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Allocation and Related Issues for Post-2012 Phases of the EU ETS

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NERA Economic Consulting ("NERA") prepared the report. NERA is a firm of more than 450 consulting economists with 22 global offices that has extensive experience in the design and evaluation of emissions trading programs in Europe, the United States and elsewhere. The authors of the report are David Harrison, Daniel Radov and Per Klevnas. James Skurray provided editorial assistance. The report draws on the authors' experience with the design of emissions trading programs, including previous research undertaken for the Commission in the context of the EU Scheme (David Harrison and Daniel Radov, 2002). Because the emphasis in this report is on distilling information for the use of the Commission—rather than on documenting the literature—citations are kept to a minimum.

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1. Introduction

This report provides information on major design options related to the allocation of emissions allowances under the European Union Emissions Trading Scheme (hereafter the EU ETS, or “the Scheme”). The report was developed to assist the European Commission in the context of the review of options for the EU ETS after 2012, during the third and subsequent phases of the Scheme.

The report covers topics related to allocation alternatives as well as several other issues. All of the material contained here was developed initially as a set of briefing notes for the Commission in 2007. The topics covered in the report are divided into two major categories: (1) assessment criteria and other general features, including cap-setting; and (2) allocation alternatives and issues specifically related to allocation.

The topics in the first category include the following:

- § Criteria and principles for assessing design options;
- § Competitiveness; and
- § Cap-setting.

The topics in the second category are the following:

- § Auctioning;
- § Emissions-based grandfathering of allowances;
- § Benchmarked allowance allocation;
- § New entrants and closure rules;
- § “Updating” of allocations; and
- § Other allocation issues.

The general structure for the chapters related to allocation alternatives is to provide background on the allocation issue, describe and evaluate the options, and provide tentative conclusions.

2. Criteria and Principles for Assessing Allocation and Cap-Setting Options

Many criteria can be used to evaluate alternatives for allocation and setting of the cap. It is useful to organize the criteria into four major categories:

1. Environmental effectiveness;
2. Economic Efficiency;
3. Administrative feasibility and costs; and
4. Fairness and distributional equity.

The following are brief summaries of these criteria and some of the complications that arise in their application.

2.1. Environmental Effectiveness

The primary objective of any cap-and-trade programme is to hold emissions to the level set by the cap. It is useful, however, to broaden this criterion to consider effects on emissions outside the cap program. Thus, we identify two aspects of environmental effectiveness:

- § Ability to maintain the cap; and
- § Ability to limit “leakage.”

2.1.1. Ability to maintain cap

The overall cap determines the level of environmental benefit to be achieved in the first instance by the cap-and-trade scheme. Certain allocation approaches may make it more or less difficult to ensure that the overall emissions cap for activities within the EU that are covered by the trading scheme delivers the intended level of emissions reductions. Aspects of allocation that may be relevant include levels of decentralisation and the extent to which allocations and caps are expected to be revised in subsequent phases.

2.1.2. Ability to limit “leakage”

If an emissions trading programme covered all of the relevant emitting activities that compete with each other, the issue of “leakage” (i.e., increases in emissions outside the programme) would not arise. However, when significant emitting activities that compete in the same markets lie outside the area covered by the trading scheme, some activities might shift to these competing areas, leading to increases in emissions that would offset reductions within the trading scheme. Shifts in production can occur in both the short-run and the long-run. Leakage also can occur through indirect mechanisms, through effects on prices of internationally traded fossil fuels and on other trade flows and exchange rates.

The net effect on overall emissions depends on the relative emissions intensities of production in different regions and the extent to which production in one region can

substitute for production in another. Because leakage reduces the emissions benefits of the trading scheme, it also reduces the scheme's cost-effectiveness, as measured as cost per global tonne reduced. Leakage therefore has the potential to undermine the central goals of emissions trading—to reduce emissions to the cap and to achieve these reductions at least cost.

Leakage would be avoided or reduced to the extent that the programme maintains production and investment in the region covered by the trading program. In addition, leakage is avoided / reduced to the extent that the geographical boundaries of the trading scheme cover more of the competing regions. Different allocation approaches may be more or less able to achieve these aims.

2.2. Economic Efficiency of Trading Scheme

This category includes the effects that the allocation approach may have on the ability of the trading scheme to incentivise emissions abatement at least cost, as well as any effects it may have on the efficient and liquid operation of the allowance market. We thus distinguish two key elements:

- § Consistency with least-cost abatement; and
- § Proper functioning of the allowance market.

2.2.1. Consistency with least-cost abatement decisions

One of the principal attractions of emissions trading is that it can provide incentives for participants to conduct their operations and make investment decisions to minimize the cost of achieving the level of emissions prescribed by the cap. These incentives are provided by establishing a consistent cost of CO₂ emissions that applies to all covered activities and products. There are many potential options for reducing CO₂ emissions, and in principle an emissions trading scheme should be able to incentivise as much of each of them as will meet the cap at least cost. However, there are some allocation approaches that may alter these incentives—either by increasing the incentives for specific abatement alternatives, or reducing the incentives for others (or both).

2.2.1.1. Options for reducing GHG emissions

When considering the efficiency of the allocation approach, it is useful to keep in mind the following options for reducing direct emissions covered by the trading program—each of which has associated costs and emissions benefits:

- § *Improving (CO₂-emitting) fuel efficiency.* The incentive is provided by the higher total costs of fuels when the cost of associated CO₂ emissions is included.
- § *Switching to less CO₂-intensive fuels.* The incentive is created when the relative costs of fuels changes because of different CO₂ contents, or because of changes to fuel market conditions occasioned by the trading scheme.
- § *Improving efficiency of other CO₂- (and other GHG)-emitting processes.* As with fuels, the incentive is provided by the higher costs or prices of inputs when their GHG costs must be included.

- § *Switching to lower GHG-intensive (non-fuel) inputs.* As with fuels, the incentive is created when the relative costs or prices of inputs change based on different GHG contents.
- § *New investment in technologies / regions / processes with lower GHG emissions.* The incentive is created because of the gains from lower emissions (and thus lower costs).
- § *Reducing production.* CO₂ and other GHG prices are reflected in higher product prices, which leads to reduced consumption and production.

One can judge the ability of an allocation mechanism to minimize the cost of compliance by considering whether the mechanism provides incentives for all of these methods of reducing emissions and whether there are any “biases” toward one or another of the options (i.e., incentives other than based upon the cost per tonne of emissions).

2.2.1.2. Factors affecting least-cost compliance

Various factors can affect the ability of a cap-and-trade program to provide incentives for least-cost compliance. One example is where product markets do not function competitively, which has the potential to affect the trading scheme’s ability to provide incentives for different abatement options—and therefore may lead to abatement decisions that deviate from the least-cost choices in perfectly competitive markets. The effects on incentives of such pre-existing market “distortions” and constraints can differ depending on the allocation approach chosen. Examples of pre-existing deviations from perfect competition that may be relevant here include markets where product prices are regulated (which may affect operators’ ability or willingness to pass GHG costs through to consumers), product markets that are characterized by market power or a lack of competition, or the presence of imperfect capital markets.

Another potentially important long-run consideration is that different allocation options could affect incentives to innovate and invest in low-emitting technologies. An appropriately designed cap-and-trade program will create incentives for such investment and for research and development to improve such technologies. To the extent that product prices incorporate the costs of CO₂ and other greenhouse gases, operators will have incentives to innovate by developing substitute production processes that use different inputs or otherwise reduce these emissions. Where prices of products and services do not incorporate the costs of greenhouse gases, the long-term incentives for technological (and process) innovation may not be as high as they should be, and this may result in inefficiencies in R&D investment in the longer term. Different allocation approaches could affect the impacts of these inefficiencies. In addition, different approaches to allocation by different Member States could affect the incentives created by the trading scheme and lead to different operating and investment decisions.

There also can be interactions between environmental and efficiency objectives, as suggested by the discussion of emissions leakage above. More generally, the presence of complicating factors such as emissions leakage makes it more difficult to determine which abatement choices represent the “least-cost” solution.

2.2.2. Functioning of the allowance market

A second aspect of the efficiency of the trading scheme relates to the proper functioning of the allowance market. This aspect is related to the efficiency of abatement options, but can be distinguished from it.

A number of commentators on the EU ETS have expressed the view that various market participants may not behave “rationally” in the allowance market. This is most often discussed in reference to whether installations or operators account for the opportunity to sell unused allowances in the allowance market and thus consider emissions as an “opportunity cost” (whether or not they have received any allowances for free). Failure to account for real opportunity costs would be economically “irrational”. If such “irrational” behaviour of participants were in fact a real feature of the current allowance market, then it may be appropriate to consider whether allocation could “correct” it. Certain allocation approaches may be better able to do this than others.

Before considering potential corrective action, however, it would be important to assess the significance of purported “irrational” behaviour, since there may be alternative explanations for the apparent “irrationality.” In particular, the high volatility followed by low prices that have characterised the EU ETS during much of the first phase, combined with the widespread uncertainty about future allocations, may have reduced incentives for operators to reduce their emissions. If this were the case, decisions based on these incentives may be entirely “rational,” and may in fact reflect the expected opportunity costs that firms actually faced. Thus care should be taken when considering ways to modify allocation to “correct” such behaviour, to ensure that any “corrections” address real efficiency concerns.

2.3. Administrative Feasibility and Costs

Any initial allocation mechanism will entail some administrative costs to set up and manage the system. These administrative costs include those incurred by governments and regulators as well as those incurred by operators of covered emissions sources and other market participants.

It is useful to organize criteria into the following two components:

- § Costs to establish and maintain the allocation approach; and
- § Transactions costs.

2.3.1. Costs to establish and maintain the allocation approach

The allocation of allowances can be data-intensive and require significant administrative resources. Costs to authorities include the development and assessment of different allocation methodologies, including consultation and negotiation with affected parties. They also may include research efforts to develop benchmarks, growth projections, or other components of the allocation formulae, as well as the collection and verification of baseline data. Additionally, costs of allocation may be incurred through the execution of actual allocation processes (such as auctions or free disbursements of allowances to registries) and the development of associated information technology infrastructure. Stakeholders also are

likely to incur costs throughout these various steps of the allocation process. As the number of affected parties is large, costs may be large in the aggregate.

Allocation approaches can differ significantly in their data and administrative costs. Relevant aspects influencing administrative costs of allocation include the complexity of the approach and the frequency of revisions to methodologies, both of which would tend to increase costs. Costs also may be influenced by the number of different approaches used in different Member States. Certain types of data also may be more sensitive commercially than others, which could make them more difficult to use as the basis for allocations.

2.3.2. Transactions costs related to the allocation approach

The cost-effectiveness of emissions trading depends on the ability to sell and buy allowances in the market, and the ability to engage in this market activity efficiently is a pre-requisite for efficient choices of abatement options. In practice, market transactions typically have costs. These may include search costs to find buyers or sellers, fees to intermediaries such as brokers who facilitate trading, or learning costs of finding out how markets work and using trading infrastructure. Another “cost” may be concern that engaging in trading may reveal information to competitors, e.g., about the level or efficiency of production. If these costs and obstacles were substantial, they could cause some trading – and thus some of the cost-minimising emissions abatement – not to be undertaken.

Total transaction costs can depend on the initial allocation of allowances. For example, an allocation that corresponded closely to market participants’ “need” for allowances could lead to less need for trading, and thus lower costs. On the other hand, if there were economies of scales in transactions, costs per trade may in fact be lower and markets more developed where the volume traded is larger.

2.4. Fairness and Distributional Equity

There are many different principles that could be used to assess the “fairness” of different approaches to allocation, many of which are not themselves precise in their implications. The various “principles” may include (but are by no means limited to):

- § making affected installations “whole” by defraying their net or stranded costs;
- § creating a “level playing field” for all covered installations;
- § allocating proportionate to need or ability to reduce emissions;
- § allocating according to pre-existing “use-rights”;
- § allocating based on the “polluter pays” principle;
- § rewarding or not penalising “early action” to reduce emissions; and
- § promoting low-emitting technologies.

Note that fairness would have quite different meanings under these various principles and, indeed, many would appear to conflict with each other.

With regard to distributional criteria, it is useful to distinguish the following effects:

§ Burdens to covered installations (or their operators);

§ Burdens to consumers of affected products; and

§ Burdens to taxpayers and other welfare effects.

2.4.1. Burdens to covered installations

The trading scheme is designed to create a market price for greenhouse gases and in so doing to impose costs on those who emit them. These costs may be direct accounting costs or opportunity costs. Different approaches to allocation could defray the costs to covered installations to a greater or lesser extent—and in different ways.

2.4.2. Burdens to consumers of affected products

Covered installations are not the only ones that may be affected by the trading scheme. In particular, companies (and individuals) who consume GHG-intensive products may face higher costs as product prices rise to reflect the costs of emissions. Many of the principles listed in the previous section could be applied to these consumers.

2.4.3. Burdens to Taxpayer and other welfare effects

Finally, in assessing the distributional impacts of allocation, it is possible to consider the implications for the economy and taxpayers as a whole. Some approaches to allocation have implications for government revenues, which can make it possible to reduce the burdens of taxes that may lead to economic inefficiencies, such as taxes on labour or income. Any efficiency benefits will only be realised to the extent that revenues actually are used to reduce inefficient taxes or to correct other pre-existing distortions or inefficiencies in the economy.

3. Competitiveness Effects

3.1. Introduction and Background

Efforts to reduce global emissions of greenhouse gases (GHGs) currently are guided by the Kyoto Protocol, and the EU ETS has been implemented as part of EU efforts to comply with its provisions. However, this international framework does not include all countries and also does not impose obligations to reduce emissions on all signatories. Additionally, no similar international agreement currently is in place for the period after 2012.

While this or a similar situation persists, the EU ETS may be in force without corresponding regulation of greenhouse gases by all trading partners. In sectors with significant international trade, this can lead to concerns about the continued “competitiveness” of production and investment within the EU. The introduction of emissions trading adds a cost of production to installations covered by the Scheme; moreover, costs can increase for firms that are not covered by the scheme as their input prices increase. To some extent, emissions trading reduces the impact of emissions limits on EU industries, because it is a “cost-effective” policy instrument that can be expected to achieve a target level of emissions abatement at the lowest possible cost. However, these costs may still be significant. Where rivals competing in the same product market do not face similar costs, EU producers therefore may find themselves at a disadvantage.

The impacts of emissions trading are likely to vary significantly between sectors. Both the additional costs incurred as a result of the scheme and the exposure to competition from rivals without corresponding costs may differ significantly between industries. One aim of this chapter is to consider definitions of “competitiveness,” a term that can have a number of meanings. Another aim of this note is to clarify the factors that may be relevant in assessing whether a sector / installation is “exposed”—that is, likely to experience reduced competitiveness as a result of the introduction of emissions trading.

The structure of this chapter is as follows. The following section considers definitions of competitiveness and also outlines the major mechanisms whereby emissions trading affects market outcomes—notably costs, prices, and quantities produced and consumed—and thereby affects these various measures of competitiveness. We use this background material as a framework for the discussion in section 3.3 of the specific characteristics of sectors that may be used to assess whether they are exposed to adverse competitiveness impacts. Section 3.4 evaluates the implications of some of the major allocation parameters (which are discussed in more detail in other chapters) for competitiveness, based upon the different definitions of competitiveness/exposure identified in the earlier sections.

3.2. Defining Competitiveness

This section considers the various parameters that might be used to define “competitiveness” and thus to measure the impacts of the Scheme—and various allocation approaches—on the competitiveness of various sectors or facilities. We also consider the market effects of the Scheme, as background for assessing the ultimate distributional/competitiveness impacts.

3.2.1. Various definitions of competitiveness

In broad terms “competitiveness” refers to the performance of firms relative to competitor firms. However, performance can be measured in different ways, and different definitions can lead to different conclusions regarding the competitiveness impacts of emissions trading.

We discuss four ways of defining competitiveness: profitability, market share, production cost, and levels of investment. Although all of these metrics can be meaningful measures of “performance” or performance relative to competitors, they differ in important ways, with implications for how they are affected by emissions trading. For example, maintaining a high level of output or market share may not always result in highest profitability; similarly, a large increase in costs may not necessarily lead to a large loss of profitability or output.¹

3.2.1.1. Profitability

Most economic analysis assumes that maximising profits is the ultimate long-term objective of firms, so relative profitability has significant appeal as a measure of competitiveness.² The effects on final profits provides a succinct summary of impacts on the firm, as they reflect the full impact of costs, price effects, and changes to demand and production. According to this measure, a sector’s competitiveness would be adversely affected if its profits were reduced as a result of the introduction of emissions trading.

One problem with using profitability as a measure of competitiveness in the context of emissions trading is that it does not capture features of firm performance that many would consider to be important for competitiveness. For example, overall profits depend on the value of any free allowance allocation received under an emissions trading scheme. Sufficient free allocation may maintain profitability even where firms experience significant reductions in the profit they earn from sales in their product markets. It is not clear that such developments, which typically would be accompanied by losses either of profit margins per unit output or of total output, correspond to the preservation of competitiveness.

To take an extreme example, an industrial producer that scaled back its output by 90 percent but was nevertheless able to maintain profits by selling the bulk of its free allocation probably would not be considered to have maintained its competitiveness. Also, to the extent concerns about competitiveness are motivated not only by preserving firm profit, but also by

¹ There are ongoing debates about the usefulness of the term “competitiveness” in different contexts. Some have argued (Krugman 1994) that the term has little meaning when applied to entire economies. The Commission staff working document “The effects of environmental policy on European business and its competitiveness – a framework for analysis” (10605/04) includes the following discussion of competitiveness:

In general, *competitiveness* is defined as a sustained increase in real incomes and in standards of living, with jobs available for all those who wish to find employment (European Competitiveness Report 2001). A related concept is *competitiveness at the level of firms and industry*, focusing on price and cost developments of production and other parameters potentially affecting the growth performance, market shares and investment and location decisions of firms in the regulated sectors. This latter concept of competitiveness will be at the heart of this exercise, as a good understanding of the impacts on individual firms is essential to understanding impacts on overall competitiveness.

² Throughout this chapter we refer to sectors, firms, installations and operators within affected sectors. Of course, many of the industrial emitters covered by the EU ETS ultimately are owned wholly or in part by large transnational corporations, so it is a simplification to talk of these corporations competing with themselves. Nevertheless, it is appropriate to consider the relative performance of specific industrial activities within and outside the EU.

maintaining employment and economic activity, preserving sector profits while output is reduced may not be regarded as a good indicator of preserved competitiveness.

To address some of the potential gaps in a definition of competitiveness based on profitability, it may be desirable to consider profits as affected by changes to international trade. These may be difficult to estimate, however. Indeed, this represents a more general concern about using profitability as an indicator: the precise effects on profits can be difficult to project in advance or to estimate after the fact, as they depend on complex interactions in a number of input and output markets.³ For this reason, it may be preferable to rely on other measures which, although less comprehensive, nonetheless provide an indication of competitiveness effects.⁴

3.2.1.2. Market share and output

Discussions of competitiveness often centre on the impact on either total output or the share of the overall market. These differ in that output is an absolute measure, whereas market share is a relative one. As market share depends on output relative to competitor firms it has an intuitive appeal as a measure of competitiveness. For example, if emissions trading were to lead to increased imports or reduced sales in export markets by EU-based firms, then the share of the world market supplied by EU-based firms would shrink and competitiveness, by this measure, would be reduced. By contrast, if total demand were to decline, output could shrink even if the market share were unaffected.

A complication with using market share as a measure of competitiveness is that there may be a tension between maintaining market share and maximising profits. For example, even if a firm were able to completely match a potential increase in costs (e.g., emissions costs) with an increase in prices, and even if it is able to maintain its market share, its profitability could still suffer if higher prices reduced overall demand for the good it produces. And as noted above, firms experiencing an increase in cost may be able to improve profitability by passing through some portion of costs into prices, even where this would lead to reduced market share. Moreover, if pass-through is significant and the reduction in market share modest, sufficient free allocation may be able to maintain overall profits for the firm. It may be considered counterintuitive to regard this net result as a loss of competitiveness. On the other hand, an emphasis on profitability could be considered unduly short-sighted if it resulted in long-term loss in market share—particularly if the period of reduced profitability were expected to be temporary (for example, until climate change policy became more uniform globally).

This distinction between maintaining production and maintaining profits can have important implications for how allocation affects “competitiveness,” as we discuss more in sections 3.4.2 and 3.4.3. The desirability of the different indicators of competitiveness also may depend on other considerations; for example, maintaining output may be a closer proxy for maintaining employment in affected industries.

³ Even for the power sector, which is (arguably) among the sectors most amenable to modelling, and whose profitability under the EU ETS has been studied more than any other, reliable estimates of the effects of the scheme on profitability are difficult to come by.

⁴ Another relevant consideration is that profits and profitability may not be directly comparable across EU Member States, because of different taxation and accounting rules. Other measures (such as earnings before interest, taxation, depreciation and amortisation, or “EBITDA”) could be used as alternatives, although all candidate metrics are likely to have their own advantages and disadvantages.

3.2.1.3. Costs

A narrower measure of relative competitiveness is to compare total production costs of different firms. This has the appeal of being relatively straightforward as well as easier to measure or project than effects on either profitability or output. For example, calculation of the emissions costs per unit of production or other suitable measure could be carried out in many sectors using “engineering-based” cost estimates—for example, the cost of producing selected commodity steel products, cement or lime, electricity, etc.—that are likely to be relatively transparent and available compared to some of the other competitiveness metrics reviewed here.

While cost impact is a straightforward measure, it also risks overlooking some of the effects noted above. Increases in costs can be accompanied by higher revenues if prices also increase; and price increases can be accompanied by reductions in market share and / or total output. These effects are central to the decisions made by firms, and therefore arguably important components of competitiveness.

3.2.1.4. Investment

A final potential indicator of the competitiveness of a particular sector is the extent to which it attracts new investment. A sector that was investing rapidly (and growing rapidly) in spite of the EU ETS would find it more difficult to argue that it was substantially constrained by international competition than one that was not investing (although this is hardly a definitive test).

Investment is, of course, closely linked to profitability, and is likely to be related to absolute levels of output (and possibly to market share). Investment also may be associated with reduced operating costs and higher efficiencies, because it can draw on (and stimulate) innovations in production. Moreover, because investment reflects a long-term perspective, it may overcome some of the weaknesses of more short-term indicators above. Unfortunately, it may be difficult to develop meaningful comparisons of levels of investment for individual sectors across different countries.

3.2.1.5. Summary

The most comprehensive measure of competitiveness impacts of emissions trading arguably is the effect on profits. However, this measure is likely to mix effects due to international competition with effects arising from allocation or domestic market developments (such as reduced demand), and therefore may require qualification (e.g., accounting only for effects arising from changes to international trade). Measuring competitiveness by market share can provide a different perspective—especially if reductions in output are thought to be incompatible with maintaining competitiveness. Conversely, there may be situations where reduced market share could be consistent with increased overall profits. Focusing on levels of investment also provides a useful indicator of the relative health of a sector, and one that necessarily reflects longer term considerations that may be absent from other indicators. Unfortunately, investment may be a relatively complicated measure to use. As a practical matter, it may be necessary to use simpler measures, such as cost impacts, to gauge competitiveness impacts, although doing so risks neglecting important market effects.

An important consideration that is relevant to all four ways of defining competitiveness is that the data that would be necessary to assess the competitiveness of European installations, companies or sectors often are very sensitive and are held closely by the affected companies, for both commercial and legal reasons. Even profitability information, which typically is reported by publicly listed companies, is unlikely to be disaggregated at a level that could be used to assess the competitiveness of EU operations relative to international competition.

Finally, impacts on competitiveness may need to be considered in a long-term *policy* context, in addition to the desirability of considering a long-term investment context. Proponents of the EU ETS and other environmental regulations have argued that by stimulating EU industries to develop new, low-emitting, efficient technologies, these industries will be *more* competitive in the long run as other countries and regions introduce their own environmental policies. Of course, the validity of this argument depends in the first instance on investment actually being maintained in the EU.

3.2.2. Market effects of emissions trading

The introduction of emissions trading leads to developments in a number of input and output markets. We briefly outline the main effects below, to help frame the subsequent discussion of which characteristics of firms make them exposed to loss of competitiveness as a result of emissions trading.

3.2.2.1. Increased production costs

The introduction of emissions trading results in increased production costs for firms. Costs increase both because of the obligation to surrender allowances for emissions (“direct costs”) and through the increased costs of inputs (“indirect costs”). Direct costs depend on the emissions intensity of production (i.e., how much CO₂ is emitted per unit of output), the allowance price, and alternatives to reduce CO₂ emissions. Indirect costs depend both on the direct costs to “upstream” firms of producing the inputs and on the extent to which these costs are passed on to product prices. Indirect costs also may arise because other market interactions lead to changes in the relative prices of goods.

The incidence of costs can vary substantially both between and within sectors. Depending on allowance prices, the direct cost of emissions can be a significant proportion of variable production costs in energy-intensive industries, but relatively minor in sectors where energy or carbon intensity is low. For some sectors, process emissions also contribute to this cost.

Indirect costs arise principally for sectors using inputs whose “upstream” production is covered by the trading scheme, and whose price therefore can increase. The magnitude of such price increases depends both on the size of upstream emissions costs, and on the extent to which the costs of upstream firms are passed through to prices. The most widespread and often largest indirect cost is increased electricity prices, although there are many other product prices that also may be affected. Indirect costs also can arise because of other market impacts. For example, higher demand for lower-emitting fuels resulting from the introduction of emissions trading can lead to higher prices. In some sectors indirect costs may be as important as (or more important than) direct costs, and indirect costs can be incurred by firms that are not themselves directly subject to the Scheme’s requirements.

The net costs faced by firms also depend on the opportunities to reduce emissions at a marginal cost lower than the allowance price, either by reducing their own emissions or by reducing indirect costs—for example, by switching inputs or increasing efficiency.

3.2.2.2. Pass-through of increased production costs to increased prices

When firms' costs increase, prices may rise, so firms may be able to sustain their profit margins per unit produced to some extent, even in the face of rising costs. However, the extent to which a cost increase is “passed through” to market prices depends on market circumstances, and the pass through may not correspond to the full additional marginal cost faced by a typical or average firm in a sector. Several factors influence the degree of pass-through, including:

- § The extent of international competition (or other substitutes) unaffected by the cost increase, which may limit the extent to which prices increase;
- § Regulation of prices, which may not allow firms to reflect the full marginal emissions cost in prices;
- § The different emissions intensity of firms, which may cause the emissions costs faced by the sector as a whole (or the average firm) to deviate from the impact on price; and
- § The nature of competition in the sector, (e.g. markets with less than perfect competition may yield either higher or lower price impacts, depending on demand characteristics).

In all cases, where costs are not passed through completely, this will result in lower profits, all else being equal, for at least some market participants. In addition, the significance of these factors can depend on several other aspects of market structure and demand, including the sensitivity of demand to price and the number of firms. The degree of pass-through thus is determined in a complex way by a range of market characteristics and interactions.

3.2.2.3. Changes in production/sales volumes

Higher marginal costs for a product typically lead to a reduction in amount supplied at a given price. Higher prices typically cause consumers to reduce the total amount they buy. Firms therefore face a dual influence of price on profits: on the one hand, passing through costs helps recover the profit margins on each unit of output sold; on the other hand, it typically leads to lower total output because of the demand effect.

A key consideration therefore is the extent to which demand falls in response to a price increase. This can be measured in terms of the price *elasticity* of demand, defined as the percentage change demand in response to a percentage increase in price. One aspect of this is the *market elasticity*, which is the change in overall demand for a product if the price of all relevant suppliers goes up. A reduction in demand may arise because consumers choose to forego some benefits of consumption; improve the “efficiency” of product use; or switch from high-emitting products to lower-emitting substitutes (whose prices increase by less as a result of the trading scheme).

A distinct concept is the *firm elasticity* of demand, which corresponds to the reduction in the demand for a single firm's products if it unilaterally raises its price. In competitive markets, firm elasticity typically is significantly greater than the market elasticity (indeed, in perfectly

competitive markets firm elasticity is infinite, or undefined). This relationship between firm and market elasticity holds because consumers are able not just to reduce their consumption of the good, but also to switch to alternative suppliers or substitute products. Rather than consumers reducing their total demand, the firm therefore loses a *share* of total demand to its competitors.

The impact on demand of higher prices therefore depends to a large extent on what proportion of market supply is affected by the cost increase. If all relevant producers in the market are covered by the trading scheme, the relevant elasticity is the market elasticity; by contrast, with substantial non-covered supply available the demand response for covered producers may be closer to the firm elasticity.

3.2.2.4. Distributional implications of these various market effects

The above market effects have a number of implications for the distributional effects of emissions trading. Without free allocation, the effects of emissions trading resemble a tax on emissions, and emitter's profits typically would be expected to be reduced. If the increased cost of allowances is not fully reflected in prices ("costs are not 100 percent passed through") profit margins per unit sold are reduced.⁵ Also, firm profits can be adversely affected because demand is reduced, either because total demand is reduced, or because of loss of market share to competitors (or both). In addition, covered installations may face costs in the form of measures to reduce emissions and potential higher input prices.

An important implication of the market effects described above is that costs may be borne not only by firms immediately covered by the trading scheme, but also by "downstream" firms that purchase their products. The reflection of CO₂ costs in product prices is an *intended* consequence of emissions trading, and the response of consumers to increased prices is generally necessary to achieve the least-cost reduction of emissions. However, higher prices also mean that costs are borne more widely than just by covered parties.

Another implication is that net impacts can vary widely between sectors. Sectors may differ in whether costs (including indirect costs) are significant; whether costs are reflected in prices; and whether the resulting changes to volumes demanded and produced are large. Distributional impacts therefore may vary significantly across different industries.

Distributional effects also depend heavily on the allocation of allowances. We discuss this issue in more detail in section 3.4.2.

3.3. Measures to Identify/Quantify "Exposed" Sectors

The above market interactions suggest adverse competitiveness impacts are a concern where costs are significant and firms have limited ability to pass on costs (*or*, potentially, face a significant loss of output if costs are passed on). However, as the above discussion highlights, there are a large number of factors that influence these broad criteria. In this

⁵ As discussed above, pass-through may be limited for a number of reasons, including exposure to international competition, presence of market power, large variation in marginal cost between suppliers, or price regulation. Also note that where there is significant variation in the emissions-intensity of production, it is possible for profits to rise even in the absence of free allocation.

section, we discuss possible concrete characteristics that could be used to identify “exposed” sectors.

3.3.1. Exposure to cost increases

A first indicator of whether a sector is likely to be adversely affected by emissions trading is whether its costs increase significantly. It is important to recognise that this is a very limited measure, as the net impact on a firm of a given cost increase depends on the associated effects on prices, output and profits. Nonetheless, if emissions costs are a very small proportion of overall costs, this provides an initial indication that competitive impacts may be less serious, all else being equal. Identifying sectors with higher emissions costs therefore can serve as a first step in identifying sectors potentially exposed to adverse competitiveness impacts—but it should not be the only or even the primary criterion.

3.3.1.1. Absolute cost increases

The direct costs faced by operators can be relatively easily estimated from emissions data, and this can be aggregated to estimate sector-level costs (although it is not always straightforward to classify installations and operators within sectors). Estimating indirect costs can be more difficult, as this depends on the characteristics of upstream markets as well as other market effects. For electricity, data on the sectors’ consumption probably would be available, but it would be necessary to estimate the impact of a given allowance price on electricity prices (including the complicated issue of pass-through).

It may be more difficult to estimate other cost impacts, including:

- § Indirect costs other than electricity costs, for which data quality is likely to be worse;
- § Indirect costs arising because of wider market impacts, such as changes to relative fuel prices; and
- § Opportunities to reduce costs through emissions abatement or changes to input use (although various models exist for specific sectors).

As a first approximation, the absolute costs faced by sectors could be calculated accounting only for direct emissions costs and electricity costs. This could be extended to incorporate other influences where these can be demonstrated to be significant.

3.3.1.2. Relative importance of cost increases

The importance of absolute cost increases for competitiveness depends on how they compare to the overall level of economic activity by the sector. To identify exposed sectors it therefore is necessary to compare absolute costs to another relevant metric, such as total production costs, total revenues, or profit margins.

3.3.1.2.1. Cost increase as a proportion of total costs

A simple measure is to compare emissions costs to total costs, which may be possible to estimate in several industries. As indicated above, this is likely to be a relatively crude measure of exposure: for example, there may be cases where profit margins are small

compared to total costs, so that emissions costs may constitute a large proportion of profits even where they are small compared to other costs.

3.3.1.2.2. *Cost increase as a proportion of profits / profit margins*

A comparison of the added production (marginal) costs arising from the Scheme and the profit margin on each unit sold could provide a more informative measure of the importance of cost increases for a sector. This information is unlikely to be available for individual firms—particularly for multinational companies with activities in different sectors—and where it is available its use may raise concerns about commercial confidentiality. However, a related measure on the sector level is “gross value added” (GVA), which is calculated as part of GDP in national accounts. GVA is roughly equal to the value of sales revenues less the costs of “intermediate consumption”, i.e., the value of goods and services consumed as input to production. If the costs incurred as a result of the trading scheme are small relative to overall GVA, this may be a first indication that competitiveness impacts are unlikely to be large.

This is subject to important caveats, however. While GVA has similarities to conventional accounting measures of “profit”, there also are important differences. Notably, GVA includes wages paid by companies. As these payments do not accrue to firms, they are not included in conventional measures of profits. A sector therefore may in principle have large GVA not because constituent companies have large profit margins, but because it is relatively labour intensive. One option therefore may be to compare costs not to GVA, but to GVA less labour costs. Such an adjustment is likely to be feasible using data collected by national statistical agencies.

Several other considerations would arise in the use of GVA data. GVA statistics exist on a number of different levels, and may exist on the level of individual enterprises in some circumstances. It therefore would be necessary to determine the *resolution* at which costs are calculated. Especially in industries with multiple products or production routes, emissions costs / GVA may differ significantly in sub-industries. It also would be necessary to account for the data time period and any changes to GVA. Especially in industries sensitive to economic cycles and / or with long investment cycles, GVA may vary over the economic cycle, and measures of the significance of emissions costs therefore also could vary.

As noted above, even if a pertinent measure of relative cost can be derived, on its own it would not be informative about competitiveness impacts. A possible use of indicators of relative cost could be to identify the “worst case scenario” impact if prices were not to increase at all and no free allowances were awarded, and thus to identify sectors for which competitiveness impacts are not likely to be significant. Even in this case, however, interpreting the results may not be straightforward—for example, if a sector or firm required substantial capital expenditure on existing or new plants, to be financed out of operating profits (essentially GVA less labour costs), it is not clear whether or not the denominator should include the required capital expenditure.

3.3.2. **Exposure to international/outside competition**

As noted above, the extent to which prices increase and demand is reduced in response to higher costs can depend on a number of factors, including price regulation, the nature of

competition in the sector, and the detailed characteristics of supply and demand. A full accounting for the impact of emissions trading on profits therefore would have to incorporate analysis of these issues. However, for the purposes of estimating *competitiveness* a particularly relevant measure is likely to be the extent to which non-covered competition either limits cost pass-through or would lead to reduced market share if costs were passed through.

