06522 DG TAXUD

TAX TREATMENT OF ETS ALLOWANCES

OPTIONS FOR IMPROVING TRANSPARENCY AND EFFICIENCY | OCTOBER 2010

INFORMED DECISIONS

COPENHAGEN ECONOMICS

COLOPHON

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Client: DG TAXUD

Date: October 2010

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PREFACE

The EU Emissions Trading System is a common EU-wide market for emission allowances, in which the companies of all Member States can participate and where the cost of greenhouse gas emissions for those companies is determined. There are, however, no common rules as regards to the treatment of emission allowances in direct taxation. This can potentially create the following types of problems:

1. Non-neutral or non-consistent tax treatment could affect the efficiency of the trading scheme. This would make the achievement of emission reduction targets more costly than otherwise would be the case.

2. The differential tax treatment could also open up opportunities for tax planning and arbitrage and give rise to new distortions in the Internal Market as well as tax losses for Member States. Bearing in mind the extremely high mobility of allowances, with trade not dependent on the physical transfer of any goods but only a shift of allowances between accounts in the electronic register, this could potentially be a serious issue.

3. The OECD Model Tax Convention does not currently deal explicitly with tradable permits (or emission allowances), and therefore the treatment of income derived from trading of allowances in bilateral tax treaties depends on their treatment in domestic law of tax jurisdictions. In this regard, the practices may vary between the countries as several possible interpretations exist. Inconsistencies in domestic law treatment could actually lead to failure in relieving double taxation, which would increase the costs to market participants.

The possibility of purchasing or creating emission credits from CDM and JI projects and the future linking of the EU ETS with other regional/national cap-and-trade schemes could further exacerbate the problems of inconsistent tax treatment in cross-border situations.

In order to cope with potential inexpediencies in EU tax treatment of allowances, we have accomplished the following four tasks in this study:

- Analyse and identify the features of a tax system serving cost-effective implementation of the ETS system and underpin the proper workings of the Internal Market
- Collect information and data on current national practices for countries involved in the EU ETS system and countries outside Europe with similar cap-and-trade systems
- Analyse and identify significant problems with current practices
- Provide possible policy responses and solutions to identified problems

Chapter 1 MAIN FINDINGS

The whole rationale for the EU implementing flexible, tradable mechanisms is to reduce the abatement costs of achieving the set reductions in greenhouse gasses by exposing enterprises throughout the EU covered by these mechanisms to the *same marginal costs of emitting* greenhouse gasses. EU's system for internal trading with greenhouse gasses between enterprises in the EU – the Emission Trading System or ETS in the following – provides ideally the same monetary benefits for nearly all firms in power generation and large energy intensive firms, when they reduce greenhouse gas emissions (GHG), mainly CO2. Countries with binding targets for reducing GHG – so-called annex 1 countries under the Kyoto Protocol – can also reduce overall compliance costs by trading reductions. Finally, enterprises covered by the scheme can choose to finance abatement activity outside the EU – for example through Clean Development Mechanisms or CDM in the following – which can provide benefits to both EU and the relevant country. Given much less stringent climate policies in these countries, the expectation is that the costs of abatements in such projects are lower than internal abatement inside the EU.

The success criteria for the taxation regime for taxing these two key flexible instruments are then that they underpin the principle of cost-effectiveness, including proper functioning of the internal market. The two most basic requirements are:

- Tax systems should not influence where abatement takes place: if post tax costs of purchasing CO2 allowances were systematically lower in France than in Germany because taxation of ETS allowances was more beneficial in the former country, we would see purely tax induced shift of CO2 abatement from France to Germany.
- Differences in tax systems between countries should not give rise to unnecessary compliance costs for firms and authorities or opportunities for tax arbitrage.

1.1. BEST PRACTICE TAXATION REGIMES FOR ETS: FOUR KEY QUESTIONS

We define and answer four questions that are crucial when reviewing the functioning of tax systems vis-à-vis ETS and put forward our recommendations for best practice.

First, should allowances be categorised in national tax systems as (1) a commodity, (2) an intangible asset or (3) a financial asset, this being the three standard possible options? We generally argue that treating allowances as a commodity is the most natural solution and creates the least problems of implementation (see also below). Essentially, the purpose of these flexible instruments is to create a new trade 'commodity', namely emissions of GHG, with a common price inside the EU, which is to be treated as any other operational expense.

Second, should firms be allowed to deduct their purchase costs for tax purpose (1) in the year when it is purchased or (2) when it is used to comply with ETS obligations? We argue that the best solution would be to deduct it when it is used. If the allowance is bought and

used within the same tax year, the distinction makes no difference. However, ETS allowances can be stored: if not used in year one, they can be transferred for use in the subsequent years. Inherently, ETS allowances are not exposed to 'wear and tear', hence there are no costs associated with buying an allowance used for future compliance (besides financing costs plus risk of price changes). Indeed, this is a main argument against treating it as an intangible asset, an asset type that is typically allowed a linear depreciation of its value over its life time.

Third, should capital gains and losses on allowances be taxed when (1) realised or (2) when they accrue? Our verdict is more open here. Most analyses on tax systems are favourable to accrual based taxation as deferred taxation typically increases risk of non-compliance and tax arbitrage. Standard arguments against this are adverse cash-flow consequences for firms (taxes have to be paid despite no incoming cash from sale) and uncertainty about the real market price of the asset/commodity. While the latter argument clearly does not apply to ETS allowances that are traded on a real-time basis, the cash-flow problem could be an issue. Moreover, the tax systems in place in EU uniformly use realisation principles for sales of other operational assets and commodities, so we would also propose this principle here (more details about the treatment of financial firms etc. in chapter 3.2).

Fourth, how should free allowances be taxed? Our focus is on the post 2012 regime where the allocation of free allowances are increasingly being restricted to energy intensive industries in international competition, i.e. the enterprises that are most likely to react to tax induced distortions by the ETS. There are essentially two options on the table here: (1) the free allowances are taxed when received and deducted for tax purposes when used or (2) untaxed when received but also no right of deduction when used. If the free allowances are received and used in same fiscal tax year, there is no difference from a cash-flow perspective. However, if the allowance is stored for use in later years, the non-tax system is preferential for the receiving companies as there is no up-front taxation. Again, referring to the previous section, we argue in favour of accrual based taxation, but suggest that uniformity of treatment across EU is the most important question.

Summing up best practice, we would recommend the following:

- Treatment of allowances: commodity
- Depreciation: none should be allowed (no 'wear and tear')
- Time of deduction for auctioned allowances: when used
- Taxation of gains/losses: for consistency with rest of tax system, realisation
- Free allowances: more open question but preference for solution 'not taxed when received, no later deduction when used'

1.2. TAX TREATMENT OF CREDITS ORIGINATING FROM CDM OR JI PROJECTS

GHG abatement projects completed outside the EU can generate credits, each of which represents 1 tonne of greenhouse gas emissions as do EU allowances. There is a cap on how many additional credits that can be used for compliance in the EU ETS, but that is not the issue here. Rather, it is whether the taxation of the economic activities (also taking the use of ETS allowances for compliance into account) distorts the balance between competing CDM projects or the overall pricing of CDM projects.

There are three basic options for taxing projects in the process: (1) allow deductions for expenditure against realised gains as they materialise; (2) tax gross value of credit when sold, and (3) treat expenditures as investments and deduct against gross value of credit when sold. We would argue that project expenditure should be treated as an investment with no ongoing deductions. A firm buying a new and less energy consuming power plant cannot deduct the entire purchase costs at the point of acquiring the assets, but will activate the assets on its balance sheet and depreciate the costs over its lifetime. That calls for a model with activation and taxation on realised gains in line with our recommendation for ETS allowances.

However, the real underlying tax issues are much more difficult to deal with than for ETS allowances. *First*, the final purchasers of CDM credits (Certified Emission Reductions, CERs) or JI credits (Emission Reduction Units, ERUs), i.e. firms with compliance requirements under the ETS system, often organise their purchases through financial investments in 'trusts' that subsequently are more directly involved in the process of generating the credits. That almost by definition implies that there will be no up-front deductions available in the EU as there is no expenditure related to a specific operational action.

Second, the actual tax treatment of such activities will ultimately be depending on the tax law in the jurisdiction, in which the activities take place (China, India, Brazil etc), i.e. not in the remit of EU taxation. As a point of departure, the underlying abatement project is likely to be embodied largely within an existing firm in the host country. That means that all salary costs as well as capital expenditures through depreciation schedules will be deducted against the firm's overall tax bill as the project proceeds and that income from credits generated and sold is taxed as it is received.

Third, there is considerable uncertainty about the true value of the project up to its completion, creating the possibility of some difficulties to control tax arbitrage. If projects are sold between related parties, there may be an interest in selling a project to a firm in a low tax environment with a too low price and sell it from that tax environment once the project is finally realised at or close to the market price of an ETS allowance.

1.3. POTENTIAL DISTORTIONS RESULTING FROM MEMBER STATE PRACTICE

The general and important point is that often no clear and explicit tax rules have been adopted while case law also remains limited within the EU. So, the summary below is based upon best estimates of current assumed practice in Member States based upon a new survey commissioned for this study.

Of the 27 EU countries, 21 treat allowances de facto as a commodity, i.e., with either immediate or time-of-use deduction, cf. Table 1.1. Of these 21 countries, 9 allow for immediate deduction of the purchase price for tax purposes, while 12 only allow deduction when actually used for compliance purposes. Five countries treat allowances as an intangible asset and allow firms to depreciate the assets over their expected life time (set to between 6 and 10 years). One country (Portugal) does not allow any deduction. As regards free allowances, a large majority of countries (24) do not tax them when received, but do also not allow a tax reduction when used. Only 3 countries tax allowances as grants when received. In practice, this implies taxation of the excess of free allowances received against allowances used for compliance. National tax treatment are summarized below, cf. Table 1.1.

Table 1.1 Tax treatment of allowances in EU Member States

Issue	Treatment		
Treatment of allowance	Commodity	Intangible asset	
Time of deduction	Immediate	When used	Depreciation allowed
Countries	BE, DE, FR, GR, IE, LU, NL, MT, EE	DK, GB, IT, SE, PL, CY, CZ, SK, SI, LT, LV, RO	AT, ES, FI, HU, BG
Taxation of free allowances	Taxed when received	Not taxed	
Countries	ES, GB, GR	AT, BE, BG, CZ, CY, DE, DK, EE, FI, FR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SK, SI	

Note: Some countries seemingly allow different treatment of allowances. When this is the case, we select the treatment that is most favourable from a net present value perspective.
Source: Copenhagen Economics based on Deloitte study.

The question is whether these differences in tax treatments cause distortions in the functioning of the ETS.

For allowances received/bought in the year when they are used for compliance, the differences in tax treatment make no difference on the cash flow of firms. Hence, the tax treatment is irrelevant for the actual costs of purchasing allowances and does not impact on the relative costs for firms across Member States.

