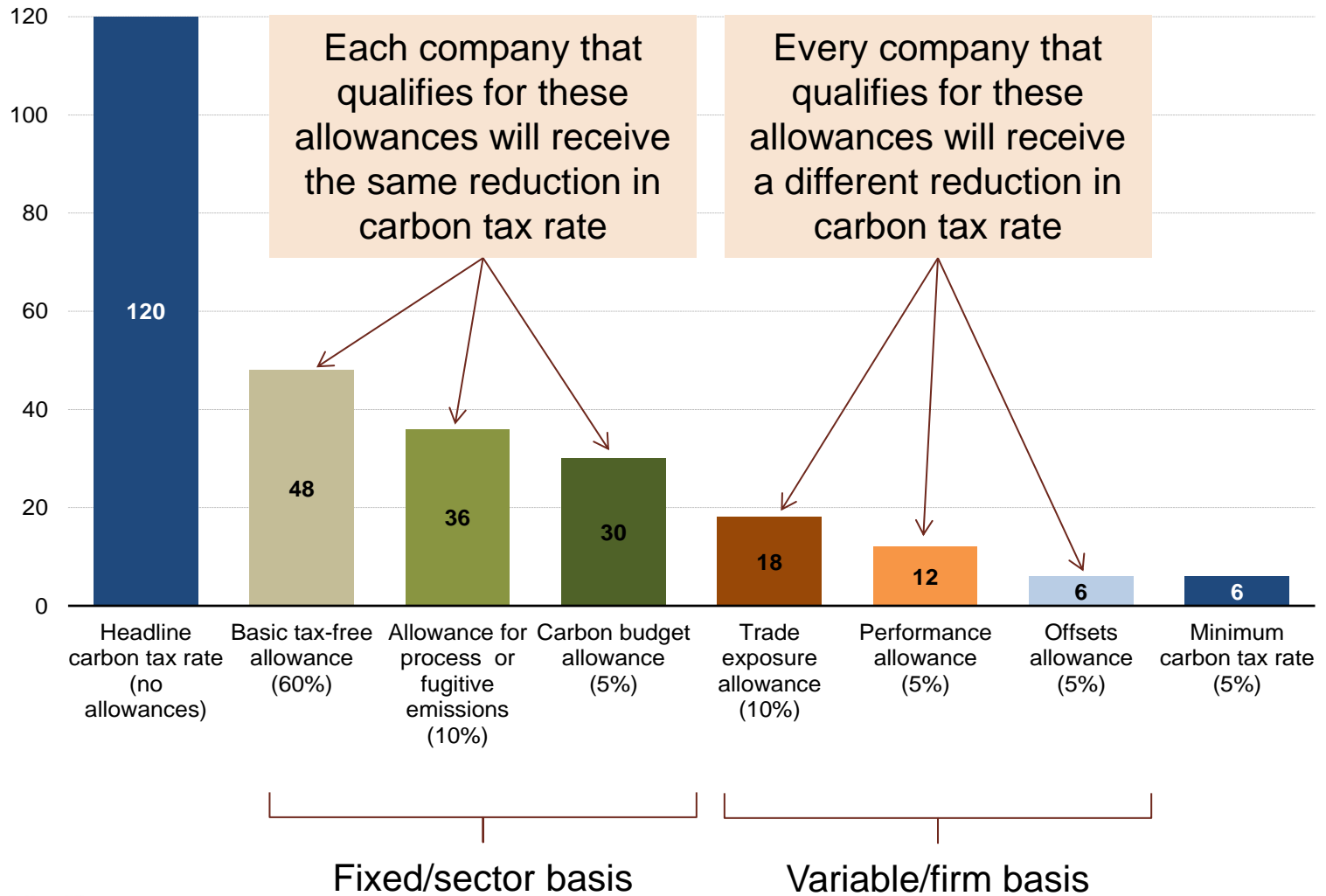
Tax-free allowances

- **Sum of all relevant tax-free allowance = 95% or smaller**
- Tax-free allowance thresholds calculated as percentages rather than absolute thresholds
 - Tax on percentage of each type of emissions
 - Akin to standard approach of providing % relief (95% cap)
 - No scope for coming in below threshold and paying no tax
- So will pay at least 5% X R120 on every tonne of CO₂e emitted
- **Allowances thus reduce carbon tax rate**, not carbon tax base
- **Only sequestration reduced carbon tax base**
- **Different carbon tax rate is calculated for each type of emissions**
 - **Combustion emissions** vs **industrial processes and product use**
missions vs **fugitive emissions**