Using this measure requires developing a measure of exposure to competition. A starting point offered by economic theory is to ask first whether different firms can be said to be offering their products “to the same market,” and we discuss the precise meaning of this below. Where the “same” market is served by EU suppliers and non-EU suppliers that are not subject to emissions costs, this is a first indication that there may be adverse competitiveness effects; conversely, competitiveness impacts are unlikely to be significant if there are no *potential* non-EU suppliers to the market served by EU firms. (The need to consider potential competition is important here: the historical absence of non-EU suppliers is not necessarily an indication that such suppliers could never compete with EU suppliers if market conditions changed.) However, it also is necessary to consider other aspects of a market, including the relative size of different suppliers, and the importance of the market to EU companies.

Although formal market definition tests provide an important theoretical basis for assessing the extent of exposure to competition, in practice determining the extent to which companies operate in the same market can be difficult. It therefore may be necessary to make use of other measures that capture aspects of exposure to competition, and we discuss some of these below.

3.3.2.1. Market definition tests

“Market definition” tests are used in competition policy cases to determine the extent to which different suppliers or firms are in competition with each other. In the context of the question of “competitiveness,” such tests could be used to ask whether firms have competitors in the same market that are not subject to costs like those introduced by the EU ETS. Where such competitors exist, a firm could be said to be “exposed” to international competition. In reality, this is likely to be a matter of degree, and the test therefore may have to account for the size and other characteristics of such competitors to gauge the relevance of such exposure.

In the context of market definition tests, the term “market” has a definition somewhat different from that in conventional usage. For economists, a market is determined by “substitutability,” that is, the extent to which consumers are able and willing to substitute one product for another, or substitute suppliers in one area for those in another. When two goods are “sufficiently” substitutable, they are said to be part of the same *product* market. Similarly, the ability and willingness to substitute between suppliers defines a *geographic market*. Geographic markets may be limited by the availability of infrastructure, transport costs, tariffs, or other barriers to trade. By contrast, product markets are limited by product differentiation and consumer preferences. Thus individual industries may be divided into several different product markets (e.g., different grades of paper, types of ceramics, etc.), depending on the threshold for substitutability that is used. Conversely, products may be in

competition with substitutes from different industries. A full market definition needs to account for the product market and geographic market.

To make this concept of a market operational, it is necessary to define what constitutes “sufficiently” substitutable products. Economic analyses typically focus on whether it would be possible for suppliers to raise prices unilaterally without experiencing a reduction in profits—if so, then this supplier or suppliers are operating in a separate market. More precisely, products are in the “same” market if the revenue lost as consumers switch to other suppliers or products more than outweighs the additional revenue earned from higher prices paid by customers that are retained.⁶ In the context of the competitiveness impacts of the EU ETS, the corresponding question is whether EU suppliers raising prices in response to increased costs would experience a loss in profits because of customer substitution to products supplied from outside the EU.⁷

An advantage of using a market definition framework to define which sectors are “exposed” is that it has a solid theoretical foundation as well as acceptance as the framework used by the European Commission in the context of competition policy. The boundaries of a number of markets in several industries have been investigated in the context of competition policy cases.⁸ However, while such existing investigations potentially could form the basis for considering allocation principles in some industries, they do not span all the products affected by the EU ETS. Also, it is important to note that these market definition investigations have been conducted for purposes unrelated to emissions trading and allowance allocation, and typically in the context of a specific proposed merger or other investigation—which generally would not involve a consideration of the potential future costs of the EU ETS.⁹ Thus these cases ultimately may not be relevant to market definitions in the current context.

A further drawback of the above framework is that it can be difficult to make operational and may require substantial research effort. The underlying theory can be complicated by issues such as product differentiation, considerations arising in wholesale/input markets, etc. A full investigation also is data intensive, and ideally requires data on a good’s “own price elasticity of demand” (i.e., the percent decrease in demand per percent increase in price) and various “cross price elasticities of demand,” which measure the change in demand for one good in response to changes in prices of *other* goods that might be in the same market. Reliable data on these and other relevant quantities may be difficult to obtain.

⁶ The formal implementation of this reasoning typically is through a “hypothetical monopolist test,” which consists of asking whether a “hypothetical monopolist” over a supposed market could increase its profits by implementing a “small but significant non-transitory increase in price” (SSNIP) above competitive levels. A relevant market is a group of products and a geographic area that is no bigger than necessary to satisfy such a test.

⁷ Note that an important accompanying issue is whether there are suppliers *within* the EU that would *benefit* from the costs imposed on others by the EU ETS, because they produce a substitute product with lower emissions intensity.

⁸ Commission guidance offers that: “A relevant product market comprises all those products and/or services which are regarded as interchangeable or substitutable by the consumer, by reason of the products’ characteristics, their prices and their intended use.” (Commission Notice on the Definition of the Relevant Market for the Purposes of Community Competition Law, Official Journal, C 372, 9/12/1997)

⁹ In particular, where a proposed merger would not give rise to competition concern within a narrow market definition (e.g., a single Member State), then competition policy investigations typically do not proceed to ask how broad the market may be (e.g., whether it is EU-wide, or world-wide).

3.3.2.2. Other measures of exposure to competition

In the absence of full and formal market definition investigations, there are other data and analyses that potentially could be used to determine the degree of “exposure.” We discuss some of these briefly below.

3.3.2.2.1. *Import and export elasticities*

Exposure to international competition can be assessed by investigating how imports to a given region (and exports from the region) change in response to a change in relative prices. These relationships, known as import and export price elasticities, can be informative even absent a full investigation of market definition. With reliable import/export elasticity data, the result of passing through a given emissions costs on increased imports or reduced exports can be estimated.

Even where good estimates are available, import/export elasticities do not account for all effects of the EU ETS. A potential weakness is that this may not take into account the full substitution effects resulting from a price increase. Increased costs of production of a good in the EU may lead not just to increased imports of this good, but also to increased demand for and imports of substitutes whose consumption is not captured in the import elasticity estimates.

More immediately, import and export elasticity estimates are not likely to be available for all relevant products, and attempting to estimate them can present statistical problems. In fact there are very few studies that estimate these elasticities in any comprehensive way across sectors, and still fewer that apply to the EU. There are existing empirical studies which attempt to disentangle the influence of changes to relative prices and other influences on trade patterns, for example, by studying changes in exchange rates. However, it is difficult to gauge to what extent these and similar studies would be relevant for the situation under the EU ETS. One reason for this is that existing estimates often reflect information on small differentials, and it may not be appropriate to assume that these relationships can be scaled in proportion to the cost difference outside the range of differentials actually studied.

For example, there may be cases where a small rise in domestic price corresponds with a negligible increase in imports, but a modestly greater increase in price induces a large change in trade patterns (such “non-linearity” may arise, for example, because the higher price offsets the cost of transporting goods from a large supplier region). Also, changes can occur with time, especially over a time horizon when additional investment (in production capacity or trade infrastructure) is possible, as such investment may lead to increased international trade in response to price differentials. For these and other reasons, it may be difficult to find estimates of import and export elasticities that provide clear evidence of exposure to outside competition.

3.3.2.2.2. *Openness index and trade intensity*

Another measure of exposure to international competition is the current extent of trade in a given industry. The share of the total demand in a given region that is satisfied by imports, and the share of the region’s total supply that ends up being exported, can indicate the “openness” to trade of the sector within the region under consideration. All else equal, a

sector with large trade volumes may be more likely to be adversely affected by the unilateral implementation of emissions trading.

Data on trade patterns are readily available and have been used in a number of analyses. Actual measures typically use combination of import penetration (share of imports in total supply in a region) and export intensity (the share of production that is exported), relative to a measure of total output (such as GVA). For the purposes of competitiveness analysis of the EU ETS, the relevant imports and exports would be trade with regions outside the scope of the EU ETS.

This approach has several limitations, many of which are also relevant to import-export elasticities as discussed above. First, these measurements are static, based exclusively on current or historical information. They thus do not capture the potential for expansion of international trade, which can constrain pass-through. For example, the introduction of a new cost differential between two regions can suddenly make a large volume of imported supply profitable that previously was not, or induce investment that increases trade in the long-run. There also is the implicit problem of market definition, in that it may be hard to determine which products should be included in the import/export statistics used.

Despite these limitations, measurements of openness and trade intensity can be useful as indicators of the *present* prevalence of trade in a sector, which can provide context for discussions of emissions trading impacts as described below. The appeal of these approaches is also helped by the availability of data, which may be greater here than for other metrics.

3.3.2.2.3. *Price and cost comparisons*

In addition to the above, it may be possible to use data on costs and prices directly to gauge whether industries are subject to competition. For example, if the same product is sold at substantially different prices in different regions it may be possible to conclude that there is little potential for trade and that the two regions thus constitute different markets. (It is important to ensure that the appropriate transport costs are included when comparing prices.) The reverse need not be true—that is, if a good is priced similarly in two regions, it could be the case that they have similar input markets, and therefore does not necessarily imply that trade is feasible. Similarly, it may be possible to analyse data on specific types of costs (e.g., transport costs, exchange rates, etc.) that inhibit the expansion of trade, and compare these costs to those introduced by emissions trading. Such studies also could highlight whether adverse impacts are likely to differ in different regions or sectors (e.g., because of differential access to transport infrastructure).

3.3.2.2.4. *Indirect exposure to competition*

Another consideration relevant to establishing exposure to international competition arises in wholesale or input markets. Even if a good is not itself internationally traded, “downstream” production using it as an input may be exposed to international competition. In this case, there can be “indirect” exposure to competitiveness effects, as demand from local downstream production is reduced. This may limit the extent to which prices of the input can increase in response to a cost increase, as sufficiently high prices could render downstream production uneconomic compared to that of its competitors.

3.3.3. Summary: Implications for definitions of “exposed” sectors

In summary, the following characteristics tend to suggest that a sector may be competition-exposed for the purpose of assessing emissions trading impacts.

- § Emissions costs, both direct and indirect, constitute a “large” share of relevant margins (e.g., profit margins, possibly allowing for capital expenditure); that is, the sector is energy- and/or carbon-intensive.
- § The sector’s products are broadly “substitutable” with products in import and/or export markets produced by overseas suppliers that are not subject to similar emissions costs;
- § In the past, price increases for the EU sector that were not matched by increases elsewhere were seen to cause an increase in imports or a decrease in exports.
- § The sector currently is trade-intensive, with a large portion of local demand satisfied by imports and/or a large portion of local supply exported.
- § A comparison of emissions costs to transport and other costs indicate that the profitability of trade would be substantially affected by the introduction of the EU ETS.

These characteristics are broadly consistent with the first three of the indicators of “competitiveness” discussed in section 3.2.1. Cost is a central consideration, but for a more complete assessment, it may be necessary to consider impacts on prices (and hence on profit margins) and on output levels and import / export market shares. The fourth competitiveness indicator, investment levels, is more difficult to use as a way of identifying exposed sectors. This is due in part to the relatively static nature of the “exposure” tests discussed above. To identify sectors that are at risk of underinvestment or of losing out to investment outside the EU, the best approach may be to compare or model production costs and transport costs, to determine whether a significant cost differential would persist even when transport costs were taken into account. Of course, in a dynamic context, it also would be necessary to take into account the possibility that carbon prices could appear or increase outside of the EU, reducing the relative attractiveness of foreign investments.

3.4. Effects of Overall Cap and Allocation Alternatives on Various Measures of Competitiveness

This section discusses how some of the key parameters of an emissions trading program affect firm competitiveness. We discuss the effects of the overall cap level, the level of free allocation, and the approach to allocation, and how they can be used to influence sector and firm competitiveness.

3.4.1. Impacts of cap level on costs

The level at which the program cap is set is the primary determinant of the market price for allowances. The more scarce allowances are, the higher their price. (Other factors, such as the supply of credits generated by CDM/JI projects, also play a role.) In turn, the market allowance price determines the emissions costs faced by EU industries. Industries directly covered by the Scheme face the cost of allowances in all production that results in emissions, while indirectly affected industries buy inputs whose costs depend, in part, on the allowance prices faced by their suppliers.

In addition, the level of the allowance price, and the additional cost to which it gives rise, can determine the amount of international competition faced by a sector. For example, transport or other costs that otherwise inhibit international trade and competition may be overcome at a certain allowance price. In other words, the relevant geographic market may grow as the cost differential faced by EU and non-EU suppliers increases.

The impact on competitiveness of a given allowance price can vary significantly between sectors—and also between regions. In sectors where emissions costs are small a high allowance price may not be a source of concern, whereas it could affect other sectors significantly. Also, adverse competitiveness impacts are likely to be limited even with high emissions costs unless there is a possibility of international trade (although trade in downstream markets may mean that such sectors are “indirectly” exposed to competition). Exposure to trade can vary significantly across different EU Member States. Trying to control competitiveness effects using the allowance price is therefore likely to be a blunt instrument, since it cannot be used to target individual sectors, sub-sectors, or regions, but instead applies across the EU.

3.4.2. Impacts of free allocation/auction percentages on competitiveness

Free allocation of emissions allowances constitutes a transfer of assets of value that can “compensate” firms whose profits are reduced or that otherwise suffer reduced competitiveness as a result of the ETS. As discussed below, an allowance auction combined with auction revenue recycling can achieve similar results.

3.4.2.1. Competitiveness impacts of “lump sum” free allocation

The creation of the allowance market means that allowances become a commodity, whose value is determined by the market price. The receipt of allowances therefore can financially offset some of the adverse other impacts of the trading scheme, either by generating revenue from sales in the allowance market, or by obviating the need to make purchases at auction or in the market. Firms whose profits are reduced through lost competitiveness—whether as a result of direct or indirect costs imposed by the trading scheme—therefore can be “compensated” to some degree through the receipt of free allowances.

This gives rise to the question of what constitutes an appropriate level of “compensation” for a sector or a firm. Where the adverse impacts of emissions trading are large (for example, with high emissions-intensity, low value products facing high CO₂ prices), profits could in theory be reduced even with “full” free allocation. This is less likely to occur for an entire sector than for an individual firm, although it is possible at the sector level. Conversely, theory and experience suggest that, where adverse product market impacts are small (e.g., where costs can be passed through without much impact on demand) full free allocation may result in “over-compensation” on a sector-level—i.e., in a situation where profits are larger with the trading scheme than they would be without it. This result is subject to important caveats. For example, individual firms may be adversely affected even if the sector as a whole is “over-compensated.” Also, some changes to profits ensue regardless of allowance allocation; for example, if prices increase, non-emitting technologies (which are not covered by the scheme—e.g. wind or nuclear power plants) typically would be expected to benefit (as their own costs do not increase) regardless of allocation.

It is important to recognise that, while free allocation of allowances can provide financial compensation for adverse impacts, it does not “eliminate” the market effects of emissions trading. Indeed, this is one of the attractions of emissions trading as a policy—it retains the price incentives to shift away from emissions-intensive products and processes while offering a means of compensating for adverse impacts. Eliminating the price incentives would reduce the ability of the policy to achieve emissions reductions at the lowest possible cost. As discussed in other chapters, and in section 3.4.3 below, any of the “idealised” allocation methods typically would not be expected to differ in their effects on product prices, quantities supplied, or abatement decisions.¹⁰ The impacts of lost competitiveness *in product markets* therefore are not improved by such allocations. (As we discuss in detail below, the “idealised” allocations referred to here differ from actual EU ETS allocations in essential ways.)

The impact of free allocation on competitiveness therefore depends on the definition of competitiveness used. If competitiveness is defined in terms of overall profits, free allocation can provide an important mechanism to ensure competitiveness is preserved. However, if competitiveness is regarded purely in terms of product markets, including the output of firms, free allocation does not directly contribute to competitiveness. Similarly, allocation would not preserve other indicators of competitiveness such as employment or investment levels.

3.4.2.2. Competitiveness impacts of auctioning and revenue recycling

As discussed in a subsequent chapter on auctioning, results similar to free allocation in theory could be achieved by selling allowances to participants and using the resulting revenue to compensate those adversely affected. Provided such “recycling” of revenues conforms to the “idealised” conditions outlined for allocations (notably, that the amount received is not contingent on subsequent actions taken by the recipient), it also would affect profitability but would not necessarily lead to output levels that differed from those observed under auctioning without any recycling.

3.4.3. Impacts of updating allocations on competitiveness

As noted in the previous section, various “idealised” forms of allocation can be used to affect profitability but not other measures of competitiveness such as outputs and price effects. However, other approaches to allocation can be used to prevent some of the loss of competitiveness in product markets. Reducing these other adverse effects typically would require that allocations be “updated,” in the sense that the allocations are contingent on current or future actions taken by recipients. We briefly discuss how this relates to competitiveness below (separate chapters on new entrants and closures and on updating discuss these issues in a wider context).

¹⁰ In particular, with “idealised” allocations the increased cost of production arises regardless of the number of allowances a firm is initially allocated. If the firm does not hold sufficient allowances, it incurs the immediate cost of purchasing them in the allowance market. However, even if the firm possesses allowances, their use constitutes an “opportunity cost”: by producing emissions and “using up” the associated allowances, it foregoes the opportunity to sell these at a profit in the allowance market.

3.4.3.1. Impacts of updating on production/sales

As discussed in the chapters on updating and new entrant allocations, linking allocations to output decisions can result in higher production than under “idealised” allocations or auctioning. The most direct example of this is where either current or future allocation levels are tied to current levels of output. This effectively provides a subsidy contingent on production, and induces a higher level of supply. In an extreme case, where allocations are allocated fully for free and are fully adjusted *ex post*, the emissions cost of *additional production* (although not of emissions generally) can be entirely eliminated. However, as discussed in the following sections (as well as in the evaluation of updating allocation approaches in Chapters 8 and 9), deviating from the “idealised” allocation approaches in this way may lead to higher allowance prices, so that the ultimate cost implications for affected sectors is difficult to predict.

New entrant allocation and closure rules, two other forms of updated allocation, also can preserve or increase output. New entrant allocation encourages new investment, because it offsets the cost of future emissions which investors would otherwise take into account when installing new capacity. Closure rules, which require facilities to forfeit their allocation if they shut down, can increase production either directly where the definition of closure is linked to the amount produced, or indirectly by encouraging production capacity to stay open that otherwise would have been shut down.

As discussed in subsequent chapters, one potential motivation for this type of allocation approach is to prevent emissions “leakage.” However, it equally could be motivated by a desire to prevent “production leakage” associated with reduced competitiveness.

3.4.3.2. Impacts of updating on investment and innovation

Updating in the form of new entrant allocations (“capacity-based updating”) also can encourage investment in the EU. As noted above, this may be regarded as another facet of competitiveness, especially in the long run. Moreover, by keeping investment in emissions-constrained locations, new entrant allocations may increase incentives for innovation in the EU, which may be regarded as yet another long-run aspect of competitiveness. As discussed in other chapters, however, new entrant allocations also can have other effects that could be inimical to competitiveness, including distortions of the internal market.

3.4.3.3. Impacts of updating on product prices and firm profits

The incentive for increased output under some forms of updated allocation may lead to lower product prices at a given allowance price. This can alleviate competitiveness effects on consumers facing higher prices for these products. In general terms, pass-through of allowance prices is lower under updating because firms face a lower effective carbon price.¹¹ On the one hand, increased production leads to an obligation to surrender valuable allowances in the present; on the other hand, increased production may lead to a benefit in the

¹¹ Certain forms of updating can provide an output subsidy that reduces the opportunity cost of emissions, so that this cost is only equal to the difference between the allocation level and actual emissions. Put another way, these forms of updating provide a greater disincentive to lose customers, because loss of customers also results in a loss of free allowances. Firms facing such incentives are less likely to increase their price offerings to the market.

form of increased future allocations. By linking production to output, some of the production costs of emissions trading therefore are offset (put differently, some of the *opportunity* cost of freely allocated allowances is eliminated). This effect needs to be evaluated in conjunction with the potential (countervailing) effects on allowance prices, discussed in the next subsection.

It is less clear that updating makes firms better off in terms of profits. While lower prices may lead to higher output, they also lead to lower margins per unit sold. Existing empirical studies of these effects suggest that, for a given proportion of free allocation, firm profits are likely to be higher *without* updating. The impact on competitiveness therefore again depends on definitions, and output-based updating may benefit competitiveness-as-output (or employment or investment) to the detriment of competitiveness-as-profits.

3.4.3.4. Impacts of updating on allowance prices and total compliance costs

As highlighted in previous chapters, updating allocations typically are not consistent with minimising the costs of reducing emissions. A major reason for this is that demand-side responses are not encouraged to the same extent. In particular, with reduced pass-through of costs consumers have less incentive to improve efficiency, switch to lower-emitting substitutes, or reduce consumption of high-emitting goods. In the absence of such responses, other, higher-cost abatement measures may have to be found, resulting in higher allowance prices for a given emissions cap. This in turn could exacerbate any adverse competitiveness effects, particularly in sectors that do not receive free allowances.

3.5. Summary and Conclusions

Although it aims to minimise the cost of achieving a given emissions target, emissions trading nevertheless has the potential to adversely affect covered industries in the EU, as well as their customers. These adverse effects are often described as impacts on competitiveness, and may refer to increased costs, reduced market share, reduced profits, or reduced attractiveness for investment. The use of different measures of competitiveness and competitive impact suggests different ways of assessing whether a sector should be considered “exposed” to international competition.

It would be possible to use the design elements of the EU ETS, including cap-setting and allocation options, to reduce various competitiveness impacts of the Scheme. Different cap-setting and allocation options would differ in their effects on each competitiveness measure. In some cases competitiveness impacts could be reduced without changing overall scheme effectiveness—for example, when competitiveness is measured solely in terms of profitability and levels of free allocation are maintained to ensure that overall sector profits do not suffer. In other cases, for example, when updating is used, scheme effectiveness—both economic and environmental—may be changed for better or for worse, depending on how one defines the economic and environmental objectives of the scheme.

If EU ETS policy-makers and stakeholders wish to modify allocation and/or cap-setting to reduce the competitive impacts of the EU ETS on selected sectors, they first need to identify which measure or measures of competitiveness are of greatest concern for Phase III and beyond. This would help to determine which of the options for allocation (or cap-setting) could in theory offer some way to offset or reduce any competitive impacts. Identification of

the competitiveness measures of concern should be accompanied by further review of the level of exposure to competition that should be considered a threat to EU industries. Stakeholders and policy-makers should then review whether there currently exists sufficient information for each sector or sub-sector—possibly differentiated by Member State or region—to determine whether the sector is threatened by external competition as a result of the EU ETS, as well as whether such information could feasibly be developed.

If the information is available, an assessment could be made of the extent of exposure. It would then be possible to consider whether different approaches to allocation could address the concern, and what the implications of these approaches might be for other scheme objectives—including emissions leakage, transparency, distributional fairness and overall cost-effectiveness. At this point, it also may be relevant to consider whether other industries *within* the EU that compete with the relevant sectors could in theory *benefit* from the EU ETS, either at the same time as, or possibly *instead of*, direct foreign competition. Having undertaken this review and analysis, policy-makers and other stakeholders could then consider the merits of the various potential options.

There are other policies that could be used to counteract the competitive impact of the scheme. These could include border tax adjustments, support for research and development for low-emissions technologies and production, tax credits, etc. The decision about which of the available policies to use (if any) can be based on assessments of the advantages and disadvantages of each, ideally including quantitative assessments of their impacts. Ultimately, however, this decision represents a choice that needs to be made by policy-makers and other stakeholders, based on the priorities they identify and the trade-offs presented.

4. Options for "Cap-Setting"

This chapter considers the issue of setting the overall cap on emissions, a topic that is separate from but related to the initial allocation of the cap. The chapter thus provides a bridge between the general issues of evaluative criteria and competitiveness and the specific issues associated with various allocation approaches.

4.1. Introduction and Background

In considering the design elements of an emissions trading scheme, it is important to distinguish the process and approach used to set the overall "cap" from the approach used for "allocation." These two aspects of a cap-and-trade scheme may be related, but they need not be, and they serve two distinct purposes. The "cap" represents the "system constraint" of the trading scheme—that is, it is the total number of allowances that are created by the regulator or government to be used by emissions sources that are covered by the scheme. In a closed trading scheme (that is, one that is not linked to another trading scheme), the cap represents the maximum emissions allowed from covered sources.

In contrast, *allocation* refers to the way that the total number of allowances is distributed. This may be by sale or auction, or via some method of free allocation. Covered sources are *not* limited by the allocation that they receive because they can always purchase more allowances on the market or at auction. The level of the cap determines the price of emissions allowances, but the level of individual allocations generally has no impact on the allowance price.

We assume that the EU will set an overall target for the period after 2012 that is consistent with the announcement of the Council to reduce emissions unilaterally by 20 percent in 2020 relative to 1990 levels, and by up to 30 percent subject to progress being made on international climate change agreements.

The characteristics of any future international agreement are yet to be determined. It is possible that such an agreement would include an aggregate EU-wide target to be achieved jointly, an aggregate target to be achieved as set out in a subsequent "Burden Sharing Agreement" (as has been the case under the Kyoto Protocol), or separate targets applied to individual Member States. The form of the international agreement is likely to have a bearing on different approaches to cap-setting, but we do not consider this issue in detail here.

The assignment of emissions reduction burden between sectors covered by the EU ETS and those not covered by the scheme is directly related to the number of emissions allowances to be made available within the EU ETS. This decision will need to be made either collectively or individually by Member States. As we discuss below, this decision is one of a set of interrelated decisions about how to determine the overall level of emissions assigned to the EU ETS (the "cap"), and then how to split the overall "pool" of available EU emissions.

The structure of this chapter is as follows. First we consider three high-level frameworks for cap-setting in which responsibility for decision-making differs. These frameworks are relevant not just for cap-setting, but also can be applied to the elements of the allocation process discussed in subsequent chapters. To a large extent, however, the application of the high-level frameworks to other allocation decisions is independent of their use in the cap-setting process.

To illustrate this point, after presenting the high-level cap-setting frameworks, we consider how different options for harmonisation of Member State allocation could be combined with the cap-setting approaches. We then consider a variety of specific ways of determining what the EU ETS cap will be, and how the split between EU ETS and non-ETS sectors could be determined. This second determination is essentially independent of the high-level framework adopted—that is, any of the cap-setting methods could be combined with any of the high-level frameworks, as well as with any of the harmonisation options considered. After describing these decisions relevant to cap-setting and its relationship to allocation, we mention two other relevant issues, before assessing all of the options considered against the agreed evaluation criteria.

As noted, the primary focus of this chapter is on the setting of the EU ETS cap in any given year—that is, the overall number of allowances to be made available to covered sources, whether allocated for free or sold. However, this chapter also refers to different *allocation* approaches within the different cap-setting frameworks that are covered. This serves to highlight the potential relationships between cap-setting and allocation, but also to make clear the ways in which decisions about cap-setting and allocation are independent of each other.

4.2. Options for Cap-Setting

In this section we first consider three high-level options for decision-making as it relates to the setting of the EU ETS cap. Having briefly described these options, we discuss how the options for cap-setting could be combined with other elements of the overall allocation approach. This helps to clarify the relationships between cap-setting and allocation.

Finally, we review a number of different options that could be used as the basis for setting the overall EU ETS cap. This essentially comes down to a decision about how to share the burden of emissions reductions between sectors covered by the EU ETS and all other economic activity. As a consequence, many of the options considered are relevant to other steps in the EU ETS allocation process, once a cap has been set.

4.2.1. High-level decision-making framework

4.2.1.1. Option 1: Cap Set at EU Level

Under this option, essentially all aspects of cap-setting would be agreed at EU-level. Thus the overall number of allowances available within the EU ETS would be determined by or pursuant to EU legislation.

This approach *could* be associated with a new “burden-sharing” (or similar) agreement that assigned to each Member State a share of the overall number of allowances under the cap. This would be different from the existing BSA, in that it would explicitly specify the number

of allowances for each Member State within the EU ETS (and possibly also for non-ETS sectors), rather than only specifying emissions targets for the entire Member State economy.

However, a new burden sharing agreement would not *necessarily* be part of the cap-setting process—for example, Member States could simply agree on a cap without specifying shares for individual Member States. Moreover, even if assignment of Member State shares did occur, it might more appropriately be considered an initial step in the *allocation* process, rather than part of the cap-setting process.¹²

The precise implementation of cap-setting at the EU level could involve a specification of cap levels over time within the revised Directive itself, or (more likely) could specify more or less detailed formulae or principles for cap-setting within the Directive, with the specifics to be determined via other decision-making procedures (Comitology, “Regulatory Procedure with Scrutiny” (2006/512/EC), decisions by the Commission, or others).

4.2.1.2. Option 2: Contribution to cap by selected sectors set at EU level, rest at MS level

Under this approach, contributions of certain sectors to the overall cap would be agreed at the EU-level, with limited or no Member State discretion in modifying these contributions. However, for the remaining sectors, the contribution to the cap would be determined independently by the individual Member States. Thus under this option, some proportion of the overall cap would be determined at the EU-level, but Member States still would be able to affect the overall total number of allowances individually through their own cap-setting and/or allocation decisions.

4.2.1.3. Option 3: Cap set by pooling individual MS decisions with EU oversight

A third and final option would be to continue the current approach, with Member States determining the total number of emissions allowances to be made available (whether for free or via auction or sale) to installations within their EU ETS sectors, subject to review by the Commission to ensure consistency with overall EU-level commitments. In this case, the sum of every Member State’s individual total yields the overall cap. Under this approach, it is also possible that there would be a new burden-sharing agreement similar to the one currently in place, which could then be used as part of the assessment of individual Member State proposals. However, unlike the type of new burden sharing agreement referred to under Option 1 above, a new BSA under Option 3 would *not* specify the aggregate contribution of the Member State to the EU ETS cap; instead it would only specify the emissions assigned to Member States as a whole.

4.2.2. Relationship of cap-setting to allocation

It is important to recognise that the three cap-setting options outlined above each can be used in combination with many different allocation approaches. In effect, decisions about cap-setting and decisions about allocation can be made largely independently of one another,

¹² Note that other initial steps would also be possible, such as allocations to sectors on an EU-wide basis, eliminating direct allocation or assignment of allowances to Member States.

although some combinations may appear more natural than others. To be very clear about the distinctions and the relationships between cap-setting and allocation, this section presents some basic discussion of allocation issues and parameters to which we return in subsequent sections and chapters of the report.

Thus if we consider one aspect of decisions about allocation, namely the degree of harmonisation of sector allocation between Member States, we can identify three options: full harmonisation of all sectors; partial harmonisation – that is, harmonisation of some sectors but not others; and no (explicit) harmonisation.

Table 4.1
Combination of High-Level Cap-Setting and Allocation Harmonisation Options

Allocation method / level	Cap-setting		
	EU-level / Centralised	Part-EU, Part-MS	MS-level only
Harmonised	Cap set at EU-level; allocation to all sectors harmonised.	Contribution to cap for selected sectors set at EU-level; free allocation harmonised to all sectors and installations, but MSs may "create" additional allowances that expand the cap, (e.g. for opted-ins sectors, or to auction AAUs, etc.).	Member States would determine their own contributions to the overall EU ETS cap (subject to review by the Commission), but allocation to all installations would be harmonised. (Any excess allowances above total installation allocation would be auctioned.)
Partially harmonised	Cap set at EU-level; selected sectors' allocations harmonised at EU-level; residual allowance shares agreed between Member States to distribute or sell as they choose.	Contribution to cap for selected sectors set at EU-level, with allocations within these sectors harmonised. Contribution to cap associated with other sectors to be decided by individual Member States, with level of allocation and share of auction also decided by them.	Member States would determine their own contributions to the overall EU ETS cap (subject to review by the Commission). Allocation for some sectors would be harmonised (or alternatively certain allocation elements, such as auction share, would be harmonised), but for the remaining sectors (or for the remaining elements of allocation), allocation would be determined by Member States.
Not harmonised	Cap set at EU-level, shares agreed between Member States to distribute or sell as they choose.	Contribution to cap for selected sectors set at EU-level; contribution to cap by other sectors determined by Member States. Within resulting Member State shares of total caps, Member States may distribute or sell allowances as they choose.	Member States would determine their own contributions to the overall EU ETS cap (subject to review by the Commission), and would also determine allocations.

Some of the combinations are not straightforward. For example, a partially-EU-determined cap, partially harmonised case could take the following form. The EU could agree that the overall EU ETS cap would reflect a specific level of emissions from the power sector for all

Member States—for example, 350 kgCO₂ / MWh. Member State shares of the associated emissions could be divided according to this same rule (or according to some alternative negotiated burden sharing agreement). Free allocation to the power sector then could reflect this same benchmark, some fraction of it, or could be fixed at zero (which would correspond to 100 percent auction). Under this hypothetical example, the contribution to the cap associated with the remaining sectors could be set individually Member States (presumably subject to Commission review, as at present). Allocations to these sectors then also would be determined by Member States.

Many variations on this single example would be possible. Similar examples (some more complicated than others) also could be elaborated for any of the nine options described in

Table 4.1.

As we discuss in the next section, although cap-setting and allocation are in principle distinct from each other, in practice decisions about the two have not been made in isolation under the EU ETS in many Member States. For example, Member States have reserved for free allocation to their own industries most of the allowances they have created, so the contribution of a Member State to the overall cap is currently closely linked to its level of free allocation. When determining the contributions to the caps that they would issue under their NAPs, most (although not all) Member States relied in part on “bottom-up” estimates of emissions from covered sectors and covered installations. To some extent this was necessary because “top-down” models and national statistics did not match the scope of the EU ETS for all sectors. But even if well-matched “top-down” data were available, it is likely that caps at the EU level and contributions from individual Member States would still be calculated with reference to the expected emissions from individual sectors and individual Member States.

Although in theory a Member State’s or sector’s “contribution to” the overall cap need bear no relation to the size of the allowance pool from which it might expect to receive free allowances, in reality, it is likely that the contribution to the cap will represent an important reference point in the subsequent allocation decision.¹³ Therefore it may be unrealistic to expect that questions of cap-setting can be divorced completely from questions of the division of the share of the overall cap. Even if the cap were to be agreed at the EU-level, we would expect Member States to pay close attention to what any agreement would mean for the “allocation” received by them (if any) and the total implied allocation to their sectors and installations relative to others in other Member States.

With these relationships between cap-setting and allocation in mind, we turn to the specific ways that the level of the EU ETS cap—understood as the split between the EU ETS and non-ETS sectors—might be calculated.

4.2.3. Options for cap-setting given high-level decision-making framework

Alongside each of the high-level frameworks that assign responsibility for setting the cap is an independent set of options for determining the level at which the cap should be set. In the context of cap-setting, these options apply to the determination of the “split” between EU ETS sectors and the sectors outside the EU ETS.¹⁴ We consider the options for cap-setting here.

As we have stressed throughout this chapter, when considering these options it is important to keep in mind here the distinction between cap-setting and allocation. It would be entirely

¹³ In essence, it seems unlikely that any sector could expect to receive a free allocation that was larger than its expected contribution to the overall cap—although the free allocation could easily be smaller as a result of auctioning some or all of the contribution to the cap. For Member States, there is a greater possibility that allowances assigned to the Member State could be in excess of the Member State’s contribution to the overall cap. This would essentially represent a transfer of entitlement to the value of allowances from one (or more) Member State to another, which could be part of the process of negotiating a new Burden Sharing Agreement.

