Competitiveness and Linking of Emission Trading Systems

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Competitiveness and Linking of Emission Trading Systems

by

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16. Abstract
The establishment of emission trading systems raises concerns among industries regarding international competitive disadvantages for the industries under an emissions cap. This study aims to assess competitiveness exposure of industrial sectors and presents policy measures to address these concerns. Moreover, the study provides a comparison of different existing approaches to competitiveness concerns proposed by regional emission trading systems.

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16. Zusammenfassung Die Einrichtung von Emissionshandelssystemen führt seitens der Industrie oftmals zu Bedenken hinsichtlich internationaler Wettbewerbsnachteile für diejenigen Industrien, die unter ein Emissionshandelssystem fallen. Diese Studie bewertet, inwieweit verschiedene Industriesektoren dem internationalen Wettbewerb ausgesetzt sind und stellt verschiedene Politikmaßnahmen vor, die darauf abzielen, entsprechende Bedenken zu adressieren. Darüber hinaus werden verschiedene Ansätze zur Adressierung der Bedenken von Wettbewerbsnachteilen, wie sie von regionalen Emissionshandelssystemen vorgeschlagen werden, miteinander verglichen.		
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Table of Contents

List of abbreviations

AAU	Assigned Amount Unit
ACESA	American Clean Energy and Security Act
A/R	Afforestation and Reforestation
ARD	Afforestation, Reforestation and Deforestation
ATFS	American Tree Farm System
AB 32	California Global Warming Solutions Act
BAU	Business-As-Usual
CA	Canada
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
COP	Conference of the Parties to the UNFCCC
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalents
COATS	CO_2 Allowance Tracking System
ERU	Emission Reduction Unit
ETS	Emission Trading System
EUA	European Unit of Allowance
EU ETS	Emission Trading System of the European Union
FPP	Forest Project Protocol
FSC	Forest Stewardship Council
GHG	Greenhouse Gas
IFCI	International Forest Carbon Initiative
JI	Joint Implementation
lCER	long-term Certified Emission Reduction
LUCAS	Land Use and Carbon Analysis System
LULUCF	Land use, Land use Change and Forestry
MRV	Monitoring, Reporting and Verification
NCAS	National Carbon Accounting System

NCAT	National Carbon Accounting Toolbox
NGO	Non-Governmental Organization
NIR	National Inventory Report
NZ	New Zealand
NZ ETS	New Zealand Emission Trading System
NZU	New Zealand Emission Unit
PIA	Project Implementation Agreement
REDD	Reducing Emissions from Deforestation and Forest Degradation
RGGI	Regional Greenhouse Gas Initiative
RMU	Removal Unit
SFI	Sustainable Forestry Institute
SFM	Sustainable Forest Management
tCER	temporary Certified Emission Reduction
UNFF	United Nations Forum on Forests
US	United States of America
WCI	Western Climate Initiative

1 Competitiveness and Carbon Leakage

Emission trading systems (ETS) are intended to introduce a price on carbon to give an incentive to reduce emissions and thereby mitigate climate change. In the absence of a global ETS, industrial sectors or subsectors are not equally affected by the resulting associated direct and indirect costs depending on if they are located in an emission constrained jurisdiction. Direct costs result from the carbon and energy intensity of the production process and the companies' or sectors' access to carbon abatement technologies. Indirect costs may be incurred through higher energy prices, particularly electricity and heat, as a result of carbon pricing.[1]. Both kinds of costs may theoretically challenge the company's competitiveness vis-à-vis carbon unconstrained competitors. The loss of competitiveness may lead production of the good to be relocated to an emission unconstrained jurisdiction, which may have negative environmental and or economic effects known as carbon leakage.

This report addresses to what extent emission constrained competitiveness concerns are reflected in different existing and evolving emission trading systems and how potential future linking may be affected. The underlying questions are: 1). what measures addressing competitiveness concerns and carbon leakage exist and 2), are these measures barriers for future linking between ETSs? By linking, we understand "that one system's trading unit can be used, directly or indirectly, by a participant in another system for compliance." (Sterk et al. 2009: 2). For answering this question it is worth noting that using the instrument of emission trading is intended to cause some affects on the competitiveness of companies based on different levels of carbon intensity existing in the market. Such affects are not linked to carbon leakage and also not subject of this report.

Chapter 1 introduces the reader to the problem of competitiveness concerns and competitiveness-driven carbon leakage[2]. Both, theoretical[3] and empirical evidence for competitiveness concerns and leakage will be presented. In Chapter 2 policies and measures to address competitiveness concerns will be analysed from a theoretical-conceptual perspective. In addition, potential barriers to linking emission trading systems will be identified. The practical relevance for dealing with these policies and measures becomes evident in Chapter 3 in which current approaches towards ensuring competitiveness and environmental integrity are compared. The variety of approaches leads to the question of how these different provisions against competitiveness loss and carbon leakage will affect linking. Chapter 4 summarizes the key findings and concludes this study.

[1] Reinaud (2008: 20) mentions additionally two other indirect cost factors: the higher risks companies bear due to uncertainty about carbon prices and a price increase of low-carbon energy products as a consequence of an increasing demand.

[2] When talking about carbon leakage in the political discussion it is mostly referred to leakage in the context of commodity markets. Görlach et al. (2008) point to the importance of also taking into account leakage attached to theoretically lower fuel prices as a consequence for less demand due to carbon pricing. In turn, these lower fuel prices may lead to higher demand in those areas with less ambitious climate policies. However, the relevance of this leakage channel is hard to determine since the prices for all kinds of raw materials have been rising – or going down due to recession rather than climate policy.

[3] Theoretical evidence is understood in this context in a broader sense including results taken from simulation analysis.

In this context, according to a report published by UNEP and WTO (Tamiotti et al. 2009: 98), “[t]he competitiveness of a sector may be defined as its ability to maintain profits and market shares” after the implementation of a carbon constraining regime. In other words, competitiveness is the ability of a sector or subsector to compete with corresponding sectors outside an ETS. With increasing costs due to carbon pricing, a company will have to decide to either pass on the increased carbon pricing costs to their customers and thus maintain profits while taking the risk of losing market share, or bear the higher costs to maintain market share but losing profit margin. The concern lies in that a carbon price affects certain companies or industries more than others and thus puts them on a competitive disadvantage which may cause carbon leakage.[4]

Reinaud (2009: 7-8) distinguishes the following channels through which competitiveness-driven carbon leakage occurs: 1) short term loss of market shares due to unconstrained competitors benefiting from an increase in costs in domestic carbon prices leading for example, to changes in trade flows (increased imports from non carbon contrained production jurisdictions), and 2) long-term leakage effects through changing investment patterns due to differences in returns on capital with unilateral mitigation action and thus relocation of capital into countries with less stringent climate policies.[5] Other authors refer to operational and investment leakage respectively (e.g. Matthes 2008: 30-31). Policies and Measures (P&M) addressing competitiveness concerns will also address carbon leakage concerns and may address both with a different degree of effectiveness. Analyzing P&M to equalize carbon pricing for certain industries will therefore also entail the evaluation of effects on carbon leakage.

But what makes a sector vulnerable to carbon leakage and a loss in competitiveness due to carbon pricing?

The factors determining the competitiveness of a company exposed to climate change measures can be subsumed under a) the specific characteristics of the sector, b) the design of the regulation, and c) other policy considerations (Tamiotti et al. 2009: 98; see also Grubb & Neuhoff 2006: 10; Graichen et al. 2008; Görlach et al. 2008).

a) Among the crucial characteristics of sectors determining their competitiveness is their exposure to international trade[6], the price elasticity of demand of products[7] and the market structure which influences whether or not a company is able to pass through the costs to the customer, the carbon intensity of the production (i.e. the GHG output

[4] Carbon leakage is understood as the increase in GHG emissions of a sector outside the home country that have less strict or no climate policy while emissions inside the country are decreasing due to climate policy. Thus, the change in emissions pattern is policy-driven.

[5] A third channel of leakage is identified which is not directly competitiveness driven: the rise in carbon emissions due to a higher energy demand in countries with less stringent climate policies. The demand in those countries is theoretically increasing as a consequence of a global energy price reduction reacting to a decrease in demand in countries faced with carbon constraints (Reinaud 2009: 8).

[6] Graichen et al. distinguish between two slightly different indicators: ‘exposure to foreign competition’ and ‘trade intensity’. The first reflects a combination of the export orientation of domestic production and the import penetration of equivalent products into the domestic market. The latter relates the sum of traded goods to total market supply (regional ex- and import over turnover and total imports) (Graichen et al. 2008: 17).

[7] Graichen et al. point to the necessity to not only consider the elasticity of aggregated demand but also the Armington elasticity reflecting the elastricity of substitution between commodities produced in different countries (Graichen et al. 2008: 26-31; see also Reinaud 2008: 22).

per tonne of product), including the electricity intensity and the ability to reduce electricity use in the production process through more efficient technology and/ or carbon abatement strategies. A company's ability to relocate its production site also depends on transport costs both for the product and input resources as well as excess capacity in the rest of the world.

b) Regulation putting a price on carbon affects a sector's or company's competitiveness through its detailed design rules as well as its stringency including accounting methods, evaluation, and sanction mechanisms. Among ETS design rules the allocation method is crucial in affecting the competitiveness directly and indirectly by the way the carbon price is formed: many regulations include exemptions and alleviations.

c) Other policies and measures influencing the carbon price or the ability to abate carbon emissions or to compensate for losses within the country as well as similar regulations in the trading partner's countries will influence the degree of exposure to competitiveness challenges imposed by ETS.

In short, the effects of ETS legislation on competitiveness are a function of the level of international competition for a specific product, the direct and indirect CO_2 emissions associated with production and the ability of a company or a sector to pass through the costs to customers, thereby allowing it to recover costs (Grubb & Neuhoff 2006:10, Tamiotti et al. 2009: 98). Typically these sectors have "some degree of product and process uniformity, leaving consumers to some extent indifferent to where the products are made as long as they are less expensive." (Reinaud 2009b: 72)

1.1 Evidence from simulation analysis

A recent publication on trade and climate change carried out for UNEP and WTO (Tamiotti et al. 2008: 99) drawing on findings of several studies[8] concludes that climate change policies only have minor effects on competitiveness for the majority of industry sectors. For electricity the price elasticity of demand is quite low. This means that the power sector is better able to pass through the costs to customers than certain industries with a higher elasticity of demand. In addition, the comparatively highly regulated market and limited international competition in the power sector make it less vulnerable to carbon increases than energy-intensive sectors (Tamiotti et al. 2009: 99). This has also been proved by several empirical studies concluding that the power sector benefited significantly from opportunity costs in the first phase of the EU ETS (Matthes & Neuhoff 2008: 6). Therefore, the electricity sector is not further addressed below since its exposition to competitiveness losses can be regarded as negligible.

Theoretical models predicted that only a few energy-intensive industries with rather uniform products and intensive international trading were likely to face competitiveness-driven

[8] Jaffe et al. (1995: 158); Harris, Kónya & Mátyás (2002); Cole & Elliott (2003: 1167-1168); Hoerner & Müller (1996: 14); Reinaud (2008: 6, 29, 56); Reinaud (2005);

leakage. Among the most homogenous products are cement, iron & steel, primary aluminium and refined petroleum products (Reinaud 2008: 22). Predicted leakage for these products varied considerably, depending on the price of carbon and the countries implicated: leakage rates for the European iron & steel sector range between 0.5% and 25% for the EU at a CO2 price of EUR20, and between 40% and 70% for the European cement sector (depending on price, how allowances are given out, and other model parameters).[9] None of the simulations indicate leakage rates close to 100% so that there is always a net carbon-saving gain (see compilation by Reinaud 2008: 4; 36; see also Grubb et al. 2009). Cement is a carbon intensive product, but is comparatively lightly traded. It is expensive to transport overland giving local production inside the continent, but can be shipped cheaply in bulk leaving cement markets close to major ports more prone to competition and therefore leakage. This accounts for major leakage figure between countries like the UK and Germany.

Graichen et al. (2008) analyzed impacts of direct and indirect costs on the value at stake and the trade intensity[10] for German industrial sectors. They applied a similar method as the analysis carried out by Grubb & Neuhoff (2006) as well as Demailly, Hourcade, Grubb, Neuhoff & Sato (2007) for the UK. Their approach allowed for the comparison of sectors receiving free allowances (which would reflect the sectors' exposure to electricity price only) with the maximum cost increases due to 100% auctioning. A second dimension was added to enrich the comparison: the sectors' exposure to international trade, indicated by the import intensity from outside the EU (Grubb & Neuhoff 2006: 10).

The studies concluded that competitive concerns are limited to a few industry sectors.

Both in the UK and in Germany, there are only a few sectors exceeding cost increases due to auctioning, leading to a maximum value at stake[11] of 10%: basic iron & steel, fertilizers & nitrogen compounds, and aluminium and aluminium products. Additionally, paper & paperboard, and other inorganic chemicals are among this group in Germany but not in the UK. Generally, the trade intensities in the UK are significantly higher than in Germany.

The trade intensities in Germany increase from cement (1-2%) to iron & steel (ca 15%), fertilizers & nitrogen compounds (ca 19%) to aluminium (ca 25%). Only dyes and pigments have a higher trade intensity of about 55%.

Other studies (e.g. Reinaud 2005, Reinaud 2008, McKinsey & Ecofys 2006) come to the conclusion that cost increases due to auctioning or permit sales will be highest for cement[12] production compared to any other sectors (this will lead to various levels of leakage depending on the point of sale as mentioned above), followed by the refinery sector and blast oven furnace steel. As the aluminium sector's competitiveness concerns are mainly due to indirect costs increases, the allocation method is only of minor importance here. In addition,

[9] Demailly and Quirion (2008) predicted a leakage ratio of 20% for the EU 27 at a EUR 15/tCO2 price. At a price of EUR20/tCO2, Panssard and Walker predicted a leakage rate of circa 70%, though in their model the ratio only rose to 73% at a price of EUR50/tCO2.