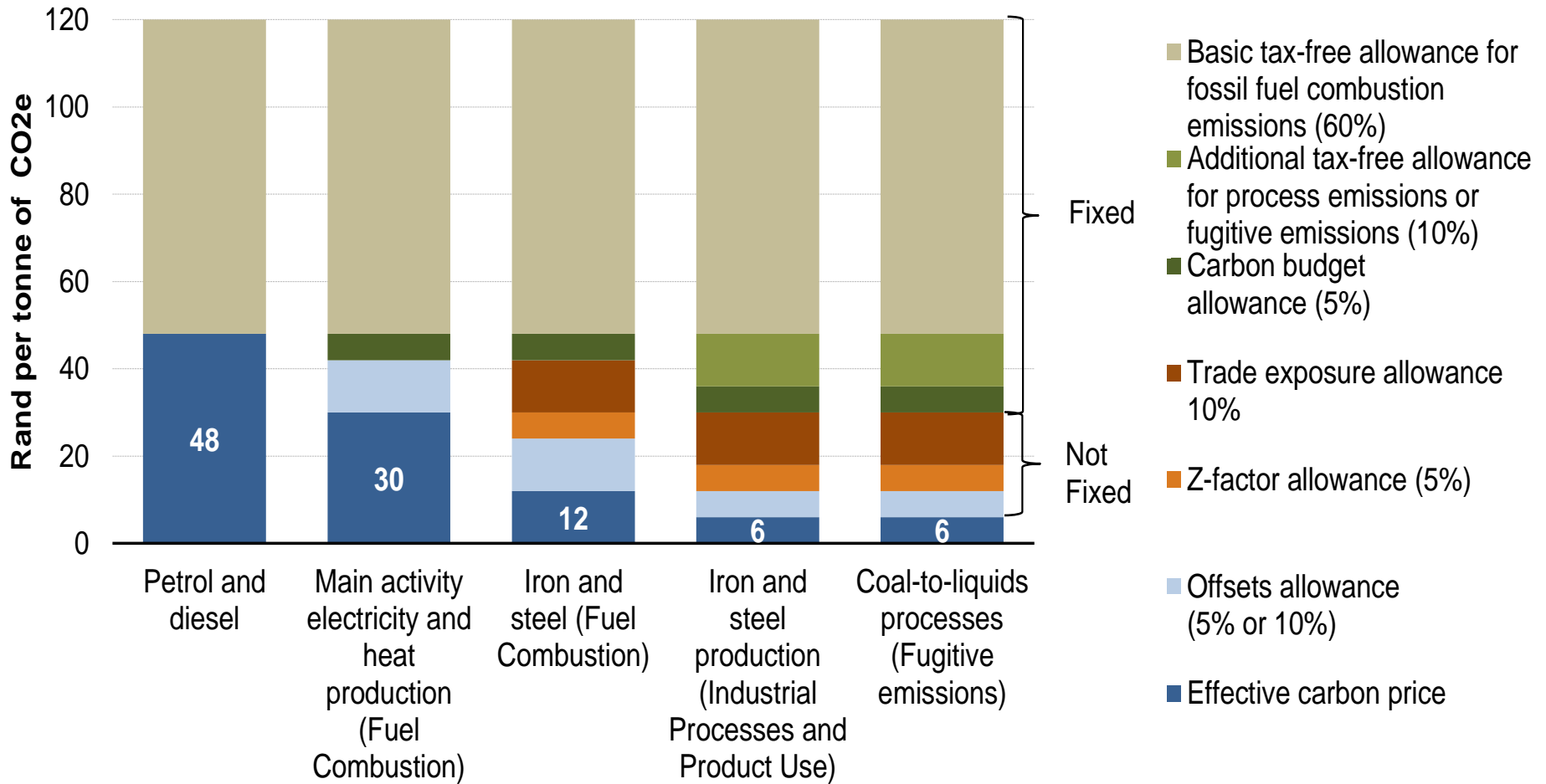
Tax-free allowances reduce carbon tax rate