¹⁴ As noted above, many of these options are also relevant for decisions at subsequent stages of the allocation process; where this is the case and there are issues specific to post-cap allocation approaches that relate to the design options considered here, we note these in footnotes.

possible to use one type of data to determine the EU ETS cap, and a completely different type of data for setting shares of free allocation within the EU ETS.

4.2.3.1. Pre-ETS historical emissions plus adjustment factor(s)

The EU's Kyoto targets and recent European Parliament and Council commitments are expressed in terms of emissions relative to 1990 levels. Assuming reliable emissions data were available, it would be straightforward to calculate the emissions reductions from EU ETS sectors in total and/or for each Member State to determine a pro-rated reduction target for the EU ETS that would set the cap. Put another way, the EU ETS sectors collectively would account for the same proportion of emissions in the future target year as they did in the baseline year. Thus if the ETS sectors accounted for 50 percent of EU emissions in the baseline year, and the non-ETS sectors the rest, the two categories of sector would be expected to account for half of the EU's emissions in the future year. In theory it would be possible to make this calculation relative to 1990 emissions, or relative to some average (e.g. 2001-2004) prior to the start of the ETS. The reduction could be designed to be consistent with the Council's 20 – 30 percent commitment.

Various levels of differentiation within the overall cap would be possible under this approach, and these would correspond to alternative burden sharing options. For example, new Member States could have a smaller adjustment factor applied to their emissions, with correspondingly more stringent targets for the EU-15. Or power sector adjustment factors could differ from those used for other combustion and/or industries. If the same overall reduction for the EU ETS cap and the non-ETS emissions were maintained, using different adjustment factors would not affect the EU ETS cap – it would simply rebalance the contribution to the cap made in the cap-setting formula by different sectors.

This approach could be applied to any of the three high-level options discussed in section 4.2.1, and in multiple ways. For example, under Option 2, each Member State would have its share of emissions, and could then allocate to sectors by reducing historical emissions according to this approach. Similarly, under Option 3, pan-EU sectors could receive overall allocations using adjustment factors that reflected EU-wide reduction targets, and Member States could choose to distribute the remaining allowances to other sectors (and/or installations) in proportion to their historical emissions. Of course, under Option 3, Member States could select other methods for calculating allocations to non-harmonised sectors.

4.2.3.2. Post-ETS historical emissions plus adjustment factor(s)

A closely related approach would be to base the split between the EU ETS and the non-ETS sectors on more recent emissions data from the period when the ETS was already in effect—for example, 2005-2007. In all other respects, this approach could be implemented in various ways along the same dimensions as an approach based on pre-ETS emissions.

4.2.3.3. "Simple" projections-based approaches

Instead of basing the split between the ETS and non-ETS sectors on historical emissions, it would be possible to base it on projected future emissions. The overall EU emissions target would still be set to be consistent with, for example, the 20-30 percent reduction commitment, but the balance between ETS and non-ETS sectors (and if used for allocations,

between sectors, Member States, etc.) would be affected. Projections could be based on data gathered prior to the start of the ETS, but in practice it seems more likely that the most recent, up-to-date information would be used for each phase. (There are arguments for both approaches, which we consider in the evaluation section.)

Projections could be calculated in a variety of ways. The “simple” approach envisaged here would be to apply growth rates and rates of change of energy- and emissions-intensity to the various sectors (the ETS and non-ETS sectors, and possibly individual sub-sectors), as a way of developing the overall ETS share of the total.

Projections could be based on expectations with or without the EU ETS and various other climate-related policies—depending on views of what would represent the fairest baseline. It also would be possible to use business as usual (“BAU”) projections for one sector (e.g. the non-ETS sector) and to tighten the cap for the other sector accordingly.¹⁵ This would place the cost burden squarely on the latter sector.

4.2.3.4. Benchmark-based approaches

A fourth approach would depart from the emissions-based approaches described in the three preceding sub-sections, and instead use other “metrics” to determine each sector’s contribution to the overall cap. We classify all of these under the heading of “benchmarking” approaches to cap-setting.¹⁶

One option for sectors with relatively homogeneous outputs would be to use output data—pre-ETS historical, post-ETS, or projected—multiplied by an appropriate GHG intensity benchmark. Such benchmarks could be uniform across the EU, or they could be differentiated by technology, fuel, other inputs, or region.

For sectors with less homogeneous output, production-based benchmarking would still be possible. Output data would need to be aggregated into a suitably concise measure—such as gross value added—and then combined with a GHG-intensity reduction factor that was consistent with expectations or aspirations of what the sector would achieve.¹⁷

As with approaches based on emissions projections, it is likely that the final level of emissions implied by the application of benchmarks and/or intensity improvement factors will not be exactly consistent with the overall EU emissions target. Thus it may be necessary to apply an adjustment factor to make the benchmarked emissions consistent with this overall target. The adjusted emissions level for those sectors covered by the EU ETS would become the EU ETS cap. The implication of this adjustment is that benchmarks that are intended to

¹⁵ This is similar to the approach to *allocation* taken by some Member States in Phases I and II. Some Member States allocated projected emissions to the non-power sector and allocated only the residual amount left over within their approved total allocation to the power sector.

¹⁶ Note that the application of rates of change in energy-intensity and emissions-intensity to projected emissions described in the previous section is a version of “benchmarking” that could be applied across the economy.

¹⁷ Other forms of benchmarking could be used to set Member State shares without reference to individual ETS sectors, their outputs, or their emissions intensity. For example, Member States could be assigned shares based on (projected) population levels or (projected) levels of overall economic activity.

represent “industry averages” or “best practice” or “BAT” may depart from these original levels once adjustment factors are applied.¹⁸ In this case, the benchmarks would determine the *relative levels* of allocation between EU ETS and non-ETS sectors, but would not necessarily determine the absolute levels.¹⁹

4.2.3.5. Other approaches

In addition to the approaches outlined above, it would be possible to make even greater use of modelling to come up with additional methods for allocating. For example, it would be possible to model the emissions of each sector assuming its marginal cost of GHG abatement was equal to the marginal abatement cost in all other sectors. This approach would imply a certain level and share of emissions for the ETS and non-ETS sectors, and the overall level of emissions could be chosen to be consistent with whatever overall emissions targets were desired.²⁰ This approach would require a detailed model of CO₂ abatement across sectors and Member States, as well as detailed models of the EU economy.

4.2.4. Other issues

4.2.4.1. Relationship between ETS / non-ETS split and allocation

As mentioned previously, the decision about how to divide emissions between the EU ETS and the non-ETS sectors and thereby set the overall EU ETS cap is very similar in form to questions of allocation *within* the EU ETS. An important difference, at least in theory, is that because the division between ETS and non-ETS sets the binding cap for ETS participants, it determines the price of allowances—whereas once the cap has been set the distribution of allowances amongst sectors will not affect the price in the same way.²¹

During Phases I and II of the ETS, many (although not all) Member States determined their contribution to the overall cap only once they had completed their allocation to sectors and installations. Under such a “bottom-up” model, the sum of all sector or individual installation allocations, plus any new entrant reserve, plus any allowances reserved for auction determine the overall contribution to the cap by each Member States, and the sum of all Member State contributions determine the overall cap. A “bottom-up” model could be followed in the post-2012 regime, whether the locus of decision-making resided within individual Member States or at the EU-level. If such a model were used, it would mean that the non-ETS sectors could be squeezed to meet overall EU reduction targets, or alternatively, it could mean that an

¹⁸ As noted, another way of ensuring that the overall cap is met would be to selectively reduce the share of one or more sectors, leaving other benchmarks at their original scale.

¹⁹ Similarly, if used explicitly to develop sector-level allocations or to calculate the shares of the overall cap that will be assigned to each Member State, the benchmarks would be used as a way of setting relative burdens, but they would not necessarily fix the absolute caps.

²⁰ For allocation to individual Member States, or where cap-setting resulted from a bottom-up process of aggregating sector or Member State allocations, it also would be possible to make the total emissions costs per unit GVA equal across sectors or to make emissions costs per unit GDP equal across Member States. Or it would be possible to determine Member State burden sharing in a way that equalized per-capita welfare costs.

²¹ In practice, because the EU ETS currently, and possibly in the future, has access to emissions rights that are outside the EU ETS (through CERs and ERUs), it is not strictly true that the cap fixes emissions within the EU ETS, and it may be the case that the cost of credits, rather than the cap, determines the price of EU ETS allowances.

adjustment or compliance factor would need to be applied to the allocations at the end of the process to ensure that the resulting cap was consistent with overall EU targets.

The use of bottom-up approaches to cap-setting may create a perception of entitlement to the emissions allowances that are "created" in respect of a particular Member State or sector's economic activity or emissions. It seems important to recognise this perception even if formally there is a distinction between the process of cap-setting and the process that determines the shares of the cap that are assigned and/or allocated for free to Member States, sectors, or installations.

4.2.4.2. Contingency arrangements for reduction commitment

As noted in the introduction, the EU has committed to a unilateral emissions reduction of 20 percent relative to 1990 levels by 2020, and a reduction as high as 30 percent if there is agreement at the international level on climate change policy. If the target increased from 20 percent to 30 percent, this could imply a reduction in the number of allowances available to the EU ETS by tightening the overall cap.²²

4.3. Evaluation

We assess the high-level decision-making options discussed above as well as the specific methods for calculating caps against the following categories of evaluation criteria:

- § Environmental effectiveness,
- § Efficiency of Trading Scheme,
- § Administrative cost and feasibility,
- § Fairness.

4.3.1. Evaluation of high-level decision-making frameworks

4.3.1.1. Environmental effectiveness

4.3.1.1.1. *Ability to maintain cap*

In principle any of the decision-making approaches could result in the same overall EU cap, which would then result in the same environmental outcome, all else being equal. In practice, the coordination that is possible under Option 1 (cap set entirely at EU-level), and to a lesser extent under Option 2 (cap set partially at EU-level), may reduce the risk that individual Member States will have an incentive to inflate their own contributions to the overall cap. Option 3 would allow individual Member States to determine their own levels of ambition, albeit subject to central review and approval, and therefore might be rated somewhat lower.

The only other relevant consideration here is whether over the longer term, there are likely to be differences in the stringency of the environmental target that may be negotiated under one

²² Such a reduction could be applied uniformly to Member States or sectors, or it could be differentiated by sector (for example, if some sectors had been receiving a higher allocation in part due to the absence of any international agreement).

or more of the high-level options. Assuming Member States will need to approve of future targets, it is not clear that the options would differ substantially here. In addition, given the existence of long-term commitments and indicative targets in the EU out to 2050, the level of ambition of future targets is known to some extent already.

4.3.1.1.2. Ability to limit leakage

The three options do not differ substantially on this criterion. Leakage could be reduced if a laxer overall cap is set, because this would result in a lower allowance price. Thus as noted, if Option 3 resulted in a less stringent cap, it could reduce leakage. Setting this possibility aside, giving more discretion to individual Member States in their own cap-setting process should not have any other impact on leakage. Leakage may be affected by other allocation options, but less so by cap-setting decisions.

4.3.1.2. Efficiency of trading scheme

4.3.1.2.1. Consistency with least-cost abatement

The high-level cap-setting options do not differ much in terms of the incentives they provide for abatement, largely because it is possible to fit various alternative allocation approaches into each framework (they do not specify, for example, the approach to allocating to new entrants). If operators believed they were more able to influence individual Member States than an EU-level decision-making process, this might reduce their incentive to abate under the decentralised cap-setting approach, because they might believe they were in a better position to argue for a greater level of allowances (or free allocation).

4.3.1.2.2. Functioning of allowance market

There is limited reason to expect that the high-level decision-making about the cap would have much effect on the functioning of the allowance market. Option 1 would set the overall cap in a single decision, which could have a significant impact on the market price if the level of the cap differed substantially from what market participants expected—but this impact would be felt only once. Option 2 would result in a greater number of decisions with some potential to affect the allowance market price—although the magnitude of any of the decisions would be smaller than under Option 1. Option 3 would be similar to Option 2, with a similar number of individual Member State decisions having the potential to affect the market, but to a much smaller extent than under Option 1.

4.3.1.3. Administrative costs and feasibility

4.3.1.3.1. Costs of establishing and maintaining allocation

There is likely to be some additional administrative burden associated with Options 2 and 3, relative to Option 1, because of the need for every Member State to develop their own methodology for determining the cap or the contribution to it (rather than having it set via a single EU-level process), and also because of the expectation that the Commission or some other EU-level authority would retain responsibility for reviewing individual Member State cap-setting decisions. This review would be likely to result in duplication of effort to at least some degree.

On the other hand, establishing a unified approach to cap-setting across all Member States could involve substantial costs to negotiate an agreed outcome. A fully unified approach (Option 1) could prove infeasible in practice if certain sectors could not be treated in a standardised fashion. Relaxing the requirement for full EU-level cap-setting therefore could result in an approach that was less difficult to negotiate and thus less costly from this perspective, and this is one potential argument for preferring Option 2.

Another small but significant issue related to cap-setting and the split between sectors is the possibility that the EU ETS will retain the current feature that allows Member States to opt-in certain sectors and activities whose coverage under the Scheme is not mandatory. If the cap were to be set entirely at EU-level, the status of opt-ins would be uncertain, since opt-ins introduce an element of Member State discretion. One way to accommodate opt-ins, while maintaining EU-level cap-setting, would be for the EU to develop consistent rules for determining how the overall cap would be affected by the opt-in of candidate sectors by individual Member States. However, because one rationale for opt-ins is that they make it possible for Member States to experiment with approaches that the EU as a whole is (at that time) unprepared to adopt, it could prove difficult for the EU to agree detailed rules for all potential opt-in sectors. Moreover, insisting on such detailed rules could be more costly administratively than allowing individual Member States to experiment.²³

4.3.1.3.2. *Transaction costs*

There is no reason to expect the level of transaction costs to be substantially different under the three high-level cap-setting options.

4.3.1.4. *Fairness and distributional equity*

4.3.1.4.1. *Burdens to covered sectors*

Under Options 2 and 3, Member States would have more discretion about how to allocate the burden of reducing emissions between their non-ETS sectors and the ETS. Thus there might be more variability of burden between Member States under these options. In addition, if there is a tendency for Member States to be more lenient with the EU ETS sectors because they face absolute targets, Options 2 and 3 could result in relatively looser caps. However, in this regard, the discretion that Member States currently have regarding their expectations for emissions reductions from the non-ETS sectors may decline as EU-wide policies affecting emissions in these sectors are agreed and implemented. Thus it may be less credible for Member States to cite greater reductions from non-ETS sectors than are anticipated from wider EU measures.

(If Option 1 were to result in more stringent caps than the other two options, it could lead to higher allowance prices, and therefore higher cost burdens to covered sectors.)

When considering the “fairness” of the burden imposed on the ETS (and non-ETS) sectors and sub-sectors, one must acknowledge that conceptions of fairness differ. This is most

²³ If there were concern that opt-in of certain sectors—for example, sectors accounting for significant share of Member State emissions such as transport or domestic heating—could significantly affect the allowance market and the overall cap, more detailed rules could be developed to apply to these, with other potential opt-in sectors left unaddressed.

relevant to questions of allocation, but in some cases may have implications for cap-setting. If there are “spill-overs” from cap-setting into allocation, or if it is not possible to disentangle the two in practice, then cap-setting approaches that reflect differences between sectors or Member States may be better able to reflect the differences in impact that firms in different Member States may face. In general, if a single, consistent interpretation of “fairness” prevails among sectors and Member States, then harmonised EU-level approaches may be preferred. But if conceptions of fairness differ, it may be preferable (measured against this criterion) to have greater decentralisation.

4.3.1.4.2. *Burdens to consumers of affected products*

The assessment under this criterion is the same as for burdens to covered sectors.

4.3.1.4.3. *Taxpayer and other welfare effects*

There is nothing in the high-level cap-setting options that differentiates them from each other in terms of their effects on taxpayers or the overall economy.

4.3.2. Evaluation of specific options for setting cap level

This subsection considers specific ways of setting the cap. We focus primarily on the metric or metrics used to determine the split between EU ETS and non-ETS sectors. In addition, although issues of “harmonisation” arguably are more closely related to the question of allocation within a given cap than to cap-setting, we have already noted that in practice there has been some blurring of the distinction between these two processes. Such “blurring” may persist in the future—particularly in light of the fact that different cap-setting options confer different levels of discretion to Member States to determine their own shares (i.e. their “allocations”) of the overall cap. Thus where it appears to us that the two processes overlap or interact significantly—either in fact or in stakeholder perception—we also assess different levels of harmonisation against the agreed criteria.

4.3.2.1. Environmental effectiveness

4.3.2.1.1. *Ability to maintain cap*

There is little difference between the specific alternatives in terms of their ability to achieve a given emissions target. The one potential difference relates to the determination of subsequent caps. Where sector-level or (for options where Member State decision-making is involved) Member State level projections are used, as well as where recent (post-ETS) information is used, there may be distortions in the incentives to reduce emissions that would result in deviations from the least-cost abatement measures.²⁴ This in turn could result in

²⁴ As we discuss in Chapters 8 and 9, this is a general point that holds for all forms of updating, including the various forms of updating of baseline data that are referred to here. However, because it is the overall cap that is being updated, the effect on the incentives of an individual firm is diluted substantially relative to an updating approach for individual allocations. Because aggregation is likely to dilute the effect, any disadvantages are likely to be more pronounced under more decentralized approaches where individual decisions can have a greater impact on a sector or Member State total.

higher allowance prices, which could make agreement on tighter targets more difficult. This disadvantage would not arise if only pre-ETS data were used.²⁵

4.3.2.1.2. *Ability to limit leakage*

One way to reduce leakage of production and emissions outside the EU may be to provide allowances contingent on output within the EU. Formally, this could apply to cap-setting in the same way that it applies to allocation. Thus if the level of the cap were set by sector emissions benchmarks multiplied by current output, or were based on current Member State emissions within the ETS, both of these approaches could create incentives for Member States or operators to maintain production within the EU. These incentives for operators are likely to be relatively limited, because of the “dilution” of individual decisions within the overall cap. The incentives for Member States could be more significant if they were able to influence the level of output within their borders—particularly if contributions to the cap were determined by covered industrial output. To the extent that Member States are able to influence output within their borders, they could have incentives to do so, which would reduce leakage.

Sector-based approaches using benchmarking have been proposed as a way to broaden the scope of emissions trading to other countries. In particular, it has been suggested that sector-based approaches could garner support from developing countries, who might be persuaded to opt in selected sectors even if they were not willing to commit larger portions of their economies to binding targets. If sector-based approaches were able to do this (which is by no means proven), they also could reduce the risk of leakage.

4.3.2.2. Economic efficiency

4.3.2.2.1. *Consistency with least-cost abatement*

An important result in the theory of environmental economics is that, assuming markets are not imperfect, the most cost-effective emissions abatement choices are made when all sectors of an economy face the same marginal cost of emissions. Applying this result to the determination of the cap on EU ETS emissions, this implies that the cap should be set at the level where the marginal abatement cost within the EU ETS (reflected in the price of EU ETS allowances) is the same as the marginal abatement cost for all of the non-ETS sectors.

The only way that this could be done would be to rely on detailed modelling of the economy—particularly of energy supply and demand, but also of other affected sectors, as well as of current and expected future abatement costs—to apply an increasing emissions “charge” to all sectors until the overall EU emissions target was achieved.²⁶ Such modelling

²⁵ If governments could credibly claim that post-ETS data would only be used once—for example, that Phase I data would be used because it was acknowledged to be substantially more accurate than previously collected data—but that this would not be repeated, use of these data would not necessarily lead to updating concerns. Having used new data once, however, governments could find it difficult to make stakeholders believe that they would not use them again.

²⁶ Another way of ensuring that the marginal abatement costs were equalised that would not require detailed modeling would be to allow some element of “trading” between the ETS and non-ETS sectors; in practice such a feature may already exist within the Kyoto framework, because individual governments are able to trade AAUs to comply with their individual Kyoto commitments.

would be complicated by the fact that many features of the EU ETS as well as other policies affect the marginal costs faced by different sectors of the EU economies. For example, renewables policies would need to be taken into account in some way when modelling the effects of a CO₂ price on electricity and other sectors. The targets for such policies already embody an effective valuation of CO₂, and this value may differ from the cost-minimising CO₂ price. Put another way, it is very likely that the "least-cost" abatement levels by sector identified by a model would differ from the actual levels of abatement delivered by different sectors (whether ETS / non-ETS or smaller sub-sectors) given the existing suite of policies.

Assessed from a slightly different perspective, approaches that are able to limit leakage by promoting output from particular sectors will not rate as well on this evaluation criterion, because by design they provide less than optimal incentives to reduce output. Thus projections- and output-based approaches using recent data will not score as well on this criterion. Of course, the magnitude of any such distortion, and its significance relative to the distortions represented by emissions leakage, are empirical questions that would need to be assessed.

In contrast, approaches that diminish the link between allocation and recent or current sector activity (for example, the per-capita approach, or the pre-ETS historical approaches) are most likely to be consistent with the least-cost abatement measures.

If cap-setting processes were expected to "spill over" into allocation,²⁷ then allowing Member States to set their own contributions to caps could result in unequal levels of free allocation to given sectors (e.g. per unit output) in different Member States. As we discuss in subsequent chapters focusing on allocation, this would not necessarily affect the cost-effectiveness of abatement decisions, but it could do so under conditions of imperfect emissions, product, or capital markets or where allocations are updated. If this were a real concern, cap-setting methods that used some form of benchmarking might provide better incentives for cost-effective abatement than others.

4.3.2.2.2. *Functioning of allowance market*

There is little to distinguish the specific cap-setting options under this criterion.²⁸

²⁷ Another way of characterising this "spill over" would be to say that the extent of EU-level decision-making about the cap is positively correlated with the extent of harmonisation in the level of allocation.

²⁸ One possible difference depends on the interaction between cap-setting and allocation approaches. Some commentators on the ETS have claimed that participants are more likely to behave "irrationally" by not taking into account the full opportunity cost of their GHG emissions if their allocations are set very close to their expected allowance need. To the extent that some methods of cap-setting (for example, projections-based approaches without correction factors) facilitate allocations equal to need, they could make this outcome more likely and therefore impede the functioning of the allowance market. However, this potential influence depends on a number of assumptions about the interactions between cap-setting and allocation and allocation and operator behaviour. There may be sufficient alternative explanations for observed behaviour that any preference for cap-setting options would be limited.

4.3.2.3. Administrative costs and feasibility

4.3.2.3.1. *Costs of establishing and maintaining allocation*

Basing caps on historical emissions data that are not updated with recent information or projections would be relatively straightforward for sectors that have already participated in the ETS. Even for sectors that are added to the Scheme it would require only a one-off effort to collect historical data. If caps were to be revised periodically—for example, between phases—this would add some administrative costs, but most (if not all) of the data would probably need to be collected anyway as part of the operation of the scheme. The experience with the use of pre-ETS historical emissions information was that the data in many Member States did not appear to be particularly accurate, leading to questions about their reliability for use in cap-setting or allocation. Similar, if not greater, concerns are likely to apply to pre-ETS data related to non-emissions metrics.

Using historical output- (or input- or capacity-) based approaches would require additional administrative effort, because of the need to define each of the relevant sectors or outputs and collect data on them for each sector and Member State. Benchmarks based on per-capita or per-GDP approaches would be fairly straightforward, because they would be based on a single metric.

If projections were used to set the cap this would lead to additional administrative effort, because of the requirement to develop (and approve) growth rates and changes to energy- and emissions-intensity. More complex modelling approaches would require even greater investment of administrative effort (and would be likely to be less transparent), because of the need to develop and maintain updated and well-accepted models.²⁹

4.3.2.3.2. *Transaction costs*

Again, market transaction costs are unlikely to be affected by the specific approaches to setting the level of the cap.

4.3.2.4. Fairness

4.3.2.4.1. *Burdens to covered sectors*

As noted, because the use of historical emissions information as the basis for cap-setting in Phase I appears to have contributed to the over-allocation in that Phase, it may not be viewed as the most appropriate basis for setting the EU ETS post 2012.³⁰

²⁹ The relative administrative costs of harmonised as opposed to non-harmonised approaches are not necessarily straightforward to assess. As noted above, if many Member States developed their own individual approaches to projections and modelling this would presumably increase administrative costs. On the other hand, with a more harmonised approach, there might be some loss in specific knowledge about sector-level developments, which would therefore require some effort to recreate; moreover, the process of reaching agreement about projection / modelling approaches could involve substantial administrative effort of its own..

³⁰ Note that it may not be fair to blame the over-allocation on the emissions data, given that sector-level allocations and overall allocations by Member States also often relied on output growth rates that may not have been accurate (and that may not have reflected changes in emissions intensity).

Simple, uniform treatment of all sectors and Member States—or of the split between ETS and non-ETS sectors for all Member States—may not automatically result in an allocation that is perceived to be “fair” for all. Under defensible “fairness” criteria, there may be plausible reasons for differences in treatment of sectors or Member States (or individual installations).

One of the attractions of emissions trading is that it provides the flexibility to vary *allocations* to accommodate different circumstances. As noted, although in theory, cap-setting could be done independently of decisions about allocations to sectors and Member States, in practice it is likely that Member States, the Commission, or others will rely on some form of bottom-up cap-setting to some extent, in which case cap-setting and allocation become more closely connected.

The current EU Burden Sharing Agreement explicitly sets targets for individual Member States’ overall emissions, but not for their contribution to the ETS cap. Subsequent agreements may make explicit reference to ETS and non-ETS sectors. If they refer to individual Member State contributions to the EU ETS cap, this could be perceived as amounting to an initial stage in the *allocation* of ETS allowances. Thus it may be difficult to disentangle the negotiation of a new overall Burden Sharing Agreement—with its associated “allocation” to Member States—from the negotiation of the EU ETS cap. Moreover, since one of the three high-level cap-setting approaches considered here is for Member States to determine their own contributions to the cap, it may be less straightforward to separate cap-setting from allocation where the “allocation” relates to Member States.

Note that differential treatment of Member States under a new agreement would not need to be considered a “distortion” from a “correct” allocation even if it led to different treatment of the same sector (or different splits between ETS and non-ETS sectors) in different Member States. Both allocation and the setting of the split between ETS and non-ETS sectors can be understood as a mechanism for achieving a negotiated agreement between various stakeholders. Done properly, and under certain conditions, this *need not* affect the efficiency or environmental characteristics of the Trading Scheme. It will, however, affect the relative burdens imposed on the ETS and non-ETS sectors, as well as the relative burden shared between different Member States and different ETS sectors.

Historical pre-ETS emissions are likely to be an increasingly poor guide to ETS and non-ETS sector emissions in the future (as well as to emissions of Member States and ETS sub-sectors). Basing the cap or new Burden Sharing arrangements on historical values therefore may be perceived as increasingly unfair over time. As noted, one alternative would be to base the ETS / non-ETS split or a new Burden Sharing Agreement on projections. However, increasing shares to the sector or to Member States whose emissions increase, and reducing them to those whose emissions decline, results in perverse incentives not to reduce emissions. Shifting to an approach that set future “caps” based on expected *output* from covered sectors (rather than emissions) would address some of the associated perverse incentives, but would not, for example, credit a shift (within the EU overall, or within individual Member States) from emissions-intensive industries to other areas of economic activity.

On some accounts of fairness sectors (whether defined as ETS / non-ETS or ETS sub-sectors) or Member States whose emitting activities are growing more quickly should receive more allowances. On other accounts of fairness, those that expand their emitting activities should

be made to “buy” that expansion from others, since they increase the cost of meeting a given emissions target or cap for everyone else. Thus it is not clear that projections based on benchmarks or periodic revisiting of Member State or sector cap contributions should be preferred to historical emissions or output metrics.

Benchmarking approaches do not necessarily provide for a “fairer” way of determining the relative burdens between sectors, because they still require judgments about relative levels of effort, and do not necessarily reflect the ultimate costs that each sector will face (which will depend on a host of other factors, not only technical potential to reduce emissions). To take one example, there is no single “fair” way of balancing the emissions reductions demanded of the automotive transport sector with the reductions demanded of the iron and steel sector, even though both can be benchmarked. Moreover, there will inevitably be sectors that cannot be benchmarked, and for which an alternative approach will be required—underscoring the fundamental role that judgment would need to play.

4.3.2.4.2. Burdens to consumers of affected products

Again, the burdens imposed on consumers will vary depending on a host of factors, not only the number of allowances or level of emissions reductions imposed upon the producers of the goods they consume. Thus the way that the level of the cap is calculated will have an indeterminate effect on consumer burden.

4.3.2.4.3. Taxpayer and other welfare effects

When considering the split between ETS and non-ETS, the different methods do not appear to differ significantly in their implications for taxes or other welfare effects. When considering Member State burdens, approaches based on population levels or GDP per capita seem most closely aligned to the aim of equalising the welfare impacts on individual taxpayers, but such approaches would not necessarily benefit taxpayers generally unless lower level allocation methodologies granted the allowance value to taxpayers in one way or another.

4.4. Conclusions

4.4.1. Summary of evaluations

The environmental effectiveness of different high-level cap-setting approaches probably does not differ substantially, except insofar as setting the cap at the EU-level (whether by centralised decision or agreement between Member States) reduces the ability of Member States to inflate their contributions to the cap, and their incentives to do so. Assuming overall EU emissions targets are fixed, setting the ETS / non-ETS split using updated activity information has the potential to reduce the overall cost-effectiveness of EU policies, increasing the allowance price and making it more difficult to agree more stringent EU ETS caps in the longer term. The magnitude of this effect is uncertain, however, and there may be other reasons to allow updated information to be used at this very high level of aggregation given the significant uncertainties about future abatement costs, etc.

The high-level cap-setting approaches do not differ substantially in their ability to reduce emissions leakage. Options for setting the cap level could differ in their effects on leakage if

they provide different incentives for intra-EU production. Thus with the two environmental effectiveness criteria, there is a possible trade-off between imposing a more stringent intra-EU target, and reducing the risk that emissions outside the EU increase.

A “positive” rating with respect to the ability to limit leakage implies the opposite with regard to the likelihood that the idealised least-cost abatement measures will be incentivised. Thus if Member State level decisions were more susceptible to operator influence, operators could face reduced incentives to abate under a decentralised cap-setting regime. In general, methods that reduce leakage by promoting output provide less-than optimal incentives, but as noted, the empirical significance of this reduce cost-effectiveness requires further analysis.

There is less of a trade-off implied by the choice among methods for determining the level of the cap. In theory at least, a method based on equalising marginal abatement costs between ETS and non-ETS sectors will result in the lowest cost of achieving the EU’s overall emissions targets. In practice, however, the models required to estimate the cost-minimising split are likely to be subject to considerable uncertainty, as well as more fundamental methodological questions about the appropriate treatment of pre-existing policies whose aim is (or includes) the reduction of CO₂ emissions.

Although the alternative high-level decision-making frameworks are likely to differ in their impacts on the functioning of the allowance market, it is not clear which of them offers the “better” option—a large single “shock” to expectations, or multiple smaller shocks. The options for setting the specific cap level of the also are unlikely to affect market functioning. None of the cap-setting parameters seem likely to affect the level of transaction costs within the Scheme.

Scheme administrative costs are likely to be lower under the EU-level decision-making framework, although some of the gains in administrative effort are likely to be lost in negotiating mutually agreed approaches among Member States. If agreement could not be achieved, Option 2 would provide a potential compromise, and could also accommodate opted-in sectors relatively easily. The administrative cost of determining cap levels would be relatively low under approaches that rely on a single metric, such as the proportion of historical emissions from EU ETS sectors / participants. Approaches that rely on projections and/or benchmarks are likely to require substantially greater effort.

The overall burden of the scheme (on covered participants, consumers, or society overall) is affected by the different cap-setting options in the obvious sense that certain alternatives will lead to a more stringent cap than others. Issues of distribution may also arise if it is deemed undesirable, unfair or not appropriate to separate questions of cap-setting from questions of allocation, so that cap-setting decisions have subsequent implications for the distribution of allowances between Member States or between ETS sectors.

4.4.2. Implications for allocation decisions

As noted in section 4.2.2, certain approaches to cap-setting could make some subsequent decisions about allocation appear more natural than others. For example, if high-level Option 2 (cap set partly at EU-level, partly by Member States) were adopted, it may be considered most natural to pursue a harmonised allocation approach for those sectors whose contribution to the cap is done at EU-level, and allow less harmonised approaches for other sectors.

Similarly, if a sector's contribution to the overall cap were to be calculated using an output-based benchmark, it might be considered most appropriate for individual allocations also to be based on output—even though the level of allocation might also reflect other decisions about the share of allowances to be auctioned, etc. There is no necessary link between the cap-setting approaches and subsequent allocation decisions, but there may be affinities between them.

For similar reasons, Member State contributions to the overall cap that were set with reference to historical or projected emissions would not necessarily be inconsistent with using partially or fully harmonised sector benchmarks for installation-level allocation. If there were sufficient consensus that harmonised sector-level free allocation was important, it would be possible to combine these two approaches. Any surplus allowances that were left over after all installations in a Member State had received their (harmonised) allocation could be reserved for each Member State's auction, for example. (In a case where the emissions-based contribution to the "cap" for a Member State would imply fewer allowances than the harmonised sector-level allocation would grant to its installations, alternative treatment would be required.)

As noted, approaches involving updating—by which we refer to any method where allocations are revised in subsequent phases using more recent data or expectations—are most likely to result in deviations from the idealised least-cost operation of the trading Scheme. (As also noted, such deviations may be intentional and/or desirable, for example, to reduce leakage.) But these deviations would be reduced the longer the phases between which updating could occur (because the longer the wait until the next "updating event"). Of course, any deviation also would be reduced by more auctioning, simply because there would be less possibility of updating to distort choices.

5. Auctioning

5.1. Introduction and Background

It is useful to consider a basic distinction between allocating allowances “for free” and auctioning allowances. To date, almost all emissions trading schemes have allocated the bulk of allowances for free, but a number of programmes have included some degree of auctioned allowances. The EU ETS has followed the latter pattern. Currently Member States are permitted to auction a maximum of 5 and 10 percent of their allowances in Phases I and II of the Scheme, respectively. Most Member States have chosen to auction well below this maximum level. Recently, however, there have been calls for a significant increase in the use of auctioning to allocate emission rights, both for the EU ETS and for other cap-and-trade programmes.

In addition to the level at which to set the share of auctioned allowances, there are various other details of auction design that could be implemented within the context of the ETS. As with other allocation options, each of these design parameters could be harmonised between Member States to a greater or lesser degree.

This chapter first describes four harmonisation options that could be applied to the use of auctioning under the ETS starting in 2013, and then discusses a number of key auction design elements that are relevant to the operation of the trading scheme. We then evaluate these various design options against the evaluation criteria agreed with the Commission. The final section summarises the evaluations and discusses important connections between other allocation decisions.

5.2. Options for Auctioning

5.2.1. Auction organisation and harmonisation

As noted, the proportion of allowances auctioned to date has been small. If the proportion grows larger in future phases, harmonisation is likely to become more important, because there may be greater possibility that the timing and design of auctions could affect the operation of the allowance market. Increased harmonisation of auctioning could be carried to different degrees. At a minimum, this could involve common design parameters and timing; at the other end of the spectrum, it would be possible to run a single (repeated) auction at EU level. The harmonisation of auctions is linked to questions of harmonisation of other aspects of the allocation process, although various combinations of design options are possible.