The tax treatment only matters when allowances are kept beyond one compliance/fiscal year. The effects of such different treatment can be measured by the Net Present Value (NPV) concept: how much is it worth for the firm in a country to be allowed linear depreciation of purchase costs up until the allowance is used for compliance, rather than just being allowed to deduct it when used? The same logic can be applied to other features that affect the timing of tax effects. Essentially, the NPV depends on the discount rate, the number of years between purchase and use for compliance (or sale of purchased allowances) and the company

tax rate. The effects on the NPV increase with the size of the discount rate (large benefit of upfront cash flows), the holding period (many years with depreciation of allowances) and the level of company tax rate.

Our general conclusion is that such NPV effects are small. There are four main reasons.

First, the effects per allowance are very limited. If we take an example, where a purchased allowance is kept for 8 years and we use a high discount rate of 10 per cent, then the NPV advantage of immediate deduction relative to time-of-use deduction is app. 8 per cent in terms of after tax costs, cf. Table 1.2. Much more modest effects are demonstrated for lower and more reasonable discount rates and shorter holding periods. The assumed realistic holding period is set to 2 years which is still somewhat high for an average allowance. When it comes to grandfathered allowances, the effects are even smaller since we know that allocation will be yearly and, therefore, does not allow for much storage.

Table 1.2 NPV adjusted cost of buying/receiving 1 € allowance

	Aggressive assumptions		**Realistic assumptions**	
Auctioning	After tax cost (€)	Pct difference from worst	After tax cost (€)	Pct difference from worst
Immediate deduction	0.77	-8%	0.77	-1%
Time of use deduction	0.83	-	0.77	-
Depreciation	0.80	-4%	0.77	-0%
Grandfathering				
Not taxable	0.00	-1%	0.00	-0%
Taxable income	0.01	-	0.00	-

Note: Aggressive assumptions contain 10 pct discounting, 25 pct depreciation, storage rate of 10 pct, and a time frame of 8 years. Realistic assumptions are based on 5 pct discounting, 12.5 pct depreciation, storage rate of 5 pct, and a time frame of 2 years. In both cases, we have corporate tax rate of 23.5 pct.
Source: Copenhagen Economics

Second, our review of firms' holding patterns suggests that very few firms hold allowances in excess of their actual needs for each compliance year. This has been so historically under rather lax emissions caps and is therefore likely to continue under future, stricter caps. Firms are free to involve in financial contracting to hedge risks over years, but that is a different tax issue.

Third, the very low differences in NPV only leads to very limited tax induced shifts in abatement. Private firms only move abatement if there is a financial incentive to do so. According to our model estimate of abatement and its costs, we observe small shifts in country abatement of around 1-2 per cent for most countries due to differential tax treatment of allowances. This leads to additional costs of around 2.6 million € under the aggressive assumptions from above, while the realistic assumptions yield an additional cost of 0.6 million €.

These figures must be seen in the light of total abatement costs of around 6 billion € for the 20 per cent reduction target for 2020. Thus, the additional costs from differential tax treatment are well below the 0.1 per cent level.

Fourth, the model experiment assumes that favourable tax treatment associated with holding ETS allowances in excess of compliance requirements translates into a cost advantage for the domestic firms located in the tax regime. However, it is far from clear that this needs to be the case. Rather, it provides an incentive for all firms irrespective of their main tax residence or production sites to hold potential excess allowances in a country with a favourable tax climate, provided it has a sufficiently large positive taxable income in that country.

1.4. Problems associated with cross border trade in allowances

As demonstrated above, the EU countries have taken different approaches to the treatment of ETS allowances, which could potentially give rise to problems when doing cross-border trade within the EU. There are traditionally two types of risk: (1) firms face double taxation or (2) firms are able to engage in tax arbitrage.

In order to prevent international double taxation, tax treaties establish two categories of rules according to which the right to tax is allocated to one of the two contracting states. *The first* category of rules determines the respective rights to tax of the state of source and the state of residence with respect to different classes of income and capital. *The second* category of rules determines that the state of residence must allow a relief from double taxation if the state of source is allocated a full or limited right to tax.

The OECD Model Tax Convention constitutes the basis of most of the tax treaties and essentially provides five main categories for treating any taxable event with regard to ETS allowances, namely 'Business Profit', 'Movable Property', 'Royalty Income', 'Capital Gain' or 'Other Income'. No case has yet tested what classification would be used, but from the inquiry carried out for this study it appears that most countries will use the clause on business profits (article 7), which is also consistent with a treatment of allowances as a commodity, cf. Table 1.3.

Table 1.3 Expectation of OECD Model Tax Convention provision in Member States

Provision	Countries	Number of countries
Article 7 on Business Profit	Austria, Estonia (has been used in practice), France, Germany, Greece, Malta (if qualified as trading asset), the Netherlands, Poland, Portugal and Spain	10
Article 6 on immovable Property	Italy	1
Article 12 on Royalties	None	0
Article 13 on Capital Gains	Bulgaria, Lithuania, Luxembourg, Malta (if qualified as capital asset), the Netherlands, Slovakia and Spain (depending on the qualification).	7
Article 21 on Other Income	Austria, Luxembourg, Malta and the Netherlands	4

Source: Copenhagen Economics based on Deloitte study

Despite the variety of treatments *expected*, we find the risk of double taxation to be limited as regards taxation of ETS allowances. The right to tax business profits, capital gain and other income is allocated to the residence state; a different qualification in the contracting states should not give rise to risks of double taxation apart from those that are involved in any cross-border activity and being non-specific to EU allowances.

1.5. GLOBAL TAX TREATMENT OF CDM/JI PROJECTS GIVES RISE TO MORE PROBLEMS

As the qualification and tax treatment of participation in CDM and JI projects as well as the qualification and tax treatment of emission credits are subject to great uncertainties, several arbitrage opportunities may exist. However, it should be noted that great uncertainties may also prevent tax planning due to the lack of due process and may further result in double taxation and the avoidance of participating in CDM or JI projects.

Potential tax planning opportunities can be divided into two main categories: (1) planning opportunities that occur due to inconsistent qualification or/and tax treatment of emission credits and participation in CDM/JI projects and (2) planning opportunities of more general character that also occur in relation to emission credits and CDM/JI projects. Below we have provided examples of both categories.

Examples of category 1 opportunities:

- Double non-taxation as a consequence of different interpretation of the term 'permanent establishment', which is likely to arise as these projects differ significantly from other types of projects. CDM and JI projects are unique as these projects only has a potential value due to legislation on the requirement of surrender of EUA's combined with the possibility of generation of emission credits (CER's and ERU's).
- Double non-taxation as a consequence of different tax characterisations and tax treatments with respect to domestic tax legislation and/or different qualification pursuant to tax treaties. This issue is relevant with respect to the qualification and tax treatment of

the emission credits, i.e. tax treatment of the grant hereof, trading and use to offset emissions in the EU ETS.

- Utilisation of the different characterisations in the various jurisdictions with respect to treating engagement in emissions credits, CDM or JI projects as acquisition of an asset (emission credit) that may be reported in the balance sheet and amortised/depreciated versus treating engagement in CDM/JI projects as a deductible expense. Although this difference may only be of a temporary nature, it could have a significant impact on cash flows of multinational groups.

Examples of category 2 opportunities:

- Centralising the possession of the group's participation in CDM, JI projects or group knowhow in one group company, which could serve as an intra-group 'creation centre'. If the group expects the creation centre to be profitable, the creation centre could be placed in a low tax jurisdiction or in an affiliated company with tax losses carried forward. If instead the creation centre is expected to be loss-making, it could be located in a profit-making affiliated company in a high tax jurisdiction.
- Transfer pricing legislation is likely to apply in relation to such intergroup transactions. In this respect it should be noted that the OECD Transfer Pricing Guidelines do not contain any guidelines on the estimation of appropriate transfer prices in the context of CDM/JI projects.

1.6. POLICY RECOMMENDATIONS

As a whole, we find little evidence that the current construct of EU national taxes and OECD based bilateral tax treaties will lead to significant malfunctioning of the EU ETS, nor to problems in relation to cross border tax issues such as double taxation or tax arbitrage as far as we have been able to identify. In particular, welfare losses from tax induced distortions to the location of abatement activities will be relatively small compared to the massive levels of abatement the system will deliver and the overall yearly purchase costs of ETS allowances. Potentially larger problem relates to the tax treatment of expenses related to CMD/JI and income from credits arising from such projects, partly specific to the nature of such projects and partly due to general transfer pricing problems arising in the evaluation of such projects, before they generate final credits vis-a-vis the ETS system.

However, the lack of clarity and transparency in terms of the treatment that Member States will apply to ETS allowances leads to unnecessary compliance costs. Auditing firms and firms with ETS compliance obligations spend time on guessing what explicit tax system will eventually emerge in countries that have not yet implemented specific tax provisions.

The EU and its Member States have several possible options.

The first and least complicated is to *adopt a set of best practice rules for taxation*, a code of essentially voluntary character. In our view, it could focus on a few key principles already outlined. Allowances should be treated as a commodity in national tax law and purchase costs deducted against the tax bill when the allowances are used for compliance. Any gains or losses resulting from changes in the price of allowances should be taxed when they are realised, i.e. when the allowances are sold. Accrual taxation is certainly possible, but deviates from tax practice in Member States. The exception is financial institutions and professional traders where accrual taxation is the norm. We also suggest that taxation of free allowances be included in the best practice guideline. We have a preference for the model where they are not taxed with the counterpart that they cannot be deducted when used.

In addition, it should be agreed in an appropriate OECD forum that ETS allowances in the context of bilateral treaties should be treated as business profits in line with the treatment as a commodity linked to firms ongoing production activities. That means 1) if profits occur from selling an allowance, the revenue shall be added to taxable income and the purchasing price will be deducted against taxable income, hence the difference constitute business profits, or 2) if the allowance is used for compliance in production of an end user product (e.g. power), the revenue from selling of the product is added to taxable income and the purchasing price of the allowance will be deducted against taxable income in the year of use, hence the allowance is treated like a commodity. As regards the treatment of CDM/JI projects, some consensus on the treatment of the taxation of expenses as well as taxation of later emission credits would be beneficial.

A second approach is to link a more co-ordinated approach to the taxation of ETS allowances with the work to create a Common Consolidated Corporate Tax Base for businesses operating within the EU, abbreviated as CCCTB. The complexity for firms and authorities of having to operate in a patchwork of 27 national tax systems entails tax uncertainty, double taxation, as well as compliance costs. This has led the Commission to initiate the work towards creating a CCCTB. If adopted, the CCCTB will make it possible for businesses *to opt* for taxation according to one set of common rules instead of national rules.

