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Carbon pricing after Copenhagen: an updated assessment

Analysis and implications of market-based emissions reductions

SYNTHESIS REPORT

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Report Author

Professor Michael Grubb
Chair of Energy and Climate Policy,
Cambridge Centre for Climate Change Mitigation Research, University of Cambridge
Editor-in-Chief, Climate Policy journal.
Board Member, Climate Strategies

Synthesis report from a Climate Strategies project in collaboration with the Institute for Global Environmental Strategies, Japan

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Carbon constraints: Assessment and implications of market-based emissions reductions for industrialised economies worldwide. Published 2012

EXECUTIVE SUMMARY

This Synthesis paper provides an overview analysis of how climate action is developing internationally, drawing upon the three component reports. It offers particular focus on the role of and lessons learnt from emissions trading, and potential implications for countries considering carbon pricing as part of climate policy, grouped around four main issues.

1. Emerging carbon constraints and their potential implications

The addition of Australia, California, and Korea to the regions implementing emissions trading, together with the emerging pilot schemes in China and elsewhere, suggest a trend which shifts the dynamic away from the Atlantic divide centred around the EU and US, to Asia-Pacific initiatives.

Rational US Federal action is blocked by a deep ideological divide reinforced by industrial lobbying, combined with the high legal hurdles in Congress. All regions, particularly industrialised countries, have responsibility to act given what is known about climate science. The absence of coherent US Federal regulation - which is likely to persist for many years - does not provide a credible excuse for inadequate action by others.

The broadening of cap-and-trade systems in the Asia-Pacific region will increase pressure for other industrialised economies – particularly in the region - to explain and strengthen their domestic policy.

Economies that fail to engage positively in the drive for stronger action may face a number of possible consequences:

- *Reduced influence on the structure of regional schemes and their potential linkages:*

  It is more likely that countries less engaged early on will ultimately have to adapt to rules developed elsewhere.

- *Weaker drive for energy efficiency due to the lack of coherent carbon price signals:*

  In theory price can be supported with either tax or trade, to date in practice energy or carbon taxes have been more complex in structure (with different prices / participation for different sectors) whilst carbon trading has established a more common price, differences instead being established through allocation.

- *Greater risk of bad investment and ''stranded assets':*

  Investing in carbon-intensive capital that may endure for decades clearly involves a risk of these being 'stranded', as the underlying science and international negotiations serve to strengthen carbon controls. Establishing a credible carbon price mechanism would make these risks more apparent to private sector investors and thus help to align long-lived investment with the scientific realities.

- *Weakened influence on international negotiations*:

  Credibility in the 2015 Durban Platform negotiations is likely to be strongly influenced by the extent to which countries have engaged in effective domestic action.

Many, though not all, of the regions now implementing cap-and-trade are energy importer regions, where it is easier to align climate policy with domestic energy security concerns. The implications of this have yet to be fully considered.

2. Potential impact of an ETS on national economies worldwide

Although national policies in many developed and emerging countries address energy efficiency, additional measures are needed to systematically address emissions from other sectors. ETS is used here in relation to industry and power generation. The potential impact of an ETS covering these sectors depends strongly upon how it is designed, and how it relates to a broader vision of the future of the national economy in a world of volatile energy prices. It is also an era in which the reality of carbon constraints must be recognised in industrial development if it is to be economically sustainability.

For most sectors within industrial economies, carbon costs will for a long time be secondary to most other factors determining competitiveness, and systems can be strengthened over time as policy design (including international cooperation) evolves. An ETS has potential to help all sectors deliver carbon targets in efficient ways, and accelerate an economic transition towards a less carbon intensive economy required in the 21st Century.

Like any policy choice, an ETS can involve both benefits and costs. Evidence from the EU ETS is that it can clearly deliver operational emission savings in efficient ways across a broad spectrum of industry. To maximise other benefits, an ETS needs to be seen as an important component of broader carbon and

economic policy against the strategic background of multiple 21st Century challenges. Attention to the linkages with other policy instruments and objectives can improve effectiveness and acceptability, e.g.:

- target free allocation where justified (below) but otherwise auction allowances
- make good use of revenues to accelerate energy efficiency (particularly for vulnerable customers) and low carbon innovation, and to support relevant infrastructure
- consider options for improving the long-run stability and incentives for low carbon investment, which may imply measures for some price stabilisation or clear principles for tightening caps in successive periods

One important consideration is whether to include electricity generation along with other sectors in an ETS. Benefits of doing this could include:

- Provision of a clear signal to the industry of the risks inherent in any new coal plant
- Improving the profitability of low carbon generation, including providing a clearer strategic 'route to competitiveness' of emergent renewable energy technologies

The cost of this would be impact 'downstream': the impact on electricity prices would depend on how this is regulated, and impact on overall bills would also include the offsetting contribution of energy efficiency policies.

More generally, the potential costs of an ETS are most obvious in relation to energy intensive industry. The continued economic and industrial strength of Germany demonstrates that an ETS does not necessarily impede economic performance, but the specific effects on industry depend on the nature and balance of 'easing policies' noted below.