Options for harmonisation could include:

- § Centralised auctioning;
- § Central auctioning with Member State contributions (an "EU platform");
- § Separate auctions with harmonised auction rules; and
- § Independent auctions (with voluntary co-ordination).

5.2.1.1. Option 1: Centralised auctioning

Under this option all decisions about auction implementation would be taken centrally at an EU level. This would include the level or percentage of auctioned allowances as well as the design, timing, and other aspects of auctioning. A central auction need not imply centralised use of auction revenue. This could be a separate decision, and revenues could be allocated to Member States (or other entities) in various ways.

5.2.1.2. Option 2: Central auction with national contributions

A less harmonised option would be to use a centrally designed and implemented auction, but allow Member State autonomy over the decision about the number of allowances to auction. This could be implemented by Member States contributing allowances to a central auction pool, and receiving back auction revenues in proportion to their contributions. This could be subject to constraints, such as specifying the minimum or maximum proportion of allowances to be auctioned.

5.2.1.3. Option 3: Separate auctions with harmonised auction rules

Another option would be to maintain the current approach of auctions run by Member States, but require that these are conducted according to rules established at an EU level. The rules could govern, for example, the auction format, timing, participation, and/or proportion auctioned. We identify specific design features that could benefit from harmonised rules in section 5.2.3 and in the evaluation sections.

5.2.1.4. Option 4: Independent auctions (with voluntary co-ordination)

Finally, Member States could retain full autonomy over auctioning decisions (with the possible exception of the proportion auctioned). This would not preclude Member States from coordinating their auctions bilaterally or multilaterally, but there would be no obligation for them to do so.

5.2.2. Auction level

If national allocations were centralised and auctions were conducted centrally as described under “Option 1” above, then a single decision about the level of auction would have to be taken and could be included in a revised Directive. Under the other approaches, where decisions about auction levels (e.g., minimum or maximum percentages) are taken individually by Member States, it would be possible to specify rules for the level of auction through the Directive, as was done under the first two phases of the Scheme.

5.2.2.1. No limits

The first option would be to have no limit on the proportion of allowances auctioned. This would be consistent with Member State autonomy in distributing the costs and benefits of emissions trading between different national groups (including non-participants in the trading scheme). Absent a revision of the ETS Directive, this scenario would represent the post-2012 *status quo*.

5.2.2.2. Maximum, minimum, allowable ranges

Rules specifying limits on the proportion auctioned could take a number of forms. In Phase I and Phase II of the ETS there was *maximum* limit of 5 and 10 percent, respectively, of a Member State's total allocation. This practice could be extended to subsequent phases, with increasing levels of auction allowed over time.

It also would be possible to specify *minimum* levels of auction. This could be motivated by the fact that it may be difficult for Member States to coordinate independent choices for higher levels of auction even if they would all prefer this (this is a version of the “prisoners’ dilemma”). In particular, because the proportion of auctioning determines the net costs to covered installations, it may be difficult for one Member State to adopt a higher level than others. Without co-ordination, this could result in a “race to the bottom”, where each Member State auctioned a smaller amount than it considers optimal, or where Member States that have not taken up the option to auction held back more auctioning in other Member States.

Maximum and minimum and levels could be combined to create an allowable range for the proportion auctioned.

5.2.2.3. Differentiation by sector

One complication with EU-wide rules for auction is that the characteristics of emissions sources differ. In particular, countries may differ in how exposed their covered installations are to international competition, or in other features that are relevant to determining the desirable proportion of auctioning. A minimum level of auctioning applied to the total number of allowances therefore may have very different implications for different Member States, to the extent that they differ in the proportion of participating emissions from facilities subject to foreign competition. To account for this and similar issues in other sectors, auctioning limits could be specified on a sector basis. For example, a minimum amount of auctioning could be specified for each of the participating sectors. Other arrangements also would be possible; for example, an arguably more relevant distinction would be to apply different minimum percentages depending on whether sectors are exposed to international competition or otherwise unable to pass on costs to their customers.

5.2.3. Auction design

A detailed discussion of auction design is outside the scope of this chapter. We discuss briefly some of the key design parameters:

- § Auction frequency and size;
- § Eligible participants; and
- § Auction format.

5.2.3.1.1. Auction frequency and size

The more auctions there were, the smaller on average would be the number of allowances available at each one. This could have both advantages and disadvantages, as discussed in

the evaluation section. There could also be interactions between the desirability of frequent auctions and the proportion of allowances auctioned.

Closely related to the frequency and size of the auction is whether the number of allowances to be offered would be constant in each auction, or would increase or decrease over time. Early “release” of allowances would provide participants with some implicit flexibility to “borrow” allowances from future compliance periods.

A related question is whether allowances of different “vintage” (i.e., pertaining to different years) should be auctioned at the same time, e.g., to provide information to market participants about the potential value of allowances in future years, or to give them the option of buying multiple years’ worth of allowances. This would be particularly relevant if the secondary market did not perform this function well.³¹

5.2.3.1.2. Eligible participants

Participation in the auction could be open to anyone (provided they held a registry accounts necessary to transfer allowances) or could be restricted in various ways. Participation could be restricted to covered installations, organisations in particular Member States, participants in particular sectors, and so forth.

It would also be possible to place restrictions related to the type or level of bid—for example, participants could be prevented from bidding for more than a certain quantity of allowances.

5.2.3.1.3. Auction format

A variety of auction formats exist, with differences along a number of dimensions. A basic categorisation is that auctions either can have multiple rounds or a single round where bidders submit a full bid schedule. In multiple-round auctions bidders have the possibility to revise their bids, and the auction proceeds until the amount demanded equals the total amount to be auctioned. By contrast, single-round auctions are conducted by aggregating a number of confidential bids specifying how much they would be prepared to buy at different prices. The auction clears at the price where the sum of bids equals the total amount auctioned. Participants submitting bids no less than the clearing price win the auction and receive allowances either against payment of the market clearing price (uniform-price auction) or at the price specified in their own bid (discriminatory auction).

The choice of auction format can be guided by a number of considerations. Perhaps the most fundamental is that rules should be sufficiently simple to understand that potential participants are not deterred or misunderstand the implications of their participation. For example, uniform-price auctions may be more familiar and require less complex bidding strategies, especially where the value of allowances or outcome of the auction is uncertain. More complex auction designs may be warranted either to offer participants the opportunity

³¹ Having multiple vintages of allowances is only relevant when allowances in one year or phase are not valid for compliance in another year or phase—or when there is a discount rate applied to their use in different periods. It is therefore closely related to questions of banking and borrowing. Under current scheme rules, allowances within a phase are interchangeable, and allowances are also bankable between all Phases but the first. Thus the notion of allowance “vintage” may only be relevant under current Scheme provisions if it is understood to refer to different forward *delivery dates* of allowances.

to acquire information throughout the auction process, or to avoid collusion or other “gaming” of the auction.

There are a number of potential variations on these basic categories of auction format. One consideration is whether to allow non-competitive bids – i.e., bids at a fixed price with a guarantee that the allowances will be won. This could be open to participants for whom participation in a fully-fledged auction may be particularly difficult or costly (e.g., small participants).

5.2.4. Use of auction revenues

In all cases a central question is how to distribute auction revenues. A threshold question here is whether Member States are assumed to be entitled to distribute these revenues, or whether this is the prerogative of the EU centrally. In either case, there are a wide range of potential options for the use of auction revenue. We discuss both issues briefly.

5.2.4.1. Entitlement to distribute auction proceeds

Control of revenues from auctions is related to the principles used to set Member State contributions to the cap. As discussed in Chapter 2, some approaches to cap-setting assume (or at least fit naturally with an assumption) that Member States receive an emissions entitlement, similar in some respects to the existing Burden Sharing Agreement for the Kyoto Protocol. Others assume that Member States themselves do not have any entitlement to emissions or allowances. Auction revenues can be considered as analogous to emissions or allowances in this regard, although cap-setting and the disposition of allowance revenues need not be treated in the same way.

If auctions were completely centralised, revenues could be held at the EU level or returned to Member States either in proportion to the allowances sold “from” each Member State or according to some new Burden Sharing arrangement. Where Member States chose the share of allocation to make available for auction, they presumably would be entitled to the revenue.

5.2.4.2. Allowable uses of auction revenue

Regardless of what authority has the right to distribute the revenues, revenue distribution could be done in many ways. This could be subject to explicit rules and restrictions in the Directive, or could be permitted subject to existing rules about the use of government funds (e.g. State Aid rules).

A common use of auction revenue in Phases I and II has been to defray the administrative costs of the ETS, and revenues have also been dedicated to financing other environmental policy (e.g., subsidising particular technologies). Some Member States have not earmarked revenues in this way, but have explicitly stated that they will be treated as any other government revenues. Without special provisions, the use of revenue by Member States is likely to be limited by State Aid rules.

As an alternative, it would be possible to specify additional permissible uses of auction revenue, including the use of revenue to compensate those adversely affected by the trading scheme.

5.3. Evaluation

We assess the approaches discussed above against the following categories of evaluation criteria:

- § Environmental effectiveness;
- § Efficiency of Trading Scheme;
- § Administrative cost and feasibility; and
- § Fairness.

5.3.1. Environmental effectiveness

5.3.1.1. Ability to maintain cap

For a given cap, the decision to auction or allocate allowances for free would not be expected to influence the amount of emissions from covered sources. The decision to auction allowances therefore would influence this only to the extent that it influenced the overall level of the cap. This would depend on political rather than primarily economic processes. Some discussions of the political economy of emissions trading note that the free allocation of allowances serves as a way to persuade affected sectors to accept a cap at all, or to accept tighter caps than they might otherwise. Thus a higher level of auction may mean greater resistance to more stringent caps.

5.3.1.2. Ability to limit leakage

Under “idealised” conditions, the rate of leakage would not be influenced by the level of auction. Among these conditions—which may not be met in practice—are that transaction costs be negligible, that there is perfect competition in product and emissions markets, a low cost of emissions relative to other costs and the overall value of economic activity, and that allocations are independent of any subsequent decisions taken by the recipients. Where these conditions do not hold, allocations may influence decisions about economic activity, including leakage.

A key reason that “idealised” allocations do not influence decisions to shift production or investment to other regions is that installations would keep their entitlement to allowances regardless of their production levels, closure of plants, or location of new investment. Because allocations do not change under different actions, they also do not influence outcomes. In this situation, the decision to auction or allocate allowances for free can be taken independently of concerns about leakage (or economic efficiency, as discussed in section 5.3.2 below).

In reality, however, allocations in the EU ETS do not conform to this idealised structure. The Scheme includes two major forms of updating: a) closure rules, which mean allocation levels depend on decisions to close plants; and b) new entrant allocations, which mean that allocations depend on decisions to undertake investment—and potentially the location, type, and other features of investment. As we discuss at greater length in Chapter 8 on these

topics, these and other “updating” features can lead to less economically efficient abatement. However, one motivation for their inclusion has been to prevent leakage, by encouraging investment in the EU and preventing closure that would risk resulting in increased production and emissions outside the EU.

Increased auctioning would lead to smaller effects of closure rules on leakage, as the allowances forfeited through closure would be of lesser value. Similarly, if new entrant allocations were reduced because of increased auctioning, new entrant allocations would create a smaller stimulus for investment. This in turn would reduce the ability of new entrant allocations to counter leakage. (In theory, however, auction revenue could be used to encourage investment in ways similar to the new entrant reserve.)

It also has been suggested that reducing free allocation could lead to less investment by Scheme participants, occasioned by capital market imperfections (see further discussion in Section 5.3.2.1.4 below). Such effects could lead to increased leakage.

With all of these effects, the real-world significance of inefficiencies and corrections to them would need to be investigated empirically.

5.3.2. Efficiency of trading scheme

As noted in the previous section, under “idealised” conditions different approaches to initial allocation, including auctioning, do not differ in their effects on production and abatement decisions, and therefore do not affect the economic efficiency of a cap-and-trade scheme. The main potential exception to this concerns the possibility that auctioning can influence the functioning of the allowance market, and possibly the way that Scheme participants incorporate the cost of emissions into decision-making.

5.3.2.1. Consistency with least-cost abatement

5.3.2.1.1. *Invariance of costs under “idealised” conditions*

The equivalence of auctioning and free allocation for economic efficiency depends on firms’ ability to incorporate the “opportunity cost” of freely allocated allowances into their decisions. Where participants have to buy allowances at auction this directly increases marginal production costs. These same costs are also relevant when allowances are allocated for free, because emitting one tonne of CO₂ entails foregoing the opportunity to sell the associated allowance in the allowance market. With this opportunity at hand, production that results in emissions therefore is worthwhile only if it leads to profits that at least equal the profits that would be obtained from *not* producing and selling the associated allowances instead. If firms maximise profits, they therefore will take the same decisions regardless of whether they are allocated allowances for free.

5.3.2.1.2. *Behavioural “inertia”*

Firms may not always behave in this way, however. For example, various surveys suggest that firms may not always incorporate opportunity costs into production decisions, and this

may vary between sectors.³² It has been argued that auctions, by imposing a “real” rather than an opportunity cost, could be more efficient in this situation, as firms may be more likely to undertake abatement options with a marginal cost lower than the cost of allowances. By contrast, it is argued, under free allocation they may forego such opportunities, even though this leads to lower profits. For a given cap, this means that other, less cost-effective measures would be required, raising the overall cost of the Scheme. As we discuss below, there is no general agreement about the magnitude of these potential effects, so the changes in compliance costs from these effects are uncertain.

5.3.2.1.3. *Elimination of updating features*

Auctioning also could eliminate some of the distortions arising from free allocations that include updating provisions—for example, new entrant allocation. However, as discussed above, and in separate chapters on new entrant allocations and other “updating”, under some circumstances these features may in fact be efficiency enhancing, because they reduce emissions leakage and promote investment in low-emitting technologies. In such circumstances, the elimination of updating via increased auctioning would not necessarily promote more cost-effective emissions reductions.

5.3.2.1.4. *Impact on investment*

Some commentators have suggested that because high levels of auctioning would remove funds from companies, this would have a detrimental impact on investment in their sectors. On this view, investment would be funded to a large extent from retained profits, and auctioning – by reducing these profits – may also reduce or delay investment. To the extent investment is curtailed, it is argued, cost-effective abatement also may be limited.

This situation could arise if capital markets were not working well, or if companies’ criteria for making investments differed from those applied by external sources of capital. It might also arise if for other reasons capital markets did not provide funds for investments that would reduce GHG emissions. For example, in the case where installations that close forfeit their allowances, it may be more profitable for an installation to remain open and invest in emissions reductions, even if in the absence of closure rules it would shut down. Depending on the circumstances of international competition and GHG regulations, such closure could be associated with leakage of emissions and production. In such a case, increasing the level of auction could reduce profitability and make closure more likely than investment (whether internal or external). It is unclear to what extent there are these failures in capital markets—or in the institutional and policy frameworks that would sustain them.³³

³² Surveys include those conducted as part of the 2005 EU ETS review undertaken for the Commission by Ecofys and McKinsey, as well as a study jointly done by New Carbon Finance and CO2e.

³³ Many investors and covered industries have indicated that uncertainty about the future of the Scheme and future allocation rules have contributed to a difficult climate for investment in emissions reductions. That is, uncertainty about the future revenue stream from allowances (because future allocations were uncertain) might discourage capital sources from underwriting investments. However, this uncertainty applies to capital investment by operators as much as to investment by external sources of capital, so it is not clear that reducing operators’ ability to make such investments (by reducing their free allocation and thereby increasing their costs and reducing their profits) would increase the disincentive to invest that results from this uncertainty.

5.3.2.2. Functioning of allowance market

Auctioning a large share of allowances could have an impact on the functioning of the allowance market. We distinguish four separate areas on which auctioning could have an effect:

- § market participation,
- § market liquidity and volatility,
- § access to allowances,
- § “gaming” of the market.

5.3.2.2.1. *Active market participation and “inertia”*

Some commentators have suggested that increased use of auctioning could bring currently “inactive” operators to the market and therefore could lead to a more liquid allowance market. This is based on the idea that, when allocations are close to the “need” of an installation, organisations may not fully incorporate emissions costs into their decision-making and therefore will not change their behaviour in response to the cost of emissions. In particular, it is argued, firms may fail to incorporate emissions opportunity costs into production and investment decisions, and also may not consider the full set of opportunities to reduce emissions and sell surplus allowances. One analysis suggests that such “inertia” was a contributing factor to the rise in allowance prices during 2006—whereas demand (chiefly from the power sector) was strong, few industrial installations appeared to be willing to enter the market as sellers, and high prices resulted. If this analysis were correct, auctioning a proportion of allowances could create a more liquid market in which installations that previously did not sell allowances would undertake additional abatement (to minimise purchases of allowances), while installations that could not reduce emissions economically would purchase them at auction.

This analysis of the allowance market is not universally accepted, and there are alternative hypotheses that could be consistent with the observed behaviour in the market (including high transaction costs, timing issues that resulted in a temporary inability to participate in the market, uncertainties about the rules governing future allocations, and later falls in the allowance price). It also is an open question to what extent emissions abatement took place, whether more would have taken place at an earlier date had allowances been auctioned, and to what extent the level of emissions abatement was in fact “inefficient”, given the price. Finally, as the inertia attributed to industrial installations would not be consistent with maximising profits, it is not clear that this behaviour would persist for a long time at high allowance prices: by neglecting to undertake profitable abatement, industrial participants potentially would forego significant revenues, a situation that may not persist for very long.

It also is unclear what the presence of inertia implies for auctioning design. For example, there is little if any theoretical or empirical basis for assessing what level of auctioning would be sufficient to “kick-start” the latent trading opportunities that, according to this view, are currently being ignored due to inertia.

5.3.2.2.2. *Market liquidity and volatility*

Increased use of auctioning potentially could make the secondary market less important. Intuitively, fewer trades might be undertaken if installations had already purchased at auction all the allowances they expect to need. This could make the secondary market less liquid, although reduced liquidity would be less important when installations had access to allowances through auction instead. Nonetheless, a secondary market with a smaller volume might be less successful at communicating to market participants the marginal cost of emissions reductions, and therefore whether it would be worthwhile to undertake emissions abatement. Any reduced liquidity, however, could be made up for by the increased importance of the auction market.

It also is possible that the functioning of the secondary market could be affected by the frequency of auctions. Especially if auctioned allowances constituted a substantial proportion of the total, the timing would be important to avoid temporary allowances shortages or gluts that could lead to allowance price volatility. To avoid such volatility it would be important to make information about auction scheduling available to market participants, and to demonstrate the reliability of such information. If auctions are conducted independently by Member States it may be important to coordinate their execution to avoid such problems.

Problems with volatility also could be alleviated through banking and borrowing provisions, which generally can help reduce volatility. The quantity auctioned over time could provide a form of borrowing if a larger proportion of allowances were released at an early stage in a relatively long compliance period—of course, the same could be done through free allocation. It also would be possible to auction allowances of future vintages early, providing installations with guaranteed access to future allowances (although a similar function could be fulfilled by futures contracts in the secondary market).

5.3.2.2.3. *Access to allowances*

One potential advantage of auctioning is that it provides another source of allowances, additional to free allocations and transactions in the secondary market. Auctions have been used in some past trading programs to guarantee access to allowances by new entrants, although this would be less important if new entrant allocations were retained.

Because smaller participants may find it more difficult to participate in auctions, the larger the proportion of allowances auctioned, the more important it may be to ensure that small participants are able to participate effectively. This would be more likely with less complicated auction designs and smaller security deposits and other qualification conditions. Especially if more complex designs of auctions are used (e.g., with multiple rounds of bidding) it would be possible to introduce a second track of “non-competitive bids” in which small participants could purchase allowances at a fixed price (although this could introduce problems associated with limiting eligibility and rationing this pool of allowances). Complexity also could be a concern with a discriminatory-price auction, in which less informed participants would be likely to pay more than well-informed participants (and, anticipating this, may elect not participate at all but rely on the secondary market).

Another barrier to participation may be if auctions are large and infrequent, which may create difficulties obtaining credit or managing cash-flows. Similarly, if many different auctions

were conducted and rules differed significantly, small participants may be effectively excluded from participating in some of them because of the costs of learning about different formats. These observations indicate that harmonisation of rules and co-ordination of timing may be beneficial to ensure access to allowances on the part of relatively small entities. On the other hand, to the extent there may be benefit to allowing some experimentation with different auction designs, it may be beneficial to allow the use of different designs in different auctions, with the prospect of future harmonisation once experience with different formats could be evaluated.

Access to auctions also could be limited if any restrictions were placed on participation. In practice, the main potential effect of such provisions would be to lower clearing prices. Those excluded from the auction therefore could end up paying a higher price, either in other auctions or in the secondary market, which may be considered to be unfair. Also, in general, the overall cost of achieving the emissions target would increase if participants faced different prices for allowances. Furthermore, an auction that leads to a sale of allowances below the going market price for allowances may require examination under state aid rules.

5.3.2.2.4. *Market power and “gaming”*

Maximising opportunities for participation in auction is closely related to the prevention of potential “gaming” opportunities in the auctioning process. Market power in the auction could arise if there were opportunities for collusion, coordination of bids, or dominance by large participants. These concerns could be mitigated by not restricting participation, and potentially also by placing limits on the size of bids by individual participants. More frequent and smaller auctions also could limit risks, as the significance of manipulation in any one auction would be more limited; similarly, it may be prudent to limit the amount auctioned initially and, if desired, gradually build up to larger volumes once auctions have been demonstrated to work as intended.

It also would be necessary to address potential credit risk, including the risk that participants renege on bids placed during the auction. For example, if the collateral required to participate is small, traders may find it profitable to enter the auction with the intention to honour bids only if the clearing price is below a particular level, but otherwise to renege on bids (and forfeit the collateral). This can be an argument for larger collateral requirements, although this could risk excluding smaller bidders.

The opportunities for market power also may vary significantly with auction design, although there often is a trade-off between complexity and ensuring participation.³⁴ The inclusion of “trigger” arrangements where the price or quantity of available allowances change discretely depending on conditions (e.g., reserve prices) can create additional opportunities for gaming under some circumstances; for example, they may result in “speculative runs” or other undesirable market activity.

A related concern is to avoid market power in the secondary market. A concern that has arisen in other auction contexts is the risk of “short-squeezes”, whereby a dominant player

³⁴ Economic theory suggests that, in many circumstances, increasing participation can be a more effective method to guard against market power than can more complex designs.

purchases a large proportion of allowances at auction and then enjoys a monopoly in the secondary market. This risk also can be limited by restricting the size of bids, and by holding smaller individual auctions. Also, because the EU ETS has a large number of participants, it may be difficult to achieve short-squeezes in this market.

Another aspect of strategic considerations is that, in the case of decentralised auctions, Member States may try to pre-empt each other or otherwise time their auctions to take advantage of market developments (and thus maximise the revenue obtained from their auctions). This could have a negative influence on the market, and could constitute an argument for coordination or centralisation of auctions.

5.3.3. Administrative Costs and Feasibility

5.3.3.1. Cost of establishing and maintaining allocation

Administrative costs of auctioning include the setup costs (auction design, creation of infrastructure, marketing to potential participants); administrative costs to regulators of conducting the auction (including support to participants); and a variety of costs incurred by participants (e.g., learning about auction rules, preparing a bid strategy, training costs, and the cost of personnel time). These costs would likely vary with the format and complexity of the auction. For example, single-round auctions may be less resource-intensive for participants than multiple-round auctions. The costs also would depend on the number of participants, with smaller overall costs if the auction were confined to specific sectors, or to large participants (with free allocation available to smaller organisations).

Setup costs and regulators' administrative costs would be multiplied with the number of auctions carried out. A larger number of auctions also could lead to higher costs for participants, if it necessitated participation in several separate auctions, and especially if the formats of the auctions differed. Reducing administrative cost therefore may be an argument in favour of centralising and limiting the number of auctions. This could extend to pooling auctions across Member States using an "EU platform" (harmonisation options 1 and 2) and limiting the frequency of auctioning. On the other hand, smaller and more frequent auctions may entail lower risk for participants, as well as lower collateral requirements.

On several dimensions, allocation by auctioning alone may offer a lower administrative burden than free allocation. In the case where auctioning is the sole method of allocation (or the sole method for selected sectors) data requirements for the allocation process are potentially lower, because there is no need to collect the data that would be necessary for free allocation, and no associated need for verification of input / production data or of historical emissions data. There also would be no need to take into account special circumstances, such as commissioning periods, rationalisation of production, partial closures, etc.

However, unless free allocation were abandoned completely, overall costs would comprise both the costs of any auctioning programme and also those associated with the pre-existing or revised framework for free allocation. Increased use of auctioning therefore would increase overall administrative costs except in the extreme case of 100 percent auctioning for the affected sectors. If 100 percent auctioning were implemented on a per-sector basis, data requirements for the "full-auction" sectors could be reduced, along with other administrative costs discussed earlier in this section.

However, even in the full auctioning case, it is also necessary to take into account the administrative processes for determining how auction revenues will be distributed, since formally this distribution could result in mechanisms that are identical to (and therefore just as administratively complicated as) the mechanisms used for free allocation. Mechanisms for both free allocation and distribution of auction revenues may be made more or less administratively complicated, so it is not clear that either method offers substantial administrative advantages *unless* more complicated approaches to distribution are more likely under one method than under the other.

5.3.3.2. Transaction costs

Auctioning also could influence the transaction costs incurred from trading in the secondary market. When a larger number of installations receive limited free allocation and therefore need to participate in auction, they may be less likely to trade in the secondary market. In general, and other things being equal, more frequent auctions (and, to a point, higher levels of auction) would be associated with a smaller volume of trading in secondary markets.

This could affect transaction costs in a number of ways. On the one hand, a smaller number of transactions would lead to lower total costs assuming transaction costs remained constant. On the other hand, more auctions could mean fewer opportunities for market intermediaries that help lower transaction costs. For example, economies of scale in brokerage, exchanges, and similar intermediaries may mean that costs per transactions are higher when volumes traded are smaller. It therefore is difficult to say *a priori* how a greater proportion auctioning would influence market transaction costs.

5.3.4. Fairness and distributional equity

5.3.4.1. Burdens to covered operators / installations

As noted in a previous chapter, the allocation of allowances can be guided by a number of different principles and ideas about “fairness”. Of the “fairness” principles mentioned there, ones generally consistent with auctioning include:

- § the “polluter pays” principle, and
- § creating a “level playing field” for all covered installations (depending on interpretation of this term).

Principles of “fairness” that are inconsistent with *any* auctioning include:

- § allocation corresponding to need, and
- § allocation according to pre-existing “use-rights”.

In addition, there are a number of principles that may be consistent with *some* level of auctioning. These include:

- § making affected installations “whole” by defraying their net or stranded costs,
- § allocation consistent with ability to reduce emissions,
- § rewarding or not penalising “early action” to reduce emissions, and

§ promoting low-emitting technologies.

Of these, the principle to defray net or stranded costs may be consistent with some level of auction, but the level is likely to vary significantly between sectors. In some sectors and markets, there is a possibility that no auctioning may lead to “over-compensation”, in the sense that profits for the sector as a whole (although not necessarily for all participants) are higher with the trading scheme than they would have been in its absence. Conversely, in many or most sectors large amounts of auctioning could lead to net losses to companies. Because effects differ significantly by sector, and possibly by Member State or region, one option is to differentiate auction levels by sector; we discuss the issue of defining “exposed” sectors more in Chapter 3 on competitiveness under the EU ETS. In general, assessing the impacts on a sector is an empirical question, and can be a highly complex undertaking.

Allowance revenues could be used to promote investment in new low-emitting production capacity. Under circumstances where leakage is a significant concern, this could result in improved global environmental effectiveness of the scheme. It also could correct economically inefficient underinvestment in low-emitting technologies that could result if production migrated out of the EU, and therefore improve the dynamic efficiency of the economy and of its long-term ability to reduce emissions.

Another issue is that differences in the levels of auction set by Member States could lead to different allocations to installations of the same type in different Member States. Thus harmonising auctioning levels is likely to be required to achieve a similar level of allocation across Member States for sectors, although various other factors – notably, Member State (and sector) contributions to the overall EU ETS cap, and installation-level allocation formulas – also could influence this.

5.3.4.2. Burdens to consumers of affected products

As noted above, the level of auction need not have an effect on consumer prices. With “idealised” allocations, as described above, the choice of auctioning or free allocation can be taken independently of concerns about the impact of emissions trading on consumers. In these circumstances, auctioning would not affect pass-through of allowance costs to prices, or the consequent effects on consumers.

There are two main potential exceptions to this.³⁵ First, auctioning is likely to reduce the significance of “updating” features such as new entrant allocations and closure rules (see section 3.1.2), which may result in *higher* product prices. This is because the price-depressing effect of updated free allocation is reduced. Second, auction revenue may be more amenable than free allocation for the compensation of consumers. This is particularly the case where consumers are numerous and would not be expected to participate in the allowance market (e.g., in the case of households), although targeting to those specifically affected may still be difficult.

³⁵ Additional exceptions can obtain in theory, for example, where product markets are not competitive; however, the net impact of more or less auctioning often is ambiguous in these circumstances.

5.3.4.3. Taxpayer and other welfare effects

Auctioning could interact with overall welfare effects if the revenue raised through auction resulted in offsetting reductions in other taxes. This would have redistributive consequences, in that affected taxpayers would pay less whereas owners of installations in the EU ETS would pay more. In addition, academic studies have identified environmental taxes as a theoretical opportunity to increase overall welfare. This is based on the observation that many existing taxes negatively affect (“distort”) economic processes; for example, personal income taxes can reduce the amount individuals choose to work, and therefore also total output and wealth created. If, by auctioning allowances, governments could make “fiscal room” for the reduction of such taxes, then overall welfare could be improved.

Simple model-based assessments typically find that welfare improvements through such tax system reform could be substantial. However, the empirical relevance is harder to assess. Environmental taxes typically are not widely used, in part because they can be regressive compared to other taxes. Also, in practice most emissions allowance auctions have used auction revenue not for tax reform but to finance environmental initiatives, defray administrative costs, or compensate participants indirectly affected by the trading program. The feasibility of tax reform funded by allowance auction therefore is largely a political decision.

5.4. Conclusions

5.4.1. Summary of evaluations

Assuming “idealised” conditions and allocation rules, the choice between free and auctioned allocation is purely a distributional issue. If the number of allowances received does not depend on actions taken, then allocation also will not influence choices about emissions reductions, production, consumption, or investment. However, there are a number of ways in which these idealised conditions are not fulfilled, and the choice whether to auction allowances – as well as the precise design of auctions – therefore may influence environmental objectives, economic efficiency, and administrative costs and feasibility.

The choice whether to auction allowances does not influence emissions from covered sources, except insofar as the level of auction could influence the acceptability of particular cap levels in the longer run. However, a greater proportion of auctioning can reduce the significance of “updating” features of allocation – such as new entrant allocations and closure rules – which can contribute to reducing emissions leakage. Conversely, the use of updating allocations is likely to come at a price of raising the cost of emissions reduction from covered sources.

Auctioning also may have an impact on cost-effectiveness if either the allowance or capital markets are not working well. It has been suggested that more auctioning would lead operators to incorporate emissions costs into their production decisions to a greater extent, with more cost-effective abatement as a result. On the other hand, it has been suggested that auctioning may be detrimental to investment to reduce emissions, because it leaves less funds available to companies and capital markets do not provide an adequate source of investment funds. Both of these arguments depend on the presence of poorly functioning markets, and the real-world significance of the market failures that they appeal to is not well-established.

Although considered in isolation, auctioning is relatively simple, auctioning in the context of the ETS would not necessarily be any simpler than free allocation. Adding more auctioning of allowances could either add to or reduce the administrative cost of the Scheme. Unless free allocation were abolished entirely (possibly on a per-sector basis), expanding the number of auctions and the number of Member States conducting auctions would add costs on top of the pre-existing administrative costs of allocation. The costs would be influenced by the complexity, frequency, and total number of auctions, and would not necessarily increase with increasing auction level—but rather with increasing auction numbers and complexity. Administrative costs of auctioning also should incorporate any administrative costs associated with distribution of auction revenues. Transactions costs in the secondary market could either increase or decrease as the result of greater auctioning.

The use of auctions also could have implications for the functioning of the allowance market. Market liquidity could be promoted if more “inactive” market participants are caused to engage in trading, but also adversely affected if auctioning meant that the secondary market assumed less significance. As noted, a less active secondary market would not necessarily reduce *overall* market liquidity if activity were simply transferred to the auctions. Auctions also could affect volatility, again either positively or negatively depending on auction design and timing. If auctions constituted a significant proportion of allocation, it would be particularly important to ensure that covered installations could participate in auctions or that the secondary market functioned well. This would be more likely with simple and harmonised auction designs, and can be further encouraged with special provisions such as non-competitive bidding for small participants.

Various additional options exist for the harmonisation of auctions. Either coordinating, pooling, or conducting auctions centrally could reduce the number of auctions and therefore costs. Similarly, harmonisation of design could reduce costs to participants. On the other hand, the limited experience so far with auctioning may mean that there are benefits to experimenting with several different designs to encourage learning. Where auctions are pooled or centralised, arrangements are necessary to determine how the revenue should be divided between Member States (if at all). Harmonisation would be important for auction timing, for participation eligibility, if any reserve price were contemplated, and possibly for auction levels depending on priorities for judging fairness. Because of significant differences in the distribution of emissions between sectors in different Member States, if auction levels are harmonised, it may also be important to consider differentiating the level of auction by sector. However, it is not clear that harmonisation of levels is required to ensure greater efficiency or environmental effectiveness.

While many considerations arise in the implementation of auctions, the most direct effect of allocation through auctioning is the impact on distributional considerations. A higher level of auctioning would lead to higher net costs for participants. Whether this is desirable depends on how “fairness” is perceived. For example, auctioning would be compatible with a “polluter pays” principle; it would be incompatible with allocations corresponding to “need”; and it may or may not be compatible with a principle to use allocation to offset net reductions in profits as a result of the trading scheme. The financial implications of a given level of auctioning would vary substantially between sectors. Determining the exact impacts – or, indeed, which level of auctioning would make a sector “whole” – is a complex empirical undertaking.

Finally, the level of auctioning could influence product prices if existing market imperfections mean that producers are not currently pricing in the full opportunity cost of CO₂. The extent to which theoretical opportunity costs are fully reflected in prices is currently an open question, but research to date indicates that it varies between Member States and sectors. In some markets, therefore, higher levels of auction could lead to higher product prices, whereas in other markets this is unlikely. Determining which category different markets fall into is a matter for empirical investigation (we discuss some of the relevant factors in a Chapter 3). On the other hand, auction revenue could be distributed to offset the potentially higher costs faced by consumers, or alternatively could be used for more structural economic reforms, such as changes to the tax system.

5.4.2. Implications for other allocation decisions

The use of auctioning potentially is consistent with many choices for other allocation decisions. For example, decisions about the proportion to sell and the design of the auction could be taken largely independently of different methods for cap-setting, metrics for remaining free allocation, or decisions about whether to include “updating” (including provisions for free new entrant allocation and forfeiture of free allocations upon closure). Of course, as the proportion of auctioning increases, the significance of the precise attributes of any remaining free allocation becomes diminishes (because its value diminishes). Thus whatever the potential advantages and disadvantages of benchmarking vs. emissions-based approaches, or updated vs. non-updated allocations, if the level of auction increases over time, these advantages and disadvantages become less important.

