Policy note no. 2

September 2008

EFFECTIVE CLIMATE CHANGE POLICY: THE SEVEN 'CS'

IMPLEMENTING DESIGN PRINCIPLES FOR EFFECTIVE CLIMATE CHANGE POLICY

GEOFF CARMODY & ASSOCIATES

FOREWORD

Amongst the reactions to Geoff Carmody & Associates' first policy note[1] setting out design principles for effective climate change policies, many have suggested that the key message, while sensible in principle, is operationally impractical. This second policy note explores the practicality of the design principles set out in policy note no. 1.

It's important to understand the real-world choices confronting governments responsible for relatively small, open economies like Australia. These choices reflect the reality that countries will not move at the same time, or at the same pace, to implement greenhouse gas abatement policies. This is a reality enshrined in the Kyoto Protocol itself and manifested even more starkly in global policy responses to date. USA-sourced financial market crises, now spreading from Wall Street to Main Street, won't enhance the climate for cooperation in this area.

The emissions *production* based model that underpins the emissions trading system proposed in the Government's Green Paper[2] will force the Australian Government to choose between two policy extremes, both ineffective in reducing *global* greenhouse gas emissions, for as long as there is no global agreement:

i. The **low average carbon price** option, under which the resultant average market price of carbon is so low that *Australian* emissions are not reduced much, if at all.

ii. The **ambitious average carbon price** option, under which a seriously high average market price for carbon reduces Australia's competitiveness, shifts industry, economic activity and employment offshore, and, in net terms, either barely reduces *global* greenhouse gas emissions, or, worse, increases them.

In our opinion, governments (of *any* country) are unlikely to choose option ii – especially at the present time. In Australia, and elsewhere, they are likely to choose an outcome closer to option i. This could involve a blend of two further options:

a. Extensive 'carve outs', exemptions and 'compensation' for any effects of the emissions trading policy, resulting in a low carbon price averaged across all emissions production, but a higher carbon price on the limited segment of the economy actually affected by the policy. This seems to be the preferred approach.

b. A much more comprehensive application of the policy, but with *actual* permits issued such that the market price for carbon will be so low as to be hardly felt, and therefore ineffective.

Indeed, *both* options a. and b. have been suggested as sensible interim outcomes for Australia. That is, Australia should set up the emissions trading *system* but should not give it any real carbon price 'teeth' until the rest of the world (or at least the major emitters) also take action. This outcome is resource-wasteful, efficiency-sapping, credibility-reducing, empty symbolism, and offers little or no prospect of promoting globally coordinated action:

Even if the whole world does likewise, the 'free rider' or 'prisoners' dilemma' problems remain firmly intact.

In this diabolically difficult environment, the practical choices confronting the Australian Government are to:

- Choose option i (either variant a. or variant b.), and pay for policy symbolism with economic inefficiency.
- Do nothing, and avoid the inefficiency associated with option i (but with international disapproval).
- Thoroughly explore practical alternatives to the production-based emissions trading model, no matter how difficult they may be to apply, if they could be made to minimise 'free rider' impediments to global action.

This policy note concentrates on the third of these choices.

Geoff Carmody, Canberra

September 2008

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1 *Effective climate change policy: the seven 'Cs'. Some design principles for evaluating greenhouse gas abatement policies*, policy note no. 1, Geoff Carmody & Associates, July 2008. Footnote 4 foreshadowed policy note no. 2.

2 *Carbon Pollution Reduction Scheme, Green Paper, July 2008,* Australian Government.

ACKNOWLEDGEMENTS

Following the release of policy note no. 1, Geoff Carmody & Associates has received many comments on the contents of that document.

Overwhelmingly, the comments have been encouraging and often constructively critical.

As noted in the Foreword to this note, the 'yes, but how do you do it?' question has been the biggest single query about the approach proposed in policy note no. 1 (especially in relation to principle #3: a comprehensive, consumption-based country policy approach).

This is an important and legitimate question.

In preparing this second policy note, Geoff Carmody & Associates has benefited greatly from readers' comments and suggestions. It is not possible to record individual acknowledgement of all of the contributors' comments here.

But they have improved the contents of policy note no. 2 substantially.

Naturally, the remaining analytical and other errors are ours.

Geoff Carmody, Canberra

September 2008

TABLE OF CONTENTS

Executive summary i

1. Introduction 1

1.1 Focus of this policy note 1

1.2 Structure of this policy note 2

2. Principle #1: countable GHG emissions 3

3. Principle #2: credible country policies 4

4. Principle #3: consumption-based, comprehensive country policies 5

4.1 Required design implementation tasks 5

4.2 Carbon price treatment of local consumption of Australian production & exports 5

4.3 Border tax adjustments for Australian imports 7

5. Principle #4: comparable effort-based country policies 15

6. Concluding observations & next steps 16

Attachments 17

A. Carbon price treatment: Australian production used locally & exported 17

B. Carbon price treatment: Australian imports 21

C. Calculating economy-wide carbon prices: an illustration 30

D. Some observations on per capita and absolute emissions targets 32

EXECUTIVE SUMMARY

This policy note builds on Geoff Carmody & Associates' (GCA) paper proposing seven broad principles for evaluating effective climate change policies.[3]

It provides some amplification, from a practical perspective, in relation to the first four of the design principles presented in that first policy note. Further comments on the remaining three design principles will be provided in the next policy note.

However, the primary objective of this policy note is to evaluate the practicality of implementing a comprehensive consumption-based emissions abatement policy, instead of the fundamentally flawed production-based policy approach currently being pursued in Australia, and as originally proposed by the European Community.

To this end, this note seeks to provide answers to the following three practical questions:

I. How can carbon cost signals be passed on throughout the Australian production supply chain to the final Australian consumer?

II. How can Australian exports be excluded from these signals (allowing importing countries to apply their own carbon costs to our exports)?

III. How can Australian imports be included within the ambit of Australia's greenhouse gas abatement policy (as a significant part of Australia's consumption of embedded emissions)?

The first two of these questions can be dealt with together. The third requires some 'Occam's Razor' thinking, and, initially, a minor refinement to the answers to the first two questions. Being able in practice to answer all three questions is essential if a comprehensive consumption-based greenhouse gas abatement policy is to be feasible.

The answer seems quite clear.

A comprehensive consumption-based approach can be used to:

- Precisely allocate the market costs of emissions generated by production within Australia along the supply chain in a highly visible way, via a single dollar data addition to existing Australian Tax Invoices already operating under the GST system. This would make the carbon price signal very visible throughout the economy, and responses to that signal would be both more likely and more pervasive as a result.
- Through a GST-style process of carbon cost remits and ITC-style rebates, or via the slightly different process involved with an ETS and auctioned permits, the embedded market cost of emissions could also be passed along the supply chain, as intended, to the final Australian resident consumer.
- Again through a GST-style process of carbon cost remits and ITC-style rebates, including at the final export stage (whether through a carbon tax or an ETS), it is a relatively simple matter to ensure that (most) Australian exports are not subject to the Australian market cost of emissions. (The exception is exports consumed within Australia – such as international tourism – where the 'destination principle' applies).

This approach comprehensively and permanently eliminates current exporter concerns about loss of international competitiveness and associated 'carbon leakage' and job losses.

It does not exempt Australian exports from carbon costs: instead, it (properly) allocates the task of imposing those costs on the importers of Australian exports.

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[3] *Effective climate change policy: the seven 'Cs'. Some design principles for evaluating greenhouse gas abatement policies*, policy note no. 1, Geoff Carmody & Associates, July 2008.

In addition, a comprehensive consumption-based approach, using the existing Australian GST/Tax Invoice accounting and reporting system; plus *Australian* data on (i) the carbon price, (ii) Australian producers' emissions intensities, and (iii) the carbon accounting system required to make any Australian GHG abatement policy effective; plus existing Australian import tariff product classification groupings, can be used to:

- comprehensively 'carve in' Australian imports into Australia's greenhouse gas abatement policy coverage;
- ensure – especially in the 'inception system' phase – no 'carbon leakage' on the import side by using trade-neutral, WTO-compliant, border tax adjustments (BTAs);
- through a GST-style process of carbon cost remits and ITC-style rebates, or via the slightly different (and somewhat more complex) process involved with an ETS and auctioned permits, the embedded market cost of imported and other emissions (as measured by the BTAs) could also be passed along the supply chain, as intended, to the final Australian resident consumer.

This approach comprehensively and permanently eliminates current import-competing concerns about loss of international competitiveness and associated 'carbon leakage' and job losses – at least in the 'inception system' phase. It reduces the 'free rider' problem on the import side.

It completes the task of applying Australia's greenhouse gas abatement policy to a comprehensive measure of Australia's consumption of greenhouse gas emissions.

A comprehensive consumption-based approach promoting effective and efficient greenhouse gas abatement policy is both practical and, in important respects, is superior to the current production-based model:

- It does *not* require detailed information on emissions embedded in imported products.
- It can be implemented using Australian data only – at least until all countries adopt similar policies. Australia's carbon price, Australian emissions intensity data, and Australian carbon price-exclusive data are the only inputs needed.
- In order for the carbon cost signal to flow comprehensively down the supply chain, the additional data required on existing GST-based Tax Invoices comprises one item: the carbon cost per transaction.
- It *can* be WTO-compliant, just as are the GST and 'revenue' excise and customs duties on specific products, and for the same reasons.
- It exploits currently-operating accounting and reporting systems and product classifications used in Australia, notably the GST-based Tax Invoice system, import tariff product classifications, and the emissions intensity data that will flow from the emissions accounting and reporting data that will be required to make the proposed ETS work effectively.
- It guarantees zero 'carbon leakage' through zero erosion of international trade competitiveness (at least in the 'inception system' phase). It is trade diversion-neutral.
- It can be delivered either via a comprehensive carbon tax (including full export rebates and equivalent border tax adjustments – BTAs – for imports), or, with slightly more complexity, via an ETS with full auctioning of all emissions permits strictly within Australia, and appropriate Tax Invoice-based rebates.

The world economy is going through difficult times following a long period of relatively strong growth. This tougher economic conjuncture will make achievement of a truly global deal on climate change policy even more 'diabolically difficult' than it already is.

The usual 'litany' with which speeches on global warming (and needed policy responses) start includes three recitations:

- Climate change is a global problem.
- We need a global policy response to deal with this problem.
- The 'prisoners' dilemma' or 'free rider' problem is the main impediment to cutting such a deal.

The speeches then usually descend into the morass associated with the EC-led advocacy of production-based policy, with its inherent concerns about trade competitiveness, 'carbon leakage' and threats of BTAs for imports from non-complying countries.

This morass simply underlines how the policy model chosen is making the impediment to cutting a global deal – the 'prisoners' dilemma' or 'free rider' problem just noted – even worse than it has to be.

To avoid this morass, the fourth recitation in the litany used to commence global warming speeches should be:

- What policy model would minimise the severity of the 'prisoners' dilemma' or 'free rider' problem, and increase chances of cutting a truly global deal?

We think policy notes 1 and 2 are directed explicitly at that question.

The answer is a comprehensive emissions consumption base for each country's policy rather than a production base.

No doubt others will be able to devise many refinements and improvements to the basic approach suggested in this note.

But we think the basic structure of the proposed policy model is both sound and practical.

The final paper in this series – policy note no. 3 – will provide an assessment of the merits of an ETS versus a carbon tax, using the design principles in policy note no. 1 and the analysis in this note as a framework. That final paper will also expand somewhat on the last three of the seven principles presented in policy note no.1, viz:

V. Compensation-constrained country policies.

VI. Carrot-inclusive country policies.

VII. Cost-effective country policies.

In this context, the scope for providing positive incentives (negative taxes) for activities sustainably withdrawing carbon emissions will be considered under principle #6.