There are three problems associated with use of the CCCTB to solve the ETS taxation problem, which in our evaluation suggests that this is not a promising route. *First* of all, it is not completely clear under the CCCTB rules how an asset should be recognised for tax purposes. Indeed, the qualification of the ETS Allowance – as an intangible asset, a commodity or as a financial asset - could in itself prove to be difficult. So the implementation of a CCCTB does not solve the problem of recognition 'automatically', but still has to be decided in advance (by the Commission). *Second*, potential benefits depend on whether businesses actually choose to opt for the CCCTB rules and whether a reasonable amount of Member States decides to introduce the CCCTB rules. As a consequence, the introduction of the CCCTB would not necessarily entail that all companies/groups involved with the EU ETS would end up being taxed according to the CCCTB rules. *Third*, the near term probabilities of CCCTB being adopted and applied widely in the EU are not very high.

A third approach, or perhaps rather aspiration, would be if the ETS allowance could be said to fall within the EU's Interest and Royalty Directive. We did not find evidence of a risk of double taxation, but if transactions in allowances fall under the Interest and Royalty Directive this may prevent double taxation. However, the conclusion in this review is that income derived from EU ETS allowances or from CDM or JI projects are not covered by the notion of interests under the Directive as neither ETS allowances, nor CER's and ERU's qualify as debt claims. Furthermore, it is submitted that payments for the use of – or the right to use – ETS Allowances, CER's or ERU's are not covered by the notion of royalties for the purpose of the Directive.

Chapter 2 | OBJECTIVE OF THE ETS AND POTENTIAL DISTORTIONS

Before turning to the four tasks, we will outline the overall purpose and the overall design elements of a common cap-and-trade scheme such as the EU ETS. This is done in order to create a benchmark when evaluating current tax treatment and proposing a solution to the identified issues.

2.1. POTENTIAL WELFARE LOSS DUE TO DIFFERENCE IN TAXATION

The main objective in task number one of the study is to analyse and identify the features of a tax system that would serve the main purpose of the EU ETS. The main purpose is to abate the GHG emissions of the covered sectors along a least cost path. Below, we briefly outline *first* the purpose and functioning of the EU ETS. S*econd*, the potential consequences in terms of loss of economic efficiency of having different tax treatment within the EU is outlined and whether those consequences are such that they might interfere with the overall purpose of the system.

Purpose and means of EU-wide emission trading

The EU has set a target of 20 per cent GHG abatement in 2020 compared to the 1990 level of emissions. Basically, this target could be reached within each country using only national means, implying that every country would reduce emissions from emitters within the country's own borders by 20 per cent. Alternatively, this target could be reached without having to distinguish between national affiliations of the emitters. In this case, the EU is taken all together 'as one country'. The EU has chosen to do the latter for the sectors covered by the ETS. By allowing trade in GHG emission allowances, the actual abatement from the ETS sectors in each country will not necessarily be 21 per cent, which is the reduction required by the sectors covered by the EU ETS, but rather above or below.[1]

The main advantage of allowing trade in emission allowances is that the necessary abatement is achieved at least cost within the EU. If the GHG abatement target of 20 per cent was set for each country and had to be reached by only national means, the overall cost of reaching the target would be higher than necessary. This is due to the fact that some amount of abatement could be reallocated between countries with different marginal abatement costs, thus reaching the same amount of abatement but at a lower cost.

By designing a common market for abatement of GHG, we might expect that the entities with the highest abatement costs also have the highest willingness to pay (WTP) for the right to emit. We may thus expect that the market will allocate emission rights according to the highest WTP, thus the entities with the lowest abatement costs will choose to abate rather than emit.

[1] The overall target is – 20 per cent for the EU as a whole. This target is divided into -21per cent for the ETS sectors and -10 per cent for the non-trading sectors. In the ETS sectors abatement will take place wherever it is cheapest, independent of national borders. For the non-trading sectors there are national binding targets, which are different for each MS.

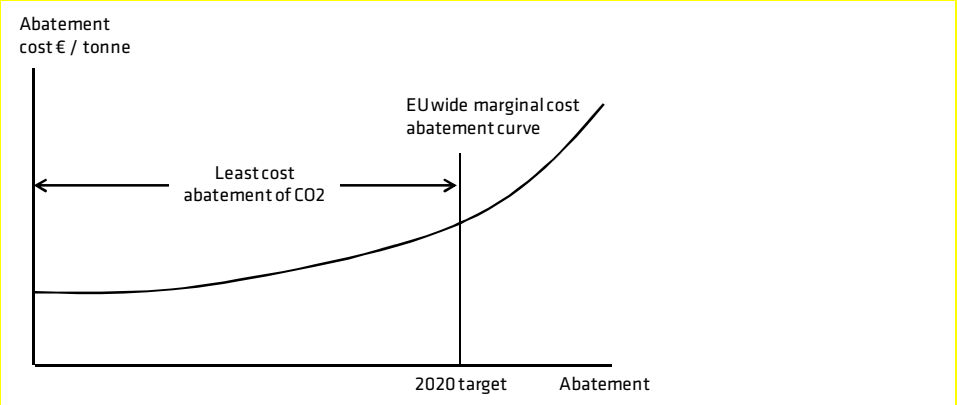
The choice of whether or not to emit is made by observing the market price of allowances. The market provides a price of emission allowances, which is used as input by the entities considering whether or not to emit.

Distortion of the EU-wide GHG abatement curve

However, the entities covered by the ETS will not only use the market price of allowances as a parameter of decision but also the after-tax price, including tax consequences of alternative use of allowances. As recognition of allowances for taxation may differ between countries the tax consequences may also differ (despite the pre-tax price being the same), potentially affecting the least cost order of abatement in the EU. A least cost order of GHG abatement in the ETS countries taken together is the benchmark for assessing the tax treatment of allowances in the ETS countries.

A least cost (pre-tax) order can graphically be illustrated as a marginal cost curve with all abatement segments ranked according to their cost, cf. Figure 2.1. In an optimal setting (with no distorting income taxation) only the segments up to the target will be activated, which is equivalent to abatement decisions being based on pre tax allowance prices.

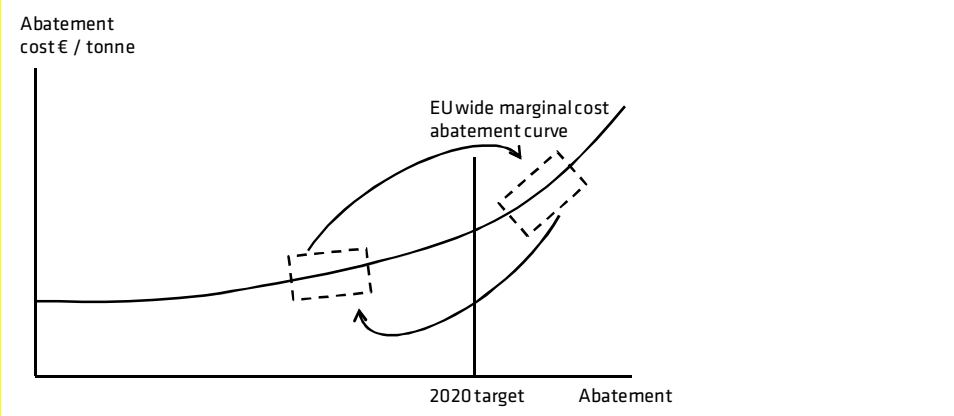
Figure 2.1 Pre-tax least cost order of CO2 abatement



Source: Copenhagen Economics

If the ranking of abatement segments changes in an after-tax set up, this may cause 'expensive' abatements in the 'wrong' places. Graphically, this can be illustrated as segments of the EU-wide abatement curve 'switching positions'. Hence, a segment with relative high costs will move from a position to the right of the target line to a position to the left of the target line. Thus, the segment will be included in the portfolio of abatement segments, cf. Figure 2.2.

Figure 2.2 After-tax order of CO2 abatement - distorted



Source: Copenhagen Economics

Please note that two segments initially located to the left of the target on the least cost curve may also switch positions (not illustrated). However, this will in the long run not be a problem in terms of economic efficiency as both segments would be activated anyway.[2] So in practice it implies that emitters with higher marginal abatement costs in the upper segment - for example because they have already accomplished investments in energy efficiency measures – will have a lower marginal willingness to pay than producers in the lower segment as the latter due to a better tax treatment face lower after tax costs.

2.2. CORE DESIGN FEATURES OF EU ETS

In order to assess the impact of differences in tax consequences some core features of the ETS instruments must be in place.

Number of allowances, the 'cap'

The EU ETS is a cap-and-trade scheme, the 'cap' being the total number of allowances (also labelled EUA) in the system in each trading period. From 2013 onwards, there is a single cap on the number of allowances for the whole EU (top down), instead of national allocation plans as in 2008-12 (bottom up). The number of allowances will be defined in such a way that there will be a linear 1.74 reduction in the number of allowances each year compared to the annual average of the 2008-2012 allocations, adjusted to take account of e.g. the wider scope as from 2013.

Methods for allocation

The allowances will be allocated in two different ways, which is relevant to note also in terms of tax treatment. EUA's will be allocated for free and by auctioning.

- In the first and second trading periods the major part of allowances are allocated free of charge (at least 95 per cent in the first and 90 per cent in the second period).

[2] If timing issues, i.e. by calculating the NPV of abatement costs, are taken into account, economic efficiency might be harmed as this is not in accordance with the principle of 'harvesting the low-hanging fruits first'.

- In the third period, the power generators, due to their capacity to pass on the cost of allowances in consumer prices, will face full auctioning from the start while for the industrial installations auctioning will be gradually phased in with a view to full auctioning by 2027.

Storage of allowances

Storage of allowances between years is a core feature of the EU ETS scheme. This feature is important, particularly in terms of economically efficient abatement of CO2 as this allows the companies to utilise the allowances at times when utilization creates the highest value, both for the company and for society. Take a coal fired power station as an example. Coal and allowances are complimentary inputs to the generation of power. Assume that coal is a scarce resource. Thus, the generator would therefore have to decide whether to generate at time *t* or store the coal to generate power at time *t+1*. If only coal is allowed to be stored but not the allowances, this might create in-optimal decisions in terms of power generation.

Between Phase II and III in EU ETS, rules allow allowances to be stored or banked[3] for use in future phases of trading, i.e. unlimited banking of allowances between the periods 2008-12 and 2013-20, and future periods. Within Phase III, allowances issued from January 1, 2013 and onwards are valid for emissions until 2020.

Theoretically, two types of allowances may exist in terms of storage; either allowances issued with a future vintage year, whereby entities cannot surrender the allowance before the allowance's 'vintage' year (that is, the first year the allowance can be surrendered) or allowances, which can be used for compliance now or be stored for future use. The first type is treated in the green paper from the Australian Government[4].

However, allowances with a future date are not a part of the EU ETS scheme. This implies that firms only can hedge against future allowance price changes by either buying more allowances than they expect to use within the current year or by engaging in purely financial hedging. There is a well defined forward market for allowances covering future years. As full storage is allowed the price of such a forward contract is essentially equal to the price of the current year plus the financing costs of holding that contract.