Harmonisation of auctioning need not coincide with harmonisation of other aspects of allocation. That is, the options are not limited to 1) central allocation and auctions and 2) separate Member State allocation and auctions. For example, it would be possible to have a central auction, but retain Member State autonomy for other aspects of allocation. If auction levels were harmonised at different levels for different sectors, however, it is likely that some form of harmonisation of sector contributions to the cap also would be required. Full harmonisation of sector contributions would not necessarily also mean full harmonisation either of *Member State* contributions to the cap or of auctions, however—sectors might be allocated the same way across the EU, while at the same time Member States received a separate (and differentiated) set of allowances reserved for auction. The revenue from these allowances could then be used by Member States as they chose (subject to the relevant State Aid rules and possibly other constraints).

Finally, the level of auction is one of the elements of the allocation that could be changed in the event of international agreement on climate policy. One motivation for free allocation is to compensate for net costs incurred through the introduction of emissions regulations. For many installations, these costs are likely to depend in part on the degree of exposure to international competition, and this exposure may change with international agreement. The ability to modify auctioning rules in response to an international agreement would depend in part on the level of harmonisation. One option could be to increase the minimum level of auction if international agreements were reached, or to increase auction levels for sectors whose exposure to competition was reduced. Another option would be to cancel allowances previously reserved for auction—as a way of tightening the cap without affecting previously allocated allowances.

5.4.3. Way forward / next steps

The growing experience of Member States with auctioning in Phases I and II of the Scheme is likely to provide useful lessons for the design and organisation of auctions during Phase III and beyond. Given the likely development of the understanding of auction design and the interaction of auctions with the secondary allowance market and other ETS design features, it seems premature to make strong recommendations about how to organise auctions. Since coordination in at least some aspects of allowance auctions may be desirable, there could be value in providing for the possibility of different levels of harmonisation—whether of auction timing, design, level, etc.—but with the specific features to be determined.

As with many of the other allocation design options we consider, evaluating the fairness or distributional impacts of auctioning depends in large part on the distributional criteria used to evaluate fairness. Although a decision to move towards full auctioning would potentially remove some of the complications associated with allocation from the remit of EU ETS policy-makers, it would not eliminate the complications, because at best, decisions about what to do with auction revenues would be transferred to others.

In deciding the share of auction, it also will be useful to consider whether auctioning provides the best way of reducing or eliminating some of the inefficiencies created by “updating”, or whether other approaches should be used to correct these inefficiencies. Indeed, it may be argued that such “inefficiencies” should not be eliminated at all, because they may serve other aims of the Scheme (e.g., protect competitiveness and prevent leakage) within the existing policy context.

If there is a consensus that, absent adverse effects on competitiveness, it would be desirable to move to greater levels of auction over time, the key challenges will be to achieve consensus on the appropriate level of auction for individual sectors and individual Member States, and how these levels should change over time. There is, however, no requirement that auction levels be set at a uniform level across sectors or Member States, nor are there absolutely compelling efficiency reasons for uniform levels of auction. Auction share appears most important in conjunction with discussions of competitive exposure of particular sectors, and if for some reason there are no other feasible ways to deal with inefficiencies created by updating. Competitiveness concerns and options for reducing the inefficiencies associated with updating thus seem the areas to focus on in moving the policy discussion of auctioning forward.

6. Emissions Grandfathering Allocation

6.1. Introduction and Background

The large majority of allowances in Phases I and II of the EU ETS has been allocated using formulae in which installations' historical emissions determine their entitlements to shares of the overall cap. In principle, such an "emissions-based grandfathering"³⁶ allocation methodology can be very simple. Provided baseline data are available, allocations can be calculated as shares of a given cap, where the share received by each installation is equal to the share of past emissions in a baseline period. In reality, however, allocations used in Member States have incorporated significant amounts of other information, leading to increased complexity.

Detailed surveys and descriptions of the allocation approaches used in Phase I and II are available elsewhere.³⁷ The principle objectives of this chapter are to identify the high-level parameters of an emissions grandfathering allocation methodology and to evaluate the general approach according to the criteria described in Chapter 2.

The structure of this chapter is as follows. The next section describes parameters that make up an emissions grandfathering allocation approach, starting with a simple "bare-bones" approach, and then describing various modifications that have been introduced in real-world implementations in the EU ETS. The subsequent section evaluates the high-level option of grandfathering against the agreed criteria. The final section concludes.

6.2. Emissions Grandfathering Options

We describe below some of the main design features and variations on emissions grandfathering allocations. Throughout this discussion, we consider the issue of allocation as separate from (and following) the setting of an overall emissions cap. We also restrict the discussion to allocations that use historical data of emissions prior to the launch of the trading scheme, and postpone discussion of the possibility of "updating" allocations to incorporate subsequent data to Chapter 9, which is dedicated to this issue.

6.2.1. "Simple" emissions grandfathering

Under a "simple" grandfathering approach, allocation shares would depend only on the past emissions of an installation. For a given cap, the allocation attributable to each installation would depend only on its share of emissions during a baseline period. Correspondingly, the only data required would be past emissions.

³⁶ In more general usage, "grandfathering" has a wider meaning of conferring a right based on past ownership or use. In this wider meaning, "grandfathering" thus would apply to any allocation approach that used only historical information, but not current or future information. This historical information used to calculate allocations could be emissions, but also output, input, capacity, or other historical information – and all these options would be referred to as "grandfathering" allocation approaches. In this report, we reserve the term for allocations based on historical emissions information, which is the most widespread use of the term in the context of the EU ETS.

³⁷ See Ecofys (2004), IVL (2004), DeHST (2005), European Environment Agency (2007)

With this “simple” approach, allocations to each installation would be a proportion of their historical emissions. Installations that have a historically high level of emissions receive correspondingly high allocations under this approach—although with a binding emissions cap, they will receive less than their emissions in prior years. This is because the approach includes an implicit “adjustment factor” to ensure that total allocations do not exceed the cap. For each installation, the same adjustment factor, corresponding to the ratio between the total cap and total baseline emissions, therefore is applied.

In most (if not all) Member States, this simple form of grandfathering has not been used. We briefly outline below the main types of modifications that have been introduced in the various National Allocation Plans under the EU ETS.

6.2.2. Baseline period and allocation metric

The simple approach requires that a procedure for establishing installations’ baseline emissions is established. To avoid “updating” elements of allocation, all baseline years must be before the start of the Scheme. It also is necessary to establish the “metric” used to calculate baseline emissions. A simple option is to use total or average emissions during a given number of years. More complex options also are possible, such as dropping maximum or minimum years.

Another possibility is to account for situations where the baseline period is considered to be “unrepresentative”. Existing NAPs include provisions to account for significant changes in production capacity during the baseline periods; temporary closures; commissioning of equipment; and “rationalisation”, whereby the production capacity of several installations is merged. These provisions typically require substantially more data, including application and adjudication procedures to establish eligibility for departures from the standard rules.

6.2.2.1. Allocation to installations without baseline data

All allocations methodologies based on historical information potentially have the problem that some installations may not have data during the baseline period that can be used to calculate allocations. In this case they would require a separate allocation methodology, possibly involving benchmarking of some form (see Chapter 8 for more discussion of this issue in the context of new entrants).

6.2.3. One-stage vs. multiple-stage allocation

The “simple” grandfathering approach can be characterised as a “one-stage” approach, as allocations to all installations are calculated in a single step as shares of a common overall pool of allowances. By contrast, many NAPs have determined allocations in two or more stages, by first dividing the Member State’s contribution to the overall cap into sector allocations or “sub-caps”, and then allocating allowances based on installations’ shares of emissions within each sector. Motivations for this procedure may include a desire to account for different levels of competitive exposure, adverse impacts, or expected growth rates among sectors.

A two-stage allocation process requires not only historical emissions data, but also information that permits the categorisation of installations into sectors. The number of sectors needs to be determined, and all installations assigned to the relevant sector. Although

assignment of installations to sectors may be relatively straightforward in some cases, in many cases it may not be. It also is necessary to establish a basis for setting sub-caps. This may include various “adjustment” (or “compliance”) factors, growth projections, or other factors, as we discuss below.

6.2.4. Potential adjustment to simple grandfathering

One modification to simple emissions grandfathering is to modify historical information by factors intended to account for expected developments of emissions.

6.2.4.1. Adjustment factors for expected growth

One factor taken into account in a number of NAPs is the expected future growth prospects of installations and/or the sectors to which they belong. Projections can be carried out at a sector level under a two-stage approach, motivated by the expectation that sectors will grow at different rates.³⁸

6.2.4.2. Adjustment factors for expected abatement potential

Allocations also can be modified by assessing the potential for abatement available from sectors (or installations). Like with growth projections, the motivation is likely to be that there are large expected differences in the potential for abatement among installations or sectors.

6.2.4.3. Adjustment for benchmarked performance

Some allocation approaches combine emissions grandfathering with a benchmarking approach. For example, historical emissions may be modified by a factor that accounts for the output or input efficiency of the installation. Such “combined” approaches may be motivated by a desire to compromise between the distributional features of emissions grandfathering and benchmarked allocation based on other historical activity measures, respectively.

6.2.4.4. Bonus and penalty factors

It also is possible to adjust allocations so that different stringencies apply to different installations or sectors. This may take the form of applying “bonus” or “penalty” factors to particular sectors, based on whether they are deemed to require a higher or lower allocation (e.g., because they would be particularly adversely affected, or to reflect emissions benefits of the associated technology).

A different way to achieve different stringency of allocation is to use a combination of top-down and bottom-up approaches to calculate allocations. In a two-stage approach, the “sub-caps” of some sectors may be calculated as the bottom-up sum of historical emissions (potentially modified by any potential growth, abatement, or compliance factors), whereas the other sector sub-caps would be calculated top-down as the “residual” allowances, which

³⁸ It also is possible to use individual installation-level growth projections.

would depend on the amount of allowances remaining given the requirement to comply within the overall Member State total number of allowances.

6.2.4.5. Set-asides

Additional modifications to allocations also may be necessary if some allowances are set-aside for particular groups of installations, thus reducing the amount available to others. In particular, set-asides for new entrants result in lower allocations for incumbents for a given cap. It also is possible to use a set-aside system to provide bonuses to particular technologies (e.g., technologies deemed to be particularly “clean”). In practice the set-aside can be deducted before or after the initial installation-level allocations are calculated.

6.3. Evaluation

This section evaluates emissions grandfathering allocation against the criteria of environmental effectiveness, economic efficiency, administrative cost and feasibility, and fairness and distributional equity.

A widely accepted result of economic theory is that, given certain standard conditions, allocations based purely on historical information will provide incentives for abatement and changes to operations that are *identical* to auctioning of allowances.³⁹ Thus grandfathered allocations would not alter the behaviour of participants, relative to what they would do under auctioning. This result applies to decisions about how to reduce emissions, how much to produce using what technologies and processes, and how prices will be affected. For this reason, the evaluation of allocation based on historical emissions is very similar to that of allocation based on other historical activity levels using benchmarked allocations. For discussion of the first two criteria, we refer the reader to the more detailed discussion of this in the next chapter on benchmarking allocations.

6.3.1. Environmental effectiveness

6.3.1.1. Ability to maintain cap

The total emissions, and therefore environmental effectiveness, of the trading scheme depend on the total number of allowances rather than on the allocation of these allowances. For a given cap, the precise implementation of emissions grandfathering therefore does not influence the environmental benefit achieved by the scheme. An exception to this may be if the allocation approach imposes significant costs on participants and therefore results in more resistance to stringent cap-setting. In addition, if the allocation approach departs from the conditions necessary to ensure that grandfathering and auctioning produce identical incentives, less stringent caps also may be more likely, because the overall cost-effectiveness of the scheme is reduced. (We discuss this latter possibility in the chapters on new entrant allocations and closures and on updating allocations.)

³⁹ As noted in section 5.3.1.2, these conditions include a requirement that transaction costs be negligible, that there is perfect competition in product and emissions markets, that emissions costs are low relative to other costs and the overall value of economic activity (eliminating any income effects), and that allocations are independent of any subsequent decisions taken by the recipients (i.e. allocations are not “updated”). Where these conditions do not hold, allocations may influence decisions about economic activity.

6.3.1.2. Ability to limit leakage

Provided grandfathered allocations were based on historical emissions only, they would not be expected to alter production decisions relative to what would be expected under auctioning or historical benchmarking, as discussed in the next chapter.

6.3.2. Economic efficiency of trading scheme

6.3.2.1. Consistency with least-cost abatement

The use of grandfathering would be consistent with least-cost abatement subject to certain conditions. One of these is that the data used to calculate allocations are not updated with reference to later actions taken by participants. In practice, this is likely to require the use of historical emissions data from the period before the launch of the trading scheme. Provided all emissions and other activity data fulfil these conditions, the choice between grandfathering and other idealised forms of allocation to incumbents (notably, benchmarked allocations that are also based on historical activity data) can be taken independently of considerations about cost-effectiveness.

For this conclusion to hold, the requirement to use historic data is relatively restrictive, and extends not only to emissions data but also to all other data entering into the calculation of allowances. This includes adjustment factors, such as growth projections, which may influence abatement decisions if they are calculated based on data since the trading scheme started (and therefore also increase the cost of reducing emissions). We discuss these issues in more detail in Chapter 9 on updating allocations.

As noted previously, allocation based on historical emissions also may not result in the least-cost abatement choices when markets are not perfectly competitive or when market prices are subject to direct regulation based on average or net costs. Where firms have market power and the ability to influence prices, they may be able to discourage market entry by keeping prices below the level that new entrants would require for profitable investment, and they may conclude that this is a profitable strategy. Such strategic behaviour could be facilitated by higher levels of free allocations, since these would make it more likely that profits could be maintained without raising prices. In product markets characterised by market power and where differences in Member State allocations were sufficiently large, it is possible that firms would choose not to pass through all of their CO₂ opportunity costs into prices as a way to deter entry by foreign competitors. Failure to pass-through full opportunity costs would not be consistent with least-cost abatement.

A related issue could arise if capital markets were not particularly liquid or competitive, and if allowance allocation provided some recipients with investment capabilities that were not available to others. Note that even if this were the case, it would not necessarily represent an efficiency issue, if we could assume that investments would be made wherever the economy signalled that they were most needed. Of course, it would represent a distributional fairness issue, because some firms would be (somewhat) better able to self-finance investment, whereas others could be forced to rely more on external financing options. To the extent that there were concerns about unequal treatment of different firms within the same sector, options based not on historical emissions but on harmonised historical benchmarks could rate slightly better in this regard. However, there could be similar concerns about unequal

treatment of firms in different sectors, and none of the options would necessarily safeguard against this.

6.3.2.2. Functioning of the allowance market

There is no reason to expect the functioning of the allowance market to be substantially affected by the use of grandfathering, assuming the cap has already been set. It has been suggested that if operators receive a level of allocation that is approximately equal to what they expect to need to cover their emissions, they may be less inclined to participate actively in the allowance market—and therefore may not undertake what would be cost-effective abatement measures. As the overall cap became more stringent, this concern would diminish, although under a two-stage approach, certain sectors could be “shielded” more than others from the need to engage the market. There is insufficient evidence at present, however, to conclude that in the face of persistent and significant CO₂ costs, Scheme participants would ignore cost-effective abatement potential and market activity from which they would be able to profit—and there is good reason to expect that they would not ignore such opportunities.

6.3.3. Administrative cost and feasibility

6.3.3.1. Costs of establishing and maintaining allocation

Emissions grandfathering has the attraction that it can provide a very simple approach to calculating allocations. Especially if the methodology is close to “simple grandfathering”, where allocations are closely linked to actual emissions, the data requirements can be relatively limited and the approach transparent. Moreover, provided allocations are not updated, allocations (or more accurately, the shares of free allocation) can remain permanently fixed.

However, as outlined above, actual allocations during Phases I and II of the EU ETS have incorporated a large number of other elements in order to address distributional concerns and achieve a better alignment of “need” (or other criteria) with allocations than can be achieved through simple grandfathering. As noted, this includes different allocation metrics, exemptions for special cases, sector-specific considerations and classifications, growth projections, adjustments for abatement potential, the inclusion of benchmarking factors, bonus provisions, and various set-asides. These factors can significantly complicate allocations and increase administrative costs. On the other hand, as the value of allocations may be large, such adjustments may be important for the acceptance of the allocation approach.

It also is not clear that alternative methods for free allocation would enable a reduction in the complexity that is created by these factors. Most of the various adjustments that have been observed under allocation plans to date may be called for also under benchmarking allocations. Meanwhile, as discussed in the next chapter, developing benchmarks is likely to involve more work than calculating shares of historical emissions.

6.3.3.2. Transaction costs

As noted in the next chapter, transaction costs can increase if the initial allocation deviates from the eventual equilibrium distribution of allowances. However, this is limited by

potential returns to scale from trading, which may lower unit transaction costs the greater the number of trades.

6.3.4. Fairness and distributional equity

As the above discussion highlights, the design of allocations to incumbents is principally a distributional issue. We discuss potential implications for covered installations, consumers, and the wider economy below.

6.3.4.1. Burdens to covered operators / installations

There are many different principles that could be used to assess the “fairness” of different approaches to allocation, many of which are not themselves precise in their implications and some of which may contradict each other. As noted in Chapter 2, principles may include:

- § rewarding or not penalising “early action” to reduce emissions,
- § promoting / rewarding low-emitting technologies,
- § creating a “level playing field” for all covered installations,
- § allocation proportionate to need or ability to reduce emissions,
- § making affected installations “whole” by defraying their net or stranded costs, and
- § allocation according to pre-existing “use-rights”.

We discuss below these principles as they relate to emissions grandfathering allocation.

6.3.4.1.1. “Early action” and low-emitting technologies

Emissions grandfathering aligns allocations with emissions during a baseline period. This generally means that historically high-emitting installations will receive larger allocations. However, it also means that installations that may have reduced emissions prior to the baseline period receive fewer allowances than ones that have not done so. Similarly, the use of low-emitting technology would result in fewer allowances. One way of addressing concerns about penalising “early action” is to extend the baseline period so that it includes the years prior to actions that are deemed worthy of reward.

Where installations were previously subject to similar relevant regulations of emissions, this may not be a significant concern, as voluntary over-compliance is unlikely to have been undertaken at high net cost to operators. In these cases, it may be argued, emissions reductions relative to peers would reflect standard business decisions rather than genuine “early action”. However, where different regulatory regimes were in place – notably in different Member States – this may be of greater concern, as companies that previously were subject to more stringent domestic regulations or targets would receive fewer allowances. One potential way to address this is to incorporate benchmarking factors in the allocation, as we discuss in the next chapter.

It is important to note that, in the context of allocation to incumbents, arguments about rewarding early action are purely a matter of distribution and the choice between emissions grandfathering and benchmarking *does not influence incentives to undertake abatement*. The

decision whether to reward early action and low-emitting technologies through allocations therefore does not promote any additional environmental or economic efficiency objectives.

6.3.4.1.2. *Creating a “level playing field” and allocation proportionate to “need”*

A potential attraction of emissions grandfathering is that it is feasible to take into account site-specific considerations, and thus to bring allocations in closer correspondence with “need”. For example, a pure output-based benchmark would not account for factors such as the age of a plant, the local availability of raw materials, the configuration of production processes, constraints from other local regulations, etc. To the extent these influenced emissions, there therefore is likely to be a greater divergence from actual emissions where benchmarked allocations are used rather than historical emissions (which implicitly would account for all relevant site-specific factors). An output-based benchmark could be made to account for site-specific factors by increasing the number of parameters in the benchmark formula, although this potentially could increase the complexity of the allocation substantially.

Of course, benchmarking may be desirable on other grounds precisely because local factors become less prominent, especially to the extent that these are not perceived to be relevant to creating a “level playing field”. In particular, benchmarks may mean that “similar” installations – in the sense of producing the same output or using the same input – receive similar levels of allocation. However, this would not necessarily be in correspondence with allocations corresponding to “need”, for the reasons mentioned above.

A separate issue is that allocations based on historical information are unlikely to entirely reflect current circumstances, especially in industries that have undergone significant change (e.g., in market shares of different companies) since the baseline period. This factor becomes more significant the longer the lag between baseline period and allocation period, and it applies both in the case of emissions grandfathering and benchmarking based on historical information (although results may differ). The price paid for updating allocations to use more recent data is a potentially significant sacrifice of efficiency, as we discuss in more detail in the chapter on updating allocations.

6.3.4.1.3. *“Stranded costs” and making installations “whole”*

“Stranded costs” may arise where past investments were undertaken prior to knowledge of emissions constraints, and are rendered less profitable because emissions limitations are imposed. Allocation can serve the purpose of “compensating” for such reductions in asset values. A related concept refers to the possession of past property rights, and one argument holds that the past holders of the right to emit (i.e., past emitters) should continue to have this right regardless of whether a total emissions cap is imposed (indeed, this is the original meaning of the term “grandfathering”). Closely related to stranded costs is the principle of using allocations to offset reductions in profits from the introduction of emissions trading (making installations “whole”).

To the extent that these principles are served by closely matching allocations to actual emissions, emissions grandfathering may be more successful at achieving compensation, although a large number of highly differentiated benchmarks also may serve as a close proxy for actual emissions. However, it is not clear that either emissions grandfathering or benchmarking allocations immediately correspond to compensation for stranded costs or lost profits, as neither past emissions nor production volumes necessarily are correlated with

adverse impacts of emissions trading. Matching emissions does not guarantee that installations or operators will be “made whole” by the allocation, because the impacts of the Scheme on covered sources (as well as on others) depends on many factors, of which the level of allocation is just one (others include abatement potential, the price of CO₂ allowances, effects on product prices and associated impacts on demand). We discuss these issues in more detail in Chapter 3, which deals with the competitiveness impacts of emissions trading.

6.3.4.2. Burdens to consumers of affected products

As noted above, (section 6.3.1 and elsewhere) the choice to use emissions grandfathering allocation would not be expected to alter operator behaviours, and therefore will not change prices or levels of consumption, relative to what would be expected from auctioning or benchmarking based on historical data (unless allocations are updated, as discussed in Chapter 9).

6.3.4.3. Taxpayer and other welfare effects

As discussed here, the decision to use emissions grandfathering as the mechanism for distributing free allowances to participants is separate from decisions about the overall level of the cap or the level of free allocation vs. auctioning. As such, different grandfathering approaches do not differ in their implications for effects on households or other welfare effects. Relative to auctioning approaches, however, grandfathering (like other free allocation approaches) does not offer a potential way of improving the overall efficiency of the tax system.

6.4. Conclusions

6.4.1. Summary of evaluations

A central conclusion from the economic theory of emissions trading is that when allowance allocations are based on purely historical data the trading scheme will not differ in either its environmental effectiveness or its economic efficiency—the least-cost abatement measures will still be incentivised. One of the key attractions of emissions trading is that distributional considerations can be addressed without compromising these objectives.

However, this requires that certain restrictions be put on the allocation approach. In particular, all data entering into the calculation of allocations must refer to activity prior to the start of the scheme, and should not be updated subsequently. Unfortunately, these restrictions may run contrary to other objectives—for example, to avoid emissions leakage or to ensure principles of equity (such as not relying on “outdated” data).

A “simple grandfathering” approach of dividing an overall cap based on shares of emissions during a baseline period can be highly transparent and avoid administrative complexity. In reality, however, actual implementations of emissions grandfathering have introduced additional elements – including sector-specific considerations, growth rates, and other adjustments – to achieve an allocation that is perceived to be more equitable. This poses a trade-off between achieving a desired distributional outcome, on the one hand, and avoiding

an administratively complex and costly allocation, on the other.⁴⁰ In general, however, it is likely that emissions grandfathering could be implemented at lower administrative effort than a benchmarking allocation.

Whether emissions grandfathering is more equitable than other principles for allocating a given number of allowances depends on which principles of fairness are preferred. Generally speaking, grandfathering may be better placed than benchmarking at matching allocations to realised emissions, as past emissions data is likely to embody more local and site-specific considerations than can feasibly be reflected in a benchmarking approach. On the other hand, benchmarking may be thought fairer because it can better reward early action.

In practice, the evaluation of approaches will depend on the details of specific allocations. For example, a highly differentiated benchmarking approach may closely resemble emissions grandfathering in outcome, whereas an emissions grandfathering approach with numerous modifications and adjustment factors may be just as complex as a benchmarking approach.

6.4.2. Implications for other allocation decisions

As discussed below, if allocations are to be updated—including giving previous new entrants allocations based on their previous period's emissions—then depending on the formula used, an emissions-based approach is likely to have undesirable consequences. Under such circumstances, it may be preferable to move away from emissions-based approaches. However, in the absence of updating, or if the share of free allocation is expected to decline and therefore become a less important motivating factor, maintaining an emissions-based approach is not necessarily undesirable, and benefits from relative simplicity.

⁴⁰ We are not aware of any studies that attempt to quantify the associated complexities and costs.

7. Benchmarking Allocation

7.1. Introduction and Background

In general, the term “benchmark” refers to a common standard that allows different cases to be compared. In the context of the EU ETS, “benchmarking” refers to the use of a common emission factor (or related factor, such as an energy efficiency factor) to determine emission allocations. The benchmarking approach can be contrasted to an approach that allocates based exclusively on historical emissions data. Under such an emissions-based approach, often referred to as “emissions grandfathering” approach, facilities would receive allocations based upon their emissions, rather than on the basis of their output or input plus some emission rate or “benchmark.” (Of course, both free allocation approaches can be contrasted against auctioning.)

This chapter focuses only on the use of benchmarks to determine allocations to existing installations using historical baseline data. Benchmarks potentially could be used for a number of functions within an allocation process, including setting the overall cap, distributing burdens between sectors, and allocating to new entrants. These issues, including the potential role of benchmarks, are discussed in separate chapters. For the purposes of this chapter, we consider allocations within a pre-determined cap.⁴¹

The structure of this chapter is as follows. First we consider options for benchmarking including benchmark categories, benchmarking peer groups, and sources of benchmark values. We then assess the different options against the agreed evaluation criteria.

7.2. Benchmarking Options

We identify three sets of issues relevant to the design of benchmarked incumbent allocations:

- § First, there are several high-level categories of benchmark depending on the type of installation-specific baseline activity (or other) data that are used to calculate allocations.
- § Second, the benchmarking “peer group”—i.e., the group of installations using the same benchmark—needs to be defined, including the number of benchmarks and the differentiation of benchmarks between groups of installations. This could include differentiation (or harmonisation) between Member States and between installations of different ages.
- § Third, there are many different potential sources of benchmark values, including empirical methods, literature references, and pre-existing industry benchmarking schemes.

We discuss each of these issues in turn.

⁴¹ Chapter 2 considers the use of benchmarks as one way of setting the overall cap and sector contributions to it within the trading scheme.

7.2.1. Benchmark categories

Benchmarks can be categorised in a number of ways. In the discussion below we focus first on the installation *baseline data* that underlie the benchmarking approach, and we note three basic different categories of benchmarks based on output, capacity, and input.

7.2.1.1. Background: emissions-based allocation

Most allocation in Phase I and Phase II of the EU ETS have employed allocation based on historical emissions. These approaches can be summarised by the following simplified formula:

$$\begin{array}{rcccl}
 \mathbf{A}_i & = & \mathbf{E}_i & * & \mathbf{Adj} \\
 \text{Annual} & & \text{Baseline} & * & \text{Adjustment} \\
 \text{Allocation} & = & \text{Emissions} & * & \text{factor} \\
 \text{tCO}_2 & & \text{tCO}_2 & & \text{[Other]}
 \end{array}$$

The allocation received by installation *i* thus is a function of i) its own past (or baseline) emissions (*E_i*), and ii) a factor or set of factors *not* specific to the installation but common to the sector (summarised as *Adj* in the formula). In many NAPs, the term *Adj* has been specific to sectors, and can fulfil a number of functions. Notably, because total allocation is likely to differ from past emissions it generally is necessary to use an adjustment factor to ensure that individual allocations sum to the total number of allowances to be distributed. The adjustment factor also may reflect other considerations, such as set-asides for new entrants or for auctions; a standardised “compliance factors” or bonuses for particular technologies; or sector-level growth projections. One consequence of this is that the actual allocation to an installation generally may differ from actual historical emissions.

7.2.1.2. Output benchmarks

Most discussion of using benchmarking as an alternative to emissions-based allocation focuses on output-based benchmarks. These can be generically described by the formula:

$$\begin{array}{rcccl}
 \mathbf{A}_i & = & \mathbf{P}_i & * & \mathbf{BM} & * & \mathbf{Adj} \\
 \text{Annual} & & \text{Baseline} & * & \text{Emission} & * & \text{Adjustment} \\
 \text{Allocation} & = & \text{production} & * & \text{benchmark} & * & \text{factor} \\
 \text{tCO}_2 & & \text{Unit} & & \text{tCO}_2 / \text{unit} & & \text{[Other]} \\
 & & \text{output} & & \text{output} & &
 \end{array}$$

In this formulation, the installation-specific information determining allocations is the amount of *output* rather than emissions during the baseline period. This is multiplied by an emissions benchmark per unit output *BM*, which is set common to the relevant peer group of organisations. The formula is completed by the adjustment factor *Adj*, serving the functions discussed above in relation to emissions-based allocation.

As with emissions-based allocations, the installation-specific information (output) determines the *share* of total allowances, rather than absolute allocations. As we discuss in more detail below, the peer group for benchmarking may coincide with a sector (e.g., one benchmark for all electricity producers) or may be smaller (e.g., one benchmark for coal-fired generation, one for gas-fired, etc.). Where the cap is set on a sector level, and several different benchmarks are used within the sector, the level of the sub-sector benchmark contributes to determining the share of allowances received by an installation. By contrast, where the cap is fixed and the *same* benchmark is applied across all installations within the cap (e.g., a sector), shares are determined only by the share of output, and not by the level of the benchmark.

Output-based benchmarks were used in both Phases of the EU ETS by some Member States, including for electricity generation and cement production.

7.2.1.3. Capacity benchmarks

The benchmark can be based on capacity instead of production by modifying the above formula such that:

$$\begin{array}{rclcl}
 P_i & = & C_i & * & U \\
 \text{Baseline} & & \text{Baseline} & & \\
 \text{Production} & = & \text{capacity} & * & \text{Utilisation} \\
 \\
 \text{Unit} & & \text{Unit} & & \\
 \text{output} & & \text{output} & & \text{Percent} \\
 & & \text{per year} & &
 \end{array}$$

In this formulation, capacity is specific to the installation but the utilisation is standardised across the peer group (of which, again, there may be several within a sector). Because the two jointly define a production number, they can be combined with the other factors in the output-based benchmark approach. This requires that a well-accepted measure of capacity is available (this may not always be the case, as we discuss in section 7.3.3.1). As with output-based benchmarks, it also is necessary to establish the baseline period for capacity.

7.2.1.4. Input benchmarks

Another form of benchmark relies on input rather than output or capacity. The generic formulation has the form:

$$\begin{array}{rclcl}
 A_i & = & I_i & * & BM & * & Adj \\
 \text{Annual} & & \text{Baseline} & & \text{Emission} & & \text{Adjustment} \\
 \text{Allocation} & = & \text{Input} & * & \text{benchmark} & * & \text{factor} \\
 \\
 \text{tCO}_2 & & \text{Unit} & & \text{tCO}_2 / \text{unit} & & \text{[Other]} \\
 & & \text{Input} & & \text{input} & &
 \end{array}$$

In this case, the benchmark is defined in terms of emissions per unit *input* rather than output, and thus differs from both the approaches described above. One example of this approach

would to allocate allowances based on the share of energy or heat input during the baseline period. Other inputs may include raw materials or other energy carriers (e.g., steam).

Input-based benchmarking may be a useful alternative where it is difficult to define an output for the relevant peer group, for example, where outputs are numerous or heterogeneous. To the extent that inputs are more homogenous (e.g., among installations outside the named sectors in the Directive), input-based benchmarking may be easier.

For many activities, a generic relationship between output and input can be described by:

$$\begin{array}{rclcl}
 \mathbf{P_i} & = & \mathbf{I_i} & * & \mathbf{Eff_i} \\
 \text{Production} & = & \text{Baseline} & * & \text{Conversion} \\
 & & \text{Input} & & \text{Efficiency} \\
 \text{Unit} & & \text{Unit} & & \text{unit output} \\
 \text{output} & & \text{Input} & & / \text{unit input}
 \end{array}$$

As this illustrates, input-based benchmarks differ from output-based ones in that the efficiency of input conversion is not reflected in the input-based benchmarking factor. Relatively less efficient technologies therefore receive a higher share of allowances, compared to a benchmark based on final output. In some cases the outputs of one process are the inputs to another process that is integrated with the first, so the distinction may not always be easy to make. We discuss some of the distributional and other potential implications of these considerations further below.

7.2.1.5. Combination benchmarks

In practice, it is possible to apply a combination of benchmarks and emissions-based allocation, as well as different types of benchmark. One example of this was the Dutch approach in Phase I, where allocations to several sectors followed the pattern:

$$\begin{array}{rclclcl}
 \mathbf{A_i} & = & \mathbf{E_i} & * & \mathbf{BM} & * & \mathbf{Adj} \\
 \text{Annual} & = & \text{Baseline} & * & \text{Relative} & * & \text{Adjustment} \\
 \text{Allocation} & = & \text{emissions} & * & \text{efficiency} & * & \text{factor} \\
 & & & & \text{benchmark} & & \\
 \text{tCO}_2 & & \text{tCO}_2 & & [\text{Other}] & & [\text{Other}]
 \end{array}$$

The benchmark in this allocation formula was not defined in terms of emissions per unit output or input, but as a number denoting energy efficiency relative to a relevant peer group of installations. Higher efficiency resulted in a larger value *BM* and thus in a larger number of allowances. Assignment of such benchmark values, which may be installation-specific, typically must make reference to input and/or output efficiency measures of some kind, otherwise the value would not constitute a benchmark. In the absence of such information, a default value (0.85 in the Dutch case) also may be used.

7.2.1.6. Fixed vs. “updated” baseline data

In all the above formulations, historical (baseline) data on activity or capacity are required to calculate allocations. A key decision in this regard is the baseline period. Emissions-based allocations in Phases I and II have been based on data available prior to the start of the trading scheme, and the European Commission has cautioned against the use of data from the period after the launch of the trading scheme. The motivation for this is that “updating” the baseline period to include subsequent years may provide less incentive to reduce emissions, as higher current emissions could lead to higher allocations in future periods.

As discussed in the evaluation section, and in more detail in Chapter 9 on updating, such updating of the baseline period also can introduce “distortions” in the case of *benchmarking*, although they may be less severe than in the case of emissions-based allocation. Such updated benchmarking approaches have been used: for example, allocation in some Member States and sectors has been based on capacity *at the start of each trading period*, rather than during a historical baseline period.