1. INTRODUCTION

The global environment for introducing global climate change-improving policies is becoming more challenging:

- On some measures, global greenhouse gas (GHG) emissions are increasing more rapidly than expected, especially allowing for some of the more potent sources (eg, methane).
- The international trade environment seems more inimical to cooperation, even when unilateral action by countries offers national benefits (eg, the collapse of the Doha trade negotiations).
- After many years of strong global economic growth, the world looks set to enter a period of slower growth, possibly somewhat higher inflation, and higher unemployment, and, as a result, lower increases (or reductions) in living standards.
- On top of all of this, the USA-sourced 'sub-prime' financial market turbulence, now radiating across the globe as a credit crunch, presents additional challenges threatening much slower economic growth – even recession in much of the developed world – as part of the painful process of 'de-leveraging' our way out of an unsustainable asset price bubble covering residential property and other assets.
- Policy responses to this financial crisis (especially in the USA) at present are subject to considerable uncertainty, which is not conducive to sustaining consumer and investment confidence.
- This is a very poor environment in which to be embarking on new policies that explicitly load additional costs – those associated with greenhouse gas emissions – on communities.

Ironically, it may be that a global economic slowdown and recession proves to be the most potent global force for slowing growth in greenhouse gas emissions. This would be the worst way to achieve that outcome – especially for less developed economies.

In this environment, how is the current EC-sourced national production-based greenhouse gas abatement policy model likely to fare? In GCA's opinion, the answer is: 'very badly indeed':

- Unless substantially corrupted by base 'carve-outs' and 'compensation', the production model is unlikely to be adopted because of employment losses as reduced national competitiveness induces 'carbon leakage' as production shifts offshore.
- Concerns about losses in international competitiveness, employment losses and 'carbon leakage' will become even more potent as the global economy slows.
- There are already public comments by some that the timetable for adopting global climate change policies will have to be delayed because of the economic conjuncture.
- Structurally, the production-based climate change policy model, as embodied in emissions trading systems (ETS), inherently makes the 'free rider' or 'prisoners' dilemma' problem worse than it has to be. That result would be bad enough in good economic times. It is highly toxic – like some of the sub-prime debt 'assets' – at the present time.
- It is highly likely that a production-based climate change model will be ignored by sovereign national governments more concerned about the economic suffering of their own electorates in the years ahead.

This is a recipe for global policy failure.

We need to seek better policy alternatives.

1.1 FOCUS OF THIS POLICY NOTE

This paper was foreshadowed in footnote 4, page 11, of policy note no. 1: *Design principles for evaluating greenhouse gas abatement policies: the seven Cs*, July 2008.

The focus of this paper is on the first four design principles set out in policy note no. 1:

I. 'Countable' country emissions.

II. Credible country policies.

III. Consumption-based, comprehensive country policies.

IV. Comparable effort-based country policies.

In particular, this policy note concentrates on principle #3, and how to translate what seems sensible in principle into an operationally effective policy approach.

The *principles* set out in policy note no. 1 seem to be broadly accepted. However, based on reader feedback, the issue of *practicality* has been the single biggest challenge to these principles (and in particular to principle #3).

1.2 STRUCTURE OF THIS POLICY NOTE

The structure of the remainder of this note is as follows:

- Section 2 offers some brief and general comments on the need for a good carbon accounting system (principle #1), and in particular on requirements from that system needed to make principles #2, #3 and #4 operational.
- Section 3 presents some general comments about the relationship between price and quantity target-setting in relation to greenhouse gas emissions, and draws out their implications for credible government policy statements (principle #2).
- Section 4, the most extensive part of this policy note, lays out a framework for translating the comprehensive consumption based policy approach outlined in principle #3 into a set of practical policy instruments.
- Section 5 offers some brief and general practical comments about how to measure 'comparable effort' when assessing country attempts to reduce greenhouse gas emissions (principle #4 in policy note no. 1).
- Section 6 presents some general concluding comments.
- More detailed material is presented in Attachments A – D.

The final paper in this climate change policy series, policy note no. 3, will build on the analysis in policy notes no. 1 and no. 2 to present an evaluation of the merits of an emissions trading system (ETS) versus a carbon tax. This is intended to offer some views on which is the most cost-effective means of introducing a broad-based, price-oriented policy intended to encourage reduced greenhouse gas emissions.

As part of this final paper, more detailed comments will be presented in relation to the last three design principles for evaluating greenhouse gas abatement policies presented in policy note no. 1:

V. Compensation-constrained country policies.

VI. Carrot-inclusive country policies.

VII. Cost-effective country policies.

This paper should be released later in October or early in November 2008.

2. PRINCIPLE #1: COUNTABLE GHG EMISSIONS

A comprehensive and 'real time' greenhouse gas emissions (carbon) accounting framework is essential if policies intended to reduce such emissions are to be both effective and efficient:

- Businesses and households need to be able to *measure* their production and consumption of such emissions over time to be able to:
  - monitor their production and consumption;
  - assess their scope for reducing such emissions; and
  - ensure they are not paying too much for their emissions (whether via a carbon tax or via the costs of emissions permits passed on down the value adding supply chain).
- Governments, and the relevant agencies acting on their behalf, need to be able to *measure* the production and consumption of such emissions to be able to:
  - monitor their production and consumption;
  - track progress in reducing such emissions;
  - report such developments as part of international commitments; and
  - ensure that producers and consumers of such emissions are paying the appropriate amount for their emissions (whether via a carbon tax or via the costs of emissions permits passed on down the value adding supply chain).

The data requirements for such an accounting system will be substantial. This must be accepted as a necessary requirement for effective and efficient policy in this field. Attempts to 'short cut' the data required will be a recipe for policy ineffectiveness, evasion and avoidance, resource waste, and unnecessary economic loss. Government agency monitoring is essential.

Inevitably, the fully detailed version of this accounting system will have to be developed over time.

But the natural competitive tension between greenhouse gas producers and consumers, on the one hand, and the agencies charged with implementing policies to reduce them, on the other, provides the basis for an incentive framework to promote reasonably efficient outcomes, given the task at hand.

Realistically, it makes sense to begin with the major primary greenhouse gas emitters, and extend the accounting framework further throughout the economy as we better understand what is required. In this particular respect, the Government's Green Paper seems mostly sensible.

GCA has no expertise in the underlying science needed to develop a good carbon accounting system. However, GCA appreciates that the data needed to populate such a system is crucial for a workable consumption based policy in this area.

Having regard, in particular, to principles #2, #3, and #4 (see below), in GCA's opinion, the following two data elements are crucial for effective and efficient policy in this area:

I. The ***carbon price*** operating throughout the economy for the period in question.

II. The ***average emissions intensity*** for the product/business for the period in question.

The first of these requirements is set either by the market (in the case of an unconstrained ETS), or by the government (in the case of a carbon tax or a temporary carbon price ceiling in the early stages of an ETS). This should not be a difficult data item to obtain.

The second requirement, ultimately, is product and business specific. It will change over time (indeed the intent of policy is to reduce it over time). It will be more difficult to obtain and to monitor.

3. PRINCIPLE #2: CREDIBLE COUNTRY POLICIES

Building on the data requirements just summarised in section 2 above, credible country policies require the following specific elements:

- A clear statement about policy objectives in terms that allow objective quantification of the current situation and progress towards those objectives over time.

- A clear statement about policy mechanisms in terms that allow the electorate to understand fully what is going on.

The first element might seem obvious. In the context of this note, the objective is to reduce greenhouse gas emissions.

But how are reductions to be measured?

Garnaut's Draft Reports[4] have argued for convergence in per capita emissions to a 'common per capita use of the atmosphere' as the appropriate target. However, the broader debate (including as covered by Garnaut himself) has been about:

- What atmospheric concentration of greenhouse gas emissions is a sensible maximum?

- What *absolute* reduction in such emissions is required relative to business as usual (BAU)?

- How should this absolute reduction be divided amongst countries to ensure individual country efforts add up to the appropriate global reduction?

The per capita targeting advocated by Garnaut has some appeal from an international equity perspective (and probably from a very long term perspective).

However, using it as a guide to appropriate transition paths, without allowing for other factors such as country populations, country resource endowments, and current per capita emission *levels*, can lead to unintended, undesirable, and even perverse outcomes (such as an increase in global emissions relative to BAU even when per capita country targets are being achieved).

Some examples of these are presented in Attachment D below.

As to policy mechanisms, governments need to be up-front about the following basic distinction, in particular:

- If they are introducing a properly-functioning, production-based, ETS, they should make it very clear that:

  - *Governments* (directly or via their agencies) will set the supply of Australian emissions permits, and their decisions, together with demand for such emissions, will set the carbon price, the volatility of that price, and 'carbon leakage' offshore.

- If they are (i) temporarily setting a carbon price ceiling, or (ii) introducing a carbon tax, they should make it very clear that, in effect:

  - They are (i) standing in the market prepared to issue as many permits to emit as are demanded at the ceiling price, or (ii) letting the market choose how much to emit at the cost determined by the carbon tax, and (iii) if using a production-based model, they are prepared to accept whatever 'carbon leakage' may result from either.

In Australia, at present, this basic distinction is not really being made very clear.

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[4] See *Targets and trajectories: supplementary draft report, September 2008*, Garnaut climate change review, chapter 5, pages 12-21. See also *Draft report, June 2008* Garnaut climate change review, chapter 12, pages 289-308.

4. PRINCIPLE #3: CONSUMPTION-BASED, COMPREHENSIVE COUNTRY POLICIES

The implementation of an effective, comprehensive, consumption-based GHG abatement policy requires measures that can be applied in practice to GHG emissions embodied in a country's total expenditures on goods and services (national emissions consumption) – including imports.

4.1 REQUIRED DESIGN IMPLEMENTATION TASKS

In national accounting terms, this means a policy applicable, without exemptions, to emissions embodied in total gross national expenditure (GNE). Under the Kyoto Protocol, if Australia starts from a position of monitoring and reporting emissions associated with total gross domestic product (GDP) this means adjusting the Australian policy target to:

- Comprehensively and permanently exclude Australian exports from the impact of Australia's policy. (They are properly caught by the importing countries' policies.)
- Comprehensively and permanently include Australian imports within the ambit of Australia's policy. (They are properly zero-rated by the exporting countries' policies.)
- Comprehensively and permanently include Australian production purchased by Australian residents within the ambit of Australia's policy. Desirably, the Australian carbon price signal should be imposed on, seen by, and passed forward by, all stages in the supply chain covering Australian production purchased by Australian residents. In the end, thereby, consumers pay.

The next two sub-sections of this policy note set out proposals for dealing with these design implementation tasks.

Sub-section 4.2 covers the appropriate carbon price treatment of exports and Australian production consumed locally, because these are most conveniently considered together.

Sub-section 4.3 covers the appropriate carbon price treatment of imports, and includes, if necessary, the modifications this may require to the carbon price treatment of exports and Australian production consumed locally to meet WTO concerns.

4.2 CARBON PRICE TREATMENT OF LOCAL CONSUMPTION OF AUSTRALIAN PRODUCTION & EXPORTS

Practical operation of a carbon price system in relation to exports and Australian production consumed locally requires (i) a simple adaptation of existing systems already operational in Australia, plus (ii) the production-based carbon accounting and recording systems required under an ETS (or carbon price ceiling or a formal carbon tax), covering the required carbon accounting framework considered in section 2 of this report. No other information or system is required.

In particular, the proposed system exploits the fact that Australia already has a GST system in operation. The key features of this system are as follows:

- Tax Invoices are required for all market transactions.
- These already provide information on (i) the GST-inclusive price of sales/receipts, from which GST can usually be inferred (but not always, in the case of input-taxed supplies); (ii) often explicitly and, for some transactions, (eg, input-taxed supplies) necessarily, the GST component.
- This information applies for all business input transactions, all final consumer transactions, and all export transactions.
- Moreover (see sub-section 4.3 below), similar Tax Invoices apply for the purchase of imports into Australia.
- These tax invoices are (i) the basis for input tax credits (ITCs) used to claim GST refunds for business inputs by GST-registered businesses, and (ii) ITCs to render export sales GST-free (except exports consumed in Australia and caught by the 'destination principle').

- As noted, this framework already exists, is highly detailed, and can be used as a vehicle to track carbon costs as they flow through the production, import, export, and consumption stages.

How would this system be employed to cover carbon costs in relation to exports and Australian production consumed in Australia?

- First, Australia could start with a production-based approach, as suggested in the Green Paper as part of our reporting and accounting obligations under the Kyoto Protocol and Convention:

  - This would cover all of Australian GDP, or as much of it as is feasible initially, pending further development of Australia's carbon accounting framework.