Effective carbon tax rate after cumulative application of allowances

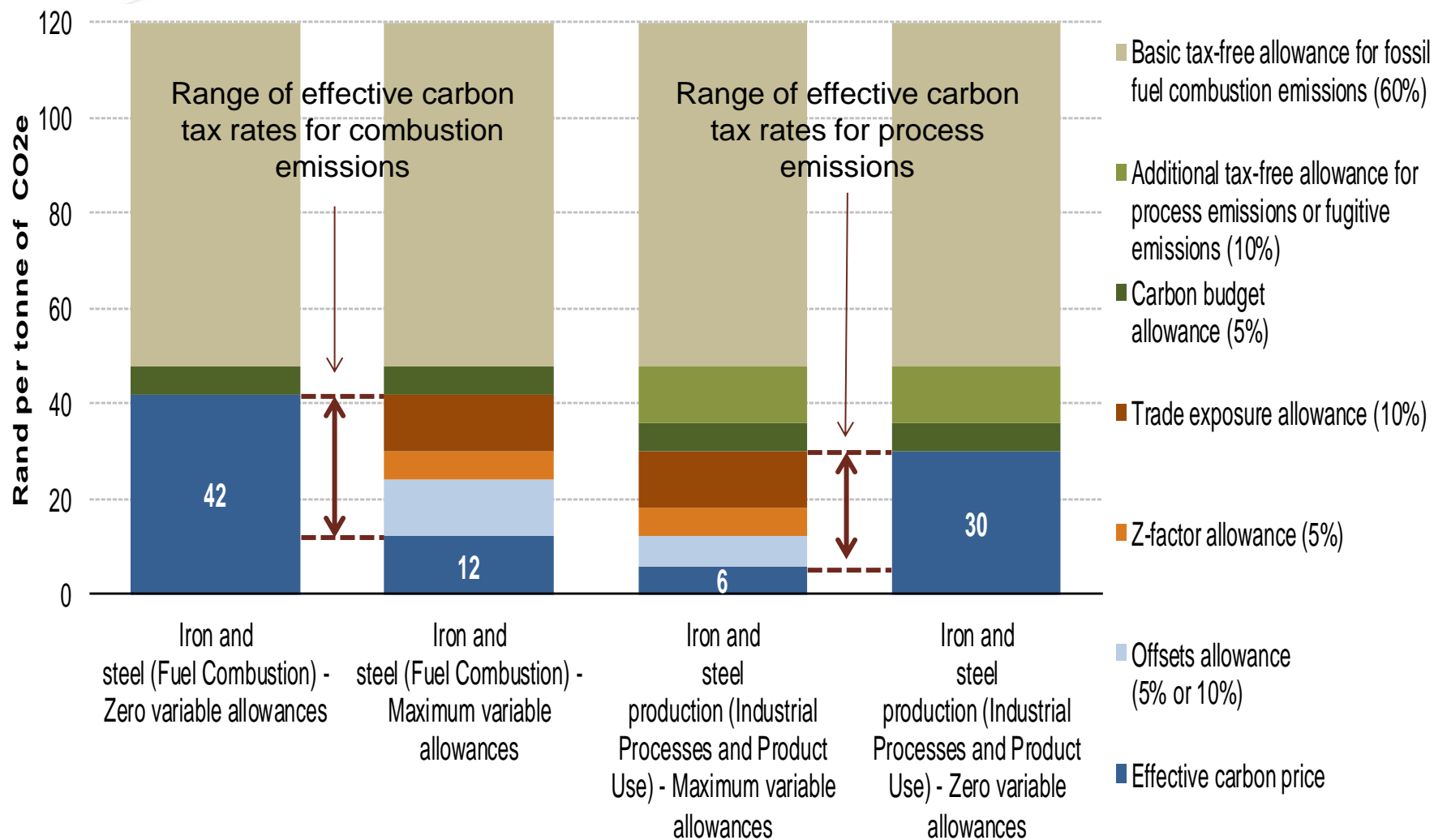


Carbon taxes in different sectors



It is assumed all firms participate in DEA's carbon budgets

Impact of variable allowances on carbon prices in the same sector



Sequestration

- Amount of carbon tax payable = $\{(E - D - S) \times (1 - C) \times R\} + \{P \times (1 - J) \times R\} + \{F \times (1 - K) \times R\}$

E = combustion GHG emissions
 D = GHG emissions from petrol and diesel
 S = sequestered GHG emissions
 C = tax relief applicable to E (sum of allowances)
 R = tax rate = R 120/tCO₂e

P = process GHG emissions
 J = tax relief applicable to P (sum of allowances)
 R = tax rate = R 120/tCO₂e