[10] Trade intensity is one indicator for a sector's ability to pass through costs. It is understood here as imports from a country plus export of the country (i.e. sum of traded goods from the non-domestic country) related to the total domestic market supply (i.e. sum of domestic production and imports) (Demailly et al. 2007, Graichen et al. 2008).

[11] Change in cost and benefits relative to the sector value added as a result of imposing an ETS (including direct and indirect cost increases).

[12] and lime in Germany

this sector is the one most unlikely to pass through the costs to their customers. McKinsey & Ecofys even conclude that the refinery sector may benefit – similarly to the electricity sector – from windfall profits. They further estimate only insignificant net cost increases to most sectors such as chemicals, pulp, electric arc furnace, or secondary aluminium.

Though various models have been developed to predict possible effects, they have had difficulty to predicting actual loss of competitiveness due to carbon leakage. Actual losses may have yet to be seen since there are currently no economies that face full auctioning (such losses may never emerge thanks to countermeasures described later in this study). Further empirical evidence is limited in that the only ETS that has already entered a second trading period, the EU ETS, over allocated credits in its first trading period. Therefore evaluations of results of actual leakage may have limited power to predict results of when a system enters full auctioning for emissions. Several studies evaluating trade flows, production patterns and price developments in those theoretically exposed sectors for the first period of the EU ETS, did not detect major impacts of this new policy instrument (see especially Reinaud 2008: 60ff; Reinaud 2009b: 72):

Primary aluminium has experienced no change in trade flow patterns in part because of long-term contracts for electricity prices cushioning the impact of carbon price signals. Additionally, high profit margins were observed and mainly attributed to a general increase in demand and thus in prices for aluminium. The refining sector has also not seen significant change in trade flow, production patterns, or prices. Indeed only modest competitiveness effects have been observed in recent years. Finally, neither did the cement nor iron & steel sectors face significant changes in trade flow or production patterns during the first auctioning period of the EU ETS (2005-2007). It is assumed that the lack of leakage in these cases was partly because of a combination of over allocation of permits, the free allocation of permits, and long standing electricity price contracts (Reinaud 2008:6).

1.2 Merging theoretical, empirical and modelling approaches to assess competitiveness exposure of industrial sectors and subsectors

Studies addressing competitiveness impacts and leakage risk conclude that only a few sectors are at risk of being affected by ETS; among those are cement, blast-furnace steel, and primary aluminium. Evaluation of the first trading period of the EU ETS show that even within these sectors, no major impacts could be observed. There are, however, doubts that carbon constraints due to emissions trading in Europe will have such minor effects in the future long-term contracts (such as for electricity) are expire, stricter caps will be imposed, and auctioning will increasingly replace free allocation. This will affect the electricity-intensive primary aluminium industry where currently no major plans for investments in Europe are scheduled. Other than in the aluminium sector, there are not yet clear signals that the importation of finished products will increase in the refining sector due to carbon pricing. This may be different for semi-finished products since their production factors can more easily be substituted. McKinsey & Ecofys expect the CO_2 price effect on the refining sector to be neutral. With a change in the allocation method to auctioning, output prices will most significantly rise in the cement sector. Depending on the location of the plant (proximity to ports as previously mentioned, etc.) a price constraint on carbon may affect the future competitiveness of the sector differently. McKinsey & Ecofys calculated cost increases for the marginal unit of cement of about 36%. This amounts to roughly the costs for transportation from abroad and thus may expose the sector to competitiveness risks. According to McKinsey & Ecofys, also the blast oven furnace steel will face stronger competitiveness impact (cost increases of marginal unit of steel of about 17%) than the electric arc furnace steel, which will only be affected to a minor extent.

Additionally, there are a number of uncertain factors affecting future commodity prices. For instance the consequences of the global financial crisis, data availability for less aggregated sectors, the need for imputing individual geographic and price building mechanisms, the consideration of the production stage (as noted above, estimates of competitiveness losses are different for semi-finished and finished products), or the influence of other policies make it very difficult to disentangle carbon price effects on a sector’s competitiveness. In turn, the determination of appropriate compensation measures (if appropriate at all) will have to deal with these factors. In order to compare different countries’ approaches towards preventing competitiveness losses and carbon leakage, it is not sufficient to just compare the basic type of measures that are discussed and decided upon. Especially the underlying definition of who is entitled to gain from compensation measures (eligibility criteria and threshold) will have to be looked at in more detail. These criteria may also vary because of country-specific priorities expressed in the policy goals. The comparison in chapter 3 will accordingly reflect the respective policy goal, the eligibility criteria and threshold, and finally the chosen policy instruments to address competitiveness and leakage concerns.

2 Policies and Measures to address competitiveness concerns

In the last chapter, it was shown no evidence for significant competitiveness losses and carbon leakage exists. Most of the studies referred to above emphasized however that this may change in future especially in the light of tightening caps. More ambitious caps are associated with higher carbon prices. In addition, many uncertainties persist such as the development of the global financial crisis. Also, differing willingness among countries to agree on binding carbon emissions reductions may influence companies' investment decisions. This has led to much attention among affected actors and policymakers to consider the implementation of policies and measures to minimise competitiveness losses due to carbon constraints. Especially in ETS covering installations from countries with differences in energy structure and degree of industrialised development (e.g. Germany vs. Poland), policies and measures addressing competitiveness concerns are often the basis for political compromises. The policies and measures addressing competitiveness concerns that are introduced in this chapter may differ according to their potential for political acceptance. ETS, or generally speaking carbon pricing only challenges competitiveness of sectors or subsectors because cost increases are unequally distributed between competitors. Achieving a global agreement would be the most comprehensive answer to prevent unequal cost burden upfront. There are principally two ways of creating global carbon trading: a top-down global ETS and a bottom-up trading system through linking existing domestic and regional ETS.

The first solution would be a fully-fledged global (i.e. top-down) ETS and thus imposing a similar marginal cost of carbon everywhere. Such a top-down system would reach the highest environmental effectiveness and economic efficiency because of its all-over inclusiveness. Introducing a global cap is politically improbable in the near future. Further, information asymmetries due to market concentration are prevalent in practice and are likely to influence the marginal abatement cost. In other words, while the price stays the same, it may not reflect the true costs. Thus while theoretically being superior in terms of environmental and economic effectiveness, barriers in the real world put the superiority into question. Accordingly, establishing global carbon trading in a bottom-up system by linking existing ETS is the next best solution (Flachsland et al. 2009).

ETS can be linked directly via uni-, bi-, or multilateral recognition of allowances[13]. The recognition of a third trading unit in several formally independent systems is often referred to as indirect linking. The eligibility of Certified Emission Reductions (CERs) in different ETS would be an example for indirect linking.

Direct linking (e.g. through the adoption of a binding treaty) results in the establishment of a uniform carbon price. As a consequence, competitiveness concerns among the trading partners are theoretically negligible but may persist with regard to trading partners outside the linked systems. However, formal linking implies political trade-offs compared to other less binding or indirect linking options. In this regard, Flachsland et al. (2009) emphasize varying

[13] Flachsland et al. (2009) refer to 'formal linking'.

emissions prices in the separate markets pre linking due to, for example, emission reduction potential or target stringency. After linking, prices converge which may not be the politically acceptable outcome. Therefore, compromises in the linking mechanisms are likely. Bottom-up linking is, to a certain extent, capable of addressing such competitiveness concerns. The resulting political compromises may however neither preclude carbon leakage outside the linked schemes, nor ensure the abolishment of policies and measures addressing competitiveness concerns (e.g. free allocation for energy-intensive sectors). If an international carbon abatement system fails to impose a global cap to place a similar carbon price for all countries, competitiveness concerns will persist.

Considering competitiveness issues in the context of linking therefore requires the examination of policies and measures addressing competitiveness concerns. Some of these measures address competitiveness issues outside the ETS (sectoral approaches, border adjustment measures). Other measures address competitiveness concerns within the ETS (allocation rules, compensations by rebates, price ceilings). The following sections will present the most prominent policies and measures addressing competitiveness concerns. They will be analysed regarding their ability to prevent carbon leakage as well as other legal, technical, or political problems that may challenge their implementation.

2.1 Sectoral Approaches

There are different kinds of sectoral approaches discussed in literature that can be distinguished along the following dimensions: binding vs. voluntary, transnational vs. domestic, and absolute vs. relative targets. Their common denominator is the limitation to industrial sectors and subsectors which allows them to take into account the sectors' specificities. While sectoral approaches are unlikely to ensure the same environmental effectiveness that a global ETS theoretically promises[14], they are politically more feasible. Some forms of sectoral agreements may serve as the first step towards a bottom-up trading system: sectoral credit trading based on sectoral caps or based on sectoral agreed baselines. This should not be understood as a technical preparation for an ETS but rather as a political signal.

Approaches linked to carbon markets

Sectoral crediting

Complying with performance or technology standards may also lead to crediting and could thus be integrated into existing carbon markets. This requires a link to the carbon market right in the beginning because some demand for the respective carbon credits is needed. There are two main approaches towards establishing the baseline that determines the

[14] The reason for an imperfect environmental effectiveness is the genuine property of sectoral approaches which – compared to global ETS – are exempting actors or branches from the scheme.

eligibility for crediting: ex-ante agreements on benchmarks leading to fixed standards as described above and rate-based crediting (Bosi & Ellis 2005). The latter can, for instance, consist of an agreement on baselines based on GHG per unit of GDP and thus allow sector of economies to grow within the boundary of a certain carbon intensity level. Such provisions could circumvent the developing countries' concerns regarding economic development, while at the same time reducing competitiveness concerns.

As part of the international climate negotiations, sectoral approaches are mainly discussed by the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) (Sterk et al. 2010). As the negotiations have continued over the years, several variations of the original concept of the sectoral approach have been developed and debated at both the international and domestic levels. Currently, sectoral trading is at work in sectoral crediting and the sectoral CDM (IETA 2010). While the first variation embraces a legally binding emission reduction cap for certain sectors in a developing country (see below "Sectoral caps"), the latter refers to offset mechanisms. The terms sectoral CDM and sectoral crediting are sometimes interchangeably used. Sectoral crediting is a "no-lose" mechanism without legally binding commitments. Another definition of the sectoral CDM is the crediting of reductions in emissions intensity at the installation level. The sectoral CDM would basically remain a project mechanism, however, it would be expanded to various activities of an installation. In Copenhagen, no post-2012 CDM reform was agreed upon. Discussions about CDM reform at COP15 mainly focused on other issues than sectoral CDM, such as the equitable regional distribution of project based CDM and the inclusion of CCS as a project category.

Reinaud (2009a: 18) contends the sectoral CDM as one approach to address carbon leakage by widening existing carbon market mechanisms. As described above, entities of a whole sector have to keep their emissions below a certain baseline (typically business-as-usual) in order to generate credits. Another option would be to the baseline below business-as-usual, often referred to as sectoral crediting mechanisms based on 'no-lose' targets. Different from sectoral targets leading to a sectoral cap-and-trade regime, sectoral crediting mechanisms are voluntary. They act as an indirect incentive for governments (in developing countries) to adopt policies to mitigate carbon emissions which has not been the case under conventional CDM (see especially Schneider & Cames 2009).

On the one hand, the burden for domestic industries might be reduced by giving them the possibility of reducing emissions elsewhere cheaper, and at the same time, increasing the incentives to effectively reduce carbon emissions in developing countries compared to existing mechanism such as project-based CDM (see also Bosi & Ellis 2005: 12). Given that these mechanisms are voluntary, their ability to address carbon leakage due to international competitiveness is on the other hand limited (Schneider & Cames 2009: 9). Moreover, these kinds of approaches may put companies in developing countries at a competitive advantage and run the risk of subsidizing laggards (Reinaud 2009). The "common but differentiated responsibility" as formulated in the UNFCCC is not meant to be called into question. Still, there is an increasing necessity for all parties to play an active role in climate protection since any present decision will affect future emission levels. In the long run, voluntary sectoral approaches may lead to convergence of climate protection performance.

Sectoral caps

Another approach leading to binding sectoral trading is the determination of a cap for greenhouse gas emissions for a certain sector on a transnational basis. The sectoral cap would accordingly lead to emission caps determined individually for companies belonging to a certain sector. The basis on which the sectoral cap is determined can be based on benchmarks (e.g. GHG intensity levels) or on historical emissions. If such a sectoral ETS, succeeds in integrating the major trading partners of a certain sector, competitiveness concerns could be considerably reduced for these sectors.

Since sectoral approaches can take various forms, their ability to address competitiveness concerns and carbon leakage differs as well. Generally, the more sectors and regions and countries are included, the more they are able to ensure competitiveness and environmental integrity. The latter is however highly dependent on the baselines level and standards that are agreed upon. Binding targets are better able to ensure both competitiveness and environmental effectiveness; transnational sectoral mechanism will better be able to address competitiveness concerns than national sectoral mechanisms (Bosi & Ellis 2005: 40).

Other than border adjustment measures (Chapter 2.5), depending on the approach, sectoral approaches may be politically less confrontational than unilateral measures. These approaches may be broken down not only to sectors but to subsectors. This is an advantage to specifically address those few industries that are realistically facing competitiveness risks (Chapter 1). Developing countries are more likely to agree on sectoral caps and standards than on economy-wide emission caps. This is particularly the case if those agreements incentivize the uptake of innovative technology and allow for economic growth. Still, establishing separate goals for certain sectors will most probably raise the costs for emission abatement if such an agreement does not allow for trading. Finally, there is a high risk that environmental targets will be undermined in the political process of defining appropriate baselines or caps.