7.2.2. Benchmark peer group and differentiation

The above broad benchmarking types define a single benchmark value for a group of installations. The next key decision in developing a benchmarking allocation approach is to consider how the benchmarking “peer group” should be defined or, equivalently, what installation characteristics should determine which benchmark is used. Benchmarks may be differentiated by sectors, products, or particular technologies – and the greater the degree of differentiation, the larger the number of benchmarks required. We concentrate on two distinctions:

§ defining the peer group by the output / product; and

§ defining the peer group by characteristics of the production process used.

7.2.2.1. Differentiation by product

An output- or capacity-based benchmark requires one benchmark factor for each product, but it may not be straightforward to define which outputs constitute separate products. A wide economic definition of “product” would depend on the substitutability of outputs, and thus on the extent to which producers are in competition.⁴² In practice, definitions based on extent of substitutability are difficult to use.

A more common approach is to use existing industry classifications of economic activity, such as General Industrial Classification of Economic Activities within the European Communities (NACE). These can be used at different levels of resolution. While this may

⁴² Such substitution may extend, as least partially, to competition between different “sectors”; for example, different types of construction materials, energy (e.g., fuel, steam, direct heat, and electricity), etc. may be substitutable and therefore compete in the same product market.

fail to treat similarly some outputs that can substitute well for each other, this may be a relatively minor issue.⁴³

Where outputs are homogenous this may be relatively straightforward to agree on a definition of product (e.g., electricity, basic chemicals, clinker).⁴⁴ In many sectors agreeing on a product definition can be substantially more complicated. This is especially so where different products with some substitutability have different quality and emissions intensities (e.g., grades of paper, or types of ceramics). With a large number of product definitions a larger number of benchmarks may be required, and each benchmark may be applicable only to a small number of installations. In these cases, it may be easier or more transparent to use an input-based benchmark (e.g. based on an intermediate such as the heat or steam *output* of a boiler or other combustion unit). This may be particularly relevant for installations that are included because they have rated combustion capacity exceeding the 20 MW combustion threshold, rather than the production of one of the named activities in the Emissions Trading Directive.

A related consideration is that, even where product definitions are well-accepted and can be objectively measured, measures of capacity may not be. Moreover, even where capacity measures are standardised (e.g., for electricity production), there may be multiple potential definitions.

7.2.2.2. Differentiation by production process

In addition to differentiation by product, benchmarks may be differentiated by processes used to produce the same output. For example, for combustion emissions, the benchmark can depend on a combination of energy efficiency (specific energy consumption, or SEC) and fuel use:

$$\begin{array}{rcccl}
 \mathbf{BM} & = & \mathbf{SEC} & * & \mathbf{EF} & * & \mathbf{Adj} \\
 \text{Emission benchmark} & = & \text{Specific Energy Consumption} & * & \text{Fuel Emissions Factor} & * & \text{Adjustment factor} \\
 \text{tCO}_2 / \text{unit output} & & \text{MWh input / unit output} & & \text{tCO}_2 / \text{MWh output} & & [\text{Other}]
 \end{array}$$

Depending on circumstances, either the SEC or the fuel emissions factor could be further broken down. Moreover, for sectors with “process emissions” that are not the result of fuel combustion, the characteristics of the raw materials may also be relevant—either for energy

⁴³ As a point of comparison, product market definitions used in competition policy cases often do not extend beyond individual NACE codes, sometimes at the 8-digit level—whereas the sector categories that have been used to define the coverage of the EU ETS are at a much higher level. This suggests that substitution between products at higher levels may not be a real concern.

⁴⁴ Even where products are physically homogenous differentiation may be relevant. For example, a narrow definition of product arguably could differentiate between peak-time and baseload electricity (based on the fact that they are produced using different production processes, are sold at different prices, and/or that they can only partially substitute for each other).

intensity requirements or for direct CO₂ emissions. Broad factors that influence emissions and which therefore may be candidates for inclusion in the benchmark factors may include:

- § *Technology type.* E.g., type of turbine or boiler; kiln types in minerals sectors; production route in steel manufacture; type of drier in pulp & paper; etc.
- § *Fuel emissions factor.* E.g., coal, natural gas, biomass; impact of particular fuels on combustion efficiency; etc.
- § *Other raw materials.* E.g., cullet (recyclable scrap) use in glass manufacture; crude oil characteristics in refining; process emissions from different clay / rock types in minerals sectors; etc.
- § *Other parameters.* E.g., age of the production facility.

Determining which of these factors should be accounted for through separate benchmarks can be a point of contention but is a key part of the process to develop benchmarked allocation approaches. In general, installations with higher emissions intensity typically would benefit from benchmarks that account for more of the specific characteristics of production processes (e.g., different fuel use, inherently less efficient processes, different raw materials, etc.). This gives rise to a trade-off between simplicity and transparency, on the one hand, and better approximating actual site emissions through a large number of different benchmarks, on the other. At one extreme, the simplest solution is a single benchmark for each product or input. At the other extreme, highly differentiated benchmarks may be applicable only to single installations without a relevant “peer group”. The results in the latter case may be very similar to emissions-based allocation.

7.2.2.3. Differentiation / harmonisation across Member States

Another relevant aspect of the benchmarking peer group is whether it is confined within individual Member States, or whether EU-wide benchmarks are used. If a consistent benchmarking approach were used across the EU to determine a sector’s contribution to the overall cap, it may be relevant to use the same benchmark values for installations in different Member States.

It is important to note, however, that even where benchmark formulas and values were the same, absolute allocations could differ if installations in different Member States were subject to different adjustment factors—for example, because of a burden sharing agreement whose targets Member States were obliged to meet.

7.2.3. Sources of benchmark values

In addition to questions of the underlying benchmarking data and the extent of differentiation, the third consideration in designing a benchmark is the choice of value of benchmark parameters. Various different sources of these values may be used, including empirically derived values, values from existing literature, and commercially available benchmarking programmes. These values can influence the absolute level of allocation received by an individual installation. However, when allocations take place within a pre-defined cap this influence is not straightforward, and depends on the number of other benchmarks that may be used within a given “cap” or sector allocation.

7.2.3.1. Simple “historical share” benchmarks

When benchmarks are used to set sector contributions to a cap in a “bottom-up” approach, the benchmark value has an immediate influence on the number of allowances received by installations. By contrast, the absolute value of a benchmark will not influence outcomes much when all installations within a pre-defined cap or sector allocation receive allocations using the same benchmark (i.e., are in the same peer group).⁴⁵ In this case, the absolute value of the benchmark is irrelevant, as a higher benchmark factor would simply be offset by corresponding reductions in the adjustment factor, which is required to constrain total allocations to the level of the cap (*BM* and *Adj* in the formula in section 7.2.1.2, for example). The allocations received by individual installations therefore depend only on the share of the relevant activity data underlying the benchmark—i.e., output, input, or capacity during the relevant baseline period.

Our assumption that caps have already been determined rules out a direct equivalence between benchmark levels and installation-level allocations. However, when several different benchmarks are used within one cap, the *relative* benchmark values influence the absolute number of allowances received by installations subject to different benchmarks. For example, if allowances within one sector allocation were distributed using two benchmarks then the *relative magnitudes* of the benchmark values would influence the number of allowances received by each group of installations.

7.2.3.2. Empirical values: Peer group average / percentile

One source of benchmark values is the peer-group average for the relevant quantity, for example, the average emissions per unit output. Deriving such benchmarks requires that the peer group first is defined (e.g., power stations, coal-fired power stations, coal-fired power stations with FGD, etc.) and that data are available for the relevant quantities and time period.⁴⁶ Another approach is to use a benchmark value corresponding to the performance of a sub-group of installations. For example, the benchmark could be set at the highest X percentile of comparable installations.⁴⁷

In these cases, the group from which this value is derived potentially can be wider than the group of installations included in the trading scheme. For example, to the extent data are available, benchmark values could be derived from the top X percent of performance worldwide. This may be particularly attractive if the intention is to use benchmarks for cap-setting and future sector agreements. It may be less relevant where benchmarks are used only for installation-level allocations, as considered here.

7.2.3.3. Literature values: Best Available Technique / other literature

An alternative approach is to rely on pre-existing literature values for benchmarks. One potential source of such values is the set of reference notes for “Best Available Technique” (BAT) defined under the IPPC process. Several of the BAT reference notes have

⁴⁵ Again, the option of using benchmarks to set the sector cap is discussed in a prior chapter, and is not considered here.

⁴⁶ As we discuss below, updating the data period can create incentives that may be contrary to least-cost abatement.

⁴⁷ Assessments could be done on the basis of actual operations based on real-world data, or based on detailed designs.

specifications for best available energy efficiency and other factors relevant to CO₂ emissions benchmarks. However, these documents also have important limitations. Not all activities covered by the EU ETS are covered by BAT reference documents. Even where values exist, the range of “best” values can be relatively large. This reflects in part the fact that the concept of BAT is site-specific, and thus describes the techniques available to a particular site. Finally, many BAT values reflect not only considerations relevant to CO₂ emissions, but to other pollutants regulated by the IPPC, and which therefore may not be relevant to emissions benchmarking under the EU ETS.

Several other potential sources of CO₂ emissions or energy benchmark values exist in academic and other literature. Depending on the original purpose of the benchmarking exercise, these may be applicable for the purposes of defining benchmarks for allowance allocation.

7.2.3.4. Industry benchmarks

A third potential source of benchmarking values are ones used in pre-existing industry benchmarks that are used for commercial management of operations. Such benchmarks have been used for allocations in some sectors in Phases I and II, notably for allocation to new entrants (for example, in the refinery sector). Such benchmarking methods may be proprietary, which may raise concerns about transparency and be an obstacle to their use in some cases.

7.3. Evaluation

This section evaluates benchmarked allocation against the criteria of environmental effectiveness, economic efficiency, administrative cost and feasibility, and fairness and distributional equity.

7.3.1. Environmental effectiveness

The environmental effectiveness of emissions trading depends first on controlling emissions from sources within the scheme (maintaining the cap) and secondly on potential consequences for emissions from sources outside the scheme (leakage). We discuss each briefly in turn.

7.3.1.1. Ability to maintain cap

The ability to maintain the cap on emissions depends on the total number of allowances rather than on their initial allocation. For a given cap, the use of benchmarking vs. other methods of allocation therefore does not have an impact on emissions from installations covered by the trading scheme. (By contrast, if benchmarks were used to determine the total cap they could have such an influence.)

One consideration is that the long-term stringency of the cap may depend on the cost of implementing emissions reductions. To the extent different benchmark approaches are associated with different overall cost, they may influence the acceptability of more stringent emissions cuts. We discuss this possibility more below.

7.3.1.2. Ability to limit leakage

Where benchmarking is used for allocation to incumbents (rather than new entrants), and where it is based on a historical baseline that is not updated, it would not be expected to influence the extent of emissions leakage. This is a special case of a more general result from economic theory which holds that different methods of free allocation do not influence the production, abatement, or consumption decisions by those affected by the trading scheme. This results holds only for certain conditions; however, there is little reason to believe that the choice of benchmarking relative to other methods of distributing allowances would influence these conditions.

By contrast, if the baseline period is updated, the type of benchmark used can influence the behaviour of scheme participants in ways that influence leakage. Generally speaking, updating leads to an incentive to increase the activity that enters into the benchmark – in the anticipation that this may lead to higher future allocations. Thus output-based benchmarks may encourage expansion of output, input-based benchmarks the use of input, etc. This raises the possibility that output-based benchmarks can encourage the preservation of production within the EU, although the magnitude of any such effects depends on the precise details of the allocation. Also, such updating typically is associated with higher allowance prices, as discussed below.

It has been suggested that the development of sector-wide allocation benchmarks could facilitate international agreements to reduce emissions and the emergence of international trading frameworks. This in turn could limit leakage, by ensuring a similar price on emissions were applicable in relevant competitor countries. Benchmarks, it is suggested, may make it easier to allow countries currently without emissions constraints to opt in selected sectors, even where other emissions may remain unregulated, and to make the sharing of reduction burdens transparent. However, such decisions ultimately are political in nature, and the use of benchmarking would not, on their own, alter the costs incurred by introducing emissions limits.

7.3.2. Economic efficiency of trading scheme

7.3.2.1. Consistency with least-cost abatement

Under “idealised” conditions, the allocation of allowances to incumbents would not be expected to influence the overall cost of reducing emissions. This extends to the use of benchmarking, which typically would not be associated with abatement or production choices that differed from other methods of allocation. The fundamental reason for this is that the allocation method would not be expected to influence the price of allowances – and therefore also not the penalty for additional emissions or reward for additional emissions reductions. Of course, the method of allocation has a direct influence on how the cost of emissions reductions is distributed, as we discuss further below.

7.3.2.1.1. *Impact of benchmarking under updating*

The main exception to this is where allocations have “updating” features, i.e., are contingent on decisions taken by installation operators after the start of the trading scheme, as discussed above. The most prevalent updating feature in the current ETS is new entrant allocation, for

which benchmarks are widely used. In this case, the exact form of the benchmark can directly influence technology and other abatement choices, and therefore also the cost of abatement. Closure rules that confiscate allowances from closed installations are another type of updating feature that can affect abatement costs and therefore choices about how to abate. Updating also may extend to incumbents, if the baseline period for activity data used for benchmarking were revised (moved forward) over time.

In general in the absence of concerns about leakage, updating features will tend to increase the price of allowances and the cost of meeting a given cap. The effects of updating depend on the precise implementation. In all of the above cases, the *type* of benchmark may influence the cost of achieving a given emissions reduction. As noted, different types of benchmark incorporate different types of information about installations. For example, output-based benchmarks do not award a higher number of allowances to less efficient installations, whereas input-based benchmarks may do this (as higher input use leads to higher allocations). This means that the updating of baselines under output-based benchmarks may be better at preserving incentives under updating, compared to the situation under input-based benchmarks, as incentives to improve efficiency need not be as adversely affected. (Nonetheless, where benchmarks are differentiated by production processes, output-based benchmarks also may weaken incentives for efficiency.)

In addition, with longer time periods between activity data and allocation periods (e.g., with a lag of one or two allocation periods), the incentive effects typically are smaller, whereas they would be at their largest where allocations were updated contemporaneously in a given year.

We discuss these and other aspects of updating further in subsequent chapters.

7.3.2.1.2. *Impact of product and capital market imperfections*

There also are some other circumstances in which the method for free allocation of allowances to incumbents may influence the total cost (rather than the distribution of that cost). These were discussed in more detail in the previous chapter on emissions-based grandfathering. Briefly, they include:

- § Where competition in product markets is distorted by market power, allocations may help deter entry; and there also may be other circumstances where free allocation means that opportunity costs of allowances are not passed through.
- § Where capital markets do not function well, the level of free allocation may influence firms' investment decisions.

The practical significance of these considerations for the EU ETS is an empirical question—and may be limited. However, even if these effects were significant, it is not clear that the use of benchmarking could directly influence outcomes or improve them relative to emissions-based allocation. In particular, there is no general guarantee that a switch to benchmarking allocations would lead to smaller absolute discrepancies between allocation levels and realised emissions, as discussed below. (Moreover, operators with installations in multiple “peer groups” might still differ in their relative need and/or ability to finance abatement, since their different installations could receive different relative levels of allowances.)

7.3.2.2. Functioning of allowance market

There is no reason to expect the functioning of the allowance market to be substantially affected by the use or format of benchmarking, assuming the cap has already been set.

7.3.3. Administrative costs and feasibility

7.3.3.1. Costs of establishing and maintaining allocation

In contrast to emissions-based allocation, the development of benchmarks is likely to require a significant amount of research and gathering of empirical information to develop allocation formulae, which may entail significant costs. Also, whereas baseline emissions data currently are held by operators and form the basis of many current allocations, much of the baseline period data (production, capacity, or input) required to calculate benchmarked allocations may not currently be held by the relevant authorities so would have to be reported and verified.

The cost of developing benchmarks is likely to vary significantly between sectors. As noted, benchmarks may be easier to establish where products are homogenous, and where production processes do not differ significantly in emissions intensity. In addition, it may be possible to use existing allocation or other benchmarks as a basis for further work in some sectors. In some sectors, definitions of “capacity” may not be standardised—this may be particularly true for installations that have multiple process, each of which may constrain the others—but where the individual processes do not have well-defined capacities. (Different definitions of capacity for sectors where this is an issue may have implications for the overall efficiency of the trading scheme if they are the same definitions applied to new entrants and/or extensions.)

The cost of developing benchmarks also is likely to differ depending on the degree of differentiation between products and production processes that is felt to be required. This may be the single most important factor determining the administrative cost of developing benchmarks. Highly standardised benchmarks (e.g., industry average emissions intensity per unit output) could be developed relatively easily, but may not result in acceptable allocations. The process therefore would involve a trade-off between on the one hand minimising the administrative cost of establishing and negotiating acceptable allocation formulae, and the requirement to ensure that outcomes result in acceptable distributional outcomes, on the other.

A final consideration affecting the feasibility of developing benchmarks is the concern about commercial confidentiality. The data used for emissions-based allocations are already reported to regulators by participants in the trading program. In contrast, both the development of benchmarks and the calculation of allocations are likely to require data on output, capacity, or input use which may be commercially sensitive. This may be alleviated by the fact that the benchmark period may be several years in the past. Another potential concern is that, where pre-existing commercially available industry benchmarking services are used, the benchmarking method itself may use proprietary or otherwise confidential data. The need to rely on confidential data may reduce the acceptability of the benchmark to both industry participants (who would prefer for the data not to be made publicly available) and/or

to other stakeholders (who may prefer reliance on more transparent data than benchmarks based on confidential information can provide.)

7.3.3.2. Transaction costs

Transaction costs may be larger where the initial allocation differs significantly from the equilibrium achieved by trading and the number / volume traded therefore is greater. However, there are several reasons that this is likely to be a minor concern for the consideration of benchmarked allocations. First, it is not clear that costs are increasing in transaction volumes, as there may be returns to scale in trading infrastructure and intermediation. Second, the difference between benchmarked and emission-based allocations, or between benchmarking options, may not be large relative to other determinants of long/short positions (such as abatement potential or differential sector growth). Finally, it is not clear that the initial allocation is an important determinant of transaction volume relative to other factors (notably, allowance, raw material and product market uncertainty – e.g. development of product demand and fuel prices).

7.3.4. Fairness and distributional equity

As the above discussion highlights, the main motivations and choices for benchmarked allocations to incumbent installations are unrelated to either environmental performance or economic efficiency. Instead, the most relevant evaluation criterion is the distributional consequences of different allocation options.

7.3.4.1. Burdens to covered operators / installations

There are many different principles that could be used to assess the “fairness” of different approaches to allocation, many of which are not themselves precise in their implications and some of which may contradict each other. As noted in Chapter 2, principles may include:

- § rewarding or not penalising “early action” to reduce emissions,
- § promoting / rewarding low-emitting technologies,
- § creating a “level playing field” for all covered installations,
- § allocation proportionate to need or ability to reduce emissions,
- § making affected installations “whole” by defraying their net or stranded costs, and
- § allocation according to pre-existing “use-rights”.

We discuss below these principles as they relate to emissions benchmarking allocations.

7.3.4.1.1. “Early action” and low-emitting technologies

Benchmarking often is proposed in connection with arguments for rewarding or not penalising “early action”. It is a feature of emissions-based allocation that historically high-polluting installations receive higher allocations than ones in the same sector but with fewer emissions during the baseline period. By contrast, under benchmarking installations with low emissions intensity would receive the same level of allocation for a given level of output /

input. Past efforts to reduce emissions (while maintaining output or input levels) therefore would not lead to lower allocations.

It is important to note that, in the context of allocation to incumbents, arguments about rewarding early action are purely a matter of distribution, and benchmarking provides no additional incentives to undertake abatement. Incentives to undertake abatement are provided by the carbon price and obligation to surrender allowances, and allocations based on past information do not contribute any additional incentive. Thus, while benchmarked allocations may be able to address concerns about early action, they play no role in promoting additional abatement unless the information is “updated”, as discussed above. Benchmarks therefore do not, *per se*, promote low-emitting technologies, whether they are set at a “high” or a “low” level.

7.3.4.1.2. *Creating a “level playing field” and allocation proportionate to “need”*

Another principle often cited as being in correspondence with benchmarking is that of creating a “level playing field”. In particular, benchmarks may mean that “similar” installations – in the sense of producing the same output or using the same input – receive similar levels of allocation. Where benchmarks reflect best practice, they also may reflect abatement potential, which could be part of allocation in proportion to “need”.

One caveat to this is that the benchmark value is one of several determinants of absolute allocations. Unless the same sector adjustment factor is applied across Member States there is no guarantee that allocations will be the same. In practice, as the adjustment factor may include information about sector caps and growth rates, if this distributional principle is considered a priority it may mean that sector-wide allocations (including benchmarks and adjustment factors) would need to be determined or coordinated at an EU-wide level.

Another caveat is that, to avoid updating, benchmarked allocation to incumbents would use activity data available prior to the launch of the trading scheme. “Similar” installation in this context therefore means installations that *in the past* have produced similar levels of output / used similar levels of input. It is possible that these installations will not remain similar over the course of the trading scheme (and indeed they may not be similar now). (The same issue arises for emissions based allocation using historical data.)

7.3.4.1.3. *“Stranded costs” and making installations “whole”*

Installations that produce similar outputs may diverge significantly in emissions intensity. The principle of rewarding early action addresses this by deliberately *not* reflecting all differences in emissions intensity, in particular where they result from previous decisions to reduce emissions. The flip side of this is that, where the differences arise from past investments in different production methods, such allocations may not reflect “stranded costs”. It thus is not clear, *a priori*, that feasible benchmarking approaches would lead to a smaller divergence between actual emissions and allocation levels than would allocation based on historical emissions. This could be addressed to some extent by using a larger number of (more differentiated) benchmarks. In practice, there is likely to be a trade-off between these different principles and solutions may differ between sectors.

7.3.4.2. Burdens to consumers of affected products

Unlike emissions-based allocations, benchmarked allocation could be used to calculate allocations to consumers of electricity or other emissions-intensive products.

The choice to use benchmarking, or between benchmarking methods would not be expected to affect consumer prices unless allocations are updated, as discussed.

7.3.4.3. Taxpayer and other welfare effects

As discussed here, the decision to use benchmarking is separate from the decisions about a) the overall level of the cap b) the level of free allocation vs. auctioning (although benchmarking could be used for these decisions, as discussed in separate chapters). As such, choices about allocation through benchmarking do not have any implications for effects on households or other welfare effects.

7.4. Conclusions

7.4.1. Summary of evaluations

Decisions to use benchmarking for allocation to incumbents have few implications for the environmental effectiveness or economic efficiency of the trading scheme unless baseline periods are revised (updated) over time. Instead, the decisions primarily affect distributional equity, with implications for administrative costs.

The distributional impacts of benchmarking can differ from emissions-based allocation to the extent that shares of baseline activity data (output or input) differ from shares of emissions. This may conform to some principles of “fairness” but not others. A challenge is to develop benchmarks that strike a balance between criteria; e.g., to reward “early action” to reduce emissions but do not penalise intrinsically more emissions intensive processes (to the extent these principles are judged to be important). Ultimately, weighing these principles is a political decision, but empirical work is required to establish the trade-offs involved.

Because of the need for adjustment factors in allocations where benchmarks do not determine the cap, Member States all must apply the same adjustment factor (or sectors must be subject to a combined EU-wide allocation approach) for benchmarking to guarantee the same installations within the same peer group. If this distributional principle is a priority, harmonised approaches to allocation may be preferred.

The administrative cost and feasibility of benchmarking is likely to differ significantly between sectors. In general, it is likely to be easier to develop acceptable benchmarked allocation approaches where emissions vary less with output characteristics or production processes. Where there is substantial variation on either of these dimensions, a large number of benchmarks may be required for distributionally “fair” outcomes, or benchmarking may not be feasible.

7.4.2. Implications for other allocation decisions

Other allocation decisions may influence the desirability of using benchmarking. In particular, if a large share of allowances were auctioned the method used for free allocation would become less quantitatively important. It therefore may be less desirable to use allocation approaches that entailed high administrative costs. This could result in a reluctance to spend time developing complicated benchmarking approaches, although it might facilitate the use of simplified approaches deemed “good enough” given that allocation levels were relatively low in any event.

Where input- or output-based benchmarks are used to set Member State or sector “caps”, it may be natural to use the same benchmarks to allocate to individual installations—although this would not be necessary. There could, however, be differences in the ways that sector-level or EU-wide benchmarks were applied to calculate caps, and the way that these benchmarks were used to allocate to individual installations—for example, in the use of growth rates and projections.

Where periodically revised (updated) baselines or other forms of updating are a feature of allocations, capacity-based or output-based benchmarks are likely to lead to less distortion of incentives for low-cost abatement than are input-based benchmarks and emissions-based allocation. However, benchmarks based on capacity or output may not always be feasible to establish and implement, or may contradict some notions of “fairness”.

Where there is no updating, benchmarks for incumbent installations can be differentiated along a number of dimensions to ensure that they match installations’ emissions characteristics more closely. However, doing the same for new entrant benchmarks can lead to significant weakening of incentives to invest in clean technology, as we discuss in more detail in a separate chapter on new entrants and closure.

Benchmarked allocation may be able to contribute to similar levels of allocation to “similar” installations in different Member States. However, as the use of benchmarks within a pre-determined cap generally implies the use of an adjustment factor, benchmarked allocation cannot guarantee the same allocation to similar installations without also harmonising sector / peer-group caps on an EU level.

7.4.3. Way Forward / Possible Next Steps

Benchmarking in various forms has already been used for allocation (and for calculating contributions to the overall emissions cap by sectors) during Phases I and II of the Scheme. If taken, a decision to shift towards a greater emphasis on benchmarked allocations than has been used during Phase I and II should focus first on setting out clearly where benchmarks are to be used (for calculating absolute contributions to the cap, for determining relative sector burdens, or for determining relative installation-level shares of free allocation), and should be clear about the reasons for using them. Care should be taken to ensure that the reason given for increasing the use of benchmarking is consistent with what is likely to be achievable—by benchmarking generally and by the specific form of benchmarking proposed.

Because benchmarking can affect distributional outcomes, but does not affect the environmental- or cost-effectiveness of the Scheme unless there is updating, the primary

concern should be to establish which of the various “fairness” and other distributional criteria should take precedence. This should not be done in isolation of other allocation decisions, so it should take into account likely levels of auctioning, for example. Thus if high levels of free allocation are expected for a given sector, it may be considered fairest to allocate on the basis of an output-based benchmark that “rewards” operators with the lowest per-unit emissions. On the other hand, if high levels of auction are expected, this may already be perceived as conferring significant advantage on operators with low emissions-intensity, so that an emissions-based allocation of the remaining (small) free allocation is considered “fair”.

If updating in its various forms persists as a feature of the ETS after 2012, the evaluation of alternatives becomes more complicated, and therefore so do the possible next steps. To minimise repetition, we reserve the bulk of any discussion of updating to Chapters 8 and 9. It suffices here to note that where there is updating, careful attention should be paid to the incentives provided by the trading scheme—both to the relative incentives to operators within a sector and to the incentives between sectors and for consumers. Generally, in the presence of updating, for the sake of programme efficiency there may be reasons to prefer benchmarking approaches that involve peer groups that are as broadly defined and as little differentiated as possible, and to prefer capacity or output-based approaches over others. Ultimately, however, any evaluation depends on the precise nature of the overall allocation approach, and a final judgment should be based on a quantitative assessment of the costs and benefits of the alternatives.

Although agreement on the *level* of free allocation is likely to be of foremost concern to operators, if sector allocations are set in advance, or if they will ultimately need to be adjusted to conform to an overall ETS cap (or Member State contribution to it), the precise levels of benchmarks may not be the most useful area to focus research. Rather, emphasis should be given to defining a fair (and in the case of updating, efficient) way of dividing allowances between installations. This will involve identifying the appropriate peer groups and relevant outputs (and/or inputs) that should enter into the benchmarking calculation.

Even if fully harmonised benchmarks are not used, it still may be helpful to impose a common format on benchmarks, to ensure that they can be compared easily. This could mean defining certain “reference” installations whose allocations under different plans would need to be specified in advance, or could involve requirements to use certain output measures, or to include or exclude certain forms or measures of capacity or other relevant parameters.

8. New Entrants and Closure Rules

8.1. Introduction and Background

The current implementation of the EU ETS allows Member States to set aside allowances for new entrants, and all national allocation plans (NAPs) have included such provisions. A related set of rules in many national allocation plans specify that installations that close forfeit their right to further allowances.

New entrant allocation and closure rule provisions have been motivated by a number of different considerations. Under the Directive, the emissions permit for an installation that closes ultimately must be withdrawn by the time a subsequent NAP is drawn up, and possibly immediately upon closure—so that allocated allowances are also withdrawn. Also under the Directive, new entrants must be provided with *access* to allowances; Commission guidance emphasises that this is to avoid barriers to entry and ensure fair treatment of both incumbent and new entrant installations. In some cases, other policy aims also have come to the fore—including allowing for economic growth, preventing migration of production and leakage of emissions outside the EU, energy security, the impact on product prices, and aims to favour particular technologies.

New entrant and closure rules mark a departure from “idealised” approaches to allowance allocation in a number of respects. Most importantly, unlike allocations based only on historical (or pre-ETS) data, they have the potential to shift incentives and behaviour—including investment, production, and emissions abatement decisions—away from the “least-cost” options for reducing emissions.⁴⁸ They therefore may increase the cost of achieving emissions reductions. In some cases, these changes to behaviour are desired outcomes, but in others they may be an unintended consequence or price to pay for achieving other aims. An important part of designing new entrant and closure provisions therefore is to assess the trade-offs that arise between different objectives.

The structure of this chapter is as follows. The next section outlines design options, broken down first into design parameters such as the structure of a new entrant reserve (NER) and the formula used, and secondly into options for harmonising allocation approaches. The subsequent section evaluates approaches against the agreed criteria of environmental effectiveness, economic efficiency, administrative cost and feasibility, and fairness and distributional equity. Throughout the discussion, we proceed on the assumption that allocation to new entrants is separate from the setting of the overall cap, which was discussed in a previous chapter.

⁴⁸ As we discuss in the evaluation section, the standard “least-cost” options may not necessarily be the most cost-effective way to reduce overall global emissions if there is a risk of significant emissions leakage.

8.2. Design Options

8.2.1. Design parameters

In this section we outline the main choices for new entrant allocations and closure, grouped into features of the overall reserve, the specific allocation formula, closure and transfer rules, and other parameters.

8.2.1.1. Basic parameters of New Entrant Reserve

A number of basic design elements must be decided for any new entrant reserve, including:

- § Number of allowances / size of reserve;
- § Types of investment eligible for allowances;
- § Time period of eligibility; and
- § Sectors eligible for allowances.

To date, decisions about the size of the reserve have been handled differently in Member States. Reserves have been determined by using growth projections, attributing some or all of the projected growth to New Entrants, and by surveying industry for known developments. Although no Member State has opted for the approach, it would also be possible not to have a new entrant reserve at all.

If there is an NER, it also needs to be established which installations are eligible for allocations from the reserve. Current rules as set out in the Directive restrict eligibility to increases in production through a physical extension of an installation, but not increased utilisation or efficiency of existing physical capacity.⁴⁹ The application of this rule has differed between Member States, for example, by applying different definitions of what constitutes such a physical extension, treatments of “de-bottlenecking”⁵⁰, definitions of capacity, and so forth.

A related issue is the period for which an installation remains eligible for new entrant allocations. The new entrant classification applies only to installations that receive their permit to emit CO₂ after the publication of a Member State NAP. The standard interpretation of the Directive, reflected in the first Commission guidance document on NAPs, is that the new entrant classification applies only for a limited period, so that once an installation has a permit, the next NAP should no longer treat them as a “new entrant”. This does not mean, however, that such former new entrants must be treated in exactly the same way as incumbent installations that were never new entrants—although this appears to be the interpretation that many have assumed must operate.

⁴⁹ The formal definition is “any installation carrying out one or more of the activities indicated in Annex I, which has obtained a greenhouse gas emissions permit or an update of its greenhouse gas emissions permit because of a change in the nature or functioning or an extension of the installation, subsequent to the notification to the Commission of the national allocation plan”.

⁵⁰ “De-bottlenecking” refers to an improvement that increases the capacity or throughput of one element of an integrated system of production equipment whose level of output or throughput had been constrained by that element. Improving the individual element makes it possible for other associated components to operate at higher levels of throughput.

Note that an implementation where the classification is permanent and not subject to change—or at least where former new entrants can be treated differently from installations—is likely to be more consistent with incentives for least-cost emissions abatement. In this case, any installation having entered after the start of the trading scheme would be regarded as a “new entrant” for the purposes of allocation in all future phases.

An intermediate option between eliminating the NER and the current eligibility criteria would be to restrict eligibility to particular sectors. For example, eligibility could be restricted to sectors particularly exposed to international competition. This would be particularly relevant where new entrant allocations are motivated by a desire to prevent leakage.

8.2.1.2. Closure and transfer rules

When installations cease operations, they no longer “need” emissions allowances, and this raises questions about how their existing allocations should be treated. Current implementations differ in this regard. Many Member State NAPs have provisions to withhold further allocations once an installation is deemed to be closed. Even where there are no such explicit provisions, the requirement that allocation can only be made to covered installations holding an EU ETS permit means that in all Member States, a *de facto* closure rule applies between allocation phases.

Closure rules can be designed in different ways. One parameter is the timing of when further allocations are forfeited (e.g., either immediately or after a delay). The criteria defining what constitutes “closure” also can vary – for example, they can involve the complete revocation of permits, or reductions in emissions or production below a threshold level. They also may attempt to make a distinction between temporary and permanent closure, although this may be difficult to determine.

A variation on closure rules are “transfer” rules that allow operators of installations to retain an entitlement to allowances of a closing installation on the condition that replacement production capacity is added. Design options for this include the geographical extent of the rule (e.g., transfer within or between Member States) and the proportion of the allowance allocation that is retained.

8.2.1.3. Allocation formula parameters

The use of benchmarks for allocation to incumbents is discussed in detail in a previous chapter. However, different considerations apply in the case of new entrants, and in general the precise allocation formulas also will differ.

The choice of allocation approaches for New Entrants is constrained by the absence of historical activity data on which to base allocations. Allocations to New Entrants typically use benchmarking approaches that reflect this, employing either standardised or projected activity information where historical data do not exist. In some Member States projected activity levels have been based on historical averages. In others they are determined through negotiation between the competent authority and the operator, possibly with reference to a business plan or other documentation.

In the absence of historical information, the capacity of the new installation may be the only parameter that can be independently verified, thus constraining the type of benchmark that

can be used. Even if benchmarks are based on capacity, the final allocation formula may resemble either an output or an input-based benchmark, depending on whether the benchmark refers to capacity to produce a final product or production capacity for intermediate inputs (e.g., heat, steam, electricity, etc.).

A key choice for new entrant benchmarks is the “peer group” of installations to which a benchmark should be applied. For example, the same benchmark may be applied for all new entrants producing the same product. This requires a definition of what constitutes “equivalent capacity”—i.e., what products are considered the “same” for the purposes of allocation. Additionally, benchmark values may vary for different installations producing the same product but using different fuels, raw materials, technologies, or otherwise differing in relevant characteristics of the production process.