  - There would be no exemptions or 'carve outs' from whatever emissions production it is deemed feasible to cover.

- Second, either the ETS carbon emission permits or the carbon price/tax should be applied at all feasible points, but especially at the top of the supply chain, most notably covering primary energy generation, transport, and, if possible, agriculture. Ultimately, as the system develops, application of the carbon price should be extended to cover all emissions production in Australia.

- Third, total emissions production by each business will then come with an absolute carbon price tag ($/tonne), and total carbon cost per period, that can be averaged across each firm's production. Averaged across unit sales, this produces an *emissions intensity* in production estimate for each business and/or each product. The Tax Invoice for each sales transaction will use this unit *emissions intensity* plus the carbon price to calculate the absolute $ carbon cost component embedded in the total sales price, and this component will be recorded separately as a single dollar amount on the Tax Invoice. Ideally:

  - This dollar amount should be added to the price *after* producer margins, so that it is margin-free as it flows down the supply chain. Costs of monitoring the emissions should be passed on as well. As with the introduction of the GST, there should be 'constant dollar margins' before and after introduction of the carbon cost, not margins added to that carbon cost. Market competition will be important in sustaining this result.

  - It should also be added to the price *after* the GST, and be GST-exclusive itself.

  - More generally, it should also *not* be part of the base for other indirect taxes (eg, stamp duty, etc.)

- Finally, as a result of these processes, this carbon price 'tag' can, and indeed should, be forward-shifted, flow down the supply chain, to be seen and felt by all businesses in the process, and be subject to GST-like ITCs (for business inputs and exports).

- In this way, carbon costs embedded in Australian production are widely signalled through the supply chain, but effectively end up being paid only by final Australian consumers (including exports consumed in Australia and subject to the 'destination principle). Australian exports would be carbon cost-free ex-Australia (but liable to carbon costs under importing countries' climate change policies).

Using a simple supply chain example, Attachment A sets out in more detail how this system could operate in practice.

The proposed approach only requires information either already available, or also required for an effective carbon accounting framework as proposed for an ETS.

The illustration used in Attachment A is based on a carbon tax approach, starting with a carbon tax on the primary emissions, and then tracing the flow-on of that tax down the supply chain using a GST-like mechanism.

While there would be differences, there seems to be no reason why a full-auction ETS in Australia could not work similarly well.

Under an ETS:

- A company would purchase emissions permits, thereby facing a carbon cost.
- That cost would be passed on to (ie, recovered from) customer companies, and could also be recorded in the relevant Tax Invoices received by them. These companies would then pass that cost on to either the final consumer or the exporter (with accompanying Tax Invoice recording at those stages).
- The final consumer would end up paying the same full carbon cost as before.
- The government will have received auction proceeds for the full cost of emissions embedded in Australian production as a result of permit sales to the energy generating and the energy using companies. When the exporter claims a GST ITC on its exports, its Tax Invoices should also allow it to claim the embedded carbon cost as a carbon price rebate as well. In that way, exports are carbon cost-free (and become liable for the importing countries' carbon prices).

In short, there seems to be no good practical reason why either a carbon tax or an ETS couldn't be made to zero-rate exports and fully cover local production purchased locally.

Conclusions

To summarise, the existing Australian GST/Tax Invoice accounting and reporting system, plus the carbon accounting system required to make any GHG abatement policy effective, can be used to achieve three objectives:

- Precisely allocate the market costs of emissions generated by production within Australia along the supply chain in a highly visible way, via a single dollar data addition to existing Australian Tax Invoices already operating under the GST system. This would make the carbon price signal very visible throughout the economy, and responses to that signal would be both more likely and more pervasive as a result.
- Through a GST-style process of carbon cost remits and ITC-style rebates, or via the slightly different process involved with an ETS and auctioned permits, the embedded market cost of emissions could also be passed along the supply chain, as intended, to the final Australian resident consumer.
- Again through a GST-style process of carbon cost remits and ITC-style rebates, including at the final export stage (whether through a carbon tax or an ETS), it is a relatively simple matter to ensure that (most) Australian exports are not subject to the Australian market cost of emissions. (The exception is exports consumed within Australia – such as international tourism – where the 'destination principle' applies).

This approach comprehensively and permanently eliminates current exporter concerns about loss of international competitiveness and associated 'carbon leakage' and job losses. It does not exempt Australian exports from carbon costs: instead, it (properly) allocates the task of imposing those costs on the importers of Australian exports.

The final step in implementing a comprehensive consumption base for Australia's GHG emissions abatement policy is comprehensively and permanently to include all Australian imports.

Sub-section 4.3 below addresses this issue.

4.3 Border tax adjustments for Australian imports

In order to include Australian imports within the ambit of Australia's GHG abatement policy, appropriate border adjustments to import prices – border tax adjustments (BTAs) – are required.

The notion of BTAs is not new. There has been considerable research on them, for example, in the context of Value Added Tax systems and tax harmonisation within the EC.[5]

One focus of attention in this research has been the conditions under which origin (production-based) and destination (consumption or expenditure-based) commodity tax regimes are equivalent.

In summary, and in relation to the issues covered in this policy note, GCA notes that:

i. under certain conditions, origin-based taxation is equivalent to destination-based taxation;
ii. if all countries acted together on climate change policy, it wouldn't matter even if they *weren't* equivalent, as long as everybody chose the same model/tax rate at the same time;
iii. under some situations (eg, non-uniform tax rates, sticky prices) equivalence breaks down;
iv. equivalence is a long run equilibrium result: transition paths can be, and in a perceived sense at least, certainly are, a real-world concern;
v. in practice, the EC VAT experience was that a destination approach was more acceptable to 'cut the deal', and the USA was ultimately convinced this was (as it is) trade competitiveness-neutral. (It is therefore ironic that the EC now apparently champions a production-based approach. One can only speculate about the reasons for that);
vi. in practice, regardless of all of this, *perceptions* of trade damage lead either to (i) large 'carve-outs' from a production base, via exclusions or export/import competing industry subsidies or *producer* 'compensation', undermining policy effectiveness and/or (ii) intensifying the 'free rider' problem;
vii. in practice, the only way to reduce or eliminate the 'carve outs' on the import-competing side is via BTAs that 'carve in' imports;
viii. taking all this on board, there's nothing to be lost in choosing a destination basis even if the first point above is correct;
ix. if the second point is correct the same conclusion applies;
x. allowing for the third to seventh points above, and different timing for individual country actions, there may be substantial net benefits in choosing a destination basis. Reducing the 'free rider' problem and 'cutting a global deal' may be the biggest benefit;
xi. allowing for possible WTO concerns about BTAs as a 'band-aid' for an origin basis of commodity taxation – whether at the border or behind the border – and the EC VAT precedent, why go through the hassle of an origin approach if we don't need to? This seems especially pertinent when we have a destination-based system – the GST, which is a *much* better version of the EC VAT – already in place in Australia.

The biggest single criticism of GCA's advocacy of a destination (consumption) approach to emissions pricing is that it would be an administrative nightmare to ascertain the embedded emissions in imports on a product-by-product, source country-by-source country basis. Where imports may be produced across supply chains spanning numerous countries these problems become even worse. In short, the required product-specific foreign *emissions intensity* data is not available.

Worse, it may be that import BTAs that differed from the corresponding taxes/prices imposed on locally produced substitutes could attract objections under WTO trade rules. (No doubt this would be especially so if imports were subject to a higher BTA than the local equivalent product, even if the difference reflected higher embedded emissions in the imported product.)

If the abovementioned source country emissions data on imports was required, and the concern about WTO objections was relevant, then indeed it would be difficult to see how 'carving in' of imports in pursuit of a comprehensive consumption base for climate change policy could be applied.

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[5] See, for example, *Uniform Domestic Tax rates, Trade Distortions and Economic Integration*, Whalley, J. (1979) Journal of Public Economics 11, pages 213-221. *Border tax Adjustments: Do They Distort Trade?* Grossman, G.M. (1980) Journal of International Economics 10, pages 117-128. *Commodity Tax Competition Under Destination and Origin Principles* Lockwood, B (1993) Journal of Public Economics 52, pages 141-162. *When Are Origin and Destination Regimes Equivalent?* Lockwood, B, De Meza, D. and Myles, G.D. (1994) International tax and Public Finance 1:1, pages 5-24.

However, in GCA's opinion, neither of these hurdles is relevant for the establishment of appropriate BTAs for imports that eliminate 'carbon leakage' from Australia.

In the approach summarised below three key assumptions are crucial:

I. The carbon price relevant for purposes of calculating Australia's BTAs for various imports is *Australia's* carbon price.

II. When considering percentage price imposts on a locally produced item and competing imported substitutes, if the same ad valorem equivalent tax or tax-like adjustment is applied to both, then there should be no WTO concerns. Such adjustments are trade competitiveness neutral. As a result, such adjustments eliminate concerns about 'carbon leakage' on the imports side. Australia's GST is a good example of this. 'Revenue' customs and excise duties are others.

III. At least during what we (below) term the 'inception system' and 'transition system' phases, only information about Australian product *emissions intensities* is required. This, together with the Australian price for carbon and the prices of the relevant Australian products, determine the percentage increase in the price of local products. That same percentage increase can be applied to imported substitutes in the same way as applies under Australia's GST. Both local products and imports prices increase by the same percentage.

Attachment B outlines an approach to import BTAs that reflects these key assumptions.

Three phases can be envisaged, progressively extending competition encouraging emissions reduction from (i) *between* product groups within Australia (the 'inception system' phase), to (ii) *within* product groups within Australia (the 'transition system' phase), with some initial international competition adding to pressure on relatively heavy emitters within each product group, to (iii) more extensive *international competition* favouring lower emissions, based on country-wide differences in emissions intensity (the 'mature system' phase), as most countries adopt emissions abatement policies and trade emissions intensity advantages (ie, favouring lower emitters).

This 'mature system' (physical) emissions trading, where the name of the game is to trade fewer, rather than more, emissions internationally, is the most sensible type of 'emissions trading' in GCA's opinion.

By definition, the 'inception system' phase eliminates 'carbon leakage' on the import side. The 'transition system' phase opens up the possibility of within-group 'carbon leakage' but is intended to be applied (a) after a warning period, (b) when other key emitting countries have adopted emissions abatement polices, and (c) to encourage relatively heavy emitters within each product group to move to technologies or practices already used by relatively low emitters within each group, thereby increasing incentives to lower group average emissions intensities.

The broad features of the three phases are summarised next.

'Inception system' phase

Instead of starting at the product-specific level, consider a policy approach to carbon pricing of imports that starts with slightly broader aggregates of imports. These might be compiled using current Australian import tariff product classifications, but re-arranged to form a ranking of import product aggregates using Australian emissions intensities of locally produced substitutes as the ranking criterion.

This grouping of import products could be as detailed as possible or initially, if data limitations warranted this approach, further aggregated to a smaller number of broader groups, ranked in descending order of emissions intensity as determined by data for *Australian* import-competing substitutes. The more detailed the product disaggregation, the better, in terms of sending better price signals to reduce emissions within Australia.

The very detailed data collection mechanism under the proposed Tax Invoice-based approach to Australian production-related emissions (see Attachment A) can provide the basis for the Australian emissions intensity data required. For example, given the market price for carbon, the emissions intensity of a product can be derived from a company's carbon cost in any period. Moreover, under proposed carbon

accounting rules, *direct* estimates of emissions intensity should also be possible. Indeed, if they are not, the effectiveness of greenhouse gas abatement policies must be questioned.

This starting point has some advantages:

- It is still consistent with reporting requirements under the Kyoto Protocol and Convention.
- It is consistent with the starting point for Australia's ETS and the approach proposed in the Green Paper.

The 'inception system' approach depends on two key assumptions:

- Only Australian production-based emissions data, and the Australian market price for carbon, are required to make this approach workable.
- Provided Australia imposes the same ad valorem equivalent tax on imports as is imposed on import-competing substitutes, there is no concern about WTO rule compliance: such an approach is trade competitiveness-neutral.

One consequence of the second assumption is that Australia could effectively impose a higher tax on imported emissions than Australian emissions, where the imported product had a lower emissions intensity than in Australia, or a lower tax on imported emissions than Australian emissions, where the imported product had a higher emissions intensity than in Australia, under current WTO rules.