The instruments: EUA, CER and ERU

In addition to EUA's the companies in the EU ETS can make use of the so called flexible mechanisms in the Kyoto protocol. The instruments that are accepted in ETS, apart from EUA's, are CER credits generated by the emissions-saving projects in developing countries in the context of Clean Development Mechanism (CDM) and ERU credits from emissions-saving projects in non-Annex 1 countries via JI's.

[3] Storage of allowances between trading periods in the EU ETS is called "banking". It does not differ fundamentally from 'storage', but the term 'banking' is explicitly used when talking about storage of allowances between ETS trading periods.

[4] Australian Government (2008)

The use of CER's/ERU's is restricted. It is an explicit restriction that CDM and JI projects shall be a supplement to domestic abatement. The overall amount of credits used for compliance under the EU ETS should not exceed 50 per cent of EU emissions reductions during the period 2008 – 2020. From the start up to March 2010 only a marginal part of total certificates surrendered have been CER's/ERU's. About 160 million CER's and 3 million ERU's have been surrendered.[5] This should be compared to about 2,000 million EUA's per year. These proportions are partly due to the low carbon prices in the first phases of ETS, where fewer CDM/JI projects provide certificates at lower costs than the cost of an EUA when prices are low.

However, the potential for growth in the CDM sector is substantial. A recent study[6] estimates that 700-1,800 million credits are available through projects at cost below today's EUA price of around 16 €. With carbon prices at 30 €[7], the supply increases to 1,100-2,300 million credits.[8] Due to this potential, CDM projects are of large relevance to any analysis of the ETS from a taxation perspective.

A CDM project is initiated by an Annex 1 country, which seeks consent from the host country. The project initiator then submits a project plan to the CDM Executive Board (EB) for approval. The approval includes definition of baseline emissions, i.e. emissions in absence of the CDM project and estimation of *additional* reduction of emissions as a result of the project by a designated entity called a Designated Operational Entity (DOE). After this is done the project is registered by the EB. When abatement occurs the DOE requests the EB to issue CER's. The CER's are always issued after instructions from the EB and transferred to a so called holding account in an Annex 1 country or in a non-Annex 1 country with authorisation from an Annex 1 country[9]. Once credits have been issued by the United Nations' CDM Executive Board they may be sold by project developers on the market and thus become so called secondary CER's.

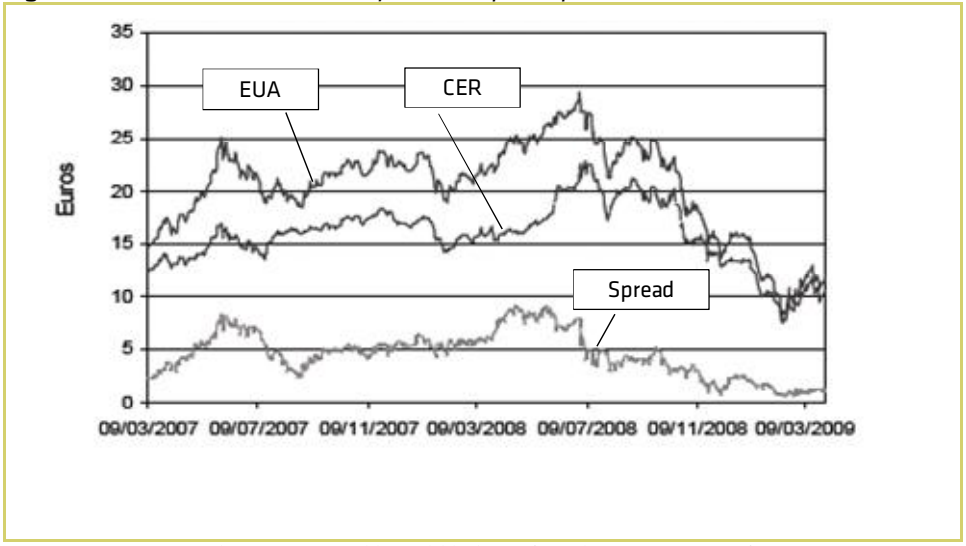
An interesting observation in the carbon market is that there is a significant price spread between the secondary CER's, which do not inherit any of the risks from the CDM-project since they have already been issued, and EUAs. In theory, as the secondary CER's are free of project delivery risks, the prices of EUA's and secondary CER's should be equal since they represent the same amount of CO2 emissions reduction (one tonne). However, the price spread is due to two reasons.

First, historically, a large share of the spread has been explained by uncertainties relating to the technical link between the European Commission's 'Community Independent Transaction Log' (CITL) and the United Nations' 'International Transaction Log' (ITL). The ITL-CITL connection involved the EU's 27 Member States disconnecting their national regis-

[5] The Community Independent Transaction Log (CITL)
[6] Frankhauser and Martin (2009)
[7] As foreseen by OECD (2009a) with a 20 per cent reduction target and gradually developing global markets for carbon.
[8] The span is due to uncertainties about the development of the CDM sector.
[9] UNFCCC website; http://cdm.unfccc.int/Registry/transaction/index.html

tries and reconnecting them to the ITL. Simultaneously, the CITL connected directly to the ITL. These operations allowed the delivery of sellers' international credits from the Kyoto Protocol (such as CER's) into buyers' EU national registries. This link was established on October 19, 2008 and before that date issued CER's remained in the UN CDM Registry, waiting for the connection with the EU registry to be completed.[10] The historical price spread has been around 5-6 € but after the ITL-CITL connection in October 2008 the spread has decreased to 2-3 €, cf. Figure 2.3.

Figure 2.3 Prices of EUA, secondary CER and price spread, 2007-2009, € / Tonne CO2



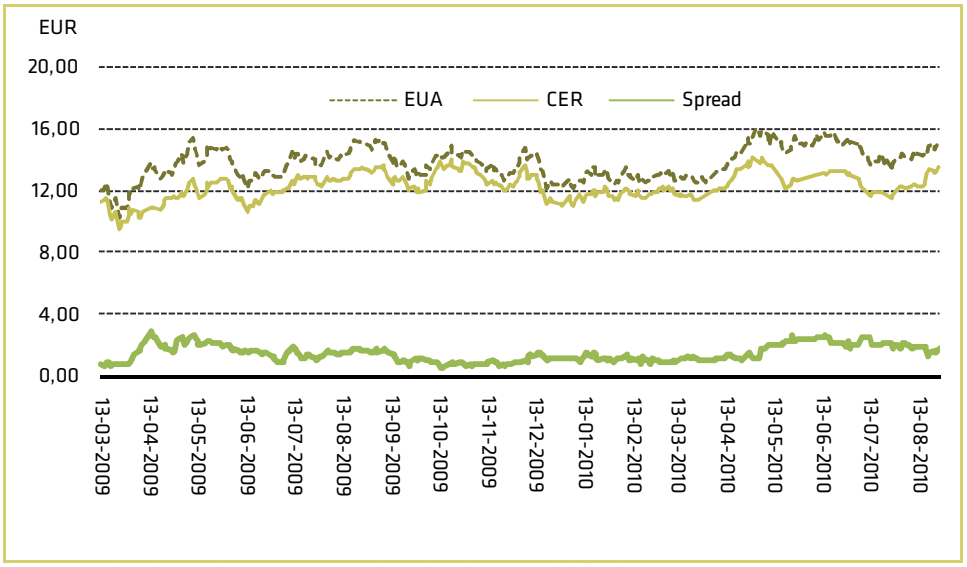
Note: Data prior to March 2009 is not readily available; hence figure layout is not in CE format.
Source: Alberiola et al (2010)

Second, a major reason for the price spread, and in our view the reason for today's price spread, is that the Commission has established a limit on the use of CER's of up to 13.4 per cent of the allocation from 2008 to 2012 on average. Due to the limit of 13.4 per cent on average of the credits surrendered, the secondary CER's' 'exchange rate' is smaller than for EUA's, which leads to secondary CER's being discounted with respect to EUA's.[11] In other words, the supply of CER's exceeds the demand and price then equals marginal cost of supply even though some buyers would be willing to pay up to the EUA price. It is important to note that the only ones who can immediately profit from the price spread are entities that are given free allowances; they may buy secondary CER and register them in their CITL, thereby offsetting their emissions. Subsequently, they may sell the EUA's that were allocated to them and earn the price spread. Market players that have not received free EUA's cannot do this. However, one has to bear in mind that this arbitrage opportunity is associated with a risk, namely that the 13.4 per cent ceiling is reached in which case any residual secondary CER's they hold will lose all value

[10] Chevallier (2010)
[11] Based on the reasoning in Alberiola et al (2010)

However, since the establishment of the ITL-CITL connection the potential benefit of such trade, i.e. the price spread between EUA's and secondary CER's, has decreased to about 2 €, cf. Figure 2.4.

Figure 2.4 Prices of EUA, secondary CER daily future (spot) prices, 2009-10, € / Tonne CO2



Note: Prices based on settlement price on each trading day. Spread defined as EUA price minus CER price.
Source: European Climate Exchange, Historical Data

With regard to tax treatment we do not see the issue regarding possibilities for arbitrage (or wind fall profits) as a tax issue. Instead, it is an issue regarding the design of the mechanisms for CO2 abatement and should be treated as such.

Like EUA's, CER's and ERU's may be transferred between Phase II and III. Upon request to national authorities, non-used CER/ERU's from 2008-12 may be exchanged to EUA's and be used from 2013 onwards.

Chapter 3 PROPER TAX TREATMENT OF ETS ALLOWANCES

We have identified five issues to be dealt with in order to design proper tax treatment of CO2 allowances:

1. How to recognize allowances for domestic tax law purposes (e.g. commodity, intangible - or financial assets) and purpose of purchasing and holding the allowance
2. Which taxation principle to follow – inventory (market value) or realisation taxation
3. Tax treatment of allowances allocated for free
4. Tax treatment of allowances originated as CDM or JI
5. Tax treatment of penalties for non-compliance

For each of the five issues we have put up the following framework for identifying proper taxation:

- Which options do we have for taxation?
- Pros and cons for different tax solutions

As the study shall analyze and identify the features of a tax system that would serve the main purpose of the EU ETS system, we will assess the options for tax treatment bearing in mind that the aim is cost efficient GHG abatement and that a tax design must aim to be in line with accepted principles for taxation:

- Simplicity
- Predictability
- Equity
- Absence of double-tax and non-tax

However, our focus will not be inefficiencies due to general differences in tax treatment, e.g. company taxation tax rates which differ between Member States leaving the after-tax price or tax value of costs defrayed for allowances at different levels. This holds for most costs for input or depreciation of assets in the Member States and may not differ in terms of CO2 allowances.