The allocations received by an installation of course also depend on the level of the benchmark. Approaches in NAPs have included benchmark values that are judged to correspond to the “best available” emissions characteristics within the relevant peer group; values based on average performance in a peer group; or values based on a top percentile of the relevant class of installations. Possible sources of such values include reference documents for “Best Available Technique” as defined under the framework of Integrated Pollution Prevention and Control; other literature sources; empirical values from existing installations; or existing industry benchmarking programmes. We have discussed this in more detail in the previous chapter on the use of benchmarks for allocation.

In addition to the benchmark value, allocations to new entrants may be affected by “adjustment” or “compliance” factors that are used to ensure allocations match an overall or sector “cap”. Where these factors are applied to incumbents it may be considered fair to apply them to new entrants as well. The benchmark value therefore might not be the sole determinant of the allocation received for a given capacity.

8.2.1.4. Other design parameters

Several other detailed decisions are required to create fully specific new entrant and closure rules. It needs to be specified how any unclaimed allowances in the NER will be treated. Options include cancelling the allowances or releasing them to the market (e.g., through auction). Related to this, rules are required to specify how deficits in the NER should be treated. Some Member States have operated their NERs on a “first come, first serve” basis, so that in theory allowances in the NER could be exhausted before all new entrants had received an allocation. The two principal options used in Phases I and II have been for governments either to purchase allowances from the market on behalf of new entrants within their borders or to leave later new entrants to procure their own allowances from the market.

8.2.2. Harmonisation options

The basic design options described above can be implemented with various degrees of harmonisation or central EU coordination. These harmonisation options are closely linked to other harmonisation decisions concerning other aspects of Scheme design—notably cap-setting. However, we outline different options specific to new entrant allocation in closure rules below, including:

- § No NER / closure rules;
- § EU-wide NER;
- § EU-wide NER with opt-out;
- § Member State NERs.

8.2.2.1. Option 1: No NER

One option would be to harmonise allocations by disallowing allocations to new entrants and / or closure rules. In this case, new entrants would be required to obtain allowances at auctions or through transactions in the allowance market. (This approach could be seen as consistent with a shift towards auctioning allowances for incumbent installations, but could be implemented independently of the treatment of incumbents.)

8.2.2.2. Option 2: EU-wide reserve

If an NER is retained, the most complete form of harmonisation would be a single NER administered at EU level. This option could centralise many, if not all decisions about new entrant allocations – including the size of the NER, eligibility to receive allocations, the formula and level of allocation for particular installations. It also would determine centrally the format of any closure and transfer rules.

The motivation for centralisation would be to standardise allocations to ensure that similar rules apply to similar investments in all Member States, either on efficiency or equity grounds. Another motivation may be co-ordination: there may be design options that Member States would wish to include only if other Member States did the same, and centralisation would be one solution to such co-ordination problems.

8.2.2.3. Option 3: EU-wide reserve with opt-out

A variation on full centralisation would be to have a central NER but allow Member States to opt out of this and use a separate national reserve under certain conditions. The purpose of such an arrangement would be to retain some of the benefits of centralisation while also recognising differences in Member State circumstances.

To make such an arrangement possible, and to retain the ability to address coordination problems, it would likely be necessary to include incentives for participation in the central reserve. This could include a “ring-fencing” arrangement whereby Member States would make contributions from the reserve from national caps and could only receive up to this amount back. This rule would aim to avoid free-riding on the contributions made by others. Another form of incentive could be to apply a discount or “penalty” to opted-out national reserve, requiring Member States to forfeit a proportion of the allowances they would otherwise be entitled to allocate, and thus ensuring that participation in the centralised reserve results in a larger total number of allowances for Member States and their installations.

8.2.2.4. Option 4: National reserves

A fourth arrangement would be to retain national reserves and allocations to new entrants as is currently the case. This could be supplemented by an EU-wide “rule book” that would set

conditions and format for such allocations. This approach would allow a relatively high degree of flexibility to address national concerns, while still harmonising those aspects of new entrant allocation that are particularly important for the competition in the internal market, the efficient functioning of the trading scheme, or the prevention of emissions leakage. The rules could specify the range of values that were permissible, the parameters that could be incorporated, which parameters were allowed to vary between installations, region, and/or Member State, etc. They could also include requirements to publish in advance all details of formulas to be used, to avoid situations where allocations are negotiated on a case-by-case basis.

8.3. Evaluation

This section assesses options for new entrant allocations against the agreed criteria of environmental effectiveness, economic efficiency, administrative cost and feasibility, and fairness and distributional equity.

8.3.1. Environmental effectiveness

8.3.1.1. Ability to maintain cap

Provided any new entrant reserve is set aside in advance, and any unclaimed allowances are returned to the market, decisions whether to have a NER and the format of any such allocations would not affect the cap on emissions from installations covered by the EU ETS. Similarly, if the allowances of closed installations were confiscated and returned to the market, the total number of allowances could be fixed in advance.

An alternative approach would be to cancel allowances that are unclaimed from the NER or that are surrendered by closed sites. The overall level of the cap would then depend in part on the extent of new entry and closure. The potential disadvantage would be less certainty about the overall level of emissions, although the overall size of the NER would put an upper bound on the size of the cap. (Harmonisation Option 3, which would allow Member States to opt-out of an EU-wide reserve at a cost of sacrificing some allowances, also could serve to tighten the overall cap.)

8.3.1.2. Ability to limit leakage

One motivation for new entrant allocations and closure rules is to limit leakage of investment and production – and therefore emissions – out of the EU ETS to areas without corresponding constraints on emissions. New entrant allocations can contribute to this objective by reducing some of the cost differential of investing in the EU relative to other locations. Because investment in the EU would be subject to emissions constraints it is likely that it would be lower-emitting than investment in countries where emissions are not regulated. However, it may be challenging to implement new entrant allocations in a way that preserves all of the incentives to invest in low-emissions technologies that are created by the trading scheme under ideal conditions.

New entrant allocations also can prevent leakage indirectly through their impact on incentives for research and development. Because they can preserve investment within the EU (rather than in regions without emissions regulations) investors have a greater incentive to take into

account emissions intensity. In the long-run, there therefore also would be more benefit from devoting resources to innovation of such technologies (although under ideal conditions this could represent “too much” innovation).

Closure rules also can have a role in reducing leakage. Such rules typically make allocations contingent on continued production, and therefore remove much of the incentive to reduce emissions by closing installations. This would tend to increase the cost of relocating production outside of the scheme. The flip side of this is that the closure of high-polluting activities can be a valid and cost-effective form of abatement. As with new entrant allocations, it therefore may be difficult to implement closure rules in a way that does not adversely affect incentives for least-cost emissions abatement.

To the extent the motivation for new entrant and closure rules is to prevent leakage, there may be reason to differentiate treatment between sectors. The amount of support required to preserve investment in the EU is likely to vary significantly between sectors, and need not be equal to “need”, i.e., the full expected emissions from new installations for the duration of the investment. As these allocation features may have adverse consequences for other aims of the trading scheme, it may be desirable to limit their duration and magnitude to be no higher than the amount required to prevent leakage, and to consider eliminating them in sectors not significantly exposed to international competition.

For the same reason, if leakage risks vary across countries, this could be viewed as a reasons to allow differentiation of allocations by Member States. Whether the potential emissions benefits of reducing leakage would outweigh the efficiency costs of differentiated new entrant allocations would need to be judged on a case-by-case basis.

8.3.2. Economic efficiency of trading scheme

8.3.2.1. Consistency with least-cost abatement

Under standard “idealised conditions”, new entrant allocations reduce the efficiency of emissions trading, because they shield investment decisions from the full price of CO₂, while exposing *operating* decisions to the full price. This skews decisions (after the start of the trading scheme) more towards new investment, and away from optimising tradeoffs between existing operations and new investments. As a result, the overall cost of reducing emissions rises. Of course, as noted in the previous section, when there is a risk of leakage, or concerns about lack of competition within a product market, there may be environmental or economic efficiency reasons for giving such a preference to investment, even though the costs of the scheme will increase.

Both new entrant allocations and closure rules can affect long-run incentives for cost-effective abatement. These impacts operate through a number of mechanisms – including the level, location, and type of investment, as well as effects on prices in product markets, and on the closure of high-emitting capacity. Moreover, impacts on incentives can vary significantly with the precise design of allocation methods, as we discuss below. Harmonisation of approaches may contribute to achieving allocations more compatible with cost-effective abatement. Member States may find it difficult to adopt approaches leading to fewer distortions if others do not do so as well.

8.3.2.1.1. *Impact on level of investment*

New entrant allocations lower the cost of investment, relative to the situation without new entrant allocations, and therefore lead to a higher *level* of investment. This is a key motivation for such allocations, whether prompted by concerns about leakage or about the viability of new investment to enter the market and compete with incumbent installations. Where such concerns exist, the additional investment resulting from new entrant allocations may be efficient when considered in the wider (non-ideal) context, in the sense of lowering the overall cost per unit of emissions reduced.

However, changing the cost of investment also risks introducing distortions to incentives for least-cost abatement. One aspect of this is that the overall level of investment may be inefficiently high, with excessive new capacity (relative to the optimum) created in response to the subsidy provided by new entrant allocations. Also, new entrant allocations are likely to be available only for physical extensions to production capacity but not to alternative methods of increasing production. They therefore may lead to incentives to carry out new investment rather than increase the efficiency or utilisation of existing capacity, even where this otherwise would be most cost-effective.

These effects occur with *any* new entrant allocations and the only way to entirely eliminate them is to eliminate new entrant allocations altogether. If an NER were retained, the effects would be smaller with lower levels of allocation. Harmonisation may help remove the incentive for Member States to use new entrant allocations to attract investment relative to other Member States, and therefore lead to less distortion overall.

8.3.2.1.2. *Impact on location of investment / closure*

New entrant allocations also can have an impact on the *location* of investment. In particular, different levels of new entrant allocations for equivalent investments in different Member States could influence where investment takes place. This may be a concern from a distributional point of view (see below), but it also has implications for economic efficiency insofar as it leads to distortions of competition within the European internal market. Ways to minimise this include eliminating new entrant allocations or centralising rules or administration so that the same level of allocation is received regardless of its location. This is more likely to be achievable under Harmonisation Options 2 (and possibly 3) than under Option 4.

The location of investment also is affected by transfer rules. Because current allocation plans are national, current implementations of transfer rules require that re-investment in new capacity after closure takes place within the borders of the Member State. This can distort the competition for investment between Member States, and creates an incentive for Member States to introduce transfer rules even where they may not be warranted for reasons of environmental integrity or economic efficiency. The distortion could be reduced by having EU-wide transfer rules, or by eliminating transfer rules altogether. However, the latter option has to be weighed against the potential benefits of transfer rules in restoring some of the incentive for replacing high-polluting installations with newer and low-polluting replacement capacity.

8.3.2.1.3. *Impact on type of investment*

One of the features of existing new entrant allocations that has given rise to the most concern is that similar new installations may be eligible to receive significantly different levels of free allocation. Differences occur between Member States, but also *within* Member States because some approaches to new entrant allocation have used different benchmarks, and thus provided different levels of allocation, to different methods of producing the same output. For example, different levels have been provided to power plants depending on the fuel, technology, or production process used to produce electricity.

Such differentiation has the potential to adversely affect incentives to invest in low-emitting technologies. Without new entrant allocations, or if all “equivalent capacity” received the same level of allocation, investors would take into account the expected future price of allowances. Higher-emitting technologies therefore would be at a relative disadvantage to lower-emitting technologies, as intended by the introduction of the trading scheme. However, if higher-emitting technologies receive a larger allocation to offset their higher emissions costs, the incentives to invest in low-emitting technologies can be weakened or even reversed.

As noted above, one way of guaranteeing that there is no such distortion of the choice of technology is not to award new entrant allocations at all. If new entrant allocations were to be retained, there are a number of different options that would help to reduce the distortions—if not eliminate them completely. As noted above, one way to do this is to award the same level of allowances to all new installations that offer the same product / service, regardless of location, technology, fuel, or inputs used. This could include providing the same level of allocation to new entrant installations that are not expected to produce *any* emissions (such as renewables) – or incentives to invest in such technologies will be weakened.⁵¹

The absolute level of any allocation to new entrants is generally less important in determining incentives for clean technology than is the *relative* level provided to different new entrants producing the same output. Provided the level of allocation is the same to all equivalent capacity, investment choices between technologies are not changed relative to the “least-cost” abatement choices. Benchmarks set at a “challenging” level do not therefore provide greater incentives for lower-emitting technologies. “Standardised” benchmarks could be designed to preserve incentives for low-emitting technology but could reflect *average* performance or some other measure. Nonetheless, as noted above and discussed further below, the level of the allocation can have implications for other evaluation criteria, including some aspects of efficiency.⁵²

Second, it is possible to use “bonus” provisions to favour particular technologies over others. For example, this has been done with combined heat and power or cogeneration in some Member States, as a way to account for the capacity to produce multiple outputs—i.e. heat

⁵¹ Many non-emitting technologies already receive additional support, so the price of CO₂ allowances does not provide the only investment signal for low-emitting technologies.

⁵² The primary difficulty here is likely to be in defining “equivalent capacity”, because of the potential substitutability of different products across the economy. Incentives that are perfectly consistent with those that drive the least-cost abatement choices may be impossible to achieve without the elimination of new entrant allocations altogether.

and power—from the installation. Awarding such bonuses is one way to reinstate the incentives that may be diminished as a result of including new entrant allocation provisions. However, in general, it may be challenging to make the incentives match exactly those that promote least-cost abatement decisions.

Allocations may be more likely to correspond to economically efficient outcomes with greater harmonisation. Inefficient allocations lead to higher allowance prices across the EU, so there are “spill-over effects” whereby decisions in one Member State have the potential to adversely affect other Member States. To the extent individual decisions do not take this impact into account, the decentralised outcome may constitute an inefficient trade-off of objectives, viewed from the perspective of total costs incurred across the EU. Moreover, and related to this, while there is significant potential for distortions in the aggregate, actions of most individual Member States are likely to have only a small incremental impact, and incentives to eliminate them may be weak unless others take the same action.

8.3.2.1.4. Impact on product prices

Another aspect of new entrant allocations and closure rules is the potential impact on product markets. Cost-effective abatement requires that the cost of emissions is reflected in the price of products. This encourages increased efficiency of end-use and reduced consumption by consumers, which typically are among the cost-effective ways to reduce emissions.

In the long run, new entrant allocations can cause product prices not to incorporate the full cost of GHG emissions. This happens when long-term equilibrium prices depend on the long-term marginal cost of production, which includes investment costs. Broadly speaking, in competitive markets prices would not be expected to rise above this level, because market entry then would be profitable and would occur until prices were bid down. Prices also could not be lower than this level in the long run, because then new entrants could not profitably enter the market to replace retired capacity or serve increased demand.

New entrant allocations have the effect of reducing the long-term marginal cost by lowering investment costs. In the long run, they therefore may keep prices lower than they would be in the absence of such allocations. This effect would only occur where capacity is scarce and new investment is undertaken in response, and thus may not be relevant in the shorter term. Similarly, closure rules also can affect prices by preventing withdrawal of production capacity. In the short-run, depending on how “closure” is defined, firms also may be willing to sell output below their full marginal cost (e.g. if this is required to produce or emit above the threshold where closure rules are triggered).

In general, in markets where product prices do not reflect the marginal cost of allowances, consumption responses and associated abatement will be smaller. For a given cap, other, more expensive abatement therefore has to be undertaken, with higher total costs as a result. These effects potentially occur with all types of new entrant allocation, and therefore would be fully eliminated only if no such allocations were awarded. They can of course be lessened by reducing the level of allocation to new entrants.

8.3.2.1.5. *Impact on operating and production decisions*

If allocations to new entrants are fixed in advance they may not affect production decisions, except indirectly through the effect on prices discussed above. However, there are some circumstances where production decisions may be changed by the allocation approach.

The most relevant instance of this concerns situations where new entrants in one phase are treated as “incumbents” in future phases—for example, if their actual output during an earlier phase of the scheme replaced a standardised utilisation rate used when they were new entrants. This could happen if the baseline for allocations was periodically revised to reflect more recent data. This has the potential to introduce distortions of production as well as investment choices. Operators / investors in new entrant installations will adjust their production and investment accordingly, anticipating that higher production in the immediate years after entry could lead to higher allocations in the future. Some of the incentives for emissions reductions (through lower output) therefore would be undermined. This is a special case of “updated” allocations, which we discuss further in the next chapter.

The simplest way to avoid such distortions (apart from eliminating allocations to new entrants altogether) would be to differentiate permanently between installations that acquired a permit after the start of the trading scheme, and whose operations predated the start of the Scheme, or to limit the extent to which activity baselines are revised in later periods.⁵³

8.3.2.1.6. *Impact on closure decisions*

Closure rules have the effect of reducing incentives to shut down otherwise uneconomic production capacity. Because such closure would reduce emissions, preventing it typically means that other, more expensive emissions reductions have to be undertaken to comply with an overall cap, with higher overall costs as a result. The importance of closure as a form of abatement is likely to increase with time, as new investment becomes possible, and as technological progress leads to higher differences in emissions intensity between new and old technology.

The impact also depends on the formulation of the closure rules. Current implementations range from not specifying the rules to relying on a threshold reduction in emissions or production, above which the installation is regarded as “closed”. If this threshold is low, the impact on incentives for abatement is likely to be greater, and may start to resemble “ex-post” adjustment of allocations, where receipt of allowances depends on the amount of activity in the previous year. The timing of closure rules also can influence the extent of distortions created. In general, the longer closed installations are able to keep allocations, the less the subsequent forfeiture of allowances will distort decisions to close (and conversely, the less effective closure rules would be at preventing leakage).

⁵³ As noted in the next chapter on “updating”, one option that would reduce the adverse efficiency implications of baseline revision would be to use aggregated and standardised load factors for each sector, rather than installation-specific baseline revisions.

8.3.2.2. Functioning of allowance market

New entrant allocations and closure are unlikely to have large impacts on the functioning of the allowance market. One possibility is that they may have an impact on the volatility of allowance prices, depending on rules for the cancellation of allowances either due to closure of installations or a surplus in the NER. If the expectation reflected in the market was that allowances would be released but they were subsequently cancelled, this could increase volatility. To prevent this kind of volatility the decision about how to treat unused allowances should be taken as early as possible (Phase II NAPs were required to state how unclaimed reserves would be treated). On the other hand, to the extent cancellation of an NER surplus provided a method to adjust the cap in response to variations in the level of investment and other economic activity, it could reduce some sources of volatility. The risk for large surpluses or deficits in the new entrant reserve may be larger with national than with an EU-wide reserve, as the uncertainty associated with individual investment projects is likely to have a smaller impact, on average, on the discrepancy between the size of the reserve and the number of allowances actually claimed.

There also is a converse relationship whereby a well-functioning allowance market may reduce the need for allocations to new entrants. One argument for new entrant allocations is that they guarantee new entrants access to allowances, which otherwise could be withheld by incumbents in an attempt to deter entry. Given the number of participants in and the overall size of the GHG allowance markets, it seems unlikely that any market participant would be able to manipulate the market in this way over the long term (influencing the market on a day-to-day basis cannot be ruled out). A liquid allowance market thus could substitute for free allocation in providing access to allowances, as could regularly held allowance auctions.

8.3.3. Administrative costs and feasibility

8.3.3.1. Costs of establishing and maintaining allocation

If new entrant allocations are awarded, it would be necessary to determine the size of the NER. The work involved will depend on the purposes of the reserve. For example, to the extent the NER is intended to account for (all) growth it is likely to require growth projections. Where national NERs are retained but rules are harmonised there would be a need for a process to review applications and enforce provisions. This could include applications to opt out of a central NER, or ensuring that particular allocation formulas comply with harmonised rules. It also would be necessary to establish eligibility rules, which may be particularly contentious if some sectors were eligible for new entrant allocations but others not. The format for reviewing national allocations could interact with State Aid reviews, or be run through a separate review process at EU level.

Developing benchmarks and detailed formulas for new entrant allocations also can require significant research and administrative effort. This is particularly the case where, as may be important for efficiency and transparency, benchmarks for potential new entrants need to be established and published in advance. Establishing allocation formulas may be particularly complicated in industries with complex production processes and/or multiple final products. In most industries no new entrant allocations have been awarded for “de-bottlenecking” or other increased use of existing capacity. However, in certain industries production is “integrated”, in the sense that a physical extension of one piece of equipment has significant

emissions implications for other parts of the production process. Drawing the line between emissions attributable to the new piece of equipment and those from existing capacity therefore may be difficult in such industries. Additional complications also can arise where new capacity provides an intermediate input into several “downstream” production processes, particularly where there are multiple (and variable) final outputs. Developing output-based benchmarks for such circumstances could be very complicated or costly, and the resulting allocations may not be transparent.

An important aspect of this process is to determine the degree of desired standardisation, and the consequences of standardised benchmarks. This empirical work is necessary to establish the potential trade-off between preserving incentives for clean technology and other considerations, including equity.

Closure rules raise other administrative questions. In particular, it may be difficult to establish whether installations have closed or not, particularly if the price of closure is forfeiture of allowances.

Because of the potentially significant administrative costs associated with developing rules for new entrant allocations and closure, it is likely that eliminating them entirely would reduce administrative costs. As with all design options, harmonisation of new entrant and closure rules offers another way of reducing the overall cost of establishing and maintaining allocations. In general, fewer approaches mean that less research and administrative work has to be undertaken.

8.3.3.2. Transaction costs

New entrant allocations and closure rules are unlikely to influence the level of transaction costs incurred in the allowance market.

8.3.4. Fairness and distributional equity

Allocations to new entrants have made up a relatively small share of allowances under Phases I and II of the EU ETS. However, over time an increasing proportion of emissions will be accounted for by installations that did not exist at the start of the Scheme in 2005. Allocation to these installations therefore also will be increasingly important for the distributional consequences of the trading scheme—particularly if they remain categorised as “new entrants” (distinct in some way from installations that existed prior to the start of the Scheme).

8.3.4.1. Burdens to covered operators / installations

8.3.4.1.1. *Distribution between incumbents and new entrants*

Without new entrant allocations, new entrant installations would receive no transfer or compensation corresponding to that received by incumbents. This may raise concerns about providing a “level playing field” but may be compatible with other principles of “fairness”; for example, it may be consistent with a principle to compensate for “stranded costs”, which new entrants arguably do not incur as a result of the trading scheme (because any investment they make is in the context of a functioning ETS). The larger the size of the NER, the

smaller the pool of allowances that remains available to incumbents (assuming a predefined overall cap).

It can be difficult to allocate to new entrants on a par with incumbents while preserving incentives for clean technology. For example, where incumbent allocations are provided through benchmarking, they can reflect a number of attributes of installations – such as fuel use, efficiency, or other attributes of the production process – and therefore may be able to match the level of allocation relatively closely to the likely emissions of the installations; moreover, in the case of incumbents, generally it is possible to do this without adversely affecting incentives for clean technology or other abatement. By contrast, differentiating new entrant allocation benchmarks along these dimensions can significantly reduce incentives to invest in clean technology, as discussed. Where different benchmarks are used for incumbents and new entrants, different allocation *levels* also may follow.

These issues become more significant if a larger proportion of installations receive allocations based on new entrant formulas over time. This would occur if, to promote efficiency, the classification as “new entrant” is permanent. As a larger share of emissions is accounted for by installations that did not exist in 2005 when the EU ETS was launched, differences between allocations to incumbents and new entrants also have a larger effect on distributional outcomes.

Closure rules also may be affected by fairness considerations. To date, although continued allocation to closed installations provides the best incentives for abatement (ignoring the possibility of leakage), allowing closed sites to retain allocations appears to have had low acceptability among many stakeholders.

8.3.4.1.2. Distribution between Member States

New entrant allocations also have a link to the distribution of allowances between Member States. With national NERs (“Option 4”, above), this issue need not arise, as overall caps can be set through a separate process. However, with an EU-wide reserve (“Option 2”), the allocation to Member States may depend in part on the actual extent of new entry in each Member State. The central NER therefore may in part account for different investment (and potentially growth) rates in different member States. The intermediate option, of a central reserve with national and “ring-fenced” contributions (“Option 3”), would not have this feature.

A feature that caused concern in Phases I and II of the Scheme was that identical new entrant capacity investment in different Member States could result in allocations of different magnitudes. Particularly where installations compete in product markets spanning several Member States, this may be undesirable and detrimental to fair competition. As discussed above, options for addressing this include awarding new entrant allocations from an EU-wide reserve that harmonises formulas, levels, transfer rules, and other aspects relevant to the absolute level of allowances received. If allocations remain at a Member State level, parity of allocations will be more difficult to achieve.

8.3.4.1.3. *Distribution between New Entrant installations*

It also may be challenging to achieve distributional equity between new entrants. As noted above, incentives for clean technology are best preserved by standardised new entrant allocations that provide the same level of allocation to equivalent capacity producing the same output. However, this may imply using the same benchmark value for installations that have very different emissions characteristics, with associated concerns about distributional fairness. For example, a standardised benchmark for electricity producers would provide the same level of allocation to technologies with widely disparate emissions characteristics, including coal plants (with and without carbon capture and storage), combined-cycle gas turbines, and (combustion) plant using renewable energy. As plants using renewables are non-emitting, they would receive an “over-allocation”; whereas any single allocation value below the level of the emissions of coal plant would result in likely “under-allocation”. Analogous technological and input differences exist in many other industries.

Choosing a benchmark that represents an average of potential new entrant technologies could reduce the aggregate over- and under-allocation created by the benchmark. However, it also would result in larger total new entrant allocations than an approach that used a low-emitting benchmark as its basis (and this may lead to lower allocations to incumbent installations). Also, this approach could not eliminate over/under-allocation individual cases. It also would entail allocations to non-emitters, which may be perceived as unfair.

8.3.4.2. *Burdens to consumers of affected products*

Consumers may be affected by new entrant and closure rules to the extent that these lead to lower long-term equilibrium product prices, as discussed above. However, this potential benefit may be offset in part or whole by the higher allowance prices to which these allocation features give rise. Put differently, consumers may be better off with high pass-through of lower allowance prices than with partial pass-through of higher allowance prices.

8.3.4.3. *Taxpayer and other welfare effects*

As noted above, new entrant allocations and closure rules can influence the location of investment, both between Member States as well as across EU trading boundaries. To the extent employment is influenced by investment, it also may be affected. The same could hold for progress in low-emitting technologies, although such progress could simply displace technological progress in other sectors.

Other potential effects, such as the prospect of a “double dividend” from auctioning, are not influenced by new entrant and closure rules *per se*, but rather by the extent of free allocation and the use of auction revenues.

8.4. Conclusions

8.4.1. Summary of evaluations

New entrant allocation (and closure) rules can reduce the efficiency of the trading scheme, although the size of this reduction depends upon how the rules are designed as well as external conditions. These rules can be motivated by a large number of policy objectives, among them equity and concerns about barriers to entry and emissions leakage. Although

they represent a departure from the standard “idealised” allocation approaches that minimise the cost of achieving a given emissions target, real-world circumstances (in particular differences in the stringency of international GHG restrictions) mean that in some cases they could increase the efficiency of the scheme.

New entrant allocation and closure rules directly affect investment decisions and therefore competition among firms in the European internal market. They therefore may represent a situation of a “prisoners’ dilemma”, where Member States would prefer an externally coordinated outcome to a “race to the bottom” resulting from individual and decentralised decisions. To this extent, harmonisation – whether through an EU-level reserve or through a detailed EU-wide “rule book” – may be a preferred outcome.

A general principle of economically efficient emissions trading is that all operators should face the same marginal incentive to reduce emissions, whether making investment or operating decisions. To the extent that the choices made by the operator / investor influence the number of allowances received, this tenet is violated. One relevant consideration in this regard is whether allocation formulas are published in advance. If they are not, allocations are likely to depend on negotiations between the operator / investor and the regulator, which can reduce certainty and transparency and affect incentives. If Member States are to retain the option of setting their own new entrant allocation rules, it seems reasonable to require that these are published in detail in advance of each trading period, to allow the rules to be reviewed and compared by all stakeholders.

New entrant allocations and closure rules may be able to prevent the migration of production and leakage of emissions to some extent, but they could do so at the price of eliminating incentives for some genuine and cost-effective abatement. This may occur via a number of mechanisms, including by influencing the level, location, and type of investment and closure, and potentially by affecting prices in product markets. Under ideal conditions, the only way to fully eliminate these distortions is to abolish closure rules and new entrant allocations altogether. Identifying and incentivising the “true” least-cost abatement choices in real-world circumstances is not be straightforward, however.

The adverse efficiency effects of new entrant allocations can be reduced by standardising the benchmarks—employing a single benchmark value for all technologies producing the same output—but even fully standardised benchmarks would not eliminate all distortions. Standardisation would impose a significant constraint on allocations and could run counter to other principles guiding allocations—including distributional concerns between different types of new entrant installations or between Member States. Some Member States may support the ability to opt out of harmonised, standardised rules under certain circumstances. The impact of closure rules may be reduced by allowing closing installations to retain their allowances for some period after shutdown, and by employing transfer rules. However, unless transfers of allowances are permitted across Member States such rules could contribute to distortions of investment in the internal market.

The “one product, one benchmark” approach required to minimise distortion of investment decisions can be a significant constraint on feasible new entrant benchmarks. It may not be desirable to extend this restriction to incumbent allocations, where differentiated benchmarks do not lead to similar incentive problems. There may, therefore, be arguments in favour of not providing the same level of allocation to new entrants and incumbents. Moreover,

standardised benchmarks for equivalent capacity is almost certain to entail some under- and over-allocation to different new entrants using different technologies—this retains efficient incentives, but could run counter to some notions of fairness.

Clarifying the trade-offs between different objectives would require information about the empirical significance of these the various considerations discussed above. There are substantial empirical uncertainties about these considerations—the potential advantages of harmonisation, the significance of leakage, the extent of distortions from new entrant allocations and closure rules, and the distributional concerns to which such rules or their absence may give rise.

8.4.2. Implications for other allocation decisions

Because new entrant allocations are likely to be benchmarked, this feature may have implications for the use of benchmarking for incumbents. For example, it seems likely that if increased use were made of benchmarking approaches to allocation for incumbents, this would reduce the additional administrative costs of developing benchmarks for new entrants. As highlighted above, however, a different set of considerations is likely to arise for new entrants, especially with regard to incentives for least-cost abatement.

The system of new entrant allocations also could be combined with that for the auctioning of allowances. One suggestion has been to combine the new entrant set-aside with the pool or allowances for auctioning into a single “new entrant and auctioning reserve”. New entrants would be eligible to receive allowances from the reserve, and the remainder would be auctioned gradually through the allocation Phase. This reserve would be designed to be larger than a reserve for new entrants only, and thus would help avoid the risk of an under-sized new entrant reserve. It would be similar to a deliberately over-sized new entrant reserve where the surplus is auctioned, but would differ in that the gradual release of allowances would mean the market would not have to wait until the end of the phase for the allowances to become available.

Harmonisation of new entrant rules could be pursued without harmonising other aspects of Scheme design—including cap-setting and incumbent allocations. However, harmonisation of cap-setting, particularly if caps were determined using EU-wide sector-based calculations, probably would entail a high degree of harmonisation of new entrant rules. Different approaches to cap-setting also may have implications for the size of the NER.

Both new entrant allocations and closure rules also are linked to other potential “updating” elements (i.e., allocations where the number of allowances is contingent on decisions made by operators). Many of the aims of new entrant allocations and closure rules, and especially the prevention of leakage, potentially could be addressed through other updating approaches as well—with similar implications for incentives for cost-effective abatement. We discuss these issues further in the next chapter on the general topic of updating.

To the extent new entrant allocations and closure rules are motivated by a desire to limit leakage, it may be desirable to develop contingency arrangements in the event of an international agreement to limit emissions after 2012 that would reduce the risk of leakage. This may be particularly relevant if NERs are used for “exposed” sectors only. The contingency rules would need to be coordinated with other potential contingency

arrangements—notably contingency arrangements for the overall cap and the levels of auction.

8.4.3. Way forward / next steps

There are several other issues that are important for future decisions about new entrant allocations. In particular, it is important to evaluate the trade-off of different objectives. As highlighted above, the chief disadvantage of new entrant allocations is the detrimental impact on the economic efficiency of the trading scheme. Inefficiencies arise due to the potential for higher allowance prices at a given cap and the potential for distortions in the Internal Market if new entrant allocations vary between Member States. Against this stand concerns about competitiveness and environmental performance, notably the possibility of investment and emissions leakage, and also some potential distributional considerations between new entrants and incumbents.

An important next step to develop the new entrant allocation approach therefore would be to determine the relative importance of these considerations. A first step may be to establish empirically the relevance of the overall losses to economic efficiency caused by different types of new entrant allocation systems applied to specific sectors. There is at present little empirical information available on this, although theoretical considerations as well as some emerging studies suggest that the adverse impact on economic efficiency could be significant under some implementations.⁵⁴ To assess the trade-off the corresponding empirical information also would be required for competitiveness concerns, and especially how the trade-off may differ by sector. In particular, an important next step would be to agree on a definition on which sectors are “exposed” to adverse competitiveness effects, a consideration we discuss in the next chapter.

This in turn would allow an evaluation of the implications of options for reducing adverse impacts on economic efficiency. Efficiency could be improved in two main ways. First, the *differentiation* of new entrant allocations could be reduced. This is likely to require additional research to clarify the trade-offs at stake. The potential disadvantage of standardisation is a wider dispersion between allocation levels and realised emissions, although this may differ significantly by sector. The advantage of a standardised benchmark approach is that many of the adverse incentive effects can be limited.

Second, the *magnitude* of new entrant allocations could be reduced. Possibilities include eliminating new entrant allocations altogether; changing the duration of new entrant allocations; and changing the magnitude of allocations. In all these cases the implementation could vary by sector, and also could be tied to overall developments in free allocation. Whether these different steps are desirable would be a political decision to be informed by information about the empirical relevance of the trade-off outlined above.

These issues are directly related to the issues of harmonisation, as some changes (notably, standardisation within sectors and measures to avoid distortions in the internal market) are

⁵⁴ The studies that we are aware of that have looked at new entrant allocation, as opposed to more stylised forms of updating, have focused on allocation to the power sector, and typically have emphasised the distortions caused by differentiation of allocation levels to different fuels and technologies, rather than the distortions caused by the existence of new entrant allocation per se.

likely to require coordinated implementation of allocations in different Member State. This chapter has set out four options, varying from the elimination of the NER altogether, to various degrees of harmonisation, to retaining the current system of Member State decisions. The choice between these options depends in large part on the decisions about the trade-offs set out above.

9. Updating Allocations

9.1. Introduction and Background

A standard and widely accepted result of the economic theory of emissions trading is that under a certain set of assumptions, different allocation approaches (including auctioning) do not differ in the overall cost of achieving emissions reductions. Given certain standard conditions, different allocations will still lead to the same decisions by firms about how to reduce emissions, the same the price of emissions allowances, and the same prices and output levels in product markets. This extends both to the level of free allocation, and to the exact distribution of any free allocations. As allocation need not affect either environmental effectiveness or economic efficiency, these aims can in principle be achieved and considered separately from concerns about the distributional consequences of emissions trading – which in turn be addressed through the allocation of allowances.