Until emissions intensity data is widely available overseas, and until WTO rules are amended (should this be necessary), uniform ad valorem tax treatment between imports and their locally produced substitutes is the 'safe option' for introducing import BTAs. This also makes sense in the 'inception system' phase anyway, because it eliminates 'carbon leakage' on the import side. A more emissions-specific concept of what constitutes a 'product' is presented in Attachment B. This may be the basis for modification to WTO rules at some stage.

It might be argued that this approach does not fully convey the 'right' signals. For example, imports with lower emissions intensity than their locally produced counterparts are 'penalised' – not in terms of product price, but in terms of reduced encouragement for demand (and supply) to switch to lower emission products. The converse is true for imports with higher emissions intensities.

Two responses are appropriate:

- The failure fully to address the 'right' signals for imports reflects the assumed lack of data on emissions intensities for most of Australia's imports. It may also reflect concerns about WTO compliance matters under current rules. These matters are taken up in the discussion below on the 'transition system' and the 'mature system' phases.
- *Within* Australia, the 'right' signals *are* being generated, if not as precisely as would true on a product-by-product basis as suggested in Attachment A. On the demand and supply sides, higher emissions intensities are penalised (via higher carbon costs) relative to lower emissions intensities. The precision of those signals is determined by how detailed the import product categories used to group Australian products are. The greater the number of categories (ranked by emissions intensities) the more precise the price signals in relation to Australian production.

How would the 'inception system' phase work?

The objective is simple. For each grouping of imports, apply the same *percentage* ad valorem equivalent BTA as is imposed as a *percentage* carbon cost increase for the corresponding grouping of locally produced substitute products. This is how the GST works. It is how 'revenue' customs and excise duties work in a more product-specific context.

This entails a modification to the approach for locally produced products, whether consumed locally or exported, outlined in Attachment A above. Specifically, such products would be subject to a carbon cost based on (i) the market price for carbon in Australia, and (ii) the *group average* emissions intensity for the group concerned, rather than the emissions intensity for specific products within each group.

The carbon cost data in the Tax Invoice would be based on these two variables, and input tax credits, including at the export stage, would similarly be based on them. As a result, zero-rating of exports, and full pass-through of carbon costs to the final Australian consumer, could still be achieved.

What about imports where there is no locally produced substitute?

In such cases:

- If there are no locally produced substitutes, by definition, there is no immediate risk of 'carbon leakage'. This suggests that the BTA in this case should be zero.
- But this ignores embedded emissions in the imports concerned, and the fact that Australians are consuming them.
- Such imports are highly unlikely to be emissions-free. Given the Australian consumption base as the policy target, this suggests a non-zero BTA is appropriate.

On balance, we favour imposition of a BTA on such imports, where such an adjustment is consistent with current WTO rules. A BTA based on Australia's carbon price and, say, an economy-wide average emissions intensity, might be one option (see Attachment C).

Clearly, this approach is workable using a carbon tax.

Could it be made to work under an ETS? The answer is: 'probably yes', but with additional complexity in relation to Tax Invoices. For example, additional tax-like ITCs or rebates would be needed for products within each group with higher than average emissions intensities to bring their cost down to the group average. The opposite would be the case for products with lower than group average emissions intensities.

On balance, this approach probably would be more easily implemented with a carbon tax than with an ETS.

Using this approach, *any* country could unilaterally introduce a very broadly-based greenhouse gas abatement policy, without concerns about 'carbon leakage' and associated excessive adjustment costs in a transition to a lower carbon world.

Some system-wide desirable incentive payoffs from the 'inception system' phase

The 'inception system' phase outlined above has some desirable features:

- As a practical consumption-based approach, it eliminates 'carbon leakage' as an excuse for not introducing greenhouse gas abatement policies within a country. By definition, the proposed policy action is trade neutral. This outcome is far superior to that likely under a production-based approach – especially in the unlikely event that such an approach was applied widely.
- Reducing greenhouse gas emissions consumption starts at home, on a 'no regrets' trade basis. Any reductions in national emissions constitute a net contribution to global emissions reduction.
- As a result, this phase minimises the 'free rider' problem impeding the implementation of a global deal. Once this phase is well established, moving further becomes more likely (albeit still difficult).
- By zero-rating exports and fully 'carving in' imports, this approach is far more attractive than the current production-based approach, not only for countries yet to implement climate change policies, but also for those that have already adopted (partial) production-based policies (some of whom have been arguing for import BTAs to 'protect' their industries anyway).
- Within the country concerned, and especially if product disaggregation is substantial, strong incentives are set up to switch from high emissions production towards lower emissions production. These incentives are higher, the higher is the market price for carbon.

‘Transition system’ phase

The ‘inception system’ phase is predicated on the assumption that Australia acts (more or less) unilaterally. The ‘transition system’ phase continues with that assumption, but proposes a further opening of competition from lower emissions imports than permitted under the ‘inception system’ phase.

In this phase countries applying greenhouse gas abatement policies of the type outlined above seek amendment of WTO rules to allow import BTAs to be determined by group averages as already proposed, but for import competing substitutes within each group to be taxed according to their product-specific emissions intensities.

The effects of this are to:

- Increase international competitive pressure on relatively high Australian emitters within each product group.
- Reduce such pressures on lower emitters within each group in Australia.
- On average, within each product group, there is trade competitiveness neutrality.

This phase might be introduced (a) when other major emitters have adopted their own greenhouse gas abatement polices, and (b) after a ‘warning period’.

If the WTO agreed to the required rule change, there would be a risk of ‘carbon leakage’. However, this phase would be preceded by a warning period so that producers could adapt to minimise that risk, and in any case, the only challenge on higher group emitters is to move to technologies and processes already being used by lower group emitters.

The associated incentives seem policy-consistent.

‘Mature system’ phase

Moving towards the ‘mature system’ phase:

- More and more countries (all developed countries and the major emitting developing economies at least?) move to adopt ‘inception system’ or ‘transition system’ policies as outlined above. These are (at least on average) trade competitiveness-neutral and focus national effort on reducing emissions intensity within national jurisdictions.
- As this happens, more international data on product emissions intensities is made available. Hopefully this data will be made available for international scrutiny and ratification (eg, by the WTO?). Similarly, national carbon price data for individual countries will be produced (on this, see also Attachment C below).
- The WTO trade rules should be opened for further review. In particular, current rules could be modified (if necessary) to accommodate differential taxation treatment of imports and import-competing products, where those differences can be justified solely by reference to ratified differences in production emissions intensity.

The following conditions would be satisfied in a ‘mature system’ global climate change policy environment:

- In all countries, policy coverage is comprehensive.
- In all countries, the same carbon price will apply.

Under these conditions, global greenhouse gas emissions can be 100% covered by policy.

In the ‘mature system’ phase, countries will negotiate an agreement gradually to introduce a degree of enhanced international competition driving lower emissions intensities, sharpening the price signals already introduced through the ‘inception system’ and ‘transition system’ phases.

How might this enhanced international competition be delivered?

Two variants might be considered: one based on an economy-wide approach, and one based on more disaggregated product groups. The first of these is illustrated in this note.

Assume countries can be divided into two groups:

I. Those applying greenhouse gas abatement policies (either an ETS or a carbon tax, say).

II. Those not applying such policies.

For the second group, we assume that product emissions intensities are not known at all or with any precision.

For the first group, average emissions intensity estimates, either for the portion of production covered by their policies, or for GDP as a whole, can be obtained if their polices are to be workable. (Extrapolating from the average emissions intensity for the policy-covered portion of production, to GDP as a whole, can be approximated using rules of thumb of various kinds – see Attachment C below.)

Assuming Australia is in the first group, the average emissions intensity of Australian GDP is assumed to be known as well, under the required carbon accounting/reporting rules.

All countries can now be placed in one of four groups:

I. Countries not applying an ETS or a carbon tax.

II. Countries applying an ETS or a carbon tax, and where their average emissions intensity, e_i ,is greater than Australia's average emissions intensity e_a.

III. Countries applying an ETS or a carbon tax, and where their average emissions intensity, e_i ,is equal to Australia's average emissions intensity e_a.

IV. Countries applying an ETS or a carbon tax, and where their average emissions intensity, e_i ,is less than Australia's average emissions intensity e_a.

We can calculate the Australian economy-wide average price for carbon as set out in Attachment C below.

Subject to applying existing source country classification rules to determine country of origin for Australia's imports, Australia could then impose adjusted BTAs – based on Australia's average market price for carbon, p_a, and Australian product group average emissions intensities – on all imports as follows:

Rule #1: For countries not applying an ETS or a carbon tax, the BTA uses p_a.

Rule #2: For countries with an ETS or a carbon tax, and where $e_i > e_a$, BTA uses $p_a.(e_i/e_a)\% > p_a\%$.

Rule #3: For countries with an ETS or a carbon tax, and where $e_i = e_a$, BTA uses $p_a.(e_i/e_a)\% = p_a\%$.

Rule #4: For countries with an ETS or a carbon tax, and where $e_i < e_a$, BTA uses $p_a.(e_i/e_a)\% < p_a\%$.

On average, the last three rules allow Australian BTAs that *very* roughly approximate the product-specific ideal, with the degree of approximation depending upon how well other countries' economy-wide production emissions intensities match their average export emissions intensities.

The first rule is less likely to be a good approximation, because it is based only on Australian information. Other variants can be considered for countries covered by rule #1 (eg, where partial information on emissions intensities for such countries is known).

There is no doubt that the 'mature system' phase, in particular, will remain difficult to achieve. By definition, it involves a degree of erosion of international competitiveness, reflecting competition to lower emissions, and therefore has the potential for trade diversion, based on which country has the lowest emissions intensity.

If individual countries each move to lower their own average emissions intensities under the 'inception system' and 'transition system' phases, the threats posed by this final step will be much lower than they are at present.

One thing seems clear.

There seems no way we will ever be in a position to contemplate the 'mature system' phase if countries do not first move through the 'inception system' and 'transition system phases.

Conclusions

To summarise, the existing Australian GST/Tax Invoice accounting and reporting system, plus the carbon accounting system required to make any GHG abatement policy effective, plus existing Australian import tariff product classification groupings and existing import source country regulations, can be used to:

- achieve comprehensive 'carving in' of Australian imports into Australia's greenhouse gas abatement policy coverage:
- ensure – especially in the 'inception system' phase – no 'carbon leakage' on the import side by using trade-neutral, WTO-compliant, BTAs;
- through a GST-style process of carbon cost remits and ITC-style rebates, or via the slightly different (and somewhat more complex) process involved with an ETS and auctioned permits, the embedded market cost of imported and other emissions (as measured by the BTAs) could also be passed along the supply chain, as intended, to the final Australian resident consumer.

This approach comprehensively and permanently eliminates current import-competing concerns about loss of international competitiveness and associated 'carbon leakage' and job losses – at least in the 'inception system' phase.

It reduces the 'free rider' problem on the import side.

It completes the task of applying Australia's greenhouse gas abatement policy to a comprehensive measure of Australia's consumption of greenhouse gas emissions.

5. PRINCIPLE #4: COMPARABLE EFFORT-BASED COUNTRY POLICIES

The measurement of 'comparable effort' set out in GCA policy note no. 1 was based on a weighted average of, say, developed country efforts (ultimately global country efforts) to reduce GHG emissions, as measured by their carbon prices. This average might be smoothed over time if underlying country carbon prices are volatile (eg, because some countries choose to introduce an ETS).

The ideal weights are GHG emissions consumption per country, or, failing that, (real) gross national expenditure (GNE) per country.

Two other practical issues are relevant here.

First, the coverage of GHG abatement policies in each country is important.

For example, if country X has a high carbon price, but this only applies to a small proportion of its emissions (whether measured by production or consumption), then its overall effort might be less than country Y, with a lower carbon price, but applied across all of its emissions (before allowing for export rebates of carbon prices).

To cover this issue, a country's *average* carbon price should be defined as the market price for carbon, adjusted for the ratio of policy coverage of country emissions production to total country emissions production (before allowing for export rebates).

Attachment C presents a simple illustration of how this averaging process might operate.

An alternative version – even more appropriate for a consumption-based model once such a model is in operation more generally – would cover all production of emissions, less exports, plus imports thereof.