3. Impact of 'easing policies' in other ETS'

All the ETS systems examined in this study include easing policies for trade exposed, carbon intensive industries. To date, they have used free allocation as the main measure for direct emissions. This has in practice increased the profitability of energy intensive industry in Europe. With a fixed cap, the ETS provides counter-cyclical support to EU industry – surplus allowances arise in recession, and costs would rise only if and when sectors resume growth and emit more than their free allocation, which now seems unlikely for several years. The support offered to new investment in electricity-intensive industry could also help such industry compete, though obviously this is offset in part by the impact of the EU ETS on electricity prices.

In this sense, combined with the added incentive towards improved efficiency, the EU ETS has provided some competitive advantage to EU industry in dealing with recession. The potential benefits have been lessened by the price volatility, and potential for accelerating industrial innovation has not yet been much harnessed, though there have been some examples as indicated in Paper 3.

The impact of easing policies in other schemes is hard to evaluate yet, but they largely neutralise any adverse impacts within these countries and do offer some potential for them to gain some competitive advantages, particularly over the mid to long term.

In general, policies are likely to evolve to maximise the potential benefits of these systems. At some point, this may mean the introduction of border-related measures, either:

- border leverage, designed to penalise countries not adopting adequate carbon control measures, or
- border levelling, designed to levelise carbon costs faced by products in the same region on a non-discriminatory basis.

The former would be potentially more damaging to any region that had not adopted adequate carbon control measures, but is also more open to abuse and far more difficult (or impossible) to square with WTO rules. The latter – border levelling - could also set regions without carbon controls at a disadvantage, since it would result in importing countries collecting the revenues associated with the carbon used in production, unless there were an agreement to the contrary. Such regions would also be at a competitive disadvantage if they lagged in decarbonisation and associated innovation.

It is unlikely that any region will introduce border-related measures before 2020, but they are clearly likely to be considered if there is insufficient progress at regional or global levels, and (for example) as a fallback option if the Durban platform negotiations fail to reach an adequate agreement in 2015.

4. Potential easing policies in an ETS

The first requirement in any ETS would be to ensure a strong database on the detailed carbon profile of industrial production, together with data on trade and trade trends. It may not make sense for other economies to follow the European model in applying easing policies to sectors purely in relation to their trade intensity. This has little logical basis, has resulted in huge amounts of work and negotiation for negligible environmental or economic benefit, and could even make the system more vulnerable to legal challenge. Carbon intensity should always be a relevant factor in selecting sectors for easing policies.

The industrial base of other economies, and variations in trade intensity, may differ significantly to those of Europe. Free allocation can be useful in certain cases, but can create complexities and risk of perverse incentives and windfall profits as noted in our paper on Easing policies.

Amongst nations with energy-intensive exports, there is a good case for exploring in depth the issues associated with export rebates of carbon control costs. This is a specific area, different from the EU's tentative exploration of 'including importers' in ETS, on which there does not yet appear to be a clear consensus regarding compatibility with the WTO GATT and Subsidies regimes. Amongst nations currently considering adoption of an ETS, it might make sense to explore this with a view to introducing in future years (eg. beyond 2020) if there is not satisfactory progress at regional and global levels.

Finally, mechanisms for carbon crediting of exported equipment – for example highly efficient steel mills – do not have value to these sectors unless they are given value through some carbon-price-related system; and they will lack international legitimacy unless the rules are agreed internationally, to ensure robust MRV and avoid double counting.

Introduction

This Synthesis paper draws upon the three papers of this study:

- Analysis of emerging carbon constraints around the world
- Analysis of 'easing policies' particularly in relation to energy intensive industries and the risk of carbon leakage
- Lessons from the EU ETS particularly regarding the effectiveness of the system and role of trading

These papers point to a complex picture of developments and lessons. This brief Synthesis paper draws some key cross-cutting insights. For convenience, the edited Executive Summaries are appended.

Drawing upon the component studies, this paper also suggests recommendations for policy against this broader background of international developments. It does this whilst acknowledging the risks involved in offering recommendations to other countries that may vary in complex ways from the ones featured in this study. One of the key insights from the study of emerging carbon constraints is that many different countries are finding their own ways to move forward, based on domestic economic and political conditions. There is no universal blueprint. Individual economies must find their own way forward.

Yet, it is also true that climate change is a global issue requiring international response, and action will be both easier and more effective to the extent that there is both coordination and learning. The following observations and suggestions reflect both the evidence in the papers of this series, combined with my own understanding of the technical, economic and political dimensions of the issues.

Context: The 'map' has changed radically

The underlying dynamics of climate change action have changed in ways hard to conceive only a few years ago. Up until the Copenhagen conference, the US was the centre of international attention; China came increasingly into focus, but partly because of US preconditions around Chinese actions. The attempt to pressure China into more action to solve an American problem backfired spectacularly. At the Copenhagen Summit of December 2009, it almost destroyed the global negotiating process.

There were however two crucial outcomes from the Copenhagen process.

The first was that it delivered an outcome the US judged as good as practicable in the circumstances. Despite this, the US was unable to deliver domestically the following summer, despite the most favourable imaginable political circumstances. Serious US Federal legislation is as a result hard to conceive for many years. One key lesson is that too few US Senators appear to care about what happens elsewhere: the US political system appears to be locked in a sceptical, ideological divide that has no relationship to the real issues in climate change or even US strategic interests.