In the paragraphs to follow we present our findings regarding proper tax treatment. However, one key point is worth underlining up front: the potential problems arising from tax issues relate to the possibilities for storage. If an allowance is acquired and submitted for surrender/sold in the same accounting period, it will not matter in terms of real economics whether the allowance is recognized as commodity or intangible asset. The reason for this is that the cost (in principle) will be fully deductable against taxable income in that period irrespective of the tax treatment. Furthermore, if acquired and sold within the same year discussions of taxation of gains or losses due to allowance price changes based upon realisation principle as opposed to inventory (market value) also become moot.

3.1. Issue 1: How to recognize allowances for domestic tax law purposes?

When a company acquires an allowance either via secondary markets or via the auctioning procedure by the government, the existing income tax law would recognise the cost of acquiring permits. Basically, there exist three options for recognition of allowances:

1. Commodity (deductable expense),
2. Intangible asset or
3. Financial asset

The most important issue might not be which method to follow, but that differences in tax treatment between countries might be the main contributor to distortions in pricing and hence allocation of allowances between countries. However, by this we do not necessarily say that only harmonisation matters; actual choice of treatment will also matter.

Commodity

An allowance can be recognized as a commodity, thus it is a necessary expenditure incurred in carrying on business. In this way an allowance is an expenditure on a par with every other deductable expenditure in a business under most current tax laws. This means that persons carrying on a business can claim a deduction against their taxable income for expenditure incurred in carrying on that business.

The allowance will be counted as cost upon purchase; there will be no further tax consequences when the allowance is held and used for compliance. If the allowance is sold it will be counted as taxable income. Furthermore, if the allowance is purchased and used in the same accounting period it will be deductable against taxable income of that period. If the allowance is purchased and stored for later use, it will have no immediate tax consequence; hence it will be added on the balance sheet as an asset with a deduction of the cost deferred to the time the allowance is used.

Intangible asset

An allowance can be recognized as an intangible asset. An incurred allowance is then capitalised (activated) in the company accounts and as such added to the balance sheet in the accounts. When an asset is activated in the accounts it becomes eligible for depreciation; hence, the cost of the asset will be spread over a span of several years. The deprecation amount (in absolute €) in each accounting period will be deductable against the taxable income of the business. Thus, there is a difference in principle vis-à-vis commodity treatment where tax deduction is deferred to the year when the allowance is used.

Financial asset

The final option is to recognize an allowance as a financial asset. In this way an allowance may be purchased for investment purposes. However, we have to distinguish between whether purchase of allowances as a financial asset is part of core business or not. Allowances

recognised as financial assets may be purchased by banks and other financial intermediaries. Hence, it may be characterised as core business. If, say, an owner of real estate purchases allowances in order to receive a payment of interest it may not be characterised as core business.

Alternatively, one could imagine that a purchase of an allowance may have the purpose of supplying price hedging to entities, which uses allowances for compliance. However, price hedging may also be managed without having a 'physical' allowance in stock. However, in this way hedging can be managed by the delivery of a 'physical' allowance instead of paying out the difference in hedging price and price at the so called delivery day.

Allowances recognised as financial assets may be purchased as part of the core business and would be eligible for income taxation. In this way, there will be a deduction of the cost of purchase, which would be added to taxable income if sold.

Purpose of holding an allowance

In terms of allowing deduction for the costs incurred, the discussion of recognition is closely related to the discussion of purpose of acquiring an allowance. The purpose of purchasing an allowance could be:

- To meet the yearly obligation under the EU ETS
- As an investment (not core business)
- As part of a financial trading portfolio (core business)
- Part of a CSR (Corporate Social Responsibility) strategy or marketing campaign where allowances are surrendered voluntarily

In terms of taxation, each of the purposes are highly coincident with the recognition of allowances; e.g. the discussion of tax treatment if an allowance is treated as a commodity (recognition) and the discussion of tax treatment if the purpose is to meet an obligation (purpose) can be expected to be equivalent. Hence, we are only treating tax treatment in terms of recognition.

Pros and cons for different solutions

The basic difference between recognition as a commodity or as an intangible asset is when to allow for deduction in the income. This difference in timing is the main driver for listing pros and cons.

Timing issue. If treated as an intangible asset the opening value of the allowance is the part of departure for depreciation. However, depreciation is a term used to describe the cost of using the asset due to normal wear and tear or a decrease in value over time under normal circumstances (patent). An allowance is not exposed to wear and tear and cannot be expected

to decrease in value over time from other reasons than variation in market price.[12] Treating the allowance as an intangible asset as opposed to a commodity does not secure *convergence between time of cost incurred and income*. Hence, it may create over-incentives to purchase allowances in order to carry out tax-planning.

Simplicity. Treating the allowance as a commodity, where the cost of purchase is deductable against income when the allowance is sold or surrendered, is *simple*. In this situation, the company does not have to keep track of depreciation and primo/ultimo book value throughout the lifetime of the allowance as it has to if treated as an intangible asset. This might be time consuming especially in a situation where more allowances are acquired at different times.

Other inputs. Treating the allowance as a commodity is *in par with treatment of other inputs* into the manufacturing of goods. The owner of a coal fired power plant may view an allowance equivalent to a piece of coal as both are necessary inputs for the generation of power.

Capital gains. If capital gains are treated differently compared to direct income in terms of tax, tax treatment of allowances should not differ for this type of financial asset. Otherwise this may distort the portfolio of investments. However, given that most allowances are purchased for compliance and tax treatment of these may differ, incentives for purchase of allowances would also differ.

3.2. Issue 2: Which realisation principle to follow?

Two methods that could be used to determine the values of allowances in terms of tax treatment are inventory or realisation taxation.

If allowances are treated according to the *inventory or the market value principle*, any difference in the value of allowances held at the beginning of an income year and at the end of that year would be reflected in taxable income, with:

- any increase in value included as assessable income
- any decrease in value allowed as a deduction

Under the market value method, the closing value of an allowance would be equal to the market value of the allowance at the end of the income year.

If allowances are treated according to the *realisation principle*, any difference in the purchase price of allowances and the selling price would be reflected in taxable income with:

- any positive difference (gain) included as assessable income
- any negative difference (loss) allowed as a deduction

[12] This is also recognised in Estrada et al (2009).

Pros and cons for different solutions

The difference in the taxation principles is timing of taxation. If the inventory principle is applied changes in value will be added/deducted from taxable income at the end of each accounting period. If the realization principle is applied taxation will take place when the allowance is sold (or used for compliance).

The difference in taxation will, however, only have significant economic impacts if the market price of allowances is volatile, showing huge fluctuations between (and not within) the accounting periods. In case the price stays constant choice of principle is not important. Whether the price of a good stays more or less constant through periods depends on the possibility for storage. Power cannot be stored, hence that way we see much price volatility on the power exchanges. Regarding allowances, we might expect that prices will only show minor fluctuations, as the storage (and banking) option will dampen fluctuations. There have been price fluctuations in the past, but they may be dampened in the future because of improved banking options.

If prices on the other hand fluctuate the pros and con for each solution become relevant. We have identified the following pros and cons for the inventory principle:

Pros:

- Economically correct and neutral treatment of allowance value, including gain and loss. Important in markets with price volatility and expected gains in price due to Hotelling rent[13]. The taxpayer should be indifferent (from a tax perspective) as to whether they sell or retain the allowances. This will be secured by the inventory principle as the taxpayer will be taxed (or may claim a deduction) whether or not the allowance is sold or used. Hence, the taxation will not have influence on the decision to sell or keep.
- Completely transparent market values in real time. Traditional problems with getting good estimates of market values are non-relevant. The price of allowances in ETS is transparent as trade of allowances is part of the trading portfolio of the power and climate exchanges all over Europe. Moreover, as no physical barriers exist for trading (in contrast to power trade), only one price for allowances exists in the entire Europe at one point in time. So, the traditional problem and burdensome issue of getting correct estimates of market prices does not exist in terms of tax treatment of allowances. However, this issue might not be counted as a 'pro' for inventory taxation. We have placed it here just to highlight that the traditional location under 'cons' is not quite an issue.

[13] Also known as Hotelling's rule, which says that owners of a 'non-replaceable' asset will seek to maximise profit, hence price volatility.

Cons:

- There is the potential for taxpayers to be taxed on unrealised gains under the inventory principle. This might occur where the value of allowances suddenly increases before year end but goes back to trend level a few days later. This may result in taxpayers being taxed on gains that they are unlikely ever to realise—although a deduction could be allowed in the subsequent year if prices fall back to trend at the end of that year.
- Taxing of unrealised gains, not in par with current praxis of definition of assessable income. Inventory taxation is the exception rather than the norm for other expenditure linked to the running of the firms.

We have for the realization principle identified the following pros and cons, realizing that these might to some degree be a mirrored image of the inventory principle.

Pros:

- Avoids the taxing of unrealised gains, which due to substantial price fluctuation may have some effects on firms' cash flow positions.

Cons:

- Keep a record of the purchase cost of each allowance until it is surrendered or sold (each allowance is unique and can be identified with a serial number). The combination of uniqueness and the realisation principle means that a company that sells or uses an allowance for compliance needs to know, which exact allowance that is depreciated from the accounts.

3.3. Issue 3: Tax treatment of allowances allocated for free?

As the ETS Directive allows for transitional free allocation of allowances for free (mainly due to the risk of carbon leakage), the question of tax treatment of free allowances arises. We have identified two options for tax treatment presently in use:

1. No recognition of the allowance as taxable income. Purchase cost zero, hence no deduction in taxable income when surrendered or sold (but added to taxable income if sold).

2. Recognize the allowance as taxable income with market price at granting period being used as purchase costs, deducted from taxable income when surrendered or sold.

Allocation of allowances in the period of 2005-2012 was for the majority of allowances (around 95 per cent) allocated for free and based upon grandfathering with the number of allowances linked to historical emissions. This is important as we are mainly looking at po-

tential distortions in the ETS market from unequal/non-appropriate taxation. Given the character of the allowance – unlinked to actual or future behaviour of the receiving firms with some caveats[14] - differences in taxation levels between countries have little or limited impact on companies' choice of location.

Post 2012 we move on to a different framework, in which allowances will be increasingly auctioned. Apart from an optional and limited exception for some power plants, only industrial firms will receive allowances for free. The allowances will be allocated based on ex-ante benchmarks. The annual allocation per installation is fixed before the beginning of each trading period and changes in production levels during a trading period do not influence the allocation. No free allocation will be given to an installation that has ceased its operations, unless the operator demonstrates that this installation will resume production within a specified and reasonable time. Hence, any differences in taxation between countries will represent distortions of competition.

In defining the principles for setting ex-ante benchmarks in individual sectors or sub-sectors, the starting point shall be the average performance of the 10 per cent most efficient installations in a sector or sub-sector in the Community in the years 2007-2008.[15]

Although allocations are to be determined in advance for the entire third phase and no ex-post adjustment is foreseen, significant extensions of production capacity will be allowed additional free allocation and, in parallel, free allocation will be updated for installations that partly or fully cease their operations.[16] We note that increased allocation of free allowances is only possible if production *capacity,* and not production, is increased while a reduction of free allowances might take place if *operations*, i.e. production, are partly or fully ceased. This distinction is important to avoid that unutilised capacity, which of course does not emit any greenhouse gasses, generates free allowances. If unutilised capacity or ceased operations would still get free allowances incentives would be introduced to avoid maintenance and instead build new installations, which would generate additional free allowances.