The second issue relates to the implications of significant differences between carbon prices across countries. Two possibilities arise where such differences are significant.

Using Australia as an example:

I. Where emissions permits can be traded internationally, a significantly higher price for carbon in Australia than in accessible overseas markets would encourage net overseas permits purchases by Australian producers, raising the carbon price overseas and lowering it in Australia. This process would effectively weaken the GHG emissions reduction effort in Australia (because available supply of permits is raised relative to a closed trading system), and strengthen the effort overseas (for the opposite reason). Is this a desirable result?

II. Where no international trading in emissions permits is allowed (eg, under a carbon tax regime?) – and to the extent that such a segmentation of the market can be enforced – 'carbon leakage' will occur until carbon prices are equalised. That is, other things being equal, production will shift to the markets where the carbon price is lowest (or non-existent).

These market realities point to two conclusions:

- Attempts to impose very different GHG emissions reduction targets on individual countries might imply very different carbon prices across countries. Such differences will be eroded either via international trade in emissions permits (where that is possible), or via 'carbon leakage', or a combination of the two mechanisms.

- A production-based policy model makes the preceding conclusion more likely. Under a consumption-based model, the preceding conclusion is less likely, but not out of the question.

A reasonably uniform international carbon price is an effective measure of international burden sharing that is likely to be sustainable. It also places a greater adjustment burden on countries with a high per capita consumption of emissions than on countries with a low per capita consumption of emissions. This seems fair too. (See also Attachment D below.)

6. CONCLUDING OBSERVATIONS & NEXT STEPS

This policy note has concentrated on establishing the feasibility of a consumption-based approach to reducing greenhouse gas emissions as an effective and efficient unilateral policy option for Australia.

The approach suggested starts from information requirements confined to Australian data, already-existing Australian recording and classification systems, and those required even under an effective production-based ETS approach.

It could be made to work under an ETS, but probably would work more efficiently under a carbon tax approach.

No doubt others will be able to devise many refinements and improvements to the basic approach suggested in this note.

But we think the basic structure of the proposed policy model is sound.

The world economy is going through difficult times following a long period of relatively strong growth. This tougher economic conjuncture will make achievement of a truly global deal on climate change policy even more 'diabolically difficult' than it already is.

The usual 'litany' with which speeches on global warming (and needed policy responses) start includes three recitations:

I. Climate change is a global problem.

II. We need a global policy response to deal with this problem.

III. The 'prisoners' dilemma' or 'free rider' problem is the main impediment to cutting such a deal.

The speeches then usually descend into the morass associated with the EC-led advocacy of production-based policy, with its inherent concerns about trade competitiveness, 'carbon leakage' and threats of BTAs for imports from non-complying countries.

This morass simply underlines how the policy model chosen is making the impediment to cutting a global deal – the 'prisoners' dilemma' or 'free rider' problem just noted – even worse than it has to be.

To avoid this morass, the fourth recitation in the litany used to commence global warming speeches should be:

IV. What policy model would minimise the severity of the 'prisoners' dilemma' or 'free rider' problem?

We think policy notes 1 and 2 are directed explicitly at that question.

The answer is an emissions consumption base for each country's policy rather than a production base.

The final paper in this series – policy note no. 3 – will provide an assessment of the merits of an ETS versus a carbon tax, using the design principles in policy note no. 1 and the analysis in this note as a framework.

ATTACHMENTS

A. CARBON PRICE TREATMENT: AUSTRALIAN PRODUCTION USED LOCALLY & EXPORTED

The proposed treatment of emissions embedded in Australian purchases of Australian production, and Australian exports of goods and services (apart from Australian exports consumed in Australia, such as spending in Australia by non-resident visitors, which are treated as local consumption under the 'destination principle') can be illustrated as follows.

Consider two companies, an energy generator and an energy user (which also co-generates some energy and generates emissions as a result), and two downstream customers, an Australian consumer and an exporter selling to non-residents. Use subscripts $_i$, $_j$, and C and X, respectively, to denote these entities. Assume, for simplicity, that the energy producer sells all of its production to the energy using company, which then sells its all of its output either to Australian consumers (say 75%) or as exports to overseas customers (say 25%).

For the energy generator (with all prices GST-inclusive, and quantities referring to per period flows):

$R_i = VA_i + p_m.E_i + C_i$ ..... (1)

$p_i.q_i = VA_i + p_m.E_i + C_i$ ..... (2)

Where R = total revenue.

VA = nominal value added.

p_m = market price for greenhouse gas emissions.

E_i = emissions (tonnes of carbon per period) by company $_i$.

C = total non-emissions input costs.

p_i = unit price for company $_i$ output.

q_i = quantity of output from company $_i$.

Equation (2) can be re-formulated to make both the GST and the cost of emissions explicit components of the selling price of the energy producer's product as follows:

$(p_{nci}.(1 + gst) + p_m.E_i/q_i).q_i = VA_i + p_m.E_i + p_{uci}.(1 + gst).c_i$ ..... (3)

Where p_{nci} = GST-exclusive product price, excluding unit emissions costs.

gst = GST rate (index).

p_{uci} = GST-exclusive average costs of inputs, excluding costs of emissions, for company $_i$.

c_i = 'real' non-emissions input costs for company $_i$.

The Tax Invoice required under the Australian GST system for sales by the energy producer:

- *Must* show the GST-inclusive sale cost (ie, $(p_{nci}.(1 + gst) + p_m.E_i/q_i.).q_i)$ as a single dollar amount.
- Typically also shows the GST component of the sale cost (ie, $(p_{nci}.gst.q_i)$ as a single dollar amount.
- The only additional item that would be required to be added to the already-existing GST reporting framework would be one showing the dollar cost of carbon emissions embedded in the energy buyer's purchase (ie, $(p_m.E_i/q_i).q_i)$ as a single dollar amount. This information would be

compiled by energy generators under carbon accounting rules. It adds just one figure, showing one dollar amount, from known data, to standard Tax Invoices already required in Australia.

Thus, imposition of a carbon price via a carbon tax, high up the value added supply chain, triggers the generation of the required data that can then flow down the supply chain, using the existing GST reporting system, and ultimately ending with final Australian consumers or exporters.

Note, incidentally, two points (these will be referred to later):

- The *net* GST remitted to the ATO by the energy generator is ($p_{nci}.gst.q_i - p_{uci}.gst.c_i$). The first term is the gross sales GST liability. This is reduced by the second term – input tax credits (ITCs) in respect of GST paid on purchases of (non-emissions) business inputs.
- Assuming the energy producer is the first point in the supply chain where a carbon price applies, the *gross* and *net* emissions cost remitted to the government/ATO is ($p_m.E_i$).

How does all this flow down the value-adding supply chain?

In our simplified model, the next step is the energy-using company producing 'widgets' for sale to final customers. For this company (which has its own emissions):

$R_j = VA_j + p_m.E_j + C_j$ …… (4)

For simplicity, assume all intermediate inputs (C_j) come from company $_i$. Equation (4) can then be transformed as:

$p_j.q_j = VA_j + p_m.E_j + VA_i + p_m.E_i + C_i$ …… (5)

Or:

$(p_{ncj}.(1 + gst) + p_m.E_j/q_j + p_m.E_i/q_j).q_j = VA_j + p_m.E_j + p_m.E_i + p_{ucj}.(1 + gst).c_j$ …….. (6)

The Tax Invoice required under the Australian GST system for sales by the energy user:

- *Must* show the GST-inclusive sale cost (ie, $(p_{ncj}.(1 + gst) + p_m.(E_j/q_j.).q_j + p_m.(E_i/q_j).q_j$ as a single dollar amount.
- Typically also shows the GST component of the sale cost (ie, ($p_{ncj}.gst.q_j$) as a single dollar amount.
- The only additional item that would be required to be added to the already-existing GST reporting framework would be one showing the dollar cost of carbon emissions embedded in the quantity of energy purchased (ie, $(p_m.(E_j/q_j.).q_j + p_m.(E_i/q_j).q_j)$ as a single dollar amount. This information would be compiled by energy generators under carbon accounting rules. It adds just one figure, showing one dollar amount, from known data, to standard Tax Invoices already required in Australia.

Thus, imposition of a carbon price via a carbon tax, high up the value added supply chain, triggers the generation of the required data that can then flow down the supply chain, using the existing GST reporting system, ultimately ending with final Australian consumers or exporters.

Note that:

- The *net* GST remitted to the ATO by the energy user is ($p_{ncj}.gst.q_j - C_j/(1 + gst)$). The first term is the gross sales GST liability. This is reduced by the second term – input tax credits (ITCs) in respect of GST paid on purchases of (non-emissions) business inputs.
- For the energy user, the *net* emissions cost remitted to the government/ATO (whether via permit auctions or a carbon tax) is ($(p_m.E_j) - (p_m.E_i)$). That is, the energy using company effectively receives a separate ITC-type refund in respect of the cost of emissions embedded in its input costs, and in net terms only remits a payment equal to the *additional* emissions costs directly associated, through co-generation, with its own production processes.

Consider the flow-on of the energy-using company's output via sales to an Australian resident final consumer. Given the 75:25 split between local consumption and exports noted above:

$C = 0.75.R_j$ …… (7)

Where C = nominal value of total revenue from sales by company $_j$.

Embedded in R_j are GST and emissions costs, for which no ITC-type refunds are available to the consumer:

- For the GST, the amount is $0.75.p_{ncj}.gst.q_j$.
- For the emissions costs, the amount is $0.75.p_m.(E_j + E_i)$.
- Along the supply chain to the final consumer, net GST remittances to the ATO are $0.75.((p_{ncj}.gst.q_j) – (p_{nci.}gst.q_i) + (p_{nci.}gst.q_i)) = 0.75.(p_{ncj}.gst.q_j)$. In short, the final consumer pays the total GST payable on local sales through the local supply chain.
- Along the supply chain to the final consumer, net emissions cost remittances are $0.75.(p_m(E_j + E_i) – p_m.E_i + p_m.E_i) = 0.75.(p_m(E_j + E_i))$. In short, the final consumer pays the total carbon cost payable on local sales through the local supply chain.

Consider the flow-on of the energy-using company's output via sales to an exporter selling to a non-resident customer. Given the 75:25 split between local consumption and exports noted above:

$X = 0.25.R_j$ …… (8)

Where X = nominal value of total revenue from export sales by company $_j$.

Embedded in R_j are GST and emissions costs, for which 100% ITC-type refunds are available to the exporter:

- For the GST, the amount is $0.25.p_{ncj}.gst.q_j$.
- For the emissions costs, the amount is $0.25.p_m.(E_j + E_i)$.
- Along the supply chain to the final consumer, net GST remittances to the ATO are $0.25.((p_{ncj}.gst.q_j) - (p_{ncj}.gst.q_j) – (p_{nci.}gst.q_i) + (p_{nci.}gst.q_i)) = 0$. In short, the exporter pays no GST. The product exported is free of Australian GST.
- Along the supply chain to the final consumer, net emissions cost remittances are $0.25.((p_m(E_j + E_i) – p_m(E_j + E_i) – p_m.E_i + p_m.E_i) = 0$. In short, the exporter pays no Australian emissions cost. Exports are free of Australian emissions costs.

The foregoing illustrations are based on a carbon tax approach, starting with a carbon tax on the primary emissions, and then tracing the flow-on of that tax down the supply chain using a GST-like mechanism.

While there would be differences, there seems to be no reason why an ETS could not work. Using the example described above:

- Company $_i$ would purchase emissions permits, thereby facing the $p_m.E_i$ cost shown above.
- That cost would be passed on to (ie, recovered from) company $_j$ and could also be recorded in the relevant Tax Invoice received by the purchaser. Company $_j$ would then pass it on to either the final consumer or the exporter (with accompanying Tax Invoice recording at that stage too).
- Company $_j$ would also purchase emissions permits (for the emissions associated with its assumed energy co-generation), thereby facing the additional $p_m.E_j$ cost shown above. Company $_j$ would then pass that additional emissions cost on to either the final consumer or the exporter (with accompanying Tax Invoice recording).

- The final consumer would end up paying $0.75.(p_m.E_i + p_m.E_j)$ as before.