F = fugitive GHG emissions
 K = tax relief applicable to F (sum of allowances)
 R = tax rate = R 120/tCO₂e

- S(equestration) only enters formula in (E-D-S) term, and $(E-D-S) \geq 0$
 - Thus, sequestration capped at taxable fossil fuel combustion emissions
 - So can get benefit for reducing process or fugitive emissions, but only by reducing combustion emissions
 - May influence choice of mitigation options when sequestration is available (combustion emissions addressed last)
- Every tonne of sequestration reduces carbon tax liability by effective carbon tax rate on combustion emissions $(1-C) \times R120$
 - So R30-R48/tonne CO₂e sequestered for coal-fired power plant

Tax free allowances

- Because of design of carbon tax, 5% allowance does not lead to 5% change in carbon tax liability
 - Moving from 15% liability (based on cumulative allowances) to 10% is 33.33% reduction in carbon tax payable
 - Moving from 10% to 5% is a 50% reduction in carbon tax payable
- So seemingly small allowances can have large impacts on decision-making
- Tax-free allowances capped, but not at similar levels

Tax-free allowances (2)

- Basic tax-free allowance of 60% on all emissions
- Carbon budget allowance
 - 5% for per cent allowance for ‘participating in carbon budget system’ / ‘complying with information reporting requirements for the carbon budgeting process’
 - Not clear what constitutes participation – broadest interpretation is that all firms will get carbon budget allowance since PPP will be a statutory requirement under Air Quality Act
- Process emissions
 - Additional allowance of 10% on firm’s industrial process and product use emissions (not all emissions)
- Fugitive emissions
 - Additional allowance of 10% on firm’s fugitive emissions (not all emissions)

Performance allowance

- Z-factor scales up basic allowance in relation to sector emissions intensity benchmark
 - Up to 5% additional allowance if firm's emissions intensity is better than sector benchmark
 - Voluntary – so no penalty for being worse than benchmark
- GHG emissions intensity benchmarks for different industrial sectors or sub-sectors will be specified in regulation
 - Based on inputs received from different industry associations or companies
 - Intensity benchmark will include both Scope 1 and Scope 2 emissions (p 24 EM)
- Z-factor rewards 'additional' action – meaning unclear...
- Because Z-factor only kicks in once firm's emissions intensity is below the benchmark – only benefit to firms that are already close to (within 5%) as carbon efficient as (or more carbon efficient than) industry average

Performance allowance (2)

- Not clear if sequestered emissions or offsets are included in Z-factor calculation
 - Sequestered emissions seem possible
 - But offsets probably not
 - Allowance reduces tax rate, not taxable emissions
- Tax benefit larger than effective tax rate since not only does firm pay no tax on emissions reduced, but they also pay a lower carbon tax rate on all remaining emissions
 - Carbon tax reduction of more than R140 per tonne found in modelling for every tonne of emissions reduced that is taken into account for Z-factor calculation
- Carbon tax can go down as emissions go up
 - Increasing output by 15% while only increasing emissions by 10% leads to a higher performance allowance (provided that firm was within 0-5% Z-factor band previously)
 - So carbon tax rate can go down as absolute emissions go up

Impact of performance allowance

	Base Case (EM Example 13 with Z=0%)	Scenario 1: Increase in output (Z=5%)	Scenario 2: Decrease in emissions (Z=5%)
Taxable emissions after S and minus D (before offsets)	9 134 000	9 134 000	8 677 300
Offset allowance (average %)	5.00%	5.00%	5.00%
X (carbon tax liability - R)	199 776 000	144 972 000	137 723 400
Change in carbon tax liability (R) (negative value indicates an increase) relative to Base Case		54 804 000	62 052 600
% change in Rand carbon tax liability		27.4%	31.1%
Emissions avoided		0.00	433 865.00
Marginal tax rate (R/tCO₂e emissions avoided)		N/A	143.02

Impact of performance allowance: Emissions increase while emissions intensity decreases

	Base Case – EM Example 13 (Z=0)	Scenario (10% increase in emissions and 15% increase in output)
Taxable emissions after S and minus D (before offsets)	9 134 000	10 047 400
X (carbon tax liability - R)	199 776 000	164 949 600
Change in carbon tax liability (R) (negative value indicates an increase)		34 826 400
% change in Rand carbon tax liability		17.4%
Emissions avoided (incl offsets) (tCO ₂ e)		-867 730

- But this effect works in both directions, if output falls by 15% and emissions only fall by 10% the carbon tax rate will go up (even though absolute emissions has declined)!