2.2 Free Allocation

Free allocation is one way to exempt certain industrial branches from the burden of paying for their emissions allowances. Using this method, such industries are given an incentive to keep their production sites within the ETS. Determining ambitious benchmarks according to which allowances will be distributed is on the one hand a way to ensure environmental effectiveness while on the other hand, outsourcing is less likely.

Free allocation of allowances was chosen to address competitiveness concerns of affected energy-intensive companies, sectors or subsectors in the EU ETS. Moreover, Directive 2009/29/EC foresees the continuation of free allocation for certain sectors (Article 10b). Free allocation involves design choices which result in different degrees of distorting carbon prices and competition between companies and sectors.

Free allocation to existing installations can be based on historical emissions (“grandfathering”) and/ or on benchmarks. Free allocation can either be solely based on a certain base period or may involve direct updating according to recent output levels (see also Fischer & Fox 2009: 2). Free and/or over allocation also has the potential to create windfall profits and may therefore considerably distort carbon prices. . Applying uniform benchmarks could help to counterbalance this distortion. Technology- or fuel-specific benchmarks could, however, foster the distortion of the carbon price and give adverse signals: the purpose of putting a price on carbon is to incentivize fuel switching and using cleaner technology is taken ad absurdum if separate benchmarks are elaborated for e.g. each type of fuel. Moreover, determining ambitious benchmarks is again a political process that may result in compromises that are not as optimal as theoretically envisaged.

Free allocation to address competitiveness concerns will not be fully effective if comprehensive and well-adjusted allocation rules for new entrants as well as plant closure provisions are not in place. The allocation method for new entrants may act as an indirect investment incentive (subsidy) and is therefore important when addressing competitiveness-driven investment leakage (Reinaud 2009a: 11). Free allocation to new entrants can obviously not be based on historical emissions but rather must be based on some kind of benchmark. Here again, the application of uniform benchmarks in order to minimize carbon price distortions is crucial. Uncertainty about the persistence of free allocation in a multi-period system and a volatile carbon market will nevertheless detract from the value of free allocation as investment subsidy. Matthes & Monjon (2008: 45) conclude that fixed explicit subsidies are more straightforward to secure investments within the borders of an ETS. Also Reinaud (2009a: 12) stresses that “free allocation may not prevent carbon leakage through the investment channel in its entirety.”

Plant closure provision might be the most important issue for addressing competitiveness while preventing operational leakage. If the operator continuously receives free allocation until the end of a trading period for a plant that he closes entirely or partially down, it may act as an incentive to close down (parts of) plants and relocate. Depending on the exact design (e.g. if a lower production level can already be understood as plant closure), rules discouraging plant closures may also give an incentive to keep an inefficient plant operational. In practice, perfect plant closure provisions are not realistic as partial plant closure opportunities for complex installations exist and operators seek for profit-maximizing phase-out strategies. Still, the more stringent and effective closure provisions are, the more likely the prevention of leakage. However, plant closure provisions are often not able to fully prevent investment leakage (Monjon & Matthes 2008: 45; Reinaud 2009a: 12-13). As previously mentioned, providing industrial sectors with free allowances can be understood as an (investment) subsidy (Matthes & Monjon 2008, Grubb & Neuhoff 2006, Johnston 2008, Bordoff 2008) thus, state aid rules must be examined. To sum up, while free allocation seems to be an easy way to counteract competitiveness loss at first glance, its impact on carbon leakage varies considerably and therefore has to be taken into careful consideration when specifying rules for free allocation. Free allocation only prevents operational leakage if it is based on ongoing updated information which is not possible under current EU legislation which precludes ex-post adjustments. Neither relocation, nor windfall profits may be prevented with free allocation since companies have their own strategies which may not follow the logic of the policy-maker. These business plans may lead to decisions contrary to the intent of even detailed rules and may thus lead e.g. to plant relocation. It may be the case that even in the absence of free allocation, companies may find it more profitable to maintain their domestic production site (see also chapter 1). First experiences have shown that free allocations indeed triggered the occurrence of windfall profits which gained political attention when evaluating the first phase of the EU ETS (Matthes & Neuhoff 2008: 5).

Further, the amount of free allocation to compensate competitiveness losses must be carefully determined. Some experts have tried to quantify the range of competitiveness losses that might occur. The following two examples illustrate that such effects, in practice, are rather small. If for example, aluminium production is likely to face a 0.8% decline in production due to carbon pricing, Aldy & Prize (2009: 26) propose to grant free allowances equal to 0.8% of their output. An analysis based on the US economy by Burtraw (2008: 17) concludes that "one can reasonably conclude that the economy-wide harm, measured as a potential loss in the market value of industries most affected by climate policy, is likely to be equal to or less than 30 percent of the value of emissions allowances."

Matthes & Monjon (2008) come to the conclusion that while free allocation may compensate for some competitiveness losses, their ability to prevent carbon leakage is uncertain. Reinaud (2009a) reinforces this conclusion and additionally emphasizes the need for sector-specific solutions (especially in the cases of emission-intensive and electricity-intensive industries). It should, however, be mentioned that in the case of allocation with ambitious benchmarks, negative impacts on environmental effectiveness can be reduced while production relocation may be prevented.

2.3 Rebating auction revenues

Auctioning emission allowances has the advantage that no provision has to be made for new installations or plant closure. It does not take the systems' purpose ad absurdum (as some form of free allocation does) since it reflects the true carbon price as close and visible as possible. Generally, a harmonization of auctioning methods and an equalized share of the proceeds to be rebated to industry throughout the participants of an ETS will reduce competitiveness concerns within the system (e.g. Ecofys 2006: 23). The same will be true for linking different ETS. Although if this rebate is based on auction as allocation method this fails to compensate companies for competitiveness losses inherently, it allows for the introduction of other compensating and carbon price equalizing measures. This is true for domestic compensation as well as for border adjustment measures (see Chapter 2.5).

In an internationally inclusive carbon trading system with auctioning as an allocation method, competitiveness losses and carbon leakage theoretically do not occur. Competitiveness affects will only come into play as far as different levels of carbon efficiency exist. Counter measures are therefore unnecessary. If however, the existing systems give prove unintended competitiveness losses, the introduction of compensation measures could be justified. One such compensation measures is to rebate auction revenues that can be used to address – as one unintended side effect of emission trading – shifts in power prices[15].

Compensating companies for a theoretical loss in competitiveness is difficult because it is imprecise. The exact level of additional costs that these companies have to bear due to an

[15] Rebating auction revenues is one kind of State Aid. We decided to refer to rebating of auctioning revenues only since this is politically the most discussed State Aid in this context. If discussing more generally State Aid as measure to address competitiveness concerns, also free allocation would qualify under these headings if strictly legally spoken.

ETS is not transparent and varies from sector to sector and is also dependent on individual companies' strategies. Burtraw (2008: 2) estimates that the opportunity costs for delivering compensations may be several times the amount of deserved compensation, i.e. the compensation granted in practice is likely to be higher than the associated costs of emission credits, or losses in the absence of competition. Revenue recycling is one way to compensate for costs due to carbon constraints. There are several routes for revenue recycling, these include output-based allocation (see Chapter 2.2 on free allocation), imposing lower tax rates on capital for the affected companies or lower payroll taxes on their workers (Aldy & Prizer 2009: 25).

Principally, other kinds of state aid may also present themselves as feasible options to compensate competitiveness losses due to carbon pricing. The determination of the level of state aid may pose a challenge for policy makers (similar to the amount of revenues to be recycled or the level of border adjustments as will be discussed in the next subsection) since the carbon price is not fixed and the carbon content of products will always be an approximation. In comparison to free allocation, direct compensation provides more certainty for investors especially taking into account investment leakage as Matthes and Neuhoff (2008) argue.

A major concern regarding state aid is probably its compatibility with European state aid rules (Matthes & Monjon 2008). From a legal point of view, the purpose of state aid is decisive whether or not state aid will be allowed. The relevant Regulation (800/2008/EC)[16] allows for some exemptions to the prohibition of state aid provided that it is introduced to support energy efficiency, co-generation, renewable energies and environmental studies or in the form of reductions in environmental taxes. If state aid does not fall under these exemptions, an individual case-specific examination by the EU Commission may still find the state aid to be appropriate. Although this way leaves room for much more uncertainty, it nevertheless allows for considerations for regional variations and sector- or plant-specific features (Johnston 2008: 53).

2.4 Border Adjustment Measures

In the absence of an international agreement, unequal carbon constraint between competitors may be diminished by introducing border adjustment measures. The main challenge of border adjustment measures is to provide "a clear rationale" (i.e. accurately assessing carbon leakage and competitiveness losses); and determining a "fair" price to be imposed on imported products to bring their prices into line with the domestic cost of compliance with an emission trading scheme" (Tamiotti et al. 2009: xviii). Historically, the discussion can be located in the context of border adjustments to compensate for carbon tax burdens. This typically requires importers to pay a tax reflecting the price of the carbon content of their product and relieves the exporter from an unequal tax burden.

[16] European state aid rules are stricter than the WTO requirements.

A widely accepted definition of border tax adjustments stems from the OECD and has been taken up by the GATT working Party on Border Tax Adjustments (BTA) (2. December 1970 § 4[17]). Accordingly, BTA is defined "as any fiscal measures which put into effect, in whole or in part, the destination principle (i.e. which enable exported products to be relieved of some or all of the tax charged in the exporting country in respect of similar domestic products sold to consumers on the home market and which enable imported products sold to consumers to be charged with some or all of the tax charged in the importing country in respect of similar domestic products)."

In the case of emissions trading, it is not only tax adjustments that would address competitiveness concerns in international trading; therefore, it is widely referred to as Border Adjustment Measures (BAM). BAM are either price-based or quantity-based (Dröge 2008). Both, impose a tax or charge that would reflect the costs from the ETS as well as tax rebates for exports to adjust costs for products when trading them across borders are price-based BAMs. The quantity-based option is most widely discussed in the context of ETS both in the US as well as in the EU: it is the obligatory purchase of allowances for imported products that do not face cost restrictions in their countries of origin due to climate change policies. Domestic producers will respectively not be required to submit emission allowances when exporting their products to a country with less strict climate policy. The general idea is to not only establish a level playing field but also to incentivize the adoption of stricter climate policy. The main difference between price versus quantity-based BAM (also referred to as 'integrated emissions trading') is the fixed carbon price of the former and the volatile carbon (or allowance) price of the latter.

BAM basically have to address three aspects (Reinaud 2009b):

- direct and indirect costs for all products vulnerable to carbon leakage that can be attributed to climate policies;
- cost adjustments for both imports AND exports; and
- carbon leakage from both production AND investment channels.

Bearing these in mind, imposing (an adequate level of) BAMs is a challenging task in several ways: first, it has to be compatible with international trade agreements, second, it has to be technically feasible, and last, it has to be politically acceptable.

Several authors have analyzed legal issues arising from the discussion about BAM (see e.g. Meyer-Ohlendorf & Mehling 2008; Dröge 2008; Fischer & Fox 2009, Biermann & Brohm 2005; Ruddigkeit 2009; Bordoff 2008, Tamiotti et al. 2009[18]). In a nutshell, the WTO requires that

- the exact measurement of the carbon content of a product and the according carbon price,

17 URL: http://www.worldtradelaw.net/reports/gattpanels/bordertax.pdf

[18] Tamiotti et al. provide a rather comprehensive overview about the legal preconditions for the application of border (tax) adjustment as acceptable measure to tackle competitiveness losses. They illustrate the basis of their conclusions not only on the interpretation of the relevant legal documents but also on historical cases that might act as precedence.

- the measure does not constitute protectionism (which might be difficult to prove),
- the measure does not lead to *de facto* discrimination, and
- the BAM is introduced for the protection of human, animal, or plant life or health, or for the conservation of natural resources.

Border adjustment measures are thus only applicable if they not only tackle competitiveness losses but are significantly linked to the prevention of carbon leakage. This has to be demonstrated in a sound way.

Border Adjustment and International Law

ETS are economically and legally speaking not taxes but regulation. It is therefore generally not possible to preclude a transposition of evaluations on BTA to BAM (Fischer & Fox 2009: 3). Stills the WTO specifications for the introduction of taxes (BTA) and value added taxes (VAT) apply in principal to the introduction of other border adjustment measures, but leave room for interpretation and thus uncertainty.

Regarding adjustment measures for exports, the GATT agreement on subsidy and countervailing measures (GATT SCM, Annex II) specifies that in addition to physically incorporated products, export rebates are permitted on energy and fuels that are used in the production process. For import adjustment, this regulation does not apply. Rather, the two principles "National Treatment" and "Most Favoured Nation Treatment" will allow for border adjustment on inputs if they are not treated less favourable than "like" domestic products and if that adjustment does not lead to discrimination amongst trading partners. Experts indicate that the latter requirement could result in lowering the environmental effectiveness. There are, however, exemptions: pursuant to Article XX (g) "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption." To summarize, the WTO requires the exact measurement of the carbon content of a product and the according carbon prices, the prohibition of protectionism (which might be difficult to prove), the requirement to prove that the measure does not lead to *de facto* discrimination and proof that BAM would be introduced for environmental purposes (Fischer & Fox 2009; Meyer-Ohlendorf & Mehling 2008; Tamiotti et al. 2009).

WTO agreements only allow adjustment for taxes, not for regulations and export rebating is probably not a possibility. Still, emission permit requirement on imports is likely to be WTO compatible. This will, however, require a multilateral understanding ofthe applied default value or what is considered as best available technology (BAT) (Dröge 2008).