- What about the exporter? The government should have received permit auction proceeds of $(p_m.E_i + p_m.E_j)$ as a result of permit sales to the energy generating and the energy using companies. When the exporter claims a GST ITC on its exports, its Tax Invoices should also allow it to claim $0.25.(p_m.E_i + p_m.E_j)$ as a carbon price rebate as well.

In short, there seems to be no good practical reason why either a carbon tax or an ETS couldn't be made to zero-rate exports and fully cover local production purchased locally.

Conclusions

The existing Australian GST/Tax Invoice accounting and reporting system can be used to achieve three objectives:

- Precisely allocate the market costs of emissions generated by production within Australia along the supply chain in a highly visible way, via a single dollar data addition to existing Australian Tax Invoices already operating under the GST system. This would make the carbon price signal very visible throughout the economy, and responses to that signal would be both more likely and more pervasive as a result.

- Through a GST-style process of carbon cost remits and ITC-style rebates, or via the slightly different process involved with an ETS and auctioned permits, the embedded market cost of emissions could also be passed along the supply chain, as intended, to the final Australian resident consumer.

- Again through a GST-style process of carbon cost remits and ITC-style rebates, including at the final export stage (whether through a carbon tax or an ETS), it is a relatively simple matter to ensure that (most) Australian exports are not subject to the Australian market cost of emissions. (The exception is exports consumed within Australia – such as international tourism – where the 'destination principle' applies).

Attachment A shows how applying a consumption base to exports and local consumption of local production for emission abatement policies in Australia should be both practicable and quite precise, using existing systems plus the proposed new carbon accounting and reporting frameworks.

To complete the consumption base, Australian imports must also be included within the ambit of the Australian market cost of emissions. Under a production base, these are excluded entirely. Worse, because of this exclusion, in response to concerns about erosion of international competitiveness, in some cases some local production consumed locally (import-competing products) may also be excluded, further eroding the base. In some cases – both overseas and in Australia – there have been calls for an alternative approach: import taxes (or 'border tax adjustments' – BTAs) on products sourced from countries without emissions reduction policies in order to counter the competitiveness effects and 'carbon leakage' risks associated with that situation.

Calls for BTAs are a move in the right direction. Indeed, ideally *all* countries should make extensive use of BTAs. On the export side, they should be used comprehensively to offset embedded local carbon costs, as outlined in Attachment A. On the import side, ideally, they should be used comprehensively to ensure that imported emissions are priced the same as locally produced and consumed emissions.

That said, including Australian imports within an Australian emissions consumption base is not straightforward.

Attachment B below deals with this question.

B. CARBON PRICE TREATMENT: AUSTRALIAN IMPORTS

The unattainable ideal?

The ideal treatment of Australian imports under a consumption base for emissions abatement policy is as follows:

- Down to the finest level of commodity detail, identify the greenhouse gas emissions embedded in the production of the import concerned, and apply the carbon price applicable in Australia to those emissions as a product-specific border tax adjustment (BTA). This BTA can – and usually will – differ from the carbon price applicable to Australian import-competing substitute products (because of different production technologies, and energy sources, at least at the margin).

- Apply this approach, product-by-product, across all Australian imports. As a result, all imports will generate either ETS-based permit auction revenue, or carbon tax-based revenue, that will be collected by the government.

- Ensure that overseas production technology, and in particular differentials in greenhouse gas emissions associated with different technologies, are fully accounted for. For example, products sourced from countries using, say, hydro- power as an energy source, should be subject to much lower BTAs than the same products, sourced either from the same countries or other countries using, say, brown coal as an energy source.

Just to describe the 'ideal' approach in this way is to underline its practical inoperability:

- Australia does not have full (or much?) information on the emissions intensity of product-specific production functions for different products imported into Australia from around the world.

- In some (many?) cases, even the relevant exporting countries probably do not have that information at present.

- Imports ultimately sourced through multiple exporting countries only complicate the problem even more.

Critics of the practicality of a consumption-based approach to emissions abatement quickly (and reasonably) draw attention to these difficulties. They may also assert that there are 'WTO problems' with this approach (presumably this could be the case, for example, where imports had higher embedded emissions, and therefore faced a higher BTA, than applied to the equivalent value local product).

They then stop, and, in effect, say:

> *The 'ideal' approach is not feasible, so we'll just give up, drop the whole idea of a consumption base, and concentrate on a (band-aided) production base. Besides, that's what we've been pursuing, led by the Europeans, for decades now. Anyway, it's too late to change course.*

That is the current situation in Australia. It has substantial costs:

- Businesses are clamouring for 'carve-outs' from the production base – whether because they produce exports or import-competing products. Their credibility suffers because they consistently fail to frame their concerns against a consumption base benchmark, even if they do (correctly) express concerns about international competitiveness and 'carbon leakage' at the margin. Differences between business groups set them up for 'wedging' and 'divide and conquer' political responses too. Nevertheless, these demands will broaden in the period ahead.

- To the extent that they fail in their demands, 'carbon leakage', to some extent, will occur for as long as Australia acts ahead of its trading partners. There will be unnecessary economic and employment costs associated with this.

- To the extent that they are successful, the burden of any given emissions abatement target will be shouldered by a smaller group of Australian producers, raising its cost (to them).

- To the extent that they are successful, for any given carbon price, the *net* auction revenue (assuming an ETS is adopted) or the carbon tax revenue collected (assuming a carbon tax approach) will be reduced, thereby reducing scope to provide income offsets to the real income effects of implementing a CPRS-type policy (although average real income effects will be reduced as well).

- Most importantly, globally, these sorts of concerns about erosion of trade competitiveness make it more difficult to persuade individual countries to take the first steps – they make the 'free rider' or 'prisoners' dilemma' problem worse.

This situation seems illogical.

At the very least, thorough exploration of 'rough justice' approximations to the ideal approach to carbon pricing of imports should be undertaken before the conceptually superior consumption-based approach is discarded. In public at least, this has not happened.

Under a consumption base, there *is* a legitimate case for comprehensively and permanently 'carving out' *all* Australian exports from Australia's carbon price. Such exports should be subject to the importers' carbon price. But this greatly reduces the exporting country's emissions policy target base, unless the equally compelling case for 'carving in' all Australian imports (via import BTAs), so that they attract Australia's carbon price, is given due attention.

If, on average, all Australian exports are 'carved out', and all Australian imports are included in the policy base, Australia would have an emissions target base, on the Australian consumption side, at least equal to the (unattainable) emissions target base on the production side – but without 'carbon leakage' risks.

Key elements of a 'rough justice' solution

The ideal approach summarised above concentrates on product-specific *emissions intensities*.

That is, Australia's carbon price burden on particular products (including imports) should vary according to their emissions intensities.

This is where the product-specific data limitation is a problem. The appropriate carbon price is *not* a problem. Under the consumption approach, *Australia's* carbon price is the appropriate impost. But the ideal approach requires a carbon price base – embedded emissions, or *emissions intensities* – for each imported product, on which we do not have the required data.

Three key thoughts might form the bases for a more tractable, 'rough justice', solution to this problem:

I. Emissions intensity can be defined as product-specific, or it can be averaged across aggregates of products. Ultimately, and for some purposes, it could be averaged across whole economies (see Attachment C below).

II. Current WTO rules permit ad valorem-equivalent BTAs on imports where these are equal to the corresponding ad valorem equivalent taxes on locally produced substitutes (plus so-called 'revenue' tariffs or customs duties). In Australia, the most broad-based example of this is the GST which (subject to the 'destination principle') applies equally to locally produced goods and services and to imports of goods and services at the same ad valorem rate (usually 10%).

III. Greenhouse gas abatement policies are (or should be) intended to drive all countries to reduce greenhouse gas emissions by targeted absolute amounts *per country* relative to country 'business as usual' (BAU) scenarios. Added up across countries, these targets are intended to meet a specified global greenhouse gas atmospheric concentration at some future time. It is the net *country wide* absolute reduction in such emissions that is important in this context. Policies that provide incentives for individual countries to reduce their total (absolute) greenhouse gas emissions relative to BAU are required. An economy-wide focus also has

advantages in avoiding the potential – however limited in practice – for 'gaming' of emissions reduction policies due to large 'carve outs' from their impact (for example, where possible, by 'streaming' high emissions to carved out production and 'streaming' low emissions to policy-covered production). Such 'gaming', if possible, could result in apparent policy compliance while country emissions relative to BAU fall little, if at all. An economy-wide focus encourages the application of broad-based greenhouse gas abatement policies.

The 'inception system' phase

Instead of starting at the product-specific level, consider a policy approach to carbon pricing of imports that starts with broader aggregates of imports. These might be compiled using current Australian customs tariff product classification, but re-arranged to form a ranking of import product aggregates using Australian emissions intensities of locally produced substitutes as the ranking criterion.

This grouping of import products could be as detailed as possible (eg, using the full scope of the current Australian customs tariff product classification), or initially, if data limitations warranted this approach, further aggregated to fewer broader groups, ranked in descending order of emissions intensity as determined by Australian import-competing substitutes. Something closer to the former is preferable in terms of sending better price signals to reduce emissions within Australia.

The very detailed data collection mechanism under the proposed Tax Invoice-based approach to Australian production-related emissions (see Attachment A) can provide the basis for the Australian emissions intensity data required. For example, given the market price for carbon, p_m, the emissions intensity of product $_i$, or e_i, which is equal to E_i/q_i, can be derived from a company's carbon cost, $p_m.E$. Moreover, under proposed carbon accounting rules, *direct* estimates of emissions intensity should also be possible. Indeed, if they are not, the effectiveness of greenhouse gas abatement policies must be questioned.

This starting point has some advantages:

- It is still consistent with reporting requirements under the Kyoto Protocol and Convention.
- It is consistent with the starting point for Australia's ETS and the approach proposed in the Green Paper.

In the 'inception system' phase, we assume that the detailed emissions intensity data available for Australia is not yet available widely overseas.

The 'inception system' approach outlined below therefore depends on two key assumptions:

- Only Australian production-based emissions intensity data, and the Australian market price for carbon, are required to make this approach workable.
- Provided Australia imposes the same ad valorem equivalent tax on imports as is imposed on import-competing substitutes, there is no concern about WTO rule compliance: such an approach is trade competitiveness-neutral.

One consequence of the second assumption is that Australia could effectively impose a higher tax on imported emissions than Australian emissions, where the imported product had a lower emissions intensity than in Australia, or a lower tax on imported emissions than Australian emissions, where the imported product had a higher emissions intensity than in Australia, under current WTO rules.

Until emissions intensity data is widely available overseas, and until WTO rules are amended (should this be necessary), uniform ad valorem tax treatment between imports and their locally produced substitutes is the 'safe option' for introducing import BTAs. This also makes sense in the 'inception system' phase anyway.

It might be argued that this approach does not convey the 'right' signals. For example, imports with lower emissions intensity than their locally produced counterparts are 'penalised' – not in terms of product price, but in terms of encouraging demand (and supply) to switch to lower emission products. The converse is true for imports with higher emissions intensities.

This is true. But two responses are appropriate:

- The failure to address the 'right' signals for imports reflects the assumed lack of data on emissions intensities for most of Australia's imports. It may also reflect concerns about WTO compliance matters. These matters are taken up in the discussion below on the 'transition system' and the 'mature system' phases.
- *Within* Australia, the 'right' signals *are* being generated, if not as precisely as would be the case on a product-by-product basis, as suggested in Attachment A. On the demand and supply sides, higher emissions intensities are penalised (via higher carbon costs) relative to lower emissions intensities. The precision of those signals is determined by how detailed the import product categories used to group Australian products are. The greater the number of categories (ranked by emissions intensities) the more precise the price signals in relation to Australian production.

How would the 'inception system' phase work?

The objective is, for each grouping of imports, to apply the same *percentage* ad valorem equivalent BTA as is imposed as a *percentage* carbon cost increase for the corresponding grouping of locally produced substitute products.

This entails a modification to the approach for locally produced products, whether consumed locally or exported, outlined in Attachment A above. Specifically, such products would be subject to a carbon cost based on (i) the market price for carbon in Australia, and (ii) the *group average* emissions intensity for the group concerned, rather than the emissions intensity for specific products within each group.