To be able to allow for additional free allowances to capacity increases and new entrants, a buffer of allowances will be established[17]; 5 per cent of community-wide allowances for 2013-2020 are put away for new entrants[18]. However, the definitions of 'significant extensions' and 'new entrants' are not yet clarified. These definitions and the implementation

[14] The allowances are not totally decoupled; receiving firms have to maintain use of the production capacity that provided the reasoning for the granting of allowances in the first place. However, there is no requirement in the Directive to maintain a certain production level. Some Member States included specific closure rules in their National Allocation Plans for the second trading period and that detailed rules will be developed under Article 10a(19) and (20) for the third and future periods. Moreover, most countries have set aside reserves of free allowances for new entrants with allocations being based upon their actual needs; hence also here we have some coupling between actual/future emissions and the amount of allowances received.
[15] EC (2009), Directive 2009/29/EC, Article 10a, paragraph 2
[16] EC (2009), Directive 2009/29/EC, Article 10a(20)
[17] EC (2009), Directive 2009/29/EC, Article 10a, paragraph 7
[18] The concept of 'New entrants' is to be defined by Dec 31 2010

measures for the mechanisms to update emission will be adopted by the Commission by December 31, 2010.[19]

In essence, we argue for a harmonised approach between Member States for the future. In the choice of norm, we would argue that the pros and cons for taxation/non-taxation are as follow. We will treat option 1 and 2 together, by treating option 1 as they are mirrored images of each other:

Option 1

Pros:

- By recognition of the allowance as taxable income, cash-flow and timing disadvantages may arise if entities are given a large number of free allowances and they choose to store those rather than using them for compliance at the end of the income year. This will result in a larger tax liability due to the recipient being assessed on the value of the free allowances that they might not surrender in that year.

Cons:

- A longstanding principle in the income tax system is that assessable income should include the value of benefits obtained, whether in the form of money or assets, that are directly related to a business or income-producing activity. This includes benefits obtained as free allowances. To ensure that the tax system supports the achievement of cost effective reductions in GHG, the tax treatment of free allowances and auctioned allowances must be tax neutral to the greatest extent possible. With no taxation of free allowances, receivers have an over-incentive to keep and use the allowances. By leaving the allowances to be purchased by the market, companies with higher marginal cost of GHG abatement are able to keep up production while companies receiving allowances for free (and with lower abatement costs) might cease production or improve energy efficiency.
- If allowances are recognized as taxable income, with market price at granting period being used as purchase cost, the company will also be allowed a deduction in taxable income when the allowance is surrendered or sold. This will in principle leave the company equally well off 'at the end of the day' compared to a regime of no taxation.
- Regarding cash-flow and timing (2nd bullet of pros), we do, however, see three arguments for these problems not to become significant. *First*, free allowances being provided to emission-intensive trade-exposed entities are allocated on an annual basis rather than up front in year one for the rest of the trading periods (until 2020), reducing potential tax liability. *Second*, as the number of free allowances are allocated based on average energy efficiency for the 10 per cent most efficient companies, the number of allowances will be tight. Hence, for this reason we do not expect storage of allowances to be pronounced. *Third*, allowances are tradeable. Hence, there is an

[19] EC (2009), Directive 2009/29/EC, Article 10a(1) and (20).

active secondary market. An entity will be able to ameliorate cash-flow problems by selling allowances in that market in one period and buy back in later periods.

- However, banking could be done if the companies receiving free allowances in addition also purchased the cheaper secondary CDM's and used these for compliance. The company would then be able to sell the allowances allocated for free and hence make an immediate net gain, because the market price of EUA´s are higher than for CDM's. This may be an argument for taxation of free allowances if this "traffic" should emerge, however the difference in price is a kind of a natural risk premium from potentially not being able to use CDM's for compliance, cf. the constraints presented in the previous chapter.

3.4. Issue 4: Tax treatment of allowances originated as CDM (or JI)?

Before an allowance originated as CDM is turned into a secondary CER and becomes eligible for the EU ETS, an investor has to accomplish a project generating CDM. We expect that an investor has expenses before the project actually returns a benefit in terms of allowances. The question is then how these expenses should be treated in terms of tax treatment?

We have identified three options for tax treatment:

1. Allow deductions for project expenses incurred against taxable income as they materialise continually.
2. Do not allow deductions for project expenses incurred, but difference in accumulated cost and market price taxable when surrendered for compliance (inventory principle).
3. Do not allow deductions for project expenses incurred, but the allowances originating from the project are activated at the value of the accumulated costs, followed by taxation when the allowances are sold /used for compliance (realisation principle).

The three options differ in terms of their costs of generating allowances. The first option has the highest tax value in terms of NPV as deductions for expenses are allowed at an earlier stage. The second and third options are basically variants of taxation according to the inventory and realisation. Hence, when the allowances are 'ready for use' tax treatment could be done according to one of two of these principles.

Pros and cons for different solutions

In terms of pros and cons we do not treat differences between options 2 and 3 as this has been done under issue number 2. Hence, we will only distinguish between options 1 and 2/3.

Allowing deductions for project expenses incurred against taxable income as they materialise continually is not in line with current tax principle. These expenses may be characterised as investments, hence they cannot be treated as operating costs in terms of taxation. A relevant benchmark is a firm's investment in new equipment that reduces future emissions. Such in-

vestments would – if above a trivial value defined by domestic law – have to be activated and subsequently depreciated over their economic life time.

Pros for option 2 and 3 are, hence, that these options are in line with current taxation principles and practice; investment expenses are non-deductible when occurred. We find the options in line with the principle of tax-neutrality. In a tax-neutral environment, a liable entity would not be influenced by the tax treatment when deciding whether to purchase allowances issued within EU ETS or to accomplish a project generating CDM or JI for later use in ETS.

In practice, we find the issue of taxation of CDM projects relatively straightforward. The costs of the project producing an offset in the form of a credit should be treated according to the general principles applying to the type of expenditure used. In practice, all spending on personnel costs would typically be deductable in the year in which they occur while purchase of investment goods would have to depreciate over the life time of the project. Upon the project that has been qualified to generate credits (secondary CDM), the credits can be sold and the price of the credits should be subject to normal income taxation. This could ensure neutrality vis-à-vis tax treatment of investment in abatement within EU.

We acknowledge that price differences between secondary CDM's and EUA's exist, which gives opens up some possibilities for short term gains at the cost of long term risks. However, we do not regard this possibility as a taxation issue; partly due to fact that the difference is a result of the chosen design of GHG abatement mechanisms in Europe, thus the limit on the use of CER's (primary or secondary) of up to 13.4 per cent of the allocation from 2008 to 2012 on average. Partly due to the fact that the price difference only reflects the risk premium of purchasing a CDM instead of a EUA[20], hence this risk premium is the market reaction on the design features.

3.5. Issue 5: Tax treatment of penalties

An important element of a cap-and-trade-scheme such as the EU ETS is that entities will face a penalty in case of non-compliance with the obligation to surrender allowances to cover last year's emissions by April 30 each year. Under the EU ETS system, this penalty is 100 € per tonne CO2 emitted and in addition, the obligation to surrender the missing number of allowances still remains.

There are two options for tax treatment of penalties:

1. Not deductable against taxable income
2. Deductable against taxable income

[20] See Chevallier (2010)

It is obvious that the difference in impact of choosing option one or two is the tax value. If a deduction is allowed the tax value of the deduction will be equal to the company tax rate x 100 € per tonne.

In terms of pros and cons of allowing deductions for penalties, it is to some degree a non-issue. The discussion of allowing a deduction shall be seen together with the level of penalty. The level of penalty can be adjusted to reflect a deduction or not a deduction, barring in mind that it is difficult to adjust as the level of the penalty is set in the Directive. However, the correct level of penalty in order to secure correct incentives is to set the penalty just as high as to give the market an incentive to abate the target of 20 per cent put up for the EU. Basically, one could argue that the penalty represents a cost to the entity, hence a deduction should be allowed according to the tax principle of simplicity; in a simple tax system all costs relevant for running the business should be deductable against taxable income. On the other hand, as the objective of the penalty is to ensure compliance, it should maybe not be considered as a normal business expense, hence deductions should not be allowed.

Chapter 4 POTENTIAL PROBLEMS IN CURRENT TAX LAW AND PRACTICES

In this chapter we will present our findings on problems in terms of welfare economics, opportunities for tax arbitrage and risk of double taxation. This presentation will be based on the information of national tax treatment collected by the questionnaire from Deloitte[21]. The focus of the first section 4.1 will on the distortions created by differences in taxation between countries while the next section 4.2 will discuss possible welfare losses at the EU level that such distortions may cause. The following two sections review opportunities for tax planning as well as risk of double taxation linked to trade in EUA allowances within the EU (section 4.3) as well as trade in CDM and JI (section 4.4).

4.1. DISTORTIONS FROM DIFFERENCES IN CARBON PRICING BETWEEN COUNTRIES

Both within the EU27 Member States and between EU and other non-EU countries, where a cap-and-trade scheme has been/will be introduced, tax treatment of allowances differs. This may cause potential distortions and tax arbitrage within EU27 and between EU and the other areas if/when the EU scheme will be linked to other schemes.

Issue 1: Recognition of allowances for tax treatment

As stated in the previous chapter there are basically three methods for recognition of allowances in terms of tax treatment: commodity (deductible expense), intangible asset, or financial asset.

Based on the questionnaire we (Deloitte) have carried out in the EU27 Member States plus four other European countries as well as Australia, New Zealand, Canada and USA, the overall conclusion to be drawn is that for the vast majority of countries it is not crystal clear, which kind of treatment is actually used. A significant number of the reporting countries state that the most likely characterisation is that of an intangible asset. However, some of these reporting countries have addressed uncertainty with respect to the actual classification, whereby the above classification is considered the best practical advice to businesses.

The actual possibility of claiming a deduction or depreciation against taxable income is what constitute the actual company incentives, hence the possibility for distortions or tax arbitrage. From the questionnaire there seems to be three approaches to deduction or depreciation: (1) no depreciation or deduction, (2) the possibility to make depreciation and (3) the possibility to make a deduction.

It seems that in some of the countries there is more than one option for tax treatment, i.e. that the actual treatment is unclear. In order for us to draw some kind of conclusion – but also for the purpose of modelling distortions – we have chosen to summarize the national tax treatment based on an assumption of rational choice of tax treatment among the companies.

[21] See appendix for the Deloitte study.

In other words, we assume that the companies will choose the method that minimizes the company's tax base.