Following the legal requirements and ensuring environmental integrity, technical problems have to be solved: how to best measure the carbon content of a product (which default values are to be chosen for baselines-BAT?), which products are to be included (only semi-refined products?), how to cost-effectively address all trade flows between the relevant countries, how to determine the carbon price in a system with volatile carbon prices (auctioning would therefore be a precondition but would not solve the entire problem[19]), how to account for climate protection measures in third countries other than taxes (e.g. product standards), and not least how to prove that the BAM would serve the environmental effectiveness of the whole system? Only determining all these issues will ensure an appropriate estimation of the amount of the border adjustment.

In order to take into account non-obvious variations of production processes (depending on products, companies, and countries) and assess the CO_2-intensity (depending on quantity and type of fuel used and the production process) at the border, several methods are discussed. Certification or labelling of certain aspects of the production process is one way. However, it remains difficult to precisely assess the carbon emission of processes, especially if the companies treat information as confidential. Another way to assess the carbon intensity is to assume the predominant method of production in a certain country, which entails discussions about what that predominant method should be (Tamiotti et al. 2009). If an average reference case is applied, countries outside the ETS lose the incentive to innovative carbon-saving technologies such as renewable energies since their additional carbon-saving potential will not be honoured at the border.

In a modelling exercise that compares price and quantity-based BAMs regarding their ability to address competitiveness concerns (Alexeeva-Talebi et al. 2008), the authors come to the conclusion that competitiveness concerns are better addressed under BTA regimes while quantity-based BAM do better in preventing carbon leakage. The authors further contend that this is only true for those sectors being regulated under either of the regimes. Those sectors that do not fall under a border adjustment measures regime, i.e. typically non-energy intensive sectors, will, according to the model, have to bear a higher burden compared to a situation without BAM. Both approaches theoretically ensure global environmental effectiveness but a precondition for achieving the intended effect is to properly implement a BAM regime. The authors expressed doubts that a proper implementation is likely in the light of ongoing political debates.

Finally, in addition to legal and technical obstacles, border adjustment measures are politically highly sensitive. BAM can be regarded as a regulatory market intervention. This may be regarded as a loss of credibility in a system that was meant to stimulate innovation and competition by using a market mechanism by then mixing it with other steering mechanisms that are perceived as being more interventionist and less market-conforming. The Pew Center (2008) strongly recommends the US government to refrain from unilateral BAMs. They estimate such measures as risky and potentially counterproductive and claim that unilateral BAM are not able to tackle competitiveness concerns. Experts estimate limited incentives for non-domestic countries to improve their climate policy. Rather, they point to the

[19] This is argument holds theoretically only for potential overallocation. However, even if there is no overallocation in practice, the political argument may persist.

politically confrontational character of BAMs. While this is especially true from an US viewpoint fearing unilateral border adjustment from their European trading partners, the arguments also apply from an EU perspective in view of other countries outside of linked systems. Equalizing carbon prices at the borders is a local/domestic solution in an environment that seeks global solutions to a global problem (Meyer-Ohlendorf & Mehling 2008; see also Reinaud 2009b). This is especially precarious in the light of a lack of clear evidence for the mechanisms' environmental effectiveness and the political connotation of this policy instrument as being part of the protectionist agenda of the industrialized world (see Ruddigkeit 2009).

2.5 Approaches outside the carbon market

Excluding certain sectors or companies from carbon constraints would be the simplest solution to maintain their competitiveness. This, however, works against the idea of emissions trading, namely to reduce emissions by the cheapest (most efficient) means possible. It will also affect the ETS carbon price and lead to major carbon price distortions (Aldy & Pizer 2009: 24-25).

Bosi & Ellis (2005) introduced sectoral agreements based on domestic policies as one approach to address competitiveness concerns. The rationale is to incentivize the strengthening of domestic climate policy in countries where production might move to in order to prevent companies regulated under ETS to relocate their production sites in these countries. Aldy & Pizer (2009) took up a similar idea and explicate that performance or technology standards can be introduced as an alternative command-and-control instrument outside the carbon market either domestically or internationally agreed. An international agreement on benchmarks could then lead to the establishment of performance standards (see also Fischer & Fox 2009: 2). The sharing of best practices would be another example for sectoral approaches outside the carbon market (IEA 2008: 96).

2.6 Summary Policies and Measures and Relevance for Linking

Though the mentioned policies and measures may have some effect in diminishing competitiveness losses, they each have various associated disadvantages and complexities. Any measure taken must simultaneously strive to maintain carbon price signals to maintain the environmental effectiveness of the ETS. *Sectoral approaches* differ very much in their ability to address carbon leakage and their degree of political acceptance. This very much depends on whether or not they are voluntary and count on climate policy convergence in the long run, or are based on performance standards on ambitious benchmarks or binding sectoral caps which are in turn politically more difficult to achieve.

Ambitious benchmarks could turn *free allocation* into an effective policy measure counteracting competitiveness concerns while ensuring environmental effectiveness. However, free allocation also entails a number of difficulties – the political agreement on benchmarking turned out to be difficult on a national level and will be more difficult if this is a matter of international negotiations. There is the necessity for closure provisions and a new entrants rule. In addition, free allocation as an investment incentive provides less certainty to investors than direct (fixed) compensation (e.g. through *rebating auctioning revenues*).

Both approaches, *free allocation* and *rebating auction revenues*, share the uncertainty of the problem of determining the exact level of compensation which in practice is probably much smaller than politically communicated and inexactly accountable. Especially rebates run the risk of counteracting emissions trading incentives to consume less carbon (see e.g. Fischer & Fox 2009: 25). Furthermore, as Aldy & Pizer worked out, such a measure results in a shift in consumption patterns that is to a large extent responsible for losses in domestic production – not internationally more competitive companies.

The identification of vulnerable industries is not the only task that is not straightforward, - as shown in chapter one: studies examining competitiveness impacts of ETS on certain industry sectors and subsectors only point towards trends but not on numbers. Further, legal requirements and economic insights may pose insurmountable technical difficulties such as the calculation carbon emissions of products (both domestic and foreign), Further, the difficulty of determining the adequate level of compensation and *border adjustment measures (BAMs)* may be equally large hurdles. Both, price- and quantity-based *BAMs* will have to ensure the exact level of direct and indirect costs to be compensated for both imports and exports. In addition, they have to accurately prove the concerns for carbon leakage and its environmental impacts.

BAMs theoretically promise environmental effectiveness by giving a clear signal for countries with less strict climate policies to strengthen their efforts. However, the design of the incentive will not necessarily promote the implementation of low carbon solutions such as the use of renewable energy. The degree to which leakage reductions are achieved depends on the specific sector, the respective trade flows and the concrete design of the BAM. In addition, this signal may cause difficulties in the political process. Not only from a legal, but especially from a political point of view, it is crucial to maintain the environmental purpose as the focus of all policies and measures addressing competitiveness issues. Otherwise, claims of protectionism will gain ground in the policy debate, making international climate negotiations even more fraught.

Implications for linking emission trading systems

A number of governments across the world have established or are developing cap-and-trade systems for greenhouse gas emissions. There is also growing interest in other regions of the world in using carbon markets as a cost-efficient mechanism to reduce greenhouse gas emissions. Thanks to these developments, the debate about harmonizing and finally linking existing and prospective trading schemes has gained increasing prominence (see e.g. Flachsland et al. 2008; Carbon Trust 2009). Two ETS are linked if one system's allowance can be used, directly or indirectly, by a participant in the other scheme for compliance purposes (Haites 2003). Indirect linking means that the two ETS to be linked agree on the common use of a certificate issued by a third system (i.e. CERs for the EU and NZ ETS).

In general, some of the design elements of ETS can pose challenges for linking – perhaps even pose barriers. The direct or indirect availability of certificates, e.g., can be problematic when provisions in one system have a harmful impact on the other or on GHG abatement as a whole. The definition and recognition of trading units accordingly is hence crucial during potential linking processes (Flachsland et al. 2008). Examples for challenges that can be managed if carefully handled are significant price differences or different enforcement provisions between systems (see Carbon Trust 2009). Further, the policies and measures to address competitiveness concerns analysed earlier in this study affect linking in quite different ways.

If *sectoral approaches* are implemented internationally the linking of the respective sectors is either no longer necessary, or this effort can de facto be considered as a first step to indirect linking. Sectoral arrangements with intensity guidelines, however, may pose other obstacles. The establishment of a sectoral cap can serve as an precursor to a link in the case that such a sectoral approach succeeds in integrating the major trading partners of a certain sector and creates compatible conditions in a specific sector. The basis on which the sectoral cap is determined can be based on benchmarks (e.g. GHG intensity levels) or on historical emissions. Here, agreement is needed on which kind of credits will be recognized in the linked system. However, benchmarking approaches will be difficult since dominant production processes/technologies etc. may differ regarding their carbon intensiveness and therefore there is a risk of agreeing on the lowest common denominator.

Assessments regarding the question of to what extent different *allocations methods* (grandfathering/ auctioning) pose a barrier to linking have found that there are no major implications of free allocations due to impacts of different allocation mechanisms across systems will occur equally both in absence and presence of linking (Flachsland et al. 2008; Carbon Trust 2009). However, different allocation approaches may cause concerns about comparability. If in one system *free allocation* occurs this may be perceived as an implicit subsidy by the other system where permits will be auctioned. Hence, the harmonisation of allocation methods may be one topic to be tackled during a linking process. This is also true for the role of *rebates* as a subsidy to compensate companies for potential competitiveness losses.

Further, *BAMs* pose a likely option to address competitiveness and leakage concerns in some regions in a pre-linked world. As a unilateral measure of regions with carbon regulation vis-à-vis those without it, BAMs will not be applied between systems to be linked. However, if different compensations measures exist (e.g. free allocation vs. BAMs)the systems provisions for leakage must first be harmonized, e.g. by agreeing on a uniform free allocation plus benchmark approach throughout the linked system. This option may be more feasible given the political and technical difficulties to pursue the BAMs approach towards countries with no or a less strict climate policy. In the case described it is also unclear if BAMs are necessary or desirable as the two measures would address the same concern and may lead to “double compensation”.

The following table gives an overview about how policies and measures may affect competitiveness and carbon leakage as well as the linking of emission trading systems.

Table I: Overview on policies and measures to address competitiveness concerns

Policy/Measure	Rationale	Effect on competitiveness & carbon leakage	Implications for Linking
Global Emissions Trading System	Same price on carbon worldwide	Level playing field; No risk of carbon leakage	No linking necessary (de facto full linkage)
Sectoral approaches	To create a level playing field within sectors by establishing similar emissions abatement incentives (this may be achieved through standards/ benchmarks/ binding caps)	Depending on the regional scope/reach of the approach (difficult political negotiations likely). Rather effective in the long-run (convergence of carbon levels)	Through the creation of compatible conditions in one sector, a potential first step for indirect linking between two or more systems
Free allocation	“Exempting” sectors or subsectors from ETS (could be limited by benchmarks); subsidy	Reflects true carbon price: Effective in compensating but not preventing production losses per se (ongoing updating needed to avoid operational leakage).	In principal, no major restriction for linking ETS (depending on other elements such as level of benchmarks etc.)
Rebating auction revenues	Subsidy to provide a compensation to companies for potential competitiveness losses	Reflects true carbon price and offers compensation method; No prevention of leakage ensured Depending on rebate level – Only relatively small rebates may be necessary, though the prevention of leakage is not guaranteed.	In principal, no major restriction for linking ETS. Agreement on compatible allocation procedures likely.
Border adjustment measures	Compensating at the border to impose a price signal to exporting economies without carbon regulation	Significant technical and political difficulties to establish BAM will challenge ability to prevent competitiveness losses. Further, leakage reduction potential unclear.	Between systems to be linked no BAMs within the linked ETS need to be applied. Potential agreement between systems to be linked to decide on continuation of BAMs for economies without regulation is desirable/necessary.

3 Approaches to competitiveness concerns in existing and emerging ETS

Competitiveness issues are reflected in all major policies and legislative proposals regarding the establishment of an ETS. The following review of six existing and prospective emissions trading systems seeks to depict the different approaches in more detail. The analysis includes the European Union Emissions Trading System (EU ETS), the Australian Carbon Pollution Reduction Scheme (CPRS), the New Zealand Greenhouse Gas Emissions Trading Scheme (NZ ETS), the Regional Greenhouse Gas Initiative (RGGI), and the Western Climate Initiative (WCI). In addition, the review comprises key proposals on climate and energy legislation in the US Congress on a prospective cap and trade system on the US Federal level: the American Clean Energy and Security Act (Waxman-Markey) as passed by the US House of Representatives on 26 June 2009, the Clean Energy Jobs and American Power Act (so-called Kerry-Boxer) proposal as passed in the U.S. Senate Committee on Environment and Public Works on 5 November 2009 as well as the American Power Act presented by Senators John Kerry and Joe Liebermann (Kerry-Liebermann Bill) in the version presented on 12 May 2010. As no climate and energy legislation was discussed in the U.S. Senate before summer recess 2010, it is now very unlikely that such legislation will be passed by the US Congress in 2010 or the next couple of years. However, a review of the of the legislative proposals in the US Congress sheds a light on the discussions in the US and provides insights into what approach will be taken in any future legislation in the US regarding competitiveness issues.

The review of each existing or proposed ETS is structured into three main parts. First, the general understanding of competitiveness and leakage concerns as reflected in these policies and proposals is described and the policy goals that they seek to achieve regarding competitiveness and leakage concerns are identified. Second, the criteria and thresholds that the policy or legislative proposal uses to identify sectors or firms that may be vulnerable to competitiveness impacts and carbon leakage are portrayed. And third, the measures that the policy or draft legislation proposes to address competitiveness and leakage concerns are illustrated.