The carbon cost data in the Tax Invoice would be based on these two variables, and input tax credits, including at the export stage, would similarly be based on them. As a result, zero-rating of exports, and full pass-through of carbon costs to the final Australian consumer, could still be achieved.

What about imports where there is no locally produced substitute? Two responses are appropriate:

- If there are no locally produced substitutes, by definition, there is no risk of 'carbon leakage'. This suggests that the BTA in this case should be zero.
- That said, such imports are highly unlikely to be emissions-free. Given the Australian consumption base as the policy target, this suggests a non-zero BTA is appropriate.

On balance, we favour imposition of a BTA on such imports, where such an adjustment is consistent with current WTO rules.

How does this proposal work? Consider an example.

$$G_1 = \Sigma_i(p_{nci}.(1 + gst).q_i + p_m.e_i.q_i) \quad \ldots\ldots (1)$$

Where G_1 = the market value of product group 1, summed across all group member products $_i$.

e_i = emissions intensity of product $_i$.

The other notation follows that in Attachment A.

$$p_{1idp} = (\Sigma_i(p_{nci}.(1 + gst).q_i + p_m.e_i.q_i))/\Sigma_i.q_i \quad \ldots\ldots (2)$$

$$= (1 + gst).(\Sigma_i(p_{nci}.q_i)/\Sigma_i.q_i + p_m.\Sigma_iE_i/\Sigma_i.q_i \quad \ldots\ldots (3)$$

Where p_{1ipd} = implicit price deflator for product group 1, including GST and emissions costs.

$$p_{1ipd} = (1 + gst).p_{1ipdnc} + p_m.e_1 \quad \ldots\ldots (4)$$

That is, the all-inclusive implicit price deflator for product group $_1$ is equal to the GST-inclusive, carbon price-exclusive, implicit price deflator for product group $_1$ plus the market price for carbon multiplied by the group $_1$ product average emissions intensity.

As a result of the introduction of a carbon price, the *change* in the group $_1$ implicit price deflator is:

$$\Delta p_{1ipd} = ((p_{1ipd} - (1 + gst).p_{1ipdnc})/p_{1ipdpnc}).100 = (p_m.e_1/p_{1ipdpnc}).100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

The larger the market price for carbon, and the larger the product group's average emissions intensity, the larger the group-average price impact of the introduction of a carbon price, other things being equal.

The relationship in equation (5) can be used to calculate the BTA for imports of products in group $_1$:

$$BTA_1 = (p_m.e_1/p_{1ipdpnc}).100 = +\varepsilon\% \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

For locally produced substitutes, this adjustment – that is, a uniform percentage price change for locally produced products in group $_1$ of +ε% – replaces the product-specific price increase described in Attachment A above. Summed across all product groups, the aggregate price change arising from the introduction of a market price for carbon will be the same, but it will comprise the sum of a number of product group averages, not the sum of individual product price increases.

By construction, the effect of this approach is to impose the same carbon price-related ad valorem tax on both locally produced products, and those imported products deemed to be in the same import tariff category.

As with the GST, this is a trade-neutral tax adjustment. The BTA represents the same percentage price increase as is applied to the locally produced substitute.

This should be WTO-compliant.

'Inception system' conclusions

Despite the slight adjustment to the approach proposed in Attachment A, exports would still be comprehensively zero-rated under the approach outlined here. Australian production consumed locally is also comprehensively covered.

In addition, this approach 'carves in' Australian imports. They are comprehensively covered by Australia's greenhouse gas emission abatement policy, and probably as well as could be expected given problems with overseas data, and, possibly, WTO compliance concerns.

As a result, an Australian consumption base for Australia's CPRS is achieved.

As a consequence of this, there is no 'carbon leakage' – that is, leakage of *Australian* carbon emissions – either on the export side, or on the import competition side. Any reduction in Australian emissions is a net contribution to reduced global emissions.

In short, in the 'inception system' phase, implementation of a consumption-based CPRS seems practical, using only Australian-sourced information.

Clearly, this approach is workable using a carbon tax.

Could it be made to work under an ETS? The answer is: 'probably yes', but with additional complexity in relation to Tax Invoices. For example, additional tax-like ITCs or rebates would be needed for products within each group with higher than average emissions intensities to bring their cost down to the group average. The opposite would be the case for products with lower than group average emissions intensities.

On balance, this approach probably would be more easily implemented with a carbon tax than with an ETS.

Combining the approaches outlined in Attachment A and in this part of Attachment B, *any* country could unilaterally introduce a very broadly-based greenhouse gas abatement policy, with a carbon price set at any level, without concerns about 'carbon leakage' and associated excessive adjustment costs in a transition to a lower carbon world.

Possible concerns #1: is this a protectionist approach?

The approaches suggested above are not perfect. Because the approaches to imports are not as precise, unlike the case of exports as covered in Attachment A above, there may be objections to them. Some of these are considered next.

Are BTAs as proposed in the 'inception system' phase a protectionist approach? We think the answer is 'no'.

Clearly, BTAs such as those involved in a value-added tax – zero-rating exports and fully taxing imports at the same percentage ad valorem rate as local production consumed locally – are not regarded as protectionist. They would not be permitted under international trade rules if they were so regarded.

The approach proposed in Attachment B above applies the same ad valorem equivalent BTA to imports as is applied to locally produced substitutes.

But more emissions-specific BTAs in the context of climate change policies might be regarded differently, at least using current ways of classifying commodities.

For example, if an import tax (BTA) on a product under the 'ideal' treatment of imports reviewed above resulted in a *higher* ad valorem equivalent tax on the imported product than that imposed on its locally produced counterpart, some might argue that protectionism was involved. (Of course, no such argument would be raised if the BTA resulted in a *lower* ad valorem equivalent tax on the import!)

But another view of imports (and products more generally) – which is relevant in the context of climate change policies – would challenge this superficial reaction.

Suppose we assume that any import of a product comprises *two* products: (i) the product as conventionally defined, and (ii) an amount of greenhouse gas emissions associated with the production of that product (which, in this illustration, is subject to a carbon price).

On this view, imports of product $_k$ can be expressed as follows:

$M_k = p_k.q_k + p_m.E_k$ …… (1)

Or

$M_k = p_{nck}.(1 + gst).q_k + p_m.e_k.q_k.$ …… (2)

Where M_k = GST and carbon price-inclusive value of imports of product $_k$.

The other symbols follow the notation in Attachment A above.

Using this approach, where the emissions intensity of the import, e_k, differs from the corresponding emissions intensity of the locally produced substitute product, a BTA for emissions that represents the same price on E_k as the equivalent carbon price on the emissions embedded in the locally produced substitute is not protectionist at all.

Note that, using this approach, the 'same' price on emissions does not have to be ad valorem, either. It can be a specific price (eg, $ per tonne of carbon) just like 'revenue' excise duties imposed on, say, alcohol.

Such BTAs based on emissions are trade-neutral where the focus is on trade in emissions.

This approach is taken up in the 'transition system' phase and the 'mature system' phase later in Attachment B.

Possible concerns #2: is this WTO-compliant?

As we understand the situation, Australia is entitled to levy the same ad valorem tax on any imported product as it imposes on the corresponding locally produced product.

The 'inception system' phase proposed above, in effect, follows a GST model approach, and should be acceptable for the same reasons as Australia's GST is acceptable.

Some system-wide desirable incentive payoffs from the 'inception system' phase

The 'inception system' phase outlined above has some desirable features:

- As a practical consumption-based approach, it eliminates 'carbon leakage' as an excuse for not introducing greenhouse gas abatement policies within a country. By definition, the proposed policy action is trade neutral. This outcome is far superior to that likely under a production-based approach – even in the unlikely event that such an approach were to be applied widely.
- Reducing greenhouse gas emissions starts at home, on a 'no regrets' trade basis. Any reductions in national emissions constitute a net contribution to global emissions reduction.
- As a result, this phase minimises the 'free rider' problem impeding the implementation of a global deal. Once this phase is well established, moving further becomes more likely (albeit still difficult).
- By zero-rating exports and fully 'carving in' imports, this approach is far more attractive than the current production-based approach, not only for countries yet to implement climate change policies, but also for those that have already adopted (partial) production-based policies (some of whom have been arguing for import BTAs to protect their industries anyway).
- Within the country concerned, and especially if product disaggregation is substantial, strong incentives are set up to switch from high emissions production towards lower emissions production. These incentives are higher, the higher is the market price for carbon.

'Transition system' phase

The 'inception system' phase is predicated on the assumption that Australia acts (more or less) unilaterally. The 'transition system' phase continues with that assumption, but proposes a further opening of competition from lower emissions imports than permitted under the 'inception system' phase.

In this phase countries applying greenhouse gas abatement policies of the type outlined above seek amendment of WTO rules to allow import BTAs to be determined by group averages as already proposed, but for import competing substitutes within each group to be taxed according to their product-specific emissions intensities.

The effects of this are to:

- Increase international competitive pressure on relatively high Australian emitters within each product group.
- Reduce such pressures on lower emitters within each group in Australia.
- On average, within each product group, there is trade neutrality.

This phase might be introduced (a) when other major emitters have adopted their own greenhouse gas abatement polices, and (b) after a 'warning period'.

If the WTO agreed to the required rule change, there would be a risk of 'carbon leakage'. However, this phase would be preceded by a warning period so that producers could adapt to minimise that risk, and in any case, the only challenge on higher group emitters is to move to technologies and processes already being used by lower group emitters.

The 'mature system' phase

Moving towards the 'mature system' phase:

- More and more countries (all developed countries and the major emitting developing economies at least?) move to adopt 'inception system' or 'transition system' policies as outlined above. These are (at least on average) trade competitiveness-neutral and focus national effort on reducing emissions intensity within national jurisdictions.

- As this happens, more international data on product emissions intensities is made available. Hopefully this data will be made available for international scrutiny and ratification (eg, by the WTO?). Similarly, national carbon price data for individual countries will be produced (on this, see also Attachment C below).

- The WTO trade rules should be opened for further review. In particular, current rules will be modified (if necessary) to accommodate differential taxation treatment of imports and import-competing products, where those differences can be justified solely by reference to ratified differences in production emissions intensity.

Conditions applying in a 'mature system' climate change policy environment

The following conditions would be satisfied in a 'mature system' global climate change policy environment:

- In all countries, policy coverage is comprehensive.

- In all countries, the same carbon price will apply.

Under these conditions, global greenhouse gas emissions can be 100% covered by policy.

In the 'mature system' phase, countries will negotiate an agreement gradually to introduce a degree of enhanced international competition driving lower emissions intensities, sharpening the price signals already introduced through the 'inception system' and 'transition system' phases.

How might this enhanced international competition be delivered?

Delivering enhanced competition to reduce emissions in the 'mature system' phase.

Two variants might be considered: one based on an economy-wide approach, and one based on more disaggregated product groups. The first of these is illustrated next.

Assume countries can be divided into two groups:

I. Those applying greenhouse gas abatement policies (either an ETS or a carbon tax, say).

II. Those not applying such policies.

For the second group, we assume that product emissions intensities are not known at all or with any precision.

For the first group, average emissions intensity estimates, either for the portion of production covered by their policies, or for GDP as a whole, can be obtained if their polices are to be workable. (Extrapolating from the average emissions intensity for the policy-covered portion of production, to GDP as a whole, can be approximated using rules of thumb of various kinds – see Attachment C below.)

Assuming Australia is in the first group, the average emissions intensity of Australian GDP is assumed to be known as well, under the required carbon accounting/reporting rules.

Denote the average economy-wide emissions intensity of country $_i$ as e_i, and Australia's average economy-wide emissions intensity as e_a.

All countries can now be placed in one of four groups:

I. Countries not applying an ETS or a carbon tax.

II. Countries applying an ETS or a carbon tax, and where $e_i > e_a$.

III. Countries applying an ETS or a carbon tax, and where $e_i = e_a$.

IV. Countries applying an ETS or a carbon tax, and where $e_i < e_a$.

We can calculate the Australian economy-wide average price for carbon by adjusting the observed Australian market price by the ratio of (i) the estimated emissions intensity of GDP covered by Australia's CPRS (ie, before zero-rating of exports), to (ii) the estimated emissions intensity of total GDP. Hopefully, with a comprehensive approach, the ratio defined by (i) and (ii) will be unity.