Based on this assumption we have made two observations. *First*, we recognise that the vast majority of the companies (in the different national countries) will de facto choose to treat allowances as a commodity, cf. Table 4.1. However, a closer study of this would reveal that some of these countries actually recognise allowances as an intangible asset, but at the same time does not allow for depreciation and instead allow for deduction. In this way, the de facto tax treatment of allowances is recognised as a commodity.

Table 4.1 Tax treatment of allowances in EU Member States

Issue	Treatment		
Treatment of allowance	Commodity	Intangible asset	
Time of deduction	Immediate	When used	Depreciation allowed
Countries	BE, DE, FR, GR, IE, LU, NL, MT, EE	DK, GB, IT, SE, PL, CY, CZ, SK, SI, LT, LV, RO	AT, ES, FI, HU, BG
Taxation of free allowances	Taxed when received	Not taxed	
Countries	ES, GB, GR	AT, BE, BG, CZ, CY, DE, DK, EE, FI, FR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SK, SI	

Note: Some countries seemingly allow different treatment of allowances. When this is the case, we select the treatment that is most favourable from a net present value perspective.
Source: Copenhagen Economics based on Deloitte study.

Second, we recognise that almost half of the countries where de facto recognition is of the commodity type allow for deduction at the time of purchase ('immediate') where the rest of these countries only allow at the time of use. In terms of net present tax value, these two groups actually constitute the upper and lower bound, where the countries allowing for depreciation lies in between. In our point of view, 'trade' of allowances between countries representing the upper and lower bound has the greatest potential for tax arbitrage or distortion of trade. This is due to the fact that net present tax value between these countries differs; hence the economic impact for a company purchasing allowances in an 'immediate' country may be more beneficial than purchasing allowances in a 'time of use' country.

In the next paragraph we illustrate by simple numerical examples the impact in terms of difference in cost due to differences in tax treatment.

Impact of different solutions

In order to illustrate the impact of differences in recognition of allowances, we have provided a small numerical example. By calculating the net present value (NPV)[22] of the tax value we are able to assess the consequences of the different options. The option with the highest NPV of taxation provides the lowest costs for the firms. So, if different tax systems yield dif-

[22] Please bear in mind that only in the case of storage of allowances differences in tax treatment does have a real impact; hence a time dimension in terms of analysis becomes relevant.

ferent NPV values, then this may effectively change the ordering of pre-tax abatement costs within the EU.

The assumptions are:

- a price of an allowance of 25 € in period 0 (corresponding to one ton of CO_2)
- depreciation rate of 40 per cent (Declining-Balance Method)
- income tax rate of 25 per cent
- discount rate of 5 per cent
- the allowance is purchased primo period 0 and held until ultimo period 2 (situation 2), thus the time length of holding the allowance is three periods
- selling price of allowance is 0 ultimo period 2 (situation 2), this is done in order to be able to carry out accelerated depreciation at the time of selling the allowance

We have to distinguish between two situations with regard to storage:

- Situation 1: The allowance is purchased and used for compliance / sold immediately after purchase, i.e. the allowance is held only for a short period within the same accounting period
- Situation 2: The allowance is held over a minimum of two years, thus the allowance is stored and transferred between minimum two accounting periods

In *situation 1,* the tax consequences of different treatment will have no real economic impact since the permit is used immediately after purchase (or within the same accounting period).

If the allowance is recognised as a commodity and used for compliance, the cost of purchase (=price) of the allowance would be fully deductable against income. If the allowance is sold, the cost of the allowance would be fully deductable against income and the selling price would be added to taxable income. In this case where purchase price is equal to selling price, this would cancel each other out leaving taxable income at zero.

If the allowance is recognized as an intangible asset and used for compliance, the value (=price) of the allowance becomes eligible for accelerated depreciation and herby fully deductable against taxable income. If the allowance is sold, the value of the allowance becomes eligible for accelerated depreciation and hereby fully deductable against taxable income. The selling price would then be added to taxable income.

No matter how the allowance is recognised and no matter whether it is used for compliance or sold, this will have no real economic impact. Thus, based on a purchase price of 25 € and a corporate tax rate of 25 per cent the tax value is calculated to 6.25 €, independently of recognition of the allowance, cf. Table 4.2.

Table 4.2 Tax value is the same if the allowance is held for only a short time

After tax value, €	Sold	Surrendered / compliance
Commodity (deductable expense) – deduction deferred until the time when the permit is surrendered or sold	6.25	6.25
Intangible assets – depreciation	6.25	6.25
Intangible assets / commodity – immediate deduction	6.25	6.25

Source: Copenhagen Economics

In s*ituation 2*, the allowance is held for one period minimum (stored). The tax consequences of different treatments will in this case have a real economic impact. The after tax value will be higher if treated as an intangible asset with the possibility of amortization, allowing deductibility for costs at an earlier point in time. As in situation 1 with no storage, it does not differ in terms of determination of tax value whether the permit is used for compliance or sold.

In this situation, where the allowance is stored and treated as a *commodity*, the tax value will again be 6.25 €. However, as deductibility against taxable income is not allowed before the allowance is sold or surrendered (end of period 2), NPV of tax is only 5.4 €. On the other hand, if deductions are allowed at time of purchase NPV will be equal to the purchase price of 6.25 €.

If the allowance is treated as an intangible asset, depreciation is allowed from the end of the first period and in each period until the allowance is sold or surrendered (or fully depreciated). Hence, the holder of the allowance gets access to deductions against taxable income at an earlier stage. To be able to compare this with the case where the allowance is recognised as a commodity, we assume that the book value of the allowance at the end of period 2 becomes eligible for accelerated depreciation. This gives rise to a 5.9 € NPV of the tax.

By allowing a deduction of the costs at the time of purchase, the after tax value has increased by 4.5 per cent compared to allowing a deduction at the time of use, cf. Table 4.3.

Table 4.3 The after tax value is higher if treated as an intangible asset

	After tax value, €	Period 0	Period 1	Period 2	NPV (5)
(1)	Commodity (deductable expense) – deduction deferred until the time the permit is surrendered or sold	0	0	6.25	5.4
(2)	Intangible assets – depreciation	2.5	1.5	2.3	5.9
(3)	Intangible assets / commodity – immediate deduction	6.25	0	0	6,25
	Difference in NPV of (1) and (3) as a percentage of after tax price	(6.25-5.4)/((1-25) x €25)			4.5 %

Note: If recognized as intangible asset, tax value is calculated as depreciation in € times income tax rate.
Source: Copenhagen Economics

Sensitivity analysis

The question is now whether this difference in tax treatment potentially is able to become significant. The answer of this can be answered by looking at the financial impact of *longer*

holding periods and *more aggressive discount rates*. Our calculations below show that the more periods and/or higher discount rate, the higher are the differences in NPV of the tax value.

If the number of periods are increased to ten (e.g. reflecting the period 2010 to 2020, second half of Phase II and entire Phase III) and we keep the discount rate at 5 per cent, the difference in NPV of the tax value will increase from 0.5 € (end period 2), cf. Table 4.3, to 1.8 € (end of period 9) if the allowance is recognised as an intangible asset instead of a commodity, cf. Table 4.4. And between the two extremes in treatment; deduction at 'time of use' or immediate deduction the difference in NPV of tax value increase from 0.9 € if the allowance is held 3 periods to 2.3 € if the allowance is held 9 periods, cf. Table 4.4.

Table 4.4 NPV as a function of periods the allowance is stored, €

	Number of periods the allowance is held	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
(1)	Commodity (deductable expense) – deduction deferred until the time the permit is surrendered or sold	6,3	6,0	5,7	5,4	5,1	4,9	4,7	4,4	4,2	4,0
(2)	Intangible asset	6,3	6,1	6,0	5,9	5,9	5,9	5,8	5,8	5,8	5,8
(3)	Intangible assets / commodity – immediate deduction	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
	Difference (1) and (2)	0,0	0,1	0,3	**0,5**	0,7	1,0	1,2	1,4	1,6	**1,8**
	Difference (1) and (3)	0.0	0.3	0.6	**0.9**	1.2	1.4	1.6	1.9	2.1	**2.3**

Note: NPV is calculated primo the period. Ultimo value at time t-1=primo value at time t
Source: Copenhagen Economics

Analogously to the calculation of the difference in NPV illustrated in Table 4.3, we have also done calculations with more periods included for the 'immediate' and the 'time of use' deduction. With a discount rate of 5 per cent, the share of the difference in NPV to after-tax price will increase from 4.5 per cent to 11.8 per cent by the end of period 9, cf. Table 4.5.

The choice of discount rate does off course also play a role for the NPV of the tax. Table 4.5 therefore shows the economic impact of decreasing the rate to 2 per cent vs. increasing the rate to 7 per cent. If the allowance is hold 9 periods, the low discount rate at 2 per cent entails the difference in NPV of tax value to the after tax price is only 5.4 per cent. This ratio increase to 15.2 per cent if the discount rate is increased to 7 per cent, cf. Table 4.5.

Table 4.5 Ratio of difference in NPV of tax value and after tax price, %

Number of periods the allowance is held	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
NPV (2%)	0.0	0.7	1.3	1.9	2.5	3.1	3.7	4.3	4.9	**5.4**
NPV (5%)	0.0	1.6	3.1	**4.5**	5.9	7.2	8.5	9.6	10.8	**11.8**
NPV (7%)	0.0	2.2	4.2	6.1	7.9	9.6	11.1	12.6	13.9	**15.2**

Source: Copenhagen Economics

The basic conclusions drawn from the above analysis is that substantial impact on the after-tax costs resulting from different tax systems of purchasing ETS allowances requires that storage is substantial and discount rates non-trivial. However, one central design feature of the EU ETS may dampen the use of storage; allowances are issued on a yearly basis. Hence, future dated allowances are not present in ETS. This contrasts most other commodities, which can be purchased and stored for later use, and the design of the upcoming Scheme in Australia seems to pursue the opposite strategy of auctioning all allowances for long periods up front. If similar large-scale storage was possible in the EU ETS, allowances could be purchased, deducted from taxable income and stored for later use, thus enhancing the effect of different national tax treatment in EU.

However, we do not expect that the difference in recognition has a potential to create significant distortions in terms of cost efficient CO2 abatement and/or tax arbitrage. As demonstrated above, tax related distortions will only arise if allowances are stored for a significant amount of time. Current experience from the 2nd trading period shows that less than 10 per cent of allocated allowances in the years 2008 and 2009 have been stored for later use, cf. Table 4.6

Table 4.6 Instruments used in the ETS in 2008-9, millions

	2009	2008
Allocated EUA	1,967	1,956
Surrendered CER (CDM)	78	82
Surrendered ERA (JI)	3,2	0,05
Total emissions (MtCO2)	1,873	2,119
Surplus	174	-81
Surplus per cent (stored to later periods)	9%	-4%

Source: Copenhagen Economics based on The Community Independent Transaction Log (CITL)

If this number of stored allowances continuous to stay below 10 per cent and even in some years goes below zero, we do not expect that the NPV of tax value will differ much between countries. Hence, distortion due to differences in tax treatment will become close to zero. This issue has been further analysed in the modelling section 4.2 above.