3.1 European Union Emissions Trading System (EU ETS)

The EU ETS was established by Directive 2003/87/EC (adopted 25 October 2003) and started operating on 1 January 2005. The system covers more than 10,000 installations in the energy and industrial sectors which are collectively responsible for close to half of the EU's CO_2 emissions and about 40% of its total greenhouse gas emissions (EC 2008). Today, it is the largest emissions trading system in the world and a key pillar of the European Union's climate policy. The EU ETS is currently operating in its second trading period (Phase II 2008-12; Phase I 2005-2007). With the adoption of Directive 2009/29/EC on 24 April 2009, the EU ETS has been improved and extended for its third trading period (Phase III 2013-2020), which will be the focus of the ensuing review.

General approach and policy goals

In order to address competitiveness impacts and minimize carbon leakage, the new provisions that take effect on 1 January 2013 foresee the allocation of 100% of allowances at the level of an ambitious benchmark free of charge to energy-intensive sectors and sub-sectors “exposed to a significant risk of carbon leakage” (EC 2009b: Article 10a, paragraph 12). It should be noted however that free allocations will be given on the basis of benchmarks, which are established by an evaluation of the 10% most efficient plants in the EU in the period 2007/2008. When the so called industry cap has been reached, a linear reduction factor of 1.74% will be implemented, corresponding to the reduction factor of the overall cap. In case a post-Kyoto agreement does not include other developed countries and other major emitters of greenhouse gases, the EU anticipates that this could result in an increase in GHGs in countries outside the EU that do not impose comparable constraints on emissions (i.e. carbon leakage). Climate policy, e.g. through emissions trading, could put energy-intensive sectors and sub-sectors subject to international competition at an economic disadvantage, thereby forcing them to relocate production to third countries (EC 2009a: recital (24)). The EU therefore seeks to achieve two policy goals regarding competitiveness and leakage impacts: 1). ensure international competitiveness of its energy-intensive sectors and sub-sectors and 2). safeguard overall environmental integrity.

Eligibility criteria and thresholds

In Phase III of the EU ETS, a sector or sub-sector is deemed to be at a significant risk of carbon leakage if (1) the EU ETS leads to additional direct and indirect costs of at least 5% of gross value added *and* if (2) its trade intensity with third countries[20] exceeds 10% (EC 2009b: Article 10a, paragraph 15). Likewise, a sector or sub-sector may also be deemed to be exposed to a significant risk of carbon leakage if the additional direct and indirect costs resulting from the implementation of the EU ETS provisions amount to more than 30% of its gross value added *or* if its trade intensity with third countries exceeds 30% (EC 2009b: Article 10a, paragraph 16). The Commission bases this assessment on “the extent to which it is possible for the sector or subsector concerned (...) to pass on the direct cost of the required allowances and the indirect costs from higher electricity prices resulting from the implementation of this Directive into product prices without significant loss of market share to less carbon efficient installations outside the Community” (EC 2009b: Article 10a, paragraph 14). Further sectors may be classified as being at a significant risk of carbon leakage according to a number of qualitative criteria, even if they do not qualify according to the quantitative assessment. Such criteria include technical hurdles for further efficiency increases in certain sectors and subsectors, market characteristics or profit margins (EC 2009b: Article 10a, paragraph 17). A list of sectors and subsectors at significant risk of carbon leakage was compiled and completed by 31 December 2009 (EC 2009b: Article 10a, paragraph 13) and published on 5 January 2010. The list currently includes 164 sectors and

[20] Defined as the total value of its exports and imports divided by the total value of its turnover and imports.

sub-sectors which the Commission judges face a significant risk of carbon leakage. Evaluation of the list is on-going: generally, every year the list can be added to and a complete review is to be held no later than 30 June 2010 and every 5 years thereafter. Free allocation is therefore meant to be on a transitory basis dependent on progress of international negotiations.

Policy measures

100% free allocation of allowances on the basis of ambitious *ex ante* benchmarks is the key measure with which to address competitiveness and leakage concerns under the EU ETS between 2013 and 2020 (EC 2009b: Article 10a, paragraph 1, 2 and 12). In general, free allowances will be allocated on product-specific - as opposed to sector-specific - benchmarks for each relevant product (EC 2009b: Article 10a, paragraph 1). Furthermore, benchmarks will not be differentiated according to fuel used. The starting point for the benchmarks is the average performance of the 10% most efficient installations with regard to GHGs in a specific sector or subsector, based on 2007-2008 emissions data (EC 2009b: Article 10a, paragraph 2). Benchmark levels will be determined ex ante and are valid for the whole trading period. There is currently some discussion of declining benchmarks that would serve as increasingly strict constraints in some sectors. Details on how to calculate the benchmarks are currently being evaluated by the Commission in a process that foresees consultations with relevant stakeholders. Overall, given the stringent benchmarks, only the most efficient installations may receive all of their needed allowances for free, even if they are exposed to a significant risk of carbon leakage. The Directive does not set a time limit by when free allocation of allowances will be reduced or phased-out.

The maximum amount of allowances available for free allocation in a given year is calculated on the basis of the average share of emissions from installations covered between 2008 and 2012 for the baseline years 2005-2007, multiplied by the overall cap in that year. For example, if emissions from industrial sources that are part of the EU ETS between 2008 and 2012 accounted for 20% of total EU average emissions for 2005-2007, then in 2015 the maximum number of allowances available for free allocation would be 20% of the 2015 cap. Added to this is are average annual emissions for 2005-2007 for installations that were not covered by the EU ETS in those years, but have since joined, adjusted by an annual reduction factor of 1.74% (EC 2009b: Article 10a, paragraph 5). This means that the linear reduction factor on all allocations can be implemented.

In addition to free allocation of allowances, Article 10a, paragraph 6 of Directive 2003/87/EC (EC 2009b) provides EU Member States with the possibility to compensate the most electricity-intensive sectors or subsectors determined to be exposed to a significant risk of carbon leakage for increases in electricity costs resulting from the EU ETS through national state aid schemes. Such compensations have to be in accordance with existing and future state aid rules.

Finally, Article 10b of Directive 2003/87/EC (EC 2009b) provides that the Commission shall assess the situation of sectors and subsectors determined to be exposed to significant risks of carbon leakage in the light of the outcome of the international negotiations by the 30 June 2010 mentioned above. In particular, the Commission is asked to study the possibility of adjusting the amount of allowances allocated to these sectors free of charge and may make proposals on the inclusion in the EU ETS of importers of products produced by energy-intensive sectors and subsectors.

3.2 Australian Carbon Pollution Reduction

Since the Labour Party took office in 2007, Australia pursued a very progressive climate policy. After the release of a Green Paper in July 2008 and a White Paper in December 2008, draft legislation on establishing the Carbon Pollution Reduction Scheme (CPRS) was published on 10 March 2009. The CPRS is a legislative proposal for the introduction of an ETS in Australia and comprises 11 Bills. After two years of attempts to finding a compromise between the government and opposition parties in the upper house of Parliament, the Australian Labour government put its carbon emissions trading plan on hold on 27 April 2010. In June 2010, Julia Gillard successfully challenged Kevin Rudd as party leader and Prime Minister. Fresh elections have been called with CPRS a major election issue. While the Rudd government had planned to re-examine an ETS for Australia at the end of 2012 when the Kyoto period expires, it is likely that the fate of legislation will be determined in the upcoming election in August 2010. Before the suspension of the CPRS, the proposal had passed the Australian House of Representatives three times, first on March 2009 and the last time on 11 February 2010. However, the proposal could not gain the necessary majority to be passed by the Australian Senate, and was rejected twice despite major concessions to the Tory and Green opposition parties that prevented the proposal from being passed. While the Tory party is strongly opposed to the proposal as it fears extensive negative impacts on the Australian economy, the Green party considered the proposal not to be ambitious enough. The following description therefore reflects the latest version of the Bill as introduced in the Senate on 2 December 2009, but which would not have taken effect in July 2011 as planned and may still be substantially revised if and when the introduction of an ETS isre-examined in Australia.

In its latest version, the proposed ETS was to commence on 1 July 2011 (one year later than originally planned) with a one-year fixed price period with AUS$10 per allowance (approx. EUR 7.00) (Australian Department of Climate Change 2009a). Australia's overall emission reduction target was conditional on the outcome of the Copenhagen UNFCCC negotiations, (minus 25% by 2020 based on 2000 levels, in the event of a global agreement aiming at CO_2e in the atmosphere at 450 ppm and a long-term emission reduction target of 60% by 2050 (based on 2000 levels)) (Australian Department of Climate Change 2009b). Following Copenhagen, the unilateral target was set at 5% below 2000 levels by 2020, which may have been increased to up to 15% if other major emitting countries agree to similar commitments.

According to the latest draft of the CPRS, regulations would specify the system's caps on an annual basis. For the first three years of operation, the respective caps would have been announced before 1 July 2010. For subsequent years, the respective caps would have been set at least five years before the end of the relevant year (Australian Department of Climate Change 2009c). In addition to the fixed price period at the beginning of the CPRS, during which no trading is going to take place, a transitional price cap of AUS$ 46 (approx. EUR 28) was planned for the following 4 years until 2016 (Australian Department of Climate Change 2009d). The CPRS would have covered 75% of Australia's GHG emissions.

General approach and policy goals

Competitiveness concerns have been the major consideration in drafting and for revising the original legislative package. In its latest version, the package foresees extensive transfer measures for Australia's industry to limit the impact that the CPRS may have on industry operations.

As already set out in the December 2008 White Paper (Australian Government 2008), the draft Carbon Pollution Reduction Scheme Bill 2009[21] (the draft Bill) foresaw the establishment of an emissions-intensive trade-exposed (EITE) assistance program in order to address competitiveness concerns. These concerns stem from the fear that the introduction of an ETS may have a negative impact on Australia's EITE industries as long as other countries do not have a similar constraint on carbon. Carbon leakage, in this context, is understood as an incentive for an EITE activity to be located in, or re-located to, foreign countries. Accordingly, the assistance program serves the dual purpose of reducing the likelihood of carbon leakage and providing a measure of assistance to EITE activities carried on in Australia (Australian Government 2010: Part 8, Section 165, Article 2). At the same time, assistance is of a transitional nature, which may become unfounded when other countries take sufficiently stringent measures to reduce GHGs.

In addition, the draft legislation envisages the introduction of an Electricity Sector Adjustment Scheme (ESAS), which provides assistance to the coal-fired electricity generation sector over 10 years and to transitional assistance to the coal sector (e.g. emission-intensive coal mines) for 5 years.

Eligibility criteria and thresholds

While the White Paper sets out the general policy framework under which an assistance program for EITE activities may be provided, the program was foreseen to be formally established by Part 8 of the draft Bill. However, the draft Bill did not contain much detail about the program, simply stating that regulations may formulate a program for the issue of free Australian emission units (AEUs) in respect of activities that, under the program, are considered to be emissions-intensive trade-exposed activities. These details have been stipulated in the draft Carbon Pollution Reduction Scheme Regulations 2009 (Australian Government 2009b), published on 19 June 2009.[22]

As EITE assistance will be provided on an activity basis, a key component of the program is to establish the eligibility of activities, which is done by the government. Eligibility for assistance is established by two tests: an emissions intensity test and a trade exposure test. The emissions intensity assessment is based on weighted average emissions per million dollars of revenue or per million dollars of value added and distinguished between two

[21] Senate version as received from the House of Representatives and read a first time on 22 February 2010 (Australian Government 2010).

[22] The Regulations have been accompanied by an explanatory paper: "Establishing the eligibility of activities under the emissions-intensive trade-exposed assistance program" (Australian Government 2009d).

thresholds: a high intensity thresholds and a medium intensity threshold.[23] Eligibility according to the trade exposure criterion is assessed through a quantitative or qualitative test. According to the quantitative test on one hand, the trade share (ratio of value of imports and exports to value of domestic production) must be greater than 10% in any one of the years 2004–05, 2005–06, 2006–07 or 2007–08. In line with the quantitative test, on the other, there must be a demonstrated lack of capacity to pass through costs that arise due to the potential for international competition in order to qualify as trade-exposed (Australian Government 2009c: 6).

The above-mentioned regulations contain the first eight activities that will be eligible for EITE assistance: carbon black production, bulk flat glass production, glass container production, methanol production, silicon production, white titanium dioxide pigment production, zinc smelting, and newsprint manufacturing. These activities have been defined in a stakeholder process and on the basis of a data collection exercise to help assess activities for the purpose of the program (see Australian Government 2009a for details). More activities may be added in future.