The other major achievement of the Copenhagen process has proved far more enduring. The intense global effort in the run-up to the summit saw more open acceptance of the basic fact that climate change is a global problem, and that it cannot be solved without major contributions in particular from the emerging economies. In practice, numerous countries adopted pledges, which together with the basics of the Copenhagen Accord have since been embodied into the ongoing UN negotiating process.

That second achievement, combined with the wider changes in international economic and politicsl conditions, appears to be the more enduring legacy of Copenhagen, which for this reasons has been called 'one of the most successful failures in the history of multilateral diplomacy.' 1 Indeed, the inability of the US to follow through its implicit promise in Copenhagen is proving to be a less serious obstacle than might have been expected for three reasons:

i. The US Federal situation has not killed off action elsewhere. The most striking finding of the paper on emerging carbon constraints is the widespread emergence of activities in many parts of the world. These include many and varied efforts to establish cap-and-trade schemes, extending well beyond the industrialised world and encompassing up to thirteen regional and city pilot schemes in China. Asia is a particular focus of activity.

ii. The US is still making some progress on emissions mitigation. This reflects a combination of (a) State level and City level actions in the US (see some observations on this pattern below), (b) Federal action on other pollutants that also act to reduce greenhouse gas emissions, and also on fuel efficiency driven by oil import concerns;

(c) the Shale Gas revolution in the US which has shifted economics towards favouring gas relative to coal power generation, particularly when combined with

(d) Sustained NGO 'grass roots' level action, which increases the regulatory cost and risk associated with coal power developments.

iii. It is now an inescapable fact that trajectories of the BASIC countries will be a major

1 Michael Jacobs, 'Deadline 2015', Nature, Vol.481:137-138, 12 Jan 2012.

determinant of future global emissions and thus they now assume a more central role in the global effort. These countries are becoming less inclined to use US gridlock as an excuse for inaction and the politics of Durban illustrated a new dynamic – the US, having insisted on a principle of 'equal legal footing' with China, was effectively forced to join the Durban Platform when China signalled its willingness to sign up to the legal principles involved.

The result of (ii) is that US emissions over this decade may move on a trajectory similar to that planned under the cap-and-trade legislation, though the messy patchwork nature of the response means that it risks being more costly for the US than it needed to be. The result of (iii) is that US is losing the dominant but largely regressive influence on global climate efforts that it has exerted over the past decade.

For other countries to make their domestic action conditional upon US Federal action is, essentially, now a thinly-veiled excuse for doing nothing. The US cannot adopt a Federal cap-and-trade system for reasons that have little to do with the pros and cons of the case, and everything to do with the state of US politics and the structure of decision-making in Congress. The rest of the world knows this, and hence will not accept the excuse of US Federal stalemate as an acceptable reason for other countries failing to implement more effective domestic legislation.

Other industrialised economies need to decide on their own terms whether to be part of the growing international effort to establish effective carbon controls. Those who do not support a strong, legally-binding top-down global deal have to show that the alternative – that countries will take strong, decisive action of their own accord without it – is credible, and not an excuse that ends up with global failure to tackle the problem. For example, Japan's stance at present – rejection of Kyoto II, unclear stance in relation to any strong 'top-down' international framework, combined with apparently inadequate domestic action – is not widely seen as a credible position and this may have growing international repercussions as negotiations, and the actions of other regions, proceed.

The pattern of action (and inaction)

It remains hard to interpret the full pattern. The reality is that different countries – and actors in different countries – make progress at different speeds, and according to the context of other political and economic developments. Australia is a notable example where legislation that once seemed almost certain, was then derailed by domestic political turmoil, and then after appearing unlikely was finally passed due to the influence of green votes in a coalition government. In principle the opposition is committed to repeal it if elected; in practice, the legislation is designed in part to be politically extremely difficult to repeal, in part because of the way revenues are redistributed to consumers.

The emergence of targets and some legislative measures – including cap-and-trade – in cities is also notable. Like some of the pilot programmes (e.g. in China, where in theory some 17% of its national emissions will be under one or other pilot trading programme) it is still hard to know the likely strength or impact of many of the schemes. Nevertheless all this points to two important conclusions.

One, as already indicated, is that the traumas of 2009-11 have not stopped international efforts on climate change. They have, rather, caused these efforts to take different and more diverse forms across various regions and with more varied actors. Once individuals within political systems have become convinced and committed to action, it appears they do not give up. This phenomenon increasingly transcends traditional North-South boundaries.

Second – and consistent with the broader history of environmental legislation – is that climate policy very rarely reverses. Apparent momentum may be stalled by political developments, but it is hard to identify any substantial legislation that has been reversed.

Is there a clear pattern that determines which regions (and actors) have made progress? Our studies have not examined this systematically, nor have we found literature that does. However one apparent pattern is that most of the jurisdictions implementing cap-and-trade legislation are energy importers; and it tends to be the role of major energy producers that oppose action. The role of the US fossil fuel industry – spending an estimated €500m on its (successful) campaign to block the cap-and-trade legislation – is the most obvious example. The money and lobbying power of these industries, combined with the extremely high legislative hurdles in the US Congress, overwhelmed a sizeable effort from NGOs and cleaner industries. However, in California it was the reverse: it is no accident that the most ambitious US action is led by a State which is neither a fossil fuel producer nor indeed major producer of heavy industrial goods.