Issue 2: Inventory or realisation principle

Taxation of allowances according to the inventory or realisations principle is not of great importance among the countries included in the questionnaire by Deloitte. A question in this regard was not asked explicitly. However, from the answers it seems that almost every country does apply the realisations principle:

> *According to the tax treatment (.....), the general picture is that the profit or loss is calculated as the difference between the sales price and the acquisition price/booked value.*

Deloitte (2010) "Study on the Tax Treatment of EU Allowances - The Issues of Corporate Income Taxation"

As tax treatment relies on the actual sales price, this indicates that the realisation principle is applied.

However, as a matter of completeness and for the purpose of addressing thoughts about a change in treatment, we have made a numerical example regarding the possible impact on company taxation from differential treatment.

Impact of different solutions

Regarding the impact of the taxation principle, we have in line with the previous issue provided a small numerical example. By going through the accounts from a fictive company, we show the economic consequences of difference in taxation principle.

As in the previous issue, the difference has only a real economic impact if the permit is stored for use in later periods. If the allowance is not stored, the allowance becomes eligible for accelerated depreciation and hereby fully deductable against taxable income in the first accounting period. In this case, purchase price (realisation) will be equal to opening value (market value) and selling price (realisation) will be equal to closing value (market value). Hence, the tax payment will not differ in terms of timing and amount.

If the allowance is kept for more than one period, our numerical example shows that there will be no difference in total payment of taxes, but timing of payment and tax base will differ. In addition, the numerical example will show that there in principle will not be any difference whether the allowance is sold or used for compliance (ultimo period 2)

The assumptions are the following:

- A company buys 10 allowances primo period 0 and holds them until ultimo period 2
- Buying price is 10 € per allowance
- During period 0-2, the market price change to 15 €, 17 €, 16 €, respectively for each period
- Corporate tax rate of 25 per cent
- Two situations: 1) allowances are all sold ultimo period 2, 2) allowances are used to meet obligations in period 2

The opening value of the allowances is 100 €. During period 0, the price increases to 15 € per allowance, hence total value increases to 150 €, which will be the closing value at the end of period 0. The book value of the allowances has increased by 50 €, equal to the difference between the opening and closing value, cf. Table 4.7.

If tax treatment of allowances is done according to the inventory principle, the gain in value of 50 € will be added to taxable income, leaving the tax payment at 12.5 €. If tax treatment

of allowances is done according to the realisation principle there will be no income to tax as gains not realised will not be added to taxable income.

Table 4.7 Timing of taxation differ between market value and realisation principle

			Allowances are sold		Allowances are used for compliance	
(€)	**Period 0**	**Period 1**	**Period 2**	**Sum of tax payment**	**Period 2**	**Sum of tax payment**
Opening value	100	150	170	-	170	-
Closing value	150	170	160	-	160	-
Change in value	50	20	(10)	-	(10)	-
Assessable income / (deductable expense)						
Inventory (Market value)	50	20	(10)	-	(10)	-
Realisation	0	0	60	-	(100)	-
Income tax – 25 %						
Inventory (Market value)	12.5	5	(2.5)	15	(2.5)	15
Realisation	0	0	15	15	-	15

In period 1, the price of allowances increases to 17 € with total value increased to 170 €. The story repeat itself, hence tax treatment according to the inventory principle cause a payment of 5 €.

In period 2 the price decreases to 16 €. As the total value decreases to 160 € the change in opening and closing value is 10 €, thus allowing a deduction of 10 € if tax treatment is according to the inventory principle. Tax treatment according to the inventory principle is based on the change in value of the allowances. Hence, it does not matter whether they are sold or used for compliance in period 2. Therefore, the company will save 2.5 € in income tax payment equal to the tax value of the deduction.

If the allowances are treated according to the realisation principle, the gain from selling the allowances in period 2 is equal to the difference in the historical purchase cost at 100 € and the revenue from selling them at 160 €. This will add 60 € to taxable income related to period 2, hence that tax payment will be equal to 15 €. If allowances are treated according to the inventory principle, total payment of taxes will also be 15 €, but timing will differ as gain and loss related to every period will be added to taxable income in each period. In period 0, tax payment will be 12.5 €, period 1 it will be 5 € and at the end of period 2 it will be -2.5 €, leaving the sum of tax payments at 15 €.

If allowances are used for compliance, the picture will change marginally when tax treatment is done according to the realisation principle. As the allowances are not sold, there will be no direct income to tax. However, we might expect a total tax payment of 15 € anyway; using the allowance as an 'input' into a production process, the company will at least add 160 € to the total revenue from selling the output (e.g. electricity), compared to a situation without

ETS. Otherwise, the company will be better off by supplying the allowances in the allowance market. Thus, revenue from selling the output is 160 € and income is 160 € - 100 € = 60 €, leaving the tax payment at 60 € x 25 per cent = 15 €.

So the basic difference between the inventory and the realisation principles is the timing of taxation. The amount of taxes paid is equal. According to the inventory principle, changes in the value of allowances will be added to/deducted from taxable income at the end of each period. According to the realisation principle, changes in value will only be added to/deducted from taxable income in the period where the allowances are sold/used.

However, even though we might expect that total tax payment is equal to both inventory and realisation taxation, the NPV of the tax payments differs. This is due to the difference in timing of payments. This issue is the same as our discussion regarding recognition in terms of tax treatment in Issue 1, but with the difference that Issue 1 is about NPV of tax value of costs whereas Issue 2 is about NPV of tax payments. Yet, to the degree that the market price of allowances stays more or less constant with only minor variations there will be only modest tax payments throughout time when applying the inventory principle. Hence, the inventory principle will de facto be 'turned into' the realisation principle.

We do not expect the issue of taxation principle to become significant; partly due to the fact that nearly all countries follow the realisations principle, partly due to the possibility of storage of allowances.

Issue 3: Taxation of free allowances

For the post 2012 system, a number of sectors – energy intensive and leakage exposed companies – will receive allowances free of charge. According to the study be Deloitte, the majority of the reporting countries reported that the initial allocation free of charge does not constitute taxable income at the time of allocation in form of a grant, subsidy, extraordinary income etc. However, as shown above three countries tax allowances when they are received even if not used in the same year.

Such differences between countries in the tax treatment of free allowances may potentially affect the pattern of investments in new capacity and of ceasing operations, thereby leading to distortions. The size of the distortions depends on the joint results of two elements:

- To what extent will changes in the location of the production of, and investment in, the economic activity that leads to CO_2 emissions affect the future allocation of free allowances?
- How large is the net tax benefit related to the tax treatment of free allowance from such a move of location of the economic activity?

Moving the production can be done in different fashions; either by closing an installation in one country and building a new installation in another country or, less drastically, by stop-

ping investments and maintenance in existing installations and instead building capacity in another country. If an installation is closed and a new one is built, no more allowances would be issued for the closed installation. If e.g. avoided maintenance leads to a significantly reduced production capacity, the number of free allowances would also be reduced, subject to rules to be adopted by the European Commission by the end of 2010. Otherwise, incentives to substitute existing capacity with new capacity are magnified since it would lead to allocation of more free allowances.

Therefore, significant extensions of production capacity will be allowed additional free allowances and, in parallel, free allowances will be discontinued for installations that partly or fully cease their operations.

To be able to allow additional free allowances to capacity increases and new entrants a buffer of allowances will be established[23]; 5 per cent of Community-wide allowances for 2013-2020 are put away for new entrants[24]. However the definitions of 'significant extensions' and 'new entrants' are not yet clarified. These definitions and the implementation measures for the mechanisms to update emissions will be adopted by the Commission on December 31, 2010.[25]

As this study is about tax issues, not design of the ETS system per se, we will restrict ourselves to a more narrow evaluation. Essentially, we suggest that distortions that result from different regimes for taxing free allowance hinge on the provisions on updating. If firms can receive free allowances when adding to or moving capacity to countries with favourable taxation of allowances, then they will have a tax incentive to relocate emission generating activities within the EU in the direction of such jurisdictions.

The exact provisions relating to definitions of what constitutes significant reductions (but not closure) as well as significant expansion of capacity is still under discussion. But we underline that resulting distortions are likely to be minor as they are essentially again linked to the issue of storage. There is only an effective difference in the level of taxation between the two set of tax systems described above to the extent that allocated free allowances exceed systematically the "needed" level for the industries concerned, providing a benefit to the industries located in the countries where there only taxed when used. In the section 4.2 below we have for illustrative purposes analysed the effect where the size of over allocation relate to actual use in the same year is set to 5 per cent.

[23] EC (2009), Directive 2009/29/EC, Article 10a, paragraph 7
[24] The concept of 'New entrants' is to be defined by Dec 31, 2010
[25] EC (2009), Directive 2009/29/EC, Article 1

4.2. Calculated welfare losses due to differences in national taxation

This section demonstrates that actual distortions from differences in tax treatments of allowances are quite limited. The basis for this conclusion is drawn from a modelling exercise of the EU27 abatement efforts. As demonstrated above, the real economic loss of different tax treatments arises as firms perceive abatement costs to be higher in a country with favourable tax treatment of allowances and therefore move abatement away from this country. The opposite holds when tax treatments are more unfavourable in a specific country than the average.

The cost of abatement displacement will most importantly depend on the degree of differential tax treatment. As we show below (see appendix), the actual degree of differentiability is so small that it hardly creates any economic effects. The reason is that despite significant formal differences in accounting principles, the actual end-of-the-year tax differences are negligible. Being allowed to depreciate or deduct at time of purchase or at time of use only generates differences from a net present value perspective.

In Table 4.8 we show the absolute value of the loss as calculated by our abatement model in terms of additional abatement costs of having non-uniform tax regimes across EU Member States. The table lists four different scenarios implying cost increases in the range 0.01-0.02 per cent (0.6-2.5 million €) on an annual basis from 2020 and onwards. In the years towards 2020, the €-value of the loss will generally be smaller since abatement is smaller. The model is based on reasonable abatement curve estimates for the last and most expensive year in the ETS Phase III, i.e. 2020, together with reasonable discount rates of 5 per cent per annum for the calculation of net present value effects.[26] Most importantly, the model quantifies the differential tax treatment of allowances so that we can estimate after-tax marginal abatement costs for each Member State. The model calculates a first-best outcome with uniform tax treatment in order to benchmark the outcome with actual differential treatment.

Table 4.8: Additional annual abatement costs from tax distortions

	Biannual purchase	Full up-front purchase
20 per cent target	0.011 % (0.6 million €)	0.021 % (1.2 million €)
30 per cent target	0.011 % (1.4 million €)	0.021 % (2.5 million €)

Source: Copenhagen Economics

The four different scenarios are built around two fundamental market design choices: the reduction target in 2020 (20 or 30 per cent), and the possibility of acquiring allowances for the entire period up front or on a biannual basis.