Policy measures

The policy measure of choice to address competitiveness and leakage concerns in the Australian CPRS is free allocation of allowances. Assistance will be provided to EITE industries with *ex ante* free allocation of permits at the beginning of each compliance period (Australian Government 2009c: 6). The Australian government estimates that this will account for about 25% of all allowances initially allocated, and increase to about 45% of all allowances available in 2020 (Australian Government 2008: xxxvii). In this activity-based system, allowances are allocated for free to determined EITE activities. Assistance is provided per unit of production in the form of free allowances at a percentage rate of the baseline allocation. There are two assistance rates: 94.5% to sectors with an emissions intensity of at least 2000t CO_2/\$m revenue or 6000t of CO_2/\$m value added, and 66% to sectors with emissions intensity above 1000t CO_2/\$m revenue or above 3000t of CO_2/\$m value added (Australian Government 2009c: 6, Australian Government 2009d: 2). For example, if a production process requires 100 t CO2e per tonne of product (baseline allocation), a highly emissions intensive activity would receive 94.5% allowances per tonne of product in the first year of allocation of allowances; A medium emissions intensive activity would receive 66 allowances per tonne of product. Assistance will be reduced by a so-called carbon productivity contribution of 1.3% per year so that the EITE sector increasingly contributes to meeting the national commitment to reduce emissions. Accordingly, in the second year of allocation, an emissions intensive activity would receive 93.2 allowances for free. While assistance rates may thus decrease from year to year, the rates of the baseline allocation will remain constant. The assistance rates include the so-called “global recession buffer” that provides an additional 5% and 10% of allowances respectively to eligible EITI

[23] Emissions intensive activities are those with an emissions intensity above 2000t CO_2/\$m revenue or 6000t of CO_2/\$m value added, medium intensive activities are those with an emissions intensity above 1000t CO_2/\$m revenue or 3000t CO_2/\$m value added. Emissions data is taken from 2006–07 to 2007–08, and revenue / value added data from 2004–05 to the first half of 2008–09 (Australian Government 2009d: 6).

industries. Originally foreseen to expire after 5 years, this buffer now continues thereafter. A new floor of 90% and 60% respectively has been introduced if the Australian Government decides that other countries are not taking steps to reduce their emissions. Upon closure, installations must relinquish permits for production that did not occur in that year. Baselines for the allocation of allowances will be determined on the basis of historic information[24] on the emission intensity of all installations conducting a particular activity. The EITI program will be reviewed with each full review of the CPRS (every five years with a first review in 2014). The Australian Government has committed to provide a five years' notice to any material change of the EITI program.

3.3 New Zealand Greenhouse Gas Emissions Trading Scheme

In December 2007, the New Zealand government introduced legislation to parliament which amended the Climate Change Response Act of November 2002 by introducing an ETS (Parker 2007). The legislative proposal was passed as the Climate Change Response (Emissions Trading) Amendment Bill in September 2008, while the NZ ETS had already entered into force on 1 January 2008 (Parker 2008). Following general elections on 8 November 2008, the newly elected conservative New Zealand Government announced it would delay further implementation of the NZ ETS and, on 14 September 2009, it declared it would aim for revision of the NZ ETS. Key considerations for the revision were, amongst others, to reduce the competitiveness impacts of the NZ ETS and costs to households, to ensure affordability of the NZ ETS in light of the economic crisis, and to maximize harmonization with the Australian CPRS (New Zealand Government 2009b: 1).

On 25 November 2009, the New Zealand Parliament passed the Climate Change Response (Moderated Emissions Trading) Amendment Bill which effectively alters the NZ ETS. The system still covers all of New Zealand's emissions and foresees the consecutive phase-in of covered sectors starting with forestry on 1 January 2008.[25] For a transitional phase until 1 January 2013, participating firms from the transport, energy and industrial sectors will have a fixed price option of NZ$25 (approx. 12 EUR) which will allow them to pay for their emissions rather than to buy allowances. In addition, they will only be held accountable for 50% of their emissions, meaning that with the 50% obligation they will only need 1 tonne unit for every 2 tonnes of CO_2e emissions during the transitional phase (New Zealand Government 2009c). While the government has announced an emissions reduction target range of 10% to 20% below 1990 levels by 2020, in the case that there is a comprehensive post-Kyoto agreement (New Zealand Ministry of Environment 2009), no explicit cap is specified on domestic

[24] Historic information in this context means the historical revenue per tonne of product. Cf. footnote 19: Emissions intensive activities are those with an emissions intensity above 2000t CO_2/$m revenue or 6000t of CO_2/$m value added, medium intensive activities are those with an emissions intensity above 1000t CO_2/$m revenue or 3000t CO_2/$m value added. Emissions data is taken from 2006–07 to 2007–08, and revenue / value added data from 2004–05 to the first half of 2008–09 (Australian Government 2009d: 6).

[25] Sectors (with new entry dates into ETS in brackets) include forestry (1 January 2008), stationary energy including electricity (1 July 2010), industrial processes for steel, cement, and aluminium (1 July 2010), liquid fossil fuels (1 July 2010), agriculture (1 January 2015), as well as waste management and all remaining sectors (1 January 2013) (New Zealand Government 2009).

emissions in the NZ ETS, which is because there is no limit on the number of Kyoto eligible units that can be used for surrender purposes. As the whole economy will be included in the NZ ETS, New Zealand's internationally agreed emission reduction target also represents the NZ ETS' cap. Provisions in the legislation ensure that units issued into the NZ ETS cannot exceed the amount of Kyoto units (or those of a successor agreement) held by the government.

General approach and policy goals

Ensuring the competitiveness of New Zealand's emissions intensive / trade exposed (EITE) industry, particularly vis-à-vis Australian companies, has been the major consideration for revising the NZ ETS. This was a particular concern in light of the current economic crisis; the NZ ETS in its old form was feared to put an additional burden on New Zealand's EITE industries, resulting in a loss of competitiveness. According to New Zealand's government, competitiveness loss may result in carbon leakage, "with market share being lost to countries that do not have emissions reduction policies in place" (New Zealand Government 2009b: 16). Free allocation of allowances to EITE industries is the key means to addressing competitiveness concerns. In general, the NZ ETS is meant to help New Zealand comply with its international climate change obligations in a way that leads to emission reductions in New Zealand and that minimizes the impact on the economy.

Eligibility criteria and thresholds

New Zealand's approach to providing EITE assistance is very similar to Australia's approach. As in Australia, EITE assistance will be provided on an activity basis, with the government being responsible to determine these activities. Activities are eligible to receive assistance if (1) they are eligible under the Australian CPRS or (2) if they meet emissions intensity and trade exposure tests. The emissions intensity assessment is based on weighted average emissions per million dollars of revenue and distinguished between two thresholds: a high intensity thresholds and a medium intensity threshold.[26] Trade exposure will be determined by the government according to a number of rules and principles that are specified in the amended Bill (see New Zealand Government 2009b: Section 161A, Paragraph 4-7). The generation of electricity is not treated as being trade exposed and accordingly will not benefit from EITE assistance.

Policy Measures

Free allocation is the means of choice to address competitiveness concerns in New Zealand. Allowances will be freely allocated to eligible industries on an intensity basis. This new approach is twofold: First, allocations to industry will be made relative to production (meaning they can be increased or reduced) as opposed to be based on fixed emission levels (previously based on 2005 emission levels). Second, allocations will be made on an emissions intensity basis, i.e. average emissions per unit of production for a particular

[26] There are two emissions intensity thresholds: a high intensity threshold above 1,600 tonnes CO_{2e}/\$m and a medium intensity threshold above 800 tonnes CO_{2e}/\$m (New Zealand Government 2009a).

industry (previously based on 2005 emission levels). This legislative change removes the cap on the level of free allocation that is available to EITE sectors (and agriculture, for which the same applies). Industries with a high intensity threshold will receive 90% of allowances for free, those with a medium intensity threshold 60% (New Zealand Government 2009b: 27). Data for emissions intensity will be taken, as far as available, from the Australian CPRS.

3.4 Regional Greenhouse Gas Initiative (RGGI)

The Regional Greenhouse Gas Initiative (RGGI) is a regional effort among ten states[27] in the north-eastern region of the United States to cap and reduce CO_2 emissions. It is the first mandatory cap and trade program in the US to reduce GHG emissions (RGGI, 2009a). The RGGI system covers CO_2 emissions from the electric power sector with the goal of stabilizing these emissions at 2009 levels[28] through 2014 and reducing them by 10% by 2018. RGGI started auctioning emissions allowances in September 2008; compliance with the program began on 1 January 2009.

Each of the ten participating states has devised an individual CO_2 Budget Trading Program that together make up the RGGI cap-and-trade system. The programs are implemented through state regulations which are based on a RGGI Model Rule (see RGGI, 2008b), and linked to each other through reciprocity of CO_2 allowances. The ten individual programs thus function as one regional market for carbon allowances (RGGI 2009b).

General approach and policy goals

The December 2005 RGGI Memorandum of Understanding (MoU) acknowledges that the potential for emissions leakage may undermine the objectives of the RGGI cap-and-trade system (RGGI 2005: Part 6, Article A). In the following, RGGI formed an Emissions Leakage Multi-State Staff Working Group to study the possibility for emissions leakage. The group was instructed to provide recommendations on the monitoring of this phenomenon and to analyze potential policy responses suited to address leakage if necessary.

In its final report (see RGGI, 2008a), the working group states that emissions leakage is “the concept that there could be a shift of electricity generation from sources subject to a RGGI cap-and-trade program to higher-emitting sources not subject to RGGI that results in a net increase in carbon dioxide (CO_2) emissions” (RGGI 2008a: 1). The main concern related to emissions leakage is therefore a shift of electricity production to installations that are not part of the RGGI cap and trade system, thereby also resulting in an increase of CO_2 emissions. Implicitly, the concept puts forward that imposing a cost on carbon may lead to a geographic shift in the operation of the electric power system in the region.

[27] Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

[28] The initial cap is minus 188t CO_2/year, which is approximately 4% above annual average regional emissions during the period 2000-2004. Starting in 2015, the maximum allowed amount of CO2 emission is reduced at 2.5% per year through 2018, resulting in an overall reduction of 10% compared to 2009 levels (RGGI 2007).

While acknowledging the possibility for emissions leakage, the working group finds that the potential for emissions leakage is only transitional in nature for as long as there is no operating national emission trading system. A nationwide and at least equally stringent cap and trade program for the electric power sector or an even more encompassing US ETS "would be expected to eliminate or significantly mitigate potential emissions leakage" (RGGI 2008a: 8).

Eligibility criteria and thresholds

In order to determine the potential for emissions leakage, the MoU provides that electricity imports into the RGGI region should be monitored on an ongoing basis with the start of the cap-and-trade program (RGGI 2005: Part 6, Article A, paragraph 3). Monitoring results shall be reported on an annual basis beginning in 2010. After the first compliance period (2009-2011), participating states will determine whether and to which extent there has been an increase in emissions from electricity production outside the RGGI region that can be attributed to the cap and trade program (RGGI 2005: Part 6, Article A, paragraph 4). Details on how this assessment should be carried out have not yet been provided.

Policy Measures

If it is shown that the RGGI cap-and-trade program has led to a considerable increase of CO_2 emissions from electricity production outside the RGGI region, participating states will implement appropriate measures aimed at mitigating such emission increases outside the RGGI region (RGGI 2005: Part 6, Article A, paragraph 5). The RGGI working group on emissions leakage has analysed various policy measures, leading to the prioritization of policy responses to emissions leakage that have "demonstrated effectiveness and short implementation time frames" (RGGI 2008a: 9). Participating states should not choose any measures that are too complex or whose implementation would require too much time and pose considerable challenges affecting their effectiveness. Among the policy measures that the working group proposes are investments in energy efficiency market transformation programs and complementary policies (e.g. building energy codes, appliance and equipment efficiency standards) that increase end-use energy efficiency. None of the measures have so far been implemented.

3.5 Western Climate Initiative (WCI)

The Western Climate Initiative (WCI) is a regional initiative of seven US states and 4 Canadian provinces in the western part of the North American continent to mitigate climate change by reducing greenhouse gas emissions. WCI was established in February 2007 by the Governors of Arizona, California, New Mexico, Oregon, and Washington. The Governors of Montana and Utah as well as the Premiers of British Columbia, Manitoba, Ontario, and Quebec in Canada have since joined the initiative (WCI 2009a). Arizona and Utah have since left the program.

The goal of the initiative is to identify, evaluate and implement ways to reduce greenhouse gas emissions in the region. For that purpose, participating states and provinces are required to set an overall regional goal to reduce emissions, develop a market-based, multi-sector mechanism to help achieve that goal, and participate in a cross-border greenhouse gas registry (WCI, 2007a). WCI partner jurisdictions are developing a joint strategy to reduce GHG emissions in the region in order to achieve an emissions reduction goal of 15% by 2020, based on 2005 levels (WCI 2007b). The main feature of that strategy is a regional emissions trading program, the details of which are currently being developed. On 23 September 2008, WCI released the Design Recommendations for the WCI Regional Cap-and-Trade Program (see WCI 2009c), a document which provides the overall framework for the future regional ETS. Set to commence on 1 January 2012, the details of the WCI cap-and-trade program are still under development.

General approach and policy goals

The design recommendations reflect certain competitiveness and leakage concerns on the part of WCI partner jurisdictions *vis-à-vis* domestic and international competitors that are not covered by climate policies. It is thought hat facilities that are unable to pass along costs of compliance may face a substantial risk of emissions leakage. Emissions leakage is understood as a situation when emissions shift out of the WCI partner jurisdictions in order to avoid compliance costs (WCI 2009c: 34). In this context, concerns over job leakage or outsourcing, including to other parts of the United States or Canada, have been put forward.

Against this background, WCI on 9 August 2009 released the Draft Statement of Principles on Competitiveness (see WCI 2009d), which is meant to guide the process by which WCI will evaluate competitiveness effects of its own cap-and-trade program. The principles are intended to build the key components for a common approach to tackling competitiveness issues agreed upon by participating states and provinces. The principles are (WCI 2009d: 4):

- Minimize leakage of GHG emissions and the transfer of production and jobs attributable to a regional cap and trade program to the extent feasible, while still rewarding innovation and facility-level GHG intensity improvements.
- Address transitional challenges faced by entities from within covered sectors that may be subject to disproportionate competitiveness risk under a regional cap and trade program.
- Consider a harmonized approach across WCI when identifying and addressing potential competitiveness risks attributable to a regional cap and trade program.

Further details of this common approach to competitiveness issues are still to be developed.