However, these properties of allocation hold only if allocations are carried out according to certain principles. As discussed above, the key condition is that allocations do not depend on any decision taken by participants after allocations have been set.⁵⁵ Intuitively, if the number of allowances received is independent of participants’ actions, they also will not influence which actions are taken. We refer to allocations that conform to this principle as “idealised” allocations. In practice, idealised conditions can be closely approximated by using metrics such as historical activity (e.g., emissions or production) or immutable physical attributes of installations to allocate allowances. As we discuss below, however, the “idealised” conditions may be more restrictive than is immediately apparent, placing significant limits on the data and principles that can be used to develop a system of allocation consistent with economic efficiency.

The structure of this chapter is as follows. The next section defines “updating” allocations and introduces five different types of allocation that fall under this definition. We then briefly discuss the interaction of updating with other allocation parameter. The subsequent section then evaluates updating provisions generally against the evaluation criteria outlined in Chapter 2, and also considers how different forms of updating perform against these criteria. The final section summarises the evaluations and discusses connections between updating and other allocation decisions.

9.2. Categories of Updating

By contrast to “idealised” allocations, if the number of allowances received is contingent on the subsequent actions taken by participants, allocations have the potential to influence the decisions taken. We refer to such allocations as “updating” allocations, because the number of allowances received is not determined in advance, but “updated” depending on the

⁵⁵ The conditions also specify certain features of product markets, including profit maximisation by firms; perfect competition in the allowance market and all relevant markets; negligible transaction costs in the allowance market; and that allowance constitute a small proportion of firms’ overall costs. We do not discuss these issues further in this note, which focuses on allocation.

decisions taken by participants. We discuss the main forms of updating allocations below, but postpone discussions of the consequences of updating to the evaluation section.

9.2.1. Updated baselines

Allocations in Phase I and Phase II of the EU ETS typically have been calculated on the basis of activity (typically, emissions) during a historical baseline period. The most direct form of updating is where this baseline period changes over time to include years since the programme started (or was announced or made law). For example, allocations in a particular year may be based on activity in the five preceding years. This allocation approach has several implications:

- § *A participant's allocation depends in part on its current and future actions.* This happens because the current year eventually forms part of the baseline period used to calculate emissions in a future time period. For example, if allocations are based on emissions, higher current emissions can lead to higher future allocations.
- § *New entrants can receive allowances.* The activity of new entrants is incorporated into the baseline period used to calculate emissions, after more or less delay.
- § *Closed facilities may no longer receive allowances.* Once a facility ceases production it may no longer register activity that enters into the formula used to calculate allocations. Depending on the precise methodology used, closed installations with zero activity in the baseline period therefore may forfeit their allocations. In the five-year example above, a facility that ceased operations entirely in 2012 would no longer receive allocations in 2018.

9.2.2. Ex-post adjustment / contemporaneous updating

An extreme case of updated baselines is where *current* activity determines *current* allocations. Under this form of allocation, instead of using a historic baseline year, which then becomes the basis for future allocations, allocations are adjusted *ex post* to reflect the activity level actually realised within the allocation year. *Ex-post* adjustment constitutes a significant departure from the approach taken under the EU ETS to date and would have important implications for the results and costs of the program, as we discuss below.

9.2.3. New entrant allocations and closure rules

While new entrants can become eligible for allocations through the updating of baselines, a more direct way to provide new entrants with allocations is to set aside a portion of allowances specifically for this purpose. This approach means that new entrant allocations can be calculated without the delay of waiting for a revised activity baseline. Such allocations were included in Phase I and Phase II NAPs, where allocations to new installations have been drawn from a pre-specified reserve of allowances and allocated on the basis of technology benchmarks and/or production / business plans. New entrant set-asides constitute a form of updating because allocations are contingent on current and future investment decisions by operators; specifically the allocation received depends on the decision to construct new capacity, and may also depend on the choice of production technology and other features of the new installations.

Similarly, provisions to remove allocations from closed installations can be explicitly included in the allocation methodology. Such closure rules are a form of updating because the number of allowances received depends on the decision to close. The definition of “closure” in turn may depend on the level of production or emissions, which can cause closure rules to resemble ex-post adjustment; for example, if all allowances are forfeited when emissions levels fall below a proportion of baseline period emissions, then reductions in emissions or production may result in smaller allocations in a way similar to that under *ex-post* adjustment.

New entrant allocations and closure rules were discussed in detail in Chapter 8, so we do not address them further here.

9.2.4. Transition from “new entrant” to “incumbent” status

A variation on new entrant allocations is to treat new entrants as incumbents after a delay, once data on their activity levels becomes available. For example, allocations for the first five years may depend on technology benchmarks, but subsequent allocations on the activity in the first five years. This period then effectively becomes the “baseline period” allocating to the installation, and therefore introduces another form of updating to new entrant allocations. Allocations depend not only on new entrant technology characteristics, but also on the operating decisions (e.g., output, or emissions) made by operators of installations.

9.2.5. Implicit updating

In addition to deliberate updating, updating-like features can be introduced implicitly through other aspects of the allocation mechanism.

One potential mechanism for this is through the use of activity growth projections. Projections of future activity have been used in most NAPs under the EU ETS to determine the allocations received by different sectors or facilities. Where projections incorporate recent historical data, there is a link between production decisions and allocation levels—as higher volumes of output can result in higher future projections, and thus in higher allocations. This can provide an indirect (and perhaps unintended) link between a firm’s output decisions and its future allocation. The magnitude of this link and of any unintended consequences depends both on the extent to which the activity of the individual firm influences projections, and on the influence of growth projections on allocations. The effect therefore typically would be smaller a) where sector-level rather than facility-level projections are used; b) where sectors are not highly concentrated among a few operators; and c) where projections are a small element in the allocation formula. Conversely, where the opposite conditions obtain, the implicit updating would be greater.

Another source of updating is through firms’ *expectations* about how their current or future actions may influence allocations. Expectations may be influenced by a range of factors, especially where rules are not well defined in advance, or are subject to change. For example, some Member States have indicated an intention to “claw back” some of the value originally awarded to companies through free allocation. If firms take this to mean that a large discrepancy between allocations and emissions risks resulting in lower future allocations, then the effect may be similar to that under explicit updating. More generally,

outcomes similar to updating may ensue where the regulator does not (or is not able to) commit to treating past allocations and activity as irrelevant for future allocations.

9.3. Interaction with Other Allocation Parameters

The effects of the above updating features depend heavily on other features of the allocation methodology. We briefly introduce some of the key considerations below.

9.3.1. Period length

With updated baselines, the link between operator decisions and allocations depends on the time period that elapses before the current time period becomes part of the baseline used to calculate allocations. With long time periods, the link is weaker, whereas contemporaneous *ex post* adjustment represents the strongest link in this regard. In the case of closure rules, the corresponding consideration is whether closed allocations forfeit further allocation immediately, or after a delay. New entrant allocations typically do not have a corresponding time dimension; indeed, one of the potential benefits of explicit new entrant provisions is that, unlike updated baselines, new installations do not need to wait until they start to receive allowances.

The repeated allocation decisions in the EU ETS mean that there can be a link between allocation Phase length and updating. This may arise because of explicit updating, if allocations are revised to use data from the previous Phase; or from implicit updating, if governments adjust the allocation or methodology in light of the actions taken by installations in the previous Phase. In both cases, the impact of updating on the Scheme is stronger with shorter allocation Phases. Of course, it would be possible to separate the updating of individual allocations from other aspects of Phases (such as the overall level of the cap, or non-updated allocations to incumbents).

9.3.2. Allocation metric

The nature of updated allocations also depends on the type of activity data that is updated. Unlike in the case of idealised allocations, the choice between emissions grandfathering and various types of benchmarking therefore has an immediate impact on scheme cost-effectiveness when updating elements are present. We discuss this in more detail in evaluation section 9.4.2.1

9.3.3. Harmonisation

The current implementation of the EU ETS harmonises certain aspects of updating but leaves others at the discretion of Member States. Currently harmonised elements include:

- § prohibition of (emissions-based) *ex post* adjustment;
- § guidance for Phase II related to the use of 2005 emissions data; and
- § certain rules governing new entrant allocations (e.g., that allowances be set aside in advance).

The status of other aspects of updating is less clear. For example, it is not clear whether the current implementation implies that new entrants should receive allocations on the basis of

historic data to put them on a par incumbents in future Phases.⁵⁶ It also is not clear whether Member States are required to apply a closure rule between allocation phases, or how such a closure rule would be enforced. Several other aspects of potential updating also have been left to Member State discretion, and may or may not be included in future NAPs.

As we discuss below, the inclusion of updating elements has implications for the emissions abatement measures that are incentivised, and the use of such features by one Member State therefore may have implications for the costs incurred by others. Further, some forms of updating may lead to outcomes that are perceived as distortions of the internal market. Moreover, there may be situations where the inclusion of updating becomes desirable to Member States because this approach is used in other Member States, but otherwise would not be. These considerations may form a rationale for harmonisation of updating provisions.

9.4. Evaluation

This section assesses options for updated allocations against the agreed criteria of environmental effectiveness, economic efficiency, administrative cost and feasibility, and fairness and distributional equity.

9.4.1. Environmental effectiveness

9.4.1.1. Ability to maintain cap

The inclusion of updating provisions need not influence the ability of a cap-and-trade scheme to achieve emissions reductions. Provided the total number of allowances is fixed, total emissions also can be limited.

Some forms of updating nonetheless may require special provisions to be compatible with a fixed cap. In particular, *ex-post* adjustment typically would require the inclusion of an adjustment factor to ensure that the total number of allowances does not exceed a pre-determined cap. In addition, because updating may lead to higher prices for emissions allowances and higher costs for participants, it may be more difficult to agree caps that require more ambitious emissions reductions.

9.4.1.2. Ability to limit leakage

As discussed in the chapter on new entrant allocations and closure rules, one motivation for updating provisions is to limit “leakage” of investment and production. New entrant allocations can contribute to this by encouraging investment in the EU, whereas closure rules can remove much of the incentive to reduce emissions by shutting down production within the EU. As noted in the previous chapter, the price paid for this may be reduced incentives for some “genuine” cost-effective abatement that would be undertaken under ideal conditions.

⁵⁶ Guidance to the Directive indicates that “new entrants” in one Phase become “incumbents” in the next phase, but this does not imply an unambiguous treatment of the prior Phase’s new entrants—for example, if incumbent allocations are based on emissions in 2002-2004, but Phase I new entrants have no such emissions, it is not clear what it means for Phase I new entrants to become incumbents in Phase II.

Similar considerations apply for other forms of updating. In particular, the concern with leakage often is linked to concern about the relocation of production outside the EU. Updating potentially can alleviate this concern by making allocations contingent on output levels, which would tend to result in a higher amounts of output from EU installations (than would be the case under “idealised” allocation approaches). For example, under output-based allocation with updated baselines, participants are faced with two opposing effects: on the one hand, producing an additional unit of output results in emissions that necessitate the surrender of current-period emissions allowances, the value of which depends on current allowance price; on the other hand, it also gives rise to an increased entitlement to emissions allowances in a future time period. The updating provision thus works similar to a “subsidy” per unit production, partly offsetting current emissions costs with future expected benefits, and thus reducing the net emissions cost of an additional unit of output. Other things being equal, the result of this mechanism typically would be to result in a higher level of output and lower product prices.

This effect is largest in the case of contemporaneous *ex-post* adjustment of output-based benchmarks. In this case, the offsetting effect of updating is immediate, as an expansion of output results in a larger number of current-period allowances. The emissions cost of expanding output therefore depends only on how generous the benchmark is. If the additional allowances completely cover the additional emissions that result from higher output (i.e., the installation performs at the benchmark level), *all* of the emissions costs of expanding output therefore would be offset. In this case, abatement through reduction of output would no longer be incentivised, and concerns about leakage would be substantially reduced.

With updating of other metrics, similar effects can be obtained, although it is less clear that they contribute to mitigating leakage. For example, input-based updating typically would result in higher input use. This would translate into reduced incentives to increase efficiency of input use, but may also increase production for a given efficiency, similarly to output-based updating. Similarly, emissions-based updating results in a lower net cost of current emissions. However, these effects also blunt incentives for some forms of abatement. As discussed below, this may result in higher allowance prices that partly offset any competitiveness benefits from reduced leakage

As noted in a previous chapter, to the extent that the risk of leakage varies between sector (and possibly by Member State), it may be desirable to differentiate updating provisions as well.

9.4.2. Economic efficiency of trading scheme

9.4.2.1. Consistency with least-cost abatement

As noted in Chapter 8, on new entrant allocations and closures, under standard “idealised conditions”, new entrant allocations can reduce economic efficiency by preventing emissions costs from entering into investment decisions. Similarly, other forms of updating can shield *operating* decisions from the full price of CO₂.

Updating causes firms to undertake less abatement for a given allowance price. Some of the emissions reductions methods that would be profitable without updating are no longer

economically viable, because they reduce the entitlement to receive allowances in the present or future. This has implications for the total cost of cutting emissions. Because the cap on total emissions has to be met, allowance prices must rise higher to induce the necessary abatement, compared to the case without updating.

The extent of this effect depends in large part on the metric used to calculate allocations. Unlike in the case of “idealised” allocations, the precise type of allocation – including the choice between benchmarked and emissions grandfathering allocations – can influence the extent of the distortion, and therefore the cost-effectiveness of the scheme as a whole.

To illustrate this, the different abatement options affected under different forms of updating of CO₂ emissions are illustrated in Figure 1.⁵⁷ Each column shows one of the four main categories of abatement available for CO₂ emissions:

- § Fuel / raw material switching—i.e., substituting high-emitting inputs for lower-emitting alternatives.
- § Efficiency improvements—i.e., reducing the amount of fuel or other input required to produce one unit of output;
- § Output reduction—i.e., reducing of the amount produced and consumed;
- § Closure of inefficient plant—i.e., the complete cessation of production (and possible replacement by new and cleaner capacity).

In the absence of this, a cap-and-trade scheme provides incentives for all these forms of abatement. However, with updating incentives are reduced to varying degrees depending on the allocation metric. Each row in the table below corresponds to a type of allocation metric. “Emissions” refers to an updated allocation based on emissions, and the other three to updated benchmarking allocation options where allocations depend on input/raw material use, product output, or installed capacity. The adverse impact on incentives for each type of allocation is marked with “ \hat{U} ”.

Figure 1
Impact of Updating on Abatement Incentives under Different Allocation Metrics

		Abatement options			
		Fuel switching	Efficiency improvement	Output reduction	Closure of inefficient plant
Allocation metric	Emissions	\hat{U}	\hat{U}	\hat{U}	\hat{U}
	Input		\hat{U}	\hat{U}	\hat{U}
	Output			\hat{U}	\hat{U}
	Capacity				\hat{U}

⁵⁷ Analogous effects take place with other GHGs, although the categories of abatement actions may be different.

As this shows, the impact of updating on incentives can vary significantly depending on the allocation metric. With an emissions-based approach, all forms of abatement are affected: reductions in current emissions always reduce the entitlement to future allocations, regardless of how the emissions reductions were achieved.⁵⁸ By contrast, updating of an allocation metric based on input preserves incentives to switch to lower-emitting inputs; for example, if allocations depend on heat input, a switch to a lower-emitting fuel would reduce current-period emissions (and thus costs) without reducing the entitlement to future allocations (and thus future revenue). With an output-based allocation metric, firms also can reduce emissions by improving their efficiency (the amount of input required to produce one unit of output) without adversely affecting their entitlement to future allowances. Finally, if allocations are based on capacity, all abatement incentives are preserved as long as the installation preserves capacity registered as eligible for allocation under program rules.⁵⁹

The implications of these abatement incentives are that any updating method will increase allowance prices (relative to the use of historical information), but the effect will depend on the type of updating used. This is illustrated schematically in Figure 2, below. The level of emissions is shown on the horizontal axis, while the vertical axis denotes the marginal cost of reducing emissions. The relationship between these two is the “marginal abatement cost curve” (MACC), which thus relates the cost of reducing emissions by an additional unit for a given level of emissions reductions. In a competitive allowance market, this marginal cost also would correspond to the price of allowances. In general, the MACC would be expected to slope down, as reducing emissions is easier at lower levels of effort, and costs nothing if emissions are left at “business as usual” (BAU) levels. Put differently, a more stringent cap level corresponds to higher allowance prices.

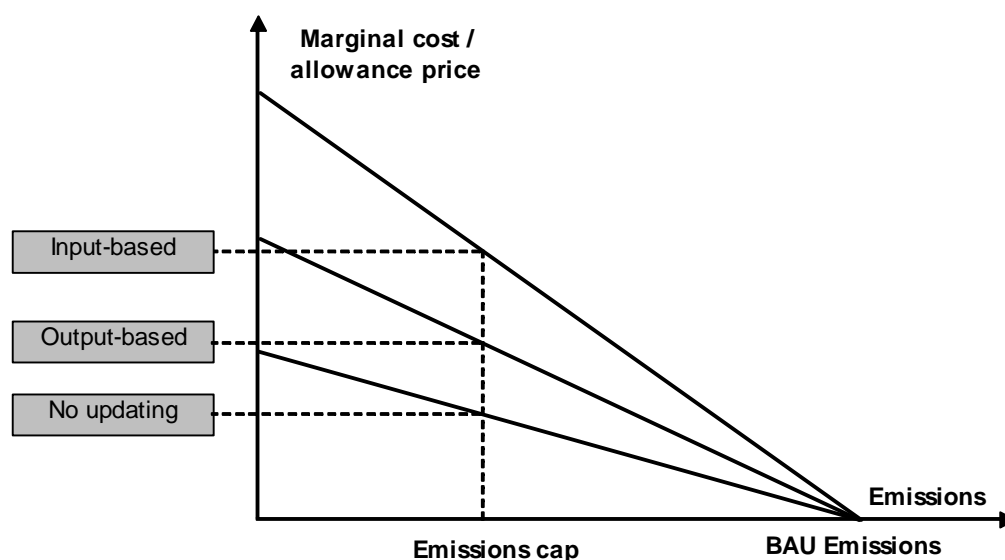
The lowest MACC illustrated in the figure corresponds to the situation with no updating. In general, the effect of reducing incentives for some abatement options is to make the marginal abatement cost curves “steeper”. Thus, because updating renders some abatement measures uneconomic, more expensive measures have to be undertaken to achieve the same level of abatement. The resulting allowance price is lowest with no updating, and in the presence of updating it varies depending on the allocation metric. Thus the MACC associated with the output-based metric is less steep than that of input-based updating, as it provides incentives for abatement through efficiency improvement. And for similar reasons, the output-based metric results in a steeper MACC than the situation with no updating, as reductions in output are not incentivised. Of course, the figure is illustrative only, and the importance of these considerations depends on how cost-effective different types of abatement measures are. Quantifying the differences in abatement costs corresponding to different updating approaches therefore requires a detailed understanding of abatement costs as well as an assessment of the precise incentive effects of the particular updating approaches being considered.⁶⁰

⁵⁸ The effect of an updated emissions-based approach are difficult to predict, and may be indeterminate, because the reduced incentives apply to all abatement options equally.

⁵⁹ As noted above, it is very difficult to define when “closure” has taken place without reference to output or other activity, and this allocation metric thus may be best regarded as a variation on output-based allocation.

⁶⁰ To our knowledge only very limited research has been undertaken to investigate these questions or related issues associated with the costs of updating more generally.

Figure 2
Impact of Different Forms of Updating on Allowance Prices



These considerations have implications for the trade-off between the potential benefits of updating and the associated higher abatement cost. Updating always entails a greater cost of reducing emissions from sources covered by the scheme. However, the potential to reduce leakage may mean that some forms of updating nonetheless may be desirable. The above discussion suggests that updating of output-based metrics is less distortionary than either input-based or emissions-based metrics, and also may be the form of updated allocation that is best suited to reducing leakage.

9.4.2.2. Wider market impacts

In addition to directly affecting abatement incentives, updating can have additional impacts on investment, closure, prices, and production. We describe some of the effects of updating briefly below. We refer the reader to the previous chapter on new entrant allocations and closure rules for a more detailed discussion of the impact of these provisions.

9.4.2.2.1. Impact on investment

New entrant allocations can increase costs by influencing the level, location, and type of investment undertaken. New entrant allocations always result in higher levels of investment than would be observed if there were no new entrant allocations, and this may lead to higher costs of achieving the emissions cap. If allocations differ between Member States there also may be distortions of the location of new investment projects. Moreover, if allocations are “differentiated”, so that operators receive different amounts of allowances depending on which technology they choose to produce a particular output, the type of investment also can be affected. In the long run, this can run the risk of substantially reducing the ability of the EU ETS to foster a switch towards “clean” technology. However, the magnitude of adverse impacts depend on the level of new entrant allocation, as well as the precise design of new entrant allocation methodologies.

9.4.2.2.2. *Impact on closure decisions*

Long-term reduction of emissions will involve the closure of high-polluting plants. Closure rules potentially can delay or prevent such developments, thus requiring other abatement to be undertaken instead. As additional capacity is kept in operation, this also may delay investment in (potentially cleaner) replacement capacity. Like with new entrant allocations, different closure rules, as well as transfer rules, also can distort the location of closure and competition in product markets.

9.4.2.2.3. *Impact on prices and downstream abatement*

Allocations that include updating of baselines can influence the price in product markets as well as the price of allowances. Under “idealised” allocations, the cost of emissions would be reflected in product prices. This is a necessary outcome if cost-effective abatement options are to be incentivised, as it encourages increased efficiency of end-use, substitution from high-emitting to low-emitting products, and reduced consumption by consumers. These actions typically are among the cost-effective ways to reduce emissions.

Updating affects this by reducing the effective CO₂ price faced by participants. As noted above, under updated baselines the cost of current allowances is offset in part by increased allocations in future time periods or, in the case of *ex-post* adjustment, increased current-period allocations. Producers would be expected to respond to this by being prepared to sell products at a lower price than they would without updating provisions (because by producing and selling more, they will receive more allowances). This is because the *effective* price of emissions is reduced, as the allowance cost is partly offset by the effect of receiving higher allocations. For a given allowance price, there therefore would be lower pass-through of costs to product prices (and therefore higher levels of output, as discussed above).

Lower product prices have implications for the “downstream” abatement undertaken. Consumption responses, including efficiency improvements and reduced consumption, would be smaller. Such measures typically are required for cost-effective abatement, and for a given cap, alternative and more costly abatement therefore would have to be undertaken. These effects potentially occur with all types of updating provisions.

9.4.2.3. **Functioning of allowance market**

The inclusion of updating provisions could have a significant effect on the functioning of the allowance market. For example, if participants received an allocation based on their actual outputs or even emissions in each year, this could significantly reduce their need to buy (or incentive to sell) allowances on the market. In addition, updating makes the scheme more complex for participants, as abatement, investment, and production decisions have to be judged not only against the current cost of emissions, but also against the potential future benefits of additional allocations, the value of which depends on future allowance prices.

9.4.3. **Administrative costs and feasibility**

9.4.3.1. **Costs of establishing and maintaining allocation**

As noted in Chapter 8, new entrant allocations entail administrative costs for processing NER applications, establishing eligibility rules, and establishing allocation benchmarks. Similarly,

closure rules can be difficult to enforce, particularly if the price of closure is forfeiture of allowances.

Other updating options also would add some additional complexity to the allocation process. Notably, in the case of updated baselines, allocations would have to be recalculated rather than remain fixed.

Updating also is likely to add to administrative costs to participants. In particular, there would be uncertainty about the amount of allocation received in future time periods and – in the case of *ex-post* adjustment – potentially also in the current allocation phase. This additional complexity may entail additional costs of participation in the scheme.

With all design options, harmonisation may offer one method for reducing the overall cost of establishing and maintaining allocations. In general, fewer approaches mean that less research and administrative work would have to be undertaken.

9.4.3.2. Transaction costs

Updating provisions are unlikely to influence the level of transaction costs incurred in the allowance market, although to the extent that the level of trading activity or market participation declines, transaction costs could be affected.

9.4.4. Fairness and distributional equity

“Idealised” allocations require that the data used to calculate allocations should be historical and should not relate to activity subsequent to the start of the scheme. Insofar as an objective of allocations is to mirror the “need” of installations, this can be a significant restriction, and may be perceived as unfair. A motivation for updating therefore may be to use more recent data that are more reflective of current conditions than are historical data from before the start of the scheme.

As noted above, however, the introduction of updating provisions also has other consequences for allowance and product prices. These also translate into changes to distribution, as we discuss below.

9.4.4.1. Burdens to covered operators / installations

9.4.4.1.1. *Burdens to participants*

Some have called for updating, and particularly *ex-post* adjustment, as a way to ensure that growth in production does not face the full cost of emissions. This can be motivated by distributional concerns, and especially the perception that declining companies otherwise would be “rewarded” whereas growing companies would be “penalised”. Indeed, it is likely that updating could produce a closer correspondence of emissions allowances awarded and the emissions actually produced.

However, the distributional implications of such an approach would be more far-reaching than may be commonly appreciated, for several reasons. First, updating may increase the total cost of reducing emissions. This will affect all participants to the extent they bear these costs.

Second, and less immediately obvious, updating may see a redistribution from producers to consumers. This is because many forms of updating (including new entrant allocations, updated baselines, and *ex-post* adjustment) are likely to reduce the pass-through of costs to prices, as discussed above. With idealised allocations, pass-through is likely to be higher, which reduces the impact on producer profits. Available studies indicate that this effect may be substantial and that, for a given level of free allocations, both prices and aggregate profits may be significantly higher with idealised allocations than under updating (while consumption and production would be higher under updating).⁶¹

9.4.4.1.2. *Distribution between participants*

Updating also can influence how costs are distributed between installations covered by the scheme. A potential motivation for updating is to use more recent or higher-quality data. There has been some concern that data from the years before the launch of the trading scheme may not be accurate, and that this contributes to an arbitrary misalignment of allocations with actual emissions. The use of data from 2005 onwards could reduce such concerns, but would lead to the incentive problems discussed above. One potential solution would be to use 2005 data for allocations from 2013, but announce that current data will not be used for future allocations. A problem with this approach would be to find a credible commitment; if allocations have been updated once, participants may conclude that this is likely to occur again. And, as discussed above, expectations about updating can influence behaviour.

A related concern is that restricting allocations to use pre-2005 data would lead to an “outdated” distribution of allowances. This may be a particular concern in industries that have seen significant changes in market shares. By updating allocations, such concerns could be addressed, but at the price of likely higher allowance prices and other distributional effects, as discussed below.

9.4.4.1.3. *Distribution between Member States*

Other concerns arise if some Member States included updating whereas others did not. The inclusion of updating by some Member States could lead to higher allowance prices that would have an impact on all others affected by the trading scheme. For this reason, updating provisions may be among the parameters that it would be important to implement centrally or through harmonised rules. In addition, if updating leads to installations in one Member States facing a lower effective cost of increasing output, it could distort competition and lead to loss of market share by companies in Member States without updating provisions.

9.4.4.1.4. *Distribution between new entrants and incumbents*

New entrant allocations have several implications for distributional considerations, as discussed in detail in the chapter on new entrants and closure. This includes the distribution

⁶¹ Few studies deal explicitly with the issue of updating, and most have focused on the electricity sector (see, for example, Neuhoff et al., 2006). For cement, see Demailly and Quirion (2005), which found that *ex-post* adjusted updating leads to cost pass-through of 5 percent, relative to pass-through of 75 percent without updating. For iron and steel, Quirion (2002) found price impacts under updating that were just 15 percent of the price impacts without updating.

between incumbents and new entrants, and potential distortions of competition between Member States.

9.4.4.2. Burdens to consumers of affected products

Consumers may benefit from some forms of updating provisions to the extent that updating leads to lower product prices and higher volumes consumed. This potential benefit could be offset in part by the higher allowance prices to which these allocation features give rise. Put differently, consumers may be better off with high pass-through of lower allowance prices than with partial pass-through of higher allowance prices—although this will depend on how significant are the distortions created by updating. Empirical information would be important to clarify these tradeoffs.

9.4.4.3. Taxpayer and other welfare effects

Other potential effects, such as the prospect of a “double dividend” from auctioning, are not influenced by new entrant and closure rules *per se*, but rather by the extent of free allocation and the use of auction revenues.

9.5. Conclusions

9.5.1. Summary of evaluations

Under idealised conditions, updating allocations typically constitute a departure from the cost-minimising method of reducing emissions. Because updating discourages some forms of abatement, other more expensive measures must be undertaken in their stead—including a greater reliance on lower-emitting production. In general, this results in higher allowance prices, and increases the cost of complying with a given emissions cap. Quantitative estimates of these effects on abatement costs are very limited, and as far as we know non-existent for most sectors. However, updating need not threaten the environmental benefit of the scheme within the EU, unless the higher overall costs associated with it lead to less ambitious emissions caps.

Updating could have environmental benefits outside the EU, by reducing emissions leakage. Updating can reduce incentives to reduce output in response to the price on emissions, resulting in reduced leakage and potentially improved competitiveness. However, it also would eliminate incentives for some output reductions (and switching from emissions-intensive goods to less emissions-intensive substitutes) that would not result in leakage but would constitute cost-effective abatement.

Another motivation for updating would be the distributional consequences of “idealised” allocations using only pre-2005 data. Motivations may be to use more accurate or recent data that enables better alignment of allocations with actual emissions or “need”. There also are indirect effects, as updating can result in lower output prices, which may benefit consumers at the expense of producers (for a given level of free allocation). These benefits would have to be judged against the potential added burden to both consumers and producers of higher allowance prices and overall costs that may result from updating provisions.

Clarifying the trade-offs between different objectives would require information about the empirical significance of the various considerations discussed above. There are substantial

empirical uncertainties about these considerations—the potential advantages of harmonisation, the significance of leakage, the extent of impact on allowance prices due to distortions from new entrant allocations and closure rules or other forms of updating, and the distributional concerns to which such rules or their absence may give rise.

9.5.2. Implications for other allocation decisions

If updating is introduced, the negative impacts can vary significantly with the general allocation approach. Among benchmarking options, capacity-based benchmarks are most likely to leave incentives relatively unchanged, and output-based benchmarks are likely to perform better than input-based benchmarks in this regard. However, as described in the chapter on benchmarking, other considerations – including data availability and the desire to match allocations to “need” – also influence the choice of benchmark. Another consideration is that output-based benchmarks may be more successful than either input-based or capacity-based benchmarked at preventing production and emissions leakage.

The impact of updating also may differ significantly with the length of the allocation phase. For example, if allocations were based on production ten years earlier, current production would only confer an emissions benefit in ten years’ time, and therefore distortions would be smaller than if they affected allocations in five years’ time. Conversely, a long lag may be unable to achieve reductions in leakage and may limit any distributional benefits (e.g., using up-to-date data) from updating.

Another consideration is that uneven implementation of updating may lead to “spill-over” effects and distortion of competition between Member States. For example, updating in one Member State can impose additional costs on other Member States, as the allowance market is EU-wide. Moreover, as the cost will be spread across the EU, but potential benefits accrue to the Member State(s) introducing updating, decentralised decisions may lead to more use of updating than Member States would find optimal if the decision were made collectively. To avoid this problem, there may be a case for centralising decisions or harmonising rules about updating.

10. Other Allocation Issues

This chapter concerns two allocation issues that do not fit clearly within the prior chapters: (1) contingencies regarding the implications of future international agreements; and (2) length of the allocation period (phase length).

10.1. Contingency Regarding Future International Agreement

There are various ways of accommodating the possibility that an international agreement on reduction of greenhouse gases would result in a more ambitious target for the EU of a 30 percent reduction in emissions, rather than a 20 percent reduction. These could include a combination of the following approaches:

- § Applying an adjustment factor to reduce all allocations in cases where benchmarking or grandfathering is used. This has the advantage of simplicity, but it may be difficult to reduce allocations that have already been awarded.
- § Reducing the number of allowances to be sold at auction. This has the advantage of not reducing the allocation of any particular recipient. It is important to recognise here that the reduction in the number of available allowances would be expected to be accompanied by a higher price for allowances.
- § Eliminating new entrant allocations. Guarding against reduced domestic investment and migration (of both production and emissions) to countries with less stringent CO₂ policies is one important argument in favour of maintaining a new entrant reserve. If this threat is diminished, new entrant allocations could be reduced or eliminated. This could apply only to new entrants after the announcement of agreement, or retrospectively to future allocations to all capacity added after the start of the trading scheme.

10.2. Phase Length

Another over-arching issue that has implications for most aspects of any approach to allocation is the length of the periods for which allocation parameters are determined in advance. There are a number of relevant periods, including the period for which the overall cap is determined, and the period for which individual allocations (and the share of free vs. auctioned allowances) are determined.

10.2.1. Phase length for overall cap

The current EU ETS cap is set for periods of five years, with the cap reviewed and set for the next period approximately 18 months prior to the start of the next period. This has the advantage that the cap can be revised in light of emerging information. In particular, concerns about emissions leakage may mean that stringent caps are feasible only if other countries also institute climate policies. The desired level of the future cap also may depend on the realised cost of abatement. Flexibility to revisit the level of the cap also was valuable at the start of the scheme, when reliable data on emissions by covered installations were not available.

The main disadvantage of sequential decisions is that they create uncertainty about future allowance prices, which depend on the overall cap level. This can form an obstacle to

investment in abatement options with long-term payback periods, which in turn leads to higher allowance prices (e.g., because other, more expensive abatement options have to be undertaken, or because investors demand an additional risk premium to account for allowance price uncertainty).

On the other hand, sequential decisions (or at least the possibility of review) make it more likely that caps that are set will be perceived as credible—a feature that is essential if participants and investors are to invest in long-term reductions. The feasible length of the cap therefore may be limited by a perception that decisions would be revised if costs were to prove larger than expected. The credibility of long-term commitments would be stronger if the commitments are difficult to reverse, so credibility depends on institutional set-up. For example, centralised decisions may be perceived as more credible to the extent they are more difficult to modify.

The phase length for the overall cap requires harmonisation to achieve certainty about the total number of allowances available. It currently is fully harmonised. While allocations and the overall cap currently are determined simultaneously, they could in principle be set for different time periods, as discussed below.

10.2.2. Phase length for individual allocations

Decisions about allocations currently are made sequentially at the same time as decisions about the overall cap. This gives the flexibility of adjusting how the burden of the trading scheme is distributed. This may be advantageous if the consequences of allocation methodologies used in previous phases were unexpected and adjustments for future phases are considered desirable. Several Member States and industries have expressed a desire to change future allocations for these reasons, though in practice most Member States used very similar methods of allocation in Phases I and II.

Repeated allocations also can have a detrimental impact on the cost-effectiveness of the trading scheme. This is not generally because future allocations are uncertain *per se*. Allocations, unless updated, need not affect abatement decisions. However, in practice repeated allocation makes updating features much more likely, as it introduces the possibility that current and future actions influence the future level of allocation received. For example, the use of growth projections for sectors typically would include recent information about economic activity, and thus recipients' actions could potentially influence future allocations. These considerations do not arise if allocations have been fixed previously.

Although the level of the cap and individual allocations currently are determined simultaneously allocations could be determined separately from the cap, and for a different time period. For example, allocations could be calculated based on the current cap, and an adjustment factor could be applied to ensure that total allocations also complied with future caps (possibly differentiated by sectors or otherwise). Conceptually, allocations thus would be set as *shares* of the overall cap, and thus vary with the separate decision on the cap.

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