In Europe too, it is Poland – by far the most coal-intensive country in the EU – that fights the rear-guard action against strengthening the EU's climate policy.

There are some notable exceptions. Australia managed to get its legislation through, but despite being the industrialised country most afflicted by climate-related disasters, it was still only a narrow victory over the opposition of coal and some heavy industry interests. In that sense it is "the exception that proves the rule." South Africa is also moving ahead with a carbon tax in a unique way for a major coal producing country. Korea has strong, energy-

intensive industries, but is far more limited in its domestic energy resources. In general, it is energy importers that are moving to adopt cap-and-trade or pricing legislation, presumably because of potential alignment with domestic energy security concerns.

Bottom up: the political context

This reflects that emissions trading – or any effort to price carbon - is not just a complex technical matter, but intertwined with much broader issues of political context. This affects both how the effort might be approached and the designs that might emerge.

Themes that emerge include the value of sustained efforts including a sense of long-term political commitment. When important actors – including industry – become convinced that climate legislation is ultimately inevitable, the nature of the negotiations changes. This is a combination of underlining the core science and avoiding making progress too conditional on others, as well as other less climate-related factors around the domestic political scene. Cultivating some bi-partisan consensus on the ultimate need for action is an important part of this.

Both this, and the move to specific legislation, requires some degree of stakeholder engagement, particularly in less strongly 'top-down' societies. The theme of cultivating stakeholder involvement over extensive periods is an emphatic conclusion from the study on emerging carbon constraints; it enables policymakers to gain more strategic allies, and also to judge better what kind of concessions are required to bring specific constituencies "on board" to support specific legislation.

From this follows the other core observation: there is no universal blueprint for how to do climate legislation. Countries are adopting a wide diversity of policy approaches. Most are characterised by a mix of instruments, and the emerging cap-and-trade schemes are many and varied in their sectoral structure and scope.

All the regions adopting more ambitious climate policies recognise that carbon pricing in some form is an important component (it is hard to reach any other credible conclusion in a market economy). Those that are not moving to price carbon are basing their arguments upon competiveness impacts (considered below) in the absence of action by others, or (for many developing countries) not yet being ready to act in this way.

Purely technology-push strategies were not evaluated systematically in this study. Nevertheless, the failure of technology-push strategies, as espoused by some governments, to make any obvious breakthrough or discernible impact on emissions has undermined their credibility. The difficult progress of CCS – and increasing emphasis upon its dependence on high carbon prices - makes CCS far less credible as a future 'retrofit' solution to continuing carbon-intensive investment. The quiet closure of the "Asia Pacific Partnership" is perhaps symbolic of the loss of credibility attached to purely technology-driven solutions.

Carbon pricing and complementary measures

At the same time, no regions are relying entirely on carbon pricing. Programmes on energy efficiency, renewable support schemes, and technology support programmes – both push and pull - all play a role. Even Australia, where the government espoused the 'purest' approach emphasising carbon pricing, has ended up acknowledging the importance of some complementary instruments. Carbon pricing is a 'necessary but not sufficient' component of a credible domestic policy.