Policy measures

While details of the WCI cap and trade system still have to be specified, the design recommendations already hint that free allocation may be a measure that will be included in the future design of the program to address competitiveness issues.[29] WCI released a document entitled “Design for the WCI Regional Program”, on July 27, 2010, which included a small section addressing competitiveness and leakage. The document does not recommend any policy measures, but mentions free allowances and benchmarking to encourage efficiency. Each jurisdiction would be responsible for their own enforcement, which is complicated by the presence of Native American lands which physically find themselves within the jurisdiction, but which would not be bound by rules governing emissions trading.

In addition, WCI is currently discussing a variation of a border measure on electricity imports. For electricity, the point of regulation in the future WCI cap-and-trade system will be the so-called First Jurisdictional Deliverer (FJD). A FJD is defined as “the first entity that delivers… electricity [imported from non-WCI jurisdictions] over which the consuming partner WCI jurisdiction has regulatory authority” (WCI 2009b). As a significant amount of electricity consumed in the WCI is generated outside of it, the overall scope of the system with respect to the electricity sector as well as the environmental benefits would only be very limited. In other words, the leakage of electricity emissions to non-WCI jurisdictions is a concern that this approach seeks to address (WCI 2009d: 22-23). However, discussions between regulators and stakeholders are still ongoing as to administrative and practical feasibility. The FJD approach would address competitiveness concerns only in the electricity sector, and only with regard to jurisdictions from which electricity would be imported into the WCI region.

3.6 Legislative Proposals on Climate and Energy in the US Congress: Waxman-Markey Bill, Kerry-Boxer Bill and Kerry-Liebermann Bill

Since the beginning of 2009, several Climate Bills have been proposed and discussed in the US Congress. The American Clean Energy and Security Act (Waxman-Markey) as passed by the US House of Representatives on 26 June 2009, the Clean Energy Jobs and American Power Act (so-called Kerry-Boxer) proposal as passed in the U.S. Senate Committee on Environment and Public Works on 5 November 2009 as well as the American Power Act presented by Senators John Kerry and Joe Liebermann (Kerry-Liebermann Bill) presented on 12 May 2010. However, as no proposal on climate or energy legislation has been introduced to the U.S. Senate since then, it is very unlikely that such legislation will be passedin the near future.. Republican members of Congress, especially, but also several Democrats, oppose the introduction of such legislation. Should climate change legislation not been passed by the Congress before that date, commentators assume that it will take several more month or even years before according legislation is likely to be discussed again.

The American Clean Energy and Security Act (ACESA, H.R.2454), a legislative proposal in the House of Representatives also known as Waxman-Markey Bill after its authors,

[29] “As a regional program, the primary mechanism for addressing this leakage risk is through the judicious distribution of allowances to facilities to ensure that they have an incentive to reduce emissions, but are not disadvantaged competitively.” (WCI 2009c: 34)

Representatives Henry Waxman of California and Edward Markey of Massachusetts, was approved by the House of Representatives on 26 June 2009 (Pew Center 2009). The bill foresees a cap leading to a 17% reduction of GHG emissions by 2020 (based on 2005 levels) for a federal cap-and-trade system, while it aims to reduce United States' emissions by 20% by 2020 and about 80 percent by 2050, again based on 2005 levels (US Congress 2009: Sec. 702, 682). In addition to establishing an emissions trading system, the bill includes provisions on a renewable electricity standard, provides for the modernization of the electrical grid and the expanded production of electric vehicles, and mandates significant increases in energy efficiency in buildings, home appliances, and electricity generation.

The Clean Energy Jobs and American Power Act (CEJAPA, S.1733) is the according legislative proposal in the US Senate introduced by Senators John Kerry of Massachusetts and Barbara Boxer of California (therefore also referred to as Kerry-Boxer Bill). It was introduced in the Senate on 30 September 2009 and was adopted as a chairman's mark in the US Senate Committee on Environment and Public Works on 5 November 2009. The economy-wide emission reduction targets as well as the ETS caps are identical to the Waxman-Markey Bill, except that Kerry-Boxer puts forward an ETS cap leading to a 20% reduction of GHG emissions by 2020 based on 2005 levels (US Senate 2009: Sec 702-703, 448). Overall, the two bills are very similar as the Kerry-Boxer proposal is very much based on the Waxman-Markey Bill. However, some difference can also be noted, e.g. regarding offsets and the competencies given to the US Environmental Protection Agency (US EPA). At the heart of each bill is an US federal ETS that would cover approx. 85% of US emissions and commence in 2012.

The Kerry-Boxer Bill does not represent a bipartisan initiative that could potentially also garner the support of Republican Senators. Senator Kerry therefore started collaboration with Senators Liebermann (I) and Graham (R) on a bipartisan compromise bill in fall 2009 that was scheduled to be unveiled on 26 April 2010. Shortly before presenting the Bill, Graham backed out from the common effort, Kerry and Liebermann then presented their version of a Climate Bill on 12 May 2010: The American Power Act (APA or Kerry-Liebermann). The Kerry-Liebermann Bill builds in many parts on the Waxman-Markey and the Kerry-Boxer Bills, but contains some significant differences to both. It would comprise a cap and trade system for covered entities as one means to reduce emissions which has to be seen in the context of the whole bill. A 17% reduction in GHG emissions by 2020 based on 2005 levels (83% by 2050) for capped sources which also represents the economy-wide cap (Kerry and Liebermann 2010: Sec. 702-703, 265). The emissions cap would cover the major sectors responsible for GHG emissions in the US, starting with electricity production/power plants in 2013 and phasing in heavy industry - energy-intensive industries and those vulnerable to foreign competition - in 2016 (Kerry and Liebermann 2010: Sec. 722, 324-331). The APA also includes an auctioning system of allowances that would start at 25% and would increase over time to full auctioning. Revenues from auctions would to a very large part be channelled back to consumers (Kerry and Liebermann 2010: Sec. 3201, 746). In addition, the bill puts forward cost containment measures such as a price floor of 12$ metric ton CO2e and increasing by 3%/year (inflation-adjusted) as well as a price ceiling of $25/metric ton CO2e and increasing by 5%/year (inflation-adjusted) (Kerry and Liebermann 2010: Sec. 790, 521 and Sec. 726, 349).

General approach and policy goals

All three bills define "carbon leakage" as "any substantial increase (here in Kerry-Boxer and Kerry-Liebermann: 'as determined by the Administrator', i.e. US EPA) in greenhouse gas emissions by industrial entities located in other countries if such an increase is caused by an incremental cost of production increase in the United States resulting from the implementation of this title" (US Congress 2009: Sec. 401, 1089; US Congress 2009: Sec. 141, 875; Kerry and Liebermann 2010: 4001, 784). The bills attempt to address associated competitiveness concerns by compensating energy-intensive, trade-exposed companies for higher costs by providing them with free allowances and through the use of border adjustment measures as contained in Waxman-Markey and Kerry-Liebermann. The purpose of these provisions is twofold: First, to promote a strong global effort to reduce GHG emissions and avoid dangerous climate change, and second, to avoid leakage of GHG emissions to countries outside the United States as a result of direct and indirect compliance costs (US Congress 2009: Sec. 401, 1087; US Senate 2009: Sec. 141, 874; Kerry and Liebermann 2010: Sec. 4001, 782). In addition, the bills would compensate eligible domestic industrial sectors and subsectors for costs resulting from GHG emission control while eliminating or reducing assistance when it is no longer necessary. Further, the bills note the importance of the international climate change negotiations for mitigating leakage and threats to industrial competitiveness, noting that this provides for the most effective way to address competitiveness issues.

Eligibility criteria and thresholds

According to all three bills, in order to qualify as being energy-intensive and trade-exposed, a sector or subsector must have an energy or GHG intensity of at least 5% of output and a trade intensity of at least 15%. Likewise, sectors are also eligible if they have an energy or GHG intensity of 20%, regardless of trade intensity (US Congress 2009: Sec. 401, 1093; US Senate 2009: Sec. 141, 878; Kerry and Liebermann 2010: Sec. 4001, 789).

Energy or GHG intensity is calculated by a formula which takes into account either costs of purchased electricity and fuel costs as well as the product output of an industrial sector (energy intensity)[30], or the CO_2e emissions and the product output of an industrial sector (GHG intensity)[31]. Trade intensity, on the other hand, is calculated by dividing the value of the total imports and exports of such sector/subsector by the value of the shipments plus the value of imports or the sector/subsector (US Congress 2009: Sec. 401, 1095; US Senate 2009: Sec. 141, 879; Kerry and Liebermann 2010: Sec. 4001, 790).

[30] Energy intensity is calculated dividing the cost of purchased electricity and fuel costs of the sector or subsector by the value of the shipments (i.e. output) of the sector or subsector (US Congress 2009: Sec. 401, 1093; US Senate 2009: Sec. 141, 878; Kerry and Liebermann 2010: Sec. 4001, 789-790).

[31] GHG intensity is calculated by dividing the number 20, multiplied by the CO2e emissions (including direct emissions from fuel combustion, process emissions, and indirect emissions from the generation of electricity used to produce the output of a sector or subsector) by the value of the shipments of the sector or subsector (US Congress 2009: Sec. 401, 1094; US Senate 2009: Sec. 141, 878; Kerry and Liebermann 2010: Sec. 4001, 790).

Based on these criteria, the US EPA is charged to publish an initial list of eligible industrial sectors by June 30, 2011 (US Congress 2009: Sec. 401, 1092; US Senate 2009: Sec. 141, 877; Kerry and Liebermann 2010: Sec. 4001, 788), which is regularly reviewed and updated.

Policy measures

All three legislative proposals seek to address competitiveness issues through rebates, provided in the form of free emission allowances. Waxman-Markey and Kerry-Liebermann, in addition, specify possible border adjustment measures (international reserve allowances) which would begin in 2020 (Waxman-Markey) or 2023 (Kerry-Liebermann) respectively unless all major emitters agree to contribute equitably to reducing GHGs by 2018 (Waxman-Markey) or 2020 (Kerry-Liebermann) respectively, while Kerry-Boxer so far only contains a placeholder that a border measure that is consistent with the US international obligations will be included (US Senate 2009: Sec. 141, 898).

Rebates are calculated based on the average product output of a covered and eligible entity (output-based), meaning that each sector is rebated at 100% of sector average of direct and indirect emissions (World Resources Institute 2009: 9). The quantity of emission allowances allocated free of charge would equal the sum of the covered entity's so-called direct carbon factor (i.e. direct costs) and its indirect carbon factor (i.e. indirect costs). These factors are sector-specific. In 2012 and 2013 (2013-2015 for Kerry Liebermann), free allocation of allowances will only be based on entities indirect costs. For calculating the direct carbon factor, the average output of the covered entity for the two years preceding the rebate distribution year is multiplied by the average direct GHG emissions per unit of output for all covered facilities in their respective sector (US Congress 2009: Sec. 401, 1106; US Senate 2009: Sec. 141, 890; Kerry-Liebermann 2010: Sec. 4001, 804). Likewise, the indirect carbon factor, rebates are calculated based on their average output (for the two years preceding the rebate distribution year) multiplied by the emissions intensity of their electricity supplier (electricity emissions intensity factor)[32] and their sector's average electricity use per unit of output (electricity efficiency factor)[33] (US Congress 2009: Sec. 401, 1107; US Senate 2009: Sec. 141, 891; Kerry-Liebermann 2010: Sec. 4001, 804). According to this formula, entities that are more efficient than their sector's average receive more allowances for free than they need to cover their direct and indirect costs, thereby generally providing an incentive to entities to become more efficient over time. The averages of emissions and electricity use per unit of output are recalculated periodically for each sector and can never be greater than they were in the previous calculation. Should a facility no longer meet the eligibility criteria of the rebates program, it has to return all allowances allocated to it under the program for all future vintage years as well as a pro-rata amount of freely allocated allowances for the year

[32] The electricity emissions intensity factor (in tons of CO2e/kWh) is determined by dividing 1) the annual sum of the hourly product of the electricity purchased by an entity, multiplied by the cost the seller of the electricity passes to the entity per ton of CO2e per kWh, by 2) the total kWh of electricity purchased by the entity from that seller in that year (US Congress 2009: Sec. 401, 1107; US Senate 2009: Sec. 401, 891; Kerry-Liebermann 2010: Sec. 4001, 805).

[33] The electricity efficiency factor is the average amount of electricity (in kWh) used per unit of output for all entities in the relevant sector/subsector (US Congress 2009: Sec. 401, 1109; US Senate 2009: Sec. 401, 893; Kerry-Liebermann 2010: Sec. 4001, 807).

in question (US Congress 2009: Sec. 401, 1105; US Senate 2009: Sec. 141, 888; Kerry-Liebermann 2010: Sec. 4001, 802).

Under the bills, there is a maximum amount of allowances that can be used for rebates (US Congress 2009: Sec. 401, 1111; US Senate 2009: Sec. 111, 897; Kerry-Liebermann 2010: Sec. 2101, 497). In 2012 and 2013, up to 2% (Waxman-Markey) or 4% (Kerry-Boxer) respectively of the total allowances available can be used for assisting eligible entities. For 2014-2016, 15% of total allowances are available for industrial assistance; between 2017 and 2025, 13.5% of total allowances are available as rebates for energy intensive, trade-exposed industries. Starting in 2026, the amount of free allowances allocated to eligible industries as rebates declines by 10% per year of the previous year allowances until 2035, when it phases out completely. In Kerry-Liebermann, up to 2% of total allowances would be available to trade-exposed industries between 2013 and 2015, up to 15% between 2016 and 2025, and declining by 3% per year of total emission allowances from 2026 onwards to phase out completely in 2030 (Kerry and Liebermann 2010: 497). For all three bills, the total number of allowances peaks in 2016 and declines thereafter, while the share of total allowances allocated under the rebate programs to eligible industries is calculated as mentioned above. The number of allowances declines in accordance with the percent reductions in the overall cap.