Ideally, what follows should be based on the average economy-wide price for carbon, p_a (see Attachment C below for details). This provides an incentive for each country to ensure broad coverage of its greenhouse gas abatement policy. We assume, for Australia, that $p_m = p_a$.

Subject to applying existing source country classification rules to determine country of origin for Australia's imports, Australia could then impose adjusted BTAs – based on p_a and Australian product group average emissions intensities – on all imports as follows:

Rule #1: For countries not applying an ETS or a carbon tax, the BTA uses p_a.

Rule #2: For countries with an ETS or a carbon tax, and where $e_i > e_a$, BTA uses $p_a.(e_i/e_a)\% > p_a\%$.

Rule #3: For countries with an ETS or a carbon tax, and where $e_i = e_a$, BTA uses $p_a.(e_i/e_a)\% = p_a\%$.

Rule #4: For countries with an ETS or a carbon tax, and where $e_i < e_a$, BTA uses $p_a.(e_i/e_a)\% < p_a\%$.

On average, the last three rules allow Australian BTAs that *very* roughly approximate the product-specific ideal, with the degree of approximation depending upon how well other countries' economy-wide production emissions intensities match their average export emissions intensities.

The first rule is less likely to be a good approximation, because it is based only on Australian information. Other variants can be considered for countries covered by rule #1 (eg, where partial information on emissions intensities for such countries is known).

'Mature system' conclusions

There is no doubt that the 'mature system' phase, in particular, will remain difficult to achieve. By definition, it involves a degree of erosion of international competitiveness and therefore the potential for trade diversion, based on which country has the lowest emissions intensity.

If individual countries each move to lower their own average emissions intensities under the 'inception system' and 'transition system' phases, the threats posed by this final step will be much lower than they are at present.

One thing seems clear. There seems no way we will ever be in a position to contemplate the 'mature system' phase if countries do not first move through the 'inception system' and 'transition system phases.

C. CALCULATING ECONOMY-WIDE CARBON PRICES: AN ILLUSTRATION

Calculating a country's economy-wide carbon price is an important prerequisite for assessing that country's effort in reducing greenhouse gas emissions. For that reason, it is essential for application of Principle #4: comparable effort-based country policies, which we regard as important for appropriate burden sharing of the global task between countries. (On burden sharing, see also Attachment D below.)

Calculating a country's economy-wide carbon price in the 'inception system' phase requires information about (i) emissions intensity by industry, (ii) industry shares in real GDP, and (iii), the coverage of the greenhouse gas abatement policy by industry across total real GDP.

The following is a simple illustration of what would be involved, using emissions production as the yardstick.

Economy-wide and policy-included emissions in the 'inception system': some relationships

For the economy as a whole:

$\Sigma_i gdp_i = gdp$ …….. (1)

Where gdp_i = share of industry or firm 'i' in economy-wide real gdp per period.

$\Sigma_i E_i = E$ …… (2)

Where E_i = greenhouse gas emissions (tonnes per period) associated with 'i' production.

E = total greenhouse gas emissions for the economy in the period.

$\Sigma_i E_i = \Sigma_i e_i.gdp_i = e.gdp$ …… (3)

Where $e_i = E_i/gdp_i$ = emissions intensity (tonnes of emissions per unit of output per period).

For an economy where greenhouse gas abatement policy is partial, not all industries are covered.

For such an economy:

$\Sigma_{ic} e_{ic}.gdp_{ic} + \Sigma_{inc} e_{inc}.gdp_{inc} = \Sigma_i e_i.gdp_i = e.gdp = E$ ……... (4)

Where subscript $_{ic}$ denotes included industries and subscript $_{inc}$ denotes excluded industries.

And:

$\Sigma_{ic} e_{ic}.gdp_{ic} / \Sigma_i e_i.gdp_i < 1$ …….. (5)

Equation (5) represents the 'scaling factor' that should be applied to the market price for carbon (see below) to adjust for coverage and translate that price into an average economy-wide production-based carbon price.

Clearly, substantial 'carve outs' from the policy therefore reduce the average economy-wide carbon price relative to the observed market price. With full coverage, the market and economy-wide average carbon prices are the same.

To operationalise this measure, constant price estimates of industry shares in an economy's real GDP are needed. These are typically available from the relevant national accounts data.

Data on emissions intensity by industry are also needed. These will depend on the quality of the carbon accounting system available for the country concerned.

For industries not covered by the greenhouse gas abatement policy, emissions intensity data may not be available.

However, that data is needed to quantify equations (2), (3), (4) and (5).

Estimates for non-covered industries can either be sourced from specific data for those industries, based on data for similar included industries or, as a worst-case default option, set at the average for included industries.

Calculating the average economy-wide carbon price given the market carbon price

The observed market price for carbon may be the result of (i) the operation of an ETS, (ii) set as a price ceiling by the government, or (iii) reflect the application of a carbon tax by the government.

In the 'inception system', the relationship between the observed market price for carbon, p_m, and the average economy-wide market price, p_a, is as follows:

$$p_m.(\Sigma_{ic} e_{ic}.gdp_{ic} / \Sigma_i e_i.gdp_i) = p_a \quad \ldots\ldots \quad (6)$$

In general:

$$p_m \geq p_a \quad \ldots\ldots \quad (7)$$

Only where $(\Sigma_{ic} e_{ic}.gdp_{ic} / \Sigma_i e_i.gdp_i) = 1$ will $p_m = p_a$.

Note that the GDP measures used here are defined as gross of export rebates of carbon prices.

The average economy-wide carbon price under a 'mature system' consumption-based model

For the 'inception system' phase, a GDP-oriented measure as described above may be appropriate. Data limitations in relation to imports preclude alternatives.

But in the 'mature system' phase, a GNE-oriented measure of individual country effort is more appropriate, consistent with consumption or GNE country weights used to average policy effort across countries.

The illustration presented above can and should be modified as the world moves towards a 'mature system' consumption based model rather than a production based model. In the 'mature system' consumption based phase, emissions intensity data for imports will be available, and these should replace country exports emissions intensity data.

In particular, all of the equations shown above should replace real GDP with real GNE (ie, 'gne' in the notation framework used here).

D. Some observations on per capita and absolute emissions targets

Ross Garnaut has proposed moving to equal *per capita* greenhouse gas (GHG) emissions to share the burden of dealing with predicted climate change problems.[6]

As noted on page 16 of his supplementary draft report:

> *Chapter 12 of the Draft Report laid out the argument that a gradual shift to equal per capita allocations is the only practicable principle for the allocation of emissions between countries…*

However, the global task is an *absolute* reduction in GHG concentrations relative to business-as-usual (BAU) in order to meet a specified global GHG concentration target.

What's the link to per capita emissions?

The following equation provides the answer (using the derivation of the product rule for changes where these are signified by Δ).

$$\Delta E_i = \Delta(E_i/N_i).N_i + \Delta N_i.(E_i/N_i) + \Delta(E_i/N_i).\Delta N_i \quad \ldots\ldots \quad (1)$$

Where N_i = population of country $_I$ and the other notation follows that in the earlier Attachments.

For small changes per annum, assume we can ignore the last term as a first approximation.

Arithmetically then, the absolute change in global GHG emissions relative to BAU is (roughly) equal to the global population-weighted change in global per capita GHG emissions relative to BAU, plus the global per capita emissions-weighted change in global population relative to BAU.

Reducing global GHG emissions relative to BAU therefore can be effected by (i) reducing GHG emissions per capita, and/or (ii) by reducing population, relative to BAU.

This relationship applies to country shares of the global emissions reduction burden too.

A large population country can achieve a large GHG emissions reduction via small reductions in per capita emissions, because the population weighting on those reductions is large. A small population country can only achieve a similarly large absolute GHG reduction via a large per capita GHG reduction, because its population weighting is small.

Changing population is difficult, takes time, and may be controversial. However, the abovementioned relationship shows that changes in population relative to BAU are also relevant to international burden sharing where an absolute global GHG reduction target is specified. A country that can reduce its population relative to BAU needs to reduce per capita GHG emissions by less in order to hit a particular target for that country – provided its target is expressed in absolute reduction terms.

The focus on per capita emissions has understandable appeal from an equity perspective. However, it may generate some unintended consequences. Here are three examples.

First, suppose a small population country is a major producer and exporter of, say, natural gas. Its high per capita emission status reflects production and large exports of relatively clean energy to other countries. A large population country with large imports of a relatively dirty energy source – say coal – may have a low per capita emission ranking because of limited indigenous production of high emission energy (and a large population).

Under a per capita emissions *production*-based burden-sharing formula, the low population country might be assigned a larger per capita emissions reduction target than the high population, high-emissions energy importing country. If both countries meet their targets, the combined energy production/usage of the two might shift from lower GHG emissions-intensive sources to higher GHG

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6 See *Targets and trajectories: supplementary draft report, September 2008*, Garnaut climate change review, chapter 5, pages 12-21. See also *Draft report, June 2008* Garnaut climate change review, chapter 12, pages 289-308.

emissions-intensive sources. While both countries would have complied with the obligations imposed under the per capita burden sharing formula, global GHG emissions might even rise relative to BAU.

This would be undesirable.

Second, if different countries have very different per capita GHG emissions reduction targets, a serious attempt by them to meet such targets might imply very different market prices for carbon in each market. These differences imply strong pressures to shift emissions production at the margin from the high carbon price markets to the low carbon price markets – 'forum shopping' to get the cheapest production cost deal.

If the low carbon price country markets have the highest emissions intensity, do these carbon price differences set up more incentives to evade the intent of the burden sharing formula, and even increase global GHG emissions relative to BAU?

This would be undesirable.

Third, suppose a high per capita emitter (say Australia) greatly increases its net immigration from a low per capita emitting developing country. If we focus on per capita emissions as the formula for international burden sharing, Australia's per capita emissions task has not changed, but its contribution to the absolute emissions reduction task has been reduced as population rises.

For the developing country supplying net emigration to Australia, its absolute contribution to emissions reduction has been enhanced, but it gets no credit for the change. A reduction in per capita emissions relative to BAU *and* a reduction in population relative to BAU both work to increase its absolute contribution to GHG reductions globally, but it only gets credit for the former.

If Australia's per capita GHG emissions are much higher than the developing country in question, the net effect of migration to Australia on global GHG emissions may be to increase them!

This would be undesirable.

Can we avoid these 'unintended consequences'?

The first problem would be greatly reduced, but not eliminated, if country GHG reduction targets were expressed in terms of per capita GHG emissions *consumption*, rather than *production*. This shift in the GHG emissions policy target base would also greatly reduce the 'free rider' or 'prisoners' dilemma' problem that is likely to prevent consummation of a truly global deal on climate change policy. It's also fairer: per capita emissions *consumption* is higher in richer countries.

Interestingly, Garnaut appears to be aware of the production/consumption problem. For example, on page 304 of his Draft report, he notes:

> *Where Australia produces emissions-intensive goods for export, it is logical to cover the emissions from that production with purchases of emissions from international markets.*

Suppose we purchase such permits from countries importing our emissions intensive products. Presumably we should add the cost of those purchases to our export prices before we sell the products to such countries. What is the result? At best, the revenue from permit sales to Australia offsets the increased cost to the importing countries and they continue to import our products. The net change in costs to them is zero: the intended price signal has been neutralised! At worst, the importing countries pocket the revenue from permit sales and switch demand to cheaper sources of supply anyway. 'Carbon leakage' is the result. This seems an ineffective and convoluted way of working around a cleaner solution: focus on emissions consumption as the target base for policy. (A similar argument could be developed on the import side, where Garnaut might argue the importing country should sell emissions rights into international markets.)

The second problem suggests that a reasonably consistent global market price for carbon is a desirable benchmark to prevent 'forum shopping', 'carbon leakage' undermining efforts to reduce country emissions, and unnecessary and ineffective 'churning' of emissions permits.

The third problem requires some policy attention to population, and where feasible, utilising scope for reducing population growth over time, as part of the burden sharing approach. The implications of net migration (which can change much more quickly) need to be addressed as well.

We need to think a good deal more about the design of globally consistent GHG abatement targets for each country if climate change policies are to be effective and efficient.

Focussing on *total* country emissions *consumption*, and not production, would help.