Figure 1. Range of mitigation opportunities

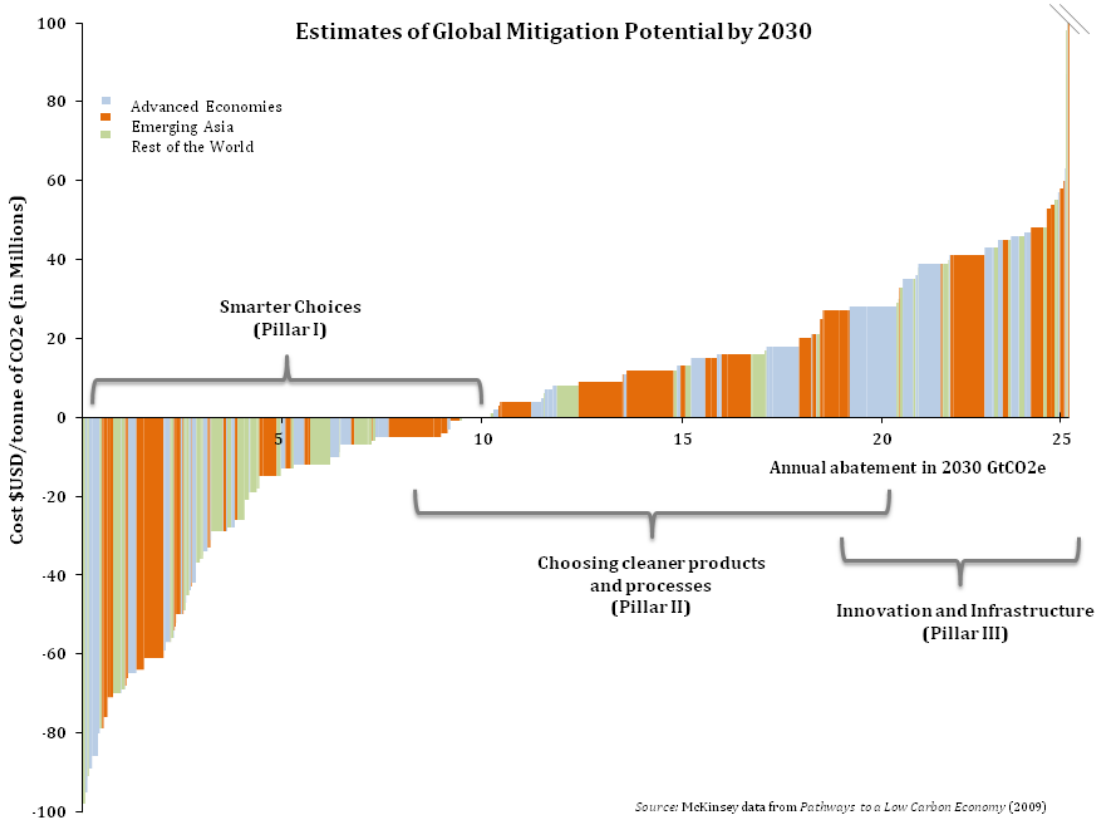
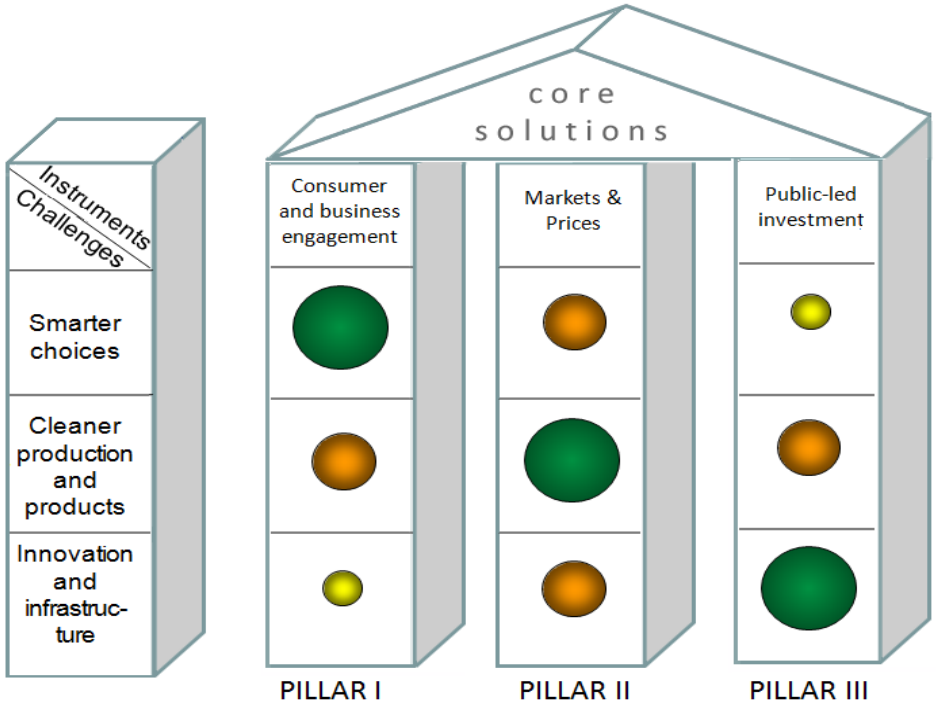


Figure 2. Three main classes of policy instruments



Source: M.Grubb, J.C.Hourcade and K.Neuhoff (forthcoming 2013), *Planetary Economics and the three domains of sustainable energy development*, Taylor & Francis / Routledge, Chapter 2 Figure 4.

This is reflected in Figures 1 & 2. The top part shows a typical "cost curve" of emissions abatement and emphasises that it has three broad components:

- the zone of 'negative cost' opportunities, notably many forms of energy efficiency;
- the zone of moderate cost, in which substituting between higher and cost products and processes requires the incentive of a carbon price;
- the zone of innovation, and infrastructure investments, which are unlikely to be stimulated just by a carbon price.

The lower half of the Figure (2) attempts to illustrate that the different opportunities are most directly targeted by different types of instrument, though all – particularly carbon pricing · have some influence across the spectrum of opportunities.

The EU experience points to the importance of considering how these various instruments may interact. The collapse of EU ETS prices in the past few months is generally attributed to the impact of the recession, although the state of international negotiations also affects market expectations, and hence carbon prices.. The recession undoubtedly made prices collapse earlier and more severely than they otherwise would have, but there was substantial analysis demonstrating that the combination of renewable energy and energy efficiency targets would leave little space for the EU ETS. This – and indeed the current distressed situation of the EU ETS – has important design implications, as indicated below.

The EU ETS has clearly cut emissions, estimated at 40-80 MtCO2/yr on average over the first four years, despite the relatively weak caps set (Paper 3, Table 1). Despite its current difficulties, the EU ETS experience has a number of other positive dimensions. It has enabled a single price to be established across multiple jurisdictions (albeit greatly aided by the existence of EU institutions and the context) – an achievement not matched in any other aspect of EU energy policy, or the prior efforts on carbon taxation. It supplanted a mix of far less ambitious and more diverse schemes. The trading has injected flexibility that has been important to industry participants, enabling aggregate caps that were collectively stronger than would have been possible under traditional instruments. Despite allowances now recognised as surplus in both Phase 1 and 2, it has clearly cut emissions, by amounts significant compared to any other instrument. Many industries have in fact profited in the process – legitimately, as well as 'wind-fall profits' (see the working paper on easing policies), which are less positive. Further its existence has unambiguously demonstrated that achieving the caps set has involved far lower carbon prices than almost anyone expected.

However, carbon pricing needs to be considered as part of a broader strategy. The interactions between different instruments must be considered. Fragmentation of markets clearly may increase costs for business, compared to a top-down, integrated, internationally-negotiated set of rules. Yet whilst this has clear potential benefits, regional cooperation – with a possible view to linking systems – at present appears to be more practical, and may help to create a more solid basis for global action in the future.

Regional interdependencies

The developments in recent years yield somewhat contradictory insights into the question of international interdependencies.

The willingness of a number of jurisdictions to proceed despite the setbacks at both Copenhagen and the US Congress would seem to suggest that progress in one country depends little on others.

However this seems far too simplistic. Canadian intransigence, whilst motivated partly by its tar sand interests, is justified with reference to US inaction. Conversely California is partly self-defined by its distance from Washington and spirit of independence – buttressed in this case by a relatively limited scale of energy trade with its neighbours, compared to the scale of its economy; and it too made its major progress in the context of expecting regional cooperation through the Western Climate Initiative. However, without the shelter of Federal action, some of the smaller states backed out; the scale of asymmetry made it hard to sustain an unequal partnership in the face of trenchant political opposition.

In Europe, it would have been impossible for the UK, France or Germany to put a price on industrial emissions in the absence of the EU-wide structure under the EU ETS. The Australian opposition tried trenchantly to argue that Australian action was pointless in the absence of key Asian players in particular. The emergent efforts in China played an important political role in helping the Australian debate, and probably in Korea too.

This suggests that the possibility for regional action, reflecting existing political and trade relationships, is an important factor. China is obviously important, but it is inward looking, its schemes are less developed, and its sheer scale and the difficult political relationships may make cooperation difficult.

Across the rest of Asia, the Korean Parliament's decision, and the strong and growing interest in cap-and-trade in Taiwan, are significant. A Pacific-rim collaboration between these and a number of other countries, perhaps together with Australia and New Zealand, could be an option for governments of these

countries to work towards. This could create a coalition sizeable enough to credibly consider direct linking with the EU ETS, if appropriate terms could be established. And/or linking with California could bolster US efforts, and create a zone also on a par with the scale of a possible emergent Chinese system – or systems.

As emphasised, this is a two-way process. The Australian government has for example underlined that the credibility of domestic action elsewhere - particularly in the Asia-Pacific region - will be of crucial importance to the future development of its own domestic legislation (personal communications).

General lessons on design

One general, systematic lesson – which sits well with the observation on the importance of stakeholder engagement – is the need for good data.

The rapid establishment of the EU ETS in the period 2002-4 was a remarkable achievement, but it came at a cost. The inadequacy of detailed data limited understanding of how the system might affect different participants. This contributed to the subsequent difficulties in cap setting (at least for Phases 1 & 2), allocation (between different sectors and entities), and the excessive range of sectors classified as being "at risk of carbon leakage". It appears that certain countries, of which Japan is one example, has used the delay in its domestic effects well to collect data and this effort should be maintained to ensure a good "time series" understanding. Maintaining a good historical record of past projections may also help to dispel the idea of spurious accuracy in projections.

The next section outlines briefly possible lessons on scope and sequencing, price uncertainty, and carbon leakage.

Scope and sequencing

The EU ETS underlines the value of establishing a system that can evolve through various stages, and this reduces the pressure to "get everything right" first time.

In terms of a system to control industry (including power sector) emissions, it probably makes sense to start with a focus on the big point sources, with a view to lowering the size threshold of participants over time if and as justified.

Tensions have arisen from the EU's decision to regulate purely at 'point of emission' (e.g. not downstream), and to include both power generators and heavy industry in the same system. The treatment has become more differentiated at each stage:

- Phase 1: Very little differentiation, rather "ad-hoc" allocation
- Phase 2: Key countries increased level of auctioning (cutback free allocation) to power sector
- Phase 3: Move to centralised allocation, end of free allocation in power sector, benchmark-based allocation and differentiation of industrial sectors classified as "at risk of carbon leakage"; some deference to downstream impacts of electricity prices through targeted revenue recycling support to efficiency investments by electricity-intensive industry, governed in the framework of EU State Aids legislation.

However, the benefits of having a single integrated carbon price across different sectors in the EU is huge. The problems of 'competitive lobbying' by industries in different countries in the Phase II allocations in particular were substantial and only resolved by central intervention by the European Commission. The problems of coping with different carbon prices in different EU Member States, or between different manufacturing sectors, would be tremendous, and would induce major inefficiencies compared to the achievement of a single carbon price across all major EU industry and power generation.

There will always be pressures to differentiate treatment, and exempt certain sectors, but this risks even greater complexity and potential for different sectors to use claims of differential carbon pricing to weaken regulation ("race to the bottom"). In general it seems better to differentiate through allocation (and maybe threshold) negotiations, rather than through different systems. Differentiation and its corresponding complexity should evolve as the system gains experiences and becomes tougher – driving the need – rather than from the outset. This does not necessarily preclude some sectoral strategies, as indicated below.

Some countries, amidst discussions on ETS, have considered "downstream" allocation of electricity-related emissions, to users. Phases I and II of the EU ETS revealed some of problems of excessive free allocation to power generators, but Phase III may provide a better model (not so appealing to the generators themselves, though they have now adapted to the Phase III design).

Price & cap uncertainties

Emissions and prices substantially below those initially expected seem to be a systematic pattern (also true in the US RGGI system). Either the caps set need to take full account of the likely impact of complementary measures and more conservative estimates of economic growth, or systems need in-built mechanisms to deal with uncertainties, including the impact of complementary measures. This points to some important lessons in design.

Decision-making to set caps is complex. If there are many diverse actors – as in Phases 1 and 2 of the EU ETS, in RGGI and in the Western Climate Initiative - this can create competitive pressures to loosen the caps, making it even harder. Without a strong, centralised and well-informed decision-maker, it is very hard to set adequate caps – and even if this is practical (which it rarely is) there is still much uncertainty.

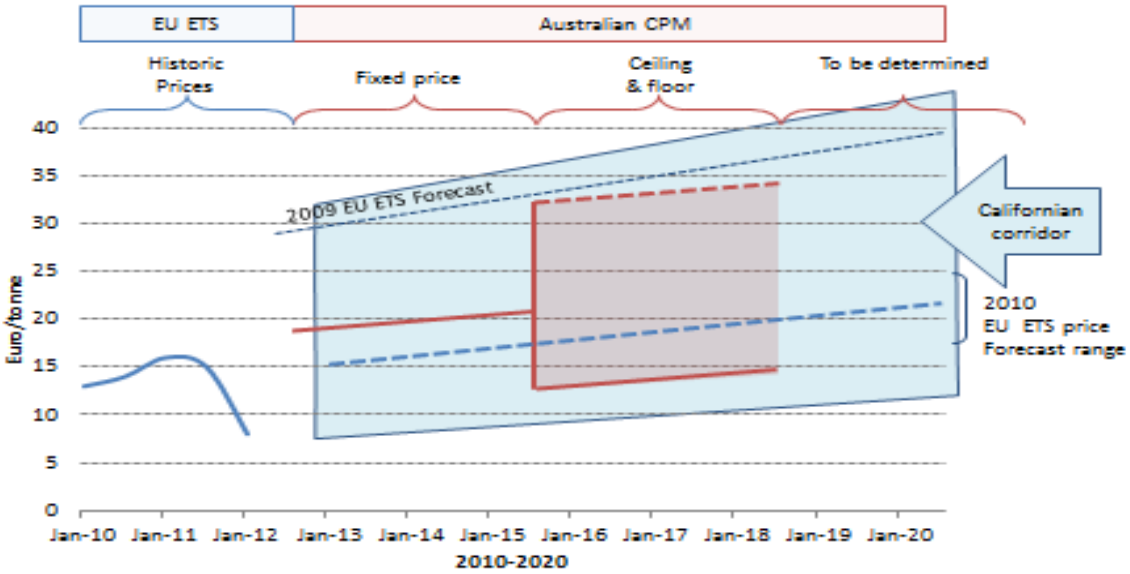
The Australian and Californian systems have mechanisms for ensuring a 'price corridor'; the EU ETS is now alone in not having such mechanisms. Figure 1 shows how the recent trend in EU ETS prices compares to the prices determined in the Australian scheme.[2]

Such price management mechanisms complicate scheme design, and particularly prospects for linking schemes. However, the experience suggests that something like this is needed. It is possible that the need for price stabilising mechanisms might be avoided if there are short sequential periods – 5 years or less, and with banking from one period to the next allowed and taken into account – to enable adjusting the cap as experience evolves. However, the EU situation suggests that an eight-year period without any price management mechanism is too long.

It is notable that the Australian and Californian systems include both floors and ceilings. They are logically separate issues, introduced for quite different reasons (though both rooted in acknowledgement of uncertainty). However, politically, it is very plausible that they are paired: price floors address concerns of environmental inadequacy, and price ceilings address concerns of excessive cost impact on industry, so in lobbying terms it may be either both or neither.

One issue amongst certain industrialised nations may be that, where industries and other sectors are especially efficient, high or steep marginal abatement

Figure 3. EU ETS prices 2010-11 and the price design of the Australian ETS to 2020



Source: M. Grubb (2012), '*Strengthening the EU ETS: creating a stable platform for energy sector investment*', Climate Strategies final report, www.climatestrategies.org.

[2] For more discussion see the international review of carbon constraints (Paper A), and also presentation by R.Betz to Climate Strategies Copenhagen Seminar, Jan 2012 (www.climatestrategies.org)

costs could be faced. Evaluating this claim is beyond the scope of this study, but there will always be disagreements and scepticism. Certainly, CO2/GDP on its own is not an adequate indicator of efficiency, since it is strongly influenced by other factors (notably, the scale and structure of both housing and transport systems, as well as the scale of service sector). A 'price ceiling' might help to test the claim and, by setting a cap on costs, reduce some of the powerful domestic opposition. Ultimately however, if this were to be considered, much would hinge on the level set.

Carbon leakage, competitiveness and easing policies

A particular concern for developed nations lies in the often major role of energy intensive industries. Although, as in Europe, these may account for only a modest share of GDP, experience shows that they cannot be ignored, and exempting them would mean omitting a sizeable share of emissions. Moreover, the EU experience indicates that there may be more substantial emission reduction opportunities than initially assumed, particularly if carbon prices can flow through to influence 'downstream' product choice and associated innovation. There is also evidence (cited in the Effectiveness of ETS paper) that sectors start to increase R&D efforts once they face a shortfall of allowances.

Policy towards carbon pricing needs to recognise the important distinction between 'operational' leakage, from changing the operation of existing facilities, and 'investment leakage' associated with new facilities (or major upgrades). It should also recognise the value of establishing some principles early, to ensure that 'early movers' in industry will benefit and do not risk being disadvantaged by later rules.[3]

Operational leakage is a shorter-term issue, somewhat easier to assess, and more confined to sectors of both very high carbon but relatively lower capital intensity. However it may be harder to address with free allocation without complex – and ultimately damaging - clauses linking allocation to output levels.[4]

More economic value and political attention centres upon actual or perceived risks of investment leakage – the relocation of new capital. This forces a longer-term perspective. It is hugely complicated by the diversity of factors that may affect industrial location decisions, which can include exchange rates, labour costs, corporate tax rates, and so on. This makes it hard to address successfully without a broad understanding of the international forces and investment trends that are often driven by other factors. It will be hard to develop rational policy without an understanding of these broader dynamics.

Against this background, climate policy carries both risks and opportunities. Obvious economic risks include the possibility that carbon costs could exacerbate competitive difficulties. There are however also two distinct risks associated with free allocation, that it could:

- become a route to 'backdoor' subsidies that support declining industries in ways not ultimately good for the domestic economy
- introduce perverse incentives that lead industry to focus on political lobbying to protect allocations, rather than innovation that could enhance competitiveness

Conversely, climate policy also offers opportunities. Minimising risks and maximising opportunities requires sector-specific attention.

A focus on steel

A crucial sector is likely to be steel, which plays a large role in the economy and emissions of many industrialised and emerging economies. It is one sector universally recognised as being potentially exposed to carbon leakage, though the degree remains hard to establish. There may be 'operational' leakage risks associated with raw pig iron production, which might point to a possible role for border-levelling for the same reason as for clinker in cement production. There is also however an increasing range of innovative possibilities.

In the EU, the steel industry is increasingly divided in its approach. Most companies accept it is not realistic to assume that they will never face a real carbon price, and even that free allocation is unlikely to be an enduring solution. They seek an industrial strategy, and to help design climate policy to aid this. Within this, two factors seem particularly important:

- increasing focus on where in the supply chain there is scope for Europe to retain or develop 'value added', given that production in low cost, resource-intensive developing countries is intrinsically cheaper, irrespective of carbon-related issues

[3] The EU ETS cement sector is one such example, where the company that led innovative changes to reduce its clinker input to cement manufacturing later complained that it was disadvantaged by rules that allocated EU ETS allowances in proportion to clinker use.

[4] A little noted clause of the EU ETS Directive sets operational thresholds below which facilities would lose allowances. This is most likely a response to risks in the cement sector; for a full discussion of these see Carbon Trust, *Tackling carbon leakage: sector-specific solutions in a world of unequal carbon prices*, which explains why border levelling is likely to be a more plausible long-term solution in this case.

- attention to the use of any revenues associated with ETS auctioning, to support innovation and industrial transformation.[5]

With companies increasingly subject to international ownership, this leads to a strategy of appropriate specialisation within broad regional supply chains – production near the cheapest resources, and with downstream value-added and innovation focussed in the European market.

Though steel is a global business, it is still predominantly characterised by regional markets, particularly for the more carbon-cost-sensitive long steel products.

There have of course been serious efforts led by Japan to establish sectoral agreements. The difficulty is that these have never seriously considered the issue of carbon pricing. If anything, they were pursued and perceived as an alternative, and hence they have lacked either credibility or public revenues.

Steel is an important 'test case' of the various options for the choice between 'levelling down', and various border-related mechanisms, as detailed in the paper on Easing mechanisms and with some implications as drawn in the Executive Summary of this paper.

Conclusions

Pricing carbon is essential to tackle climate change, but it is not easy. Probably, Europe was fortunate in being able to seize a political window of opportunity to establish its EU ETS quickly. Other regions need to accept that pricing carbon is not just an environmental issue: it is also a sophisticated challenge of economic and industrial policy, and the associated politics. Some, like Australia, California and now Korea, have navigated these complexities to the point of basic principles and decision, and are moving to design details and implementation. Other regions are developing pilot programmes.

At the same time, many valuable lessons have now been learned. The end of the international obsession with US Federal action offers new opportunities for regions to learn and to act. Carbon pricing needs to be understood in the broader context of complementary measures and regional developments. It offers economic opportunities as well as challenges, and those opportunities could be magnified with appropriate regional cooperation.

Emissions trading offers flexibility to address distributional issues (e.g. with free allocation to key sectors adjusted over time), and international linkages (though linking and crediting systems), as well as clarity around environmental objectives. A decade of challenges has failed to produce any credible approach that doesn't involve carbon pricing. For these multiple reasons, emissions trading is a key part of the responses emerging in many parts of the world, and is likely to remain so.

[5] This is an insight from the Climate Strategies project on Industrial Competitiveness, Synthesis report forthcoming 2012.

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Climate Strategies
21 Silver Street
Cambridge CB3 9EL
United Kingdom