Performance allowance (5)

- Downside risk created by nature of production processes
 - Typically configured to operate most efficiently at full capacity
 - Changes in output influence carbon-intensity of production
 - Reductions in output tend to increase carbon-intensity
 - But only affects firms that are more carbon efficient than benchmark
- Carbon-efficiency adjustment could lead to pro-cyclical carbon price for efficient firm
 - In times of depressed demand GHG-efficient firms may find that their carbon tax liabilities (as a percentage of costs) increase at the same time as their revenues decline (provided that had a better than average GHG-emissions intensity to start with)
 - Depends how fast industry benchmarks are adjusted
- Allowance capped at 5%, but impact on carbon tax liability can be much larger (above 30% seen in modelling)

Offsets

- Amount of carbon tax payable = $\{(E - D - S) \times (1 - C) \times R\} + \{P \times (1 - J) \times R\} + \{F \times (1 - K) \times R\}$

E = combustion GHG emissions
 D = GHG emissions from petrol and diesel
 S = sequestered GHG emissions
 C = tax relief applicable to E (sum of allowances)
 R = tax rate = R 120/tCO₂e)

P = process GHG emissions
 J = tax relief applicable to P (sum of allowances)
 R = tax rate = R 120/tCO₂e)

F = fugitive GHG emissions
 K = tax relief applicable to F (sum of allowances)
 R = tax rate = R 120/tCO₂e)

- Offsets are included in total amount of allowances applicable to combustion, process and fugitive emissions (so C, J and K) and not subtracted directly from E, P or F (as is the case with S)
 - Double counting if reduce both tax base and tax rate
- Benefit of R120/tCO₂e for each tonne of emissions offset

Value of offsets

	E (tCO ₂ e)	F (tCO ₂ e)	C (%)	K (%)	Headline carbon tax rate (R)		
Scenario 1	100	100	65%	75%	120		
Taxable emissions (E-D-S) + F	200						
Offsets (tCO ₂ e)	0						
Tax liability (R)	7200						
Scenario 2	100	100	66.0%	75.0%	120		
Taxable emissions (E-D-S) + F	200						
Offsets (tCO ₂ e)	1					1 = 1% of combustion emissions	
Tax liability (R)	7080						
Change in tax liability (R) relative to Scenario 1	120						

Trade exposure allowance

- Trade exposed allowance
 - Defined only on basis of ratio of exports to sales (no consideration of imports)
 - Sliding scale of support
 - Support depends on firm performance, not sector performance (which is international norm)

Table 2: Trade-exposed, tax-free threshold relief

Exports (E)	
0.4	
% relief (Y2)	% of sales
0	Below 5
2	5
4	10
6	15
7.2	18
8	20
10	25
10	30
10	35
$Y2 = 0.4 \times E$ E must be >5%	
Maximum for Y2 = 10%	

Trade exposure allowance (2)

- Calculated on firm-level data, not industry
 - Exports can be influenced by factors like location or access to infrastructure
 - Current level of exports not perfect indicator of potential to export for individual firm
 - Firm exports more variable than industry/sector exports
- Using firm-level data can lead to large swings in effective carbon tax rates, particularly when allowances are interdependent
- Example illustrates possible relationship between trade exposure allowance and performance allowance
 - Simplified example using product benchmarking rather than activity benchmarking as proposed in Draft Carbon Tax Bill – but principle remains

Interplay between export allowance and performance allowance

	Base Case (EM Example 12)	Scenario 1 (exports reduced by 10% of sales, local sales replace lost exports)	Scenario 2 (10% reduction in output and 5% reduction in emissions, local sales do not replace lost exports)
Taxable emissions after S and minus D (before offsets)	28 220	28 220	26 749
X (carbon tax liability - R)	213 816	349 270	469 552
Change in carbon tax liability (R) (negative value indicates an increase)		-135 454	-255 736
% change in Rand carbon tax liability		-63.4%	-119.6%
Input data			
Exports (R)	7 718.82	4 631.29	4 631.29
Total Sales (R)	30 875.30	30 875.30	27 787.77
TX (trade exposure allowance) - capped at 10%	10%	6%	7%
Output	30 875.30	30 875.30	27 787.77
Z-factor	5%	5%	0%

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