In addition to the 100% free allocation of sector average direct and indirect emissions cost, the Waxman-Markey Bill and the Kerry-Liebermann Bill (though not the Kerry Boxer Bill) foresee border adjustment measures which may be applied from 2020 or 2023 respectively onwards (US Congress 2009: Sec. 401, 1123; Kerry and Liebermann 2010: Sec. 4001, 816). By 2018 or 2010 respectively, all major emitters are required to contribute equitably to the reduction of GHGs. This can be achieved either in form of a binding international agreement or by comparable climate policies in a sector that is covered by the US climate bill. If neither way is successfully established, the bill requires emission allowances (so-called international reserve allowances) for the importation of products in energy-intensive and trade-exposed sectors (US Congress 2009: Sec. 401, 1123; Kerry and Liebermann 2010: Sec. 4001, 819) to adjust the prices of energy-intensive imports at the border. This provision is set to take effect automatically in 2020, unless one of the following conditions applies (US Congress 2009: Sec. 401, 1118, 1120 and 1124; Kerry-Liebermann 2010: 816, 820 and 822):

- The President determines that the adjustment is not necessary for a given sector and Congress concurs;
- At least 85% of imports in a given sector come from (Waxman Markey) or 70% of global production or produced or manufactured in (Kerry-Liebermann) a country that meets one or more of the following criteria: (1) the country is party to an international agreement and has emission targets at least as stringent as those in the US; (2) the country and the US are both party to an international sectoral agreement; (3) the country has energy or GHG intensities in that sector no higher than those in the US.
- Imports come from a Least Developed Country or other nations that account for less than 0.5% of global GHG emissions and less than 5% of US imports in a given sector.

3.7 Comparison

The following table provides an overview of the key provisions relating to competitiveness issues in the respective existing or planned ETS:

Table IIa: Overview of provisions addressing competitiveness issues

Issue	EU ETS (Phase III)	Australian CPRS	NZ ETS	RGGI	WCI	Waxman-Markey / Kerry-Boxer / Kerry-Liebermann
Policy goals						
	Ensuring international competitiveness; Safeguarding environmental integrity including providing incentives for emissions reductions	Reducing likelihood of relocation of industry; Providing measure of transitional assistance	Minimize negative impact of ETS on domestic industry	Avoiding shift of electricity production to outside RGGI region; safeguarding environmental integrity including providing incentives for emissions reductions	Ensuring competitiveness, safeguarding environmental integrity including providing incentives for emissions reductions; Providing transitional assistance	Ensuring international competitiveness of domestic sectors of the economy; Safeguarding environmental integrity including providing incentives for emissions reductions
Eligibility criteria and thresholds						
Criteria for determining sectors	Quantitative: Increase of production costs; Non-EU trade intensity Qualitative: Technical hurdles for further efficiency increases; market characteristics; profit margins	Quantitative: Emissions intensity; trade exposure Qualitative: Trade intensity: Demonstrated lack of capacity to pass through additional costs	Quantitative: Emissions intensity Qualitative: Trade exposure	Monitoring of electricity imports into the RGGI region; Evaluation of increase in emissions from electricity production outside the RGGI region that can be attributed to the cap and trade program Criteria to be determined		Quantitative: Energy or GHG intensity; trade intensity
Costs included	Direct and indirect	Direct	Direct			Direct and indirect
Thresholds	5% increase of production cost (GVA) and 10% non-EU trade intensity; or 30% increase of production costs; or 30% non-EU trade intensity	Emissions intensive above 1000t CO_2/\$m revenue or 3000t CO_2/\$m value added Trade intensity: trade share (ratio of value of imports and exports to value of domestic production) > 10 %	Emissions intensity: A high intensity threshold above 1,600 tonnes CO_{2e}/\$m revenue; a medium intensity threshold above 800 tonnes CO_{2e}/\$m revenue			Energy or GHG intensity of at least 5% and a trade intensity of at least 15%; or Energy or GHG intensity of 20%

A review of competitiveness issues as contained in the major policies and current legislative proposals on establishing an ETS shows that they all pursue similar policy goals: they seek to ensure international competitiveness of domestic sectors for sectors found to be eligible for some kind of assistance while on the one hand safeguarding environmental integrity and on the other providing incentives for emissions reductions.

The criteria that are used to identify eligible sectors are similar. Quantitative criteria are included in most systems such as the increase of production costs (EU ETS), trade intensity (EU ETS with non-EU countries, CPRS, W-M, K-B, K-L), emissions intensity in the CPRS and NZ ETS as well as energy or GHG intensity in the US proposals. Qualitative criteria complement the eligibility assessment in the EU ETS, the CPRS and the NZ ETS, but are not used in the US proposals. Neither RGGI nor WCI have specified provisions regarding competitiveness in place so far. Concerning the costs that are included in the eligibility assessment, the EU ETS as well as the three proposals in the US Congress all take direct and indirect costs into account, whereas the CPRS and the NZ ETS only account for direct costs. As the above table shows, the thresholds that are used in the different systems in order to assess the eligibility of sectors differ between the systems. The EU ETS and the US proposals seem to follow somewhat similar procedures, while the CPRS and the NZ ETS again follow similar procedures with that are however different to the former two.

Free allocation is the key policy measure to address competitiveness concerns in most systems. The way that the amount of free allocation is calculated however differs. In the EU ETS, eligible sectors receive 100% free allocation at the level of ambitious benchmarks. In the US proposals, eligible sectors will receive 100% free allowances based on historical output and emissions data. In the CPRS and the NZ ETS, again a different approach is pursued that specifies two fixed assistance rate for different emissions intensity levels. The EU ETS calculates free allocation on the basis of benchmarks, while the CPRS pursues an activity-based approach based on historical data. The NZ ETS allocated based on an activity-based approach relative to production and the US proposals have an output-based approach based on historical data. Only the EU ETS and the US proposals specify a maximum amount of allocations that can be given to eligible industries. In the case of the US proposals, these are phased out over time. Border measures are only foreseen in two of the US proposals: Waxman-Markey and Kerry-Liebermann.

Table IIb: Overview of policies & measures addressing competitiveness issues

Issue	EU ETS (Phase III)	Australian CPRS	NZ ETS	RGGI	WCI	Waxman-Markey / Kerry-Boxer / Kerry-Liebermann
Policy measures						
Amount of free allocation	100% at the level of ambitious benchmarks	Two rates: 94.5% (high emissions intensity) or 66% (med. emissions intensity) of the baseline allocation; reduced over time	Two rates: 90% (high emissions intensity) and 60% (medium emissions intensity)		The details of common approach to competitiveness issues are still to be developed.	100% for eligible sectors
Calculation of free allocation	Sector basis Benchmark: Average performance of 10% most efficient installations	Activity basis (historical) 94.5%: intensity of at least 2000t CO_2/\$m revenue or 6000t of CO_2/\$m value added, 66%: emissions intensity above 1000t CO_2/\$m revenue or above 3000t of CO_2/\$m value added	Activity basis. No cap on level of free allocation available to EITE sectors. Allocation made relative to production and on emissions intensity basis, i.e. average emissions per unit of production for a particular activity	Implement appropriate measures to mitigate such emissions, e.g. investments in energy efficiency market transformation programs and complementary policies that increase end-use energy efficiency	Possibly free allocation, amount not yet determined Regarding electricity: First Jurisdictional Deliverer approach	Sector basis (historical) Output-based: Average direct and indirect emissions cost calculated on the basis of a direct and an indirect emissions factor (rebate approach)
Max. amount of free allocation	Yes. Baseline average proportion multiplied by cap of given year.	No. Estimates: 25% of all allowances initially and about 45% of allowances in 2020	No. Allocations to industry will be made relative to production.			Yes. **W-M and K-B**: In 2012 and 2013, 2% (W-M) or 4% (K-B) max. 2014-2016 15% of total allowances; 2017-2025 13.5% of total allowances. Starting in 2026, the amount of free allowances declines by 10%/year of the previous year allowances until 2035, when it phases out completely. **K-L**: Max. 2% of total allowances between 2013 and 2015, max 15% between 2016 and 2025, and declining by 3%/year of total emission allowances from 2026 onwards to phase out completely in 2030
Border measures	No. Introduction possible if no substantive international agreement	No.	No.	No.		**W-M and K-L**: Yes. So-called international reserve allowances program. Requires allowances for import of products in energy-intensive and trade-exposed sectors. Exemptions apply. **K-B**: Not specified.

4 Conclusions: Competitiveness and Linking

Competitiveness concerns and the risks of carbon leakage as a result of carbon regulation have been widely discussed in theory and practice. The discussion of theoretical and empirical evidence, however, suggests that only a limited number of specific sectors may be affected: i.e. there is basically little reason to consider carbon pricing as a concern for the wider national economies. Moreover, a number of other factors (e.g. labor costs, differing input costs, and currency exchange rates) have larger impacts on competitiveness than the pricing of carbon. Finally, approaches to identify industries that are vulnerable to carbon leakage face a number of methodological difficulties as studies on competitiveness impacts of emissions trading systems suggest.

Nevertheless, parties with emissions trading systems in place or under development all consider compensatory measures to avoid negative impacts on the competitiveness of those sectors mostly exposed to international competition at least for a transitory phase. Competitiveness issues are reflected in all major policies and current legislative proposals on establishing an ETS. The review of the provisions of six existing and emerging emissions trading systems shows: the free allocation of allowances is the key policy measure to address competitiveness concerns in all systems. Its impact on carbon leakage varies considerably and must therefore be carefully taken into consideration when specifying rules for free allocation (e.g. though benchmarking). The amount of free allocation differs, indicating different approaches to provide for the environmental effectiveness of the approach. The EU ETS puts forward the most ambitious effectiveness requirements. Though 100% of allowances are allocated free, they are limited to a strict benchmark caps encouraging efficiency.The CPRS pursues an activity-based approach based on historical data, while the NZ ETS takes an activity-based approach relative to production. Proposals in the US have suggested an output-based approach based on historical data. Only the EU ETS and the US proposals specify a maximum amount of allocations that can be given to eligible industries.

Sectoral approaches are not planned or foreseen in any of the proposals in order to address competitiveness concerns, BAMs are only foreseen in two of the current US proposals (Waxman-Markey; Kerry-Liebermann) though it is unlikely that anything like their proposals will now come to fruition. It is difficult to prove that BAMs help to ensure the environmental effectiveness of the whole system although the general idea is to incentivize the adoption of stricter climate policy in countries currently without carbon regulation. Since BAMs are pursued unilaterally they are politically highly sensitive in a context searching for a global solution. Most commonly, this option is discussed with respect to the compatibility to WTO law. There is some reason to consider such measures as compatible if they are designed in a non-discriminatory way. However, this will obviously not be the case if companies receive free allocation or rebates in addition to the establishment of BAMs, both of which are foreseen in US proposals.

Assessments of the extent to which policies and measures to address competitiveness concerns pose a barrier to linking indicate that some challenges need to be considered. Different allocation methods (grandfathering/auctioning) as the most relevant measure should have no major implications. Nevertheless, different allocation approaches may cause concerns about comparability of the regulation. If in one system free allocation occurs, this may be perceived as an implicit subsidy by installations regulated by the other system where permits will be auctioned. Hence, the harmonisation of allocation methods may be one topic to be addressed during a linking process. In addition, if different compensation measures exist (e.g. free allocation vs. BAMs) harmonisation has to be achieved, e.g. by agreeing on a uniform free allocation approach throughout the linked system. This option may be more feasible given the political and technical difficulties to pursue the BAMs approach towards countries lacking policies or sufficiently strict policies.

So far, the most obvious policy measure to address leakage concerns, the stronger international coordination in the sectors affected, has widely been neglected. A global incentive for low carbon solutions in the sectors affected, i.e. by jointly defining a pricing of carbon emissions in certain sectors can deliver both: emission reductions and a reduction of competitiveness concerns (Grubb et al. 2009 refer to the option of “leveling up”). From this perspective, linking of emission trading systems or, at least, the harmonization of certain sectors is the most powerful response to commonly raised leakage concerns (see below). Linked trading schemes will lead to harmonized carbon prices which can help to eliminatepotential competitive distortions which may arise from different carbon prices in the respective region before linking occurs.

Broad coverage of international emissions through coordinated regulation can ensure that the probability of leakage remains low in the future. Since a global carbon market is probably not realistic in the coming decade, sector specific agreements or linking agreements between major trading partners are a feasible interim option. In a similar vein, the discussion on border adjustment measures can at least be considered as a starting point to define the level of acceptability of addressing competitiveness concerns – although BAMs are politically sensitive and only relevant for a minor part of the systems analyzed here. Since the ETS analyzed use or intend to use (at least to a certain degree) of free allocation, an increased focus on this specific compensatory measure can help to aim for a level playing field in the long run. This is especially important for sectors that may be particularly exposed to competition with regions without a regulation on carbon emissions. A first step could be in-depth discussions about the use of benchmarks as a basis for determining the allocation of emission allowances. An international harmonization process needs to consider above all the design of an allocation scheme, the number of benchmarks to be applied in the various sectors as well as the concrete values for the actual benchmarks. Identifying standards and best practices on the technical implementation of these elements of trading systems can pave the way for further carbon market integration.

In the absence of further substantial progress after Copenhagen, partnerships like the International Carbon Action Partnership (ICAP) can play a crucial role in discussing options how to harmonize different means of addressing leakage concerns not only among industrialized countries but also with respect to emerging economies that do not yet regulate their carbon emissions. ICAP or any other network representing existing and evolving emission trading systems can help to facilitate future solutions for a comprehensive global trading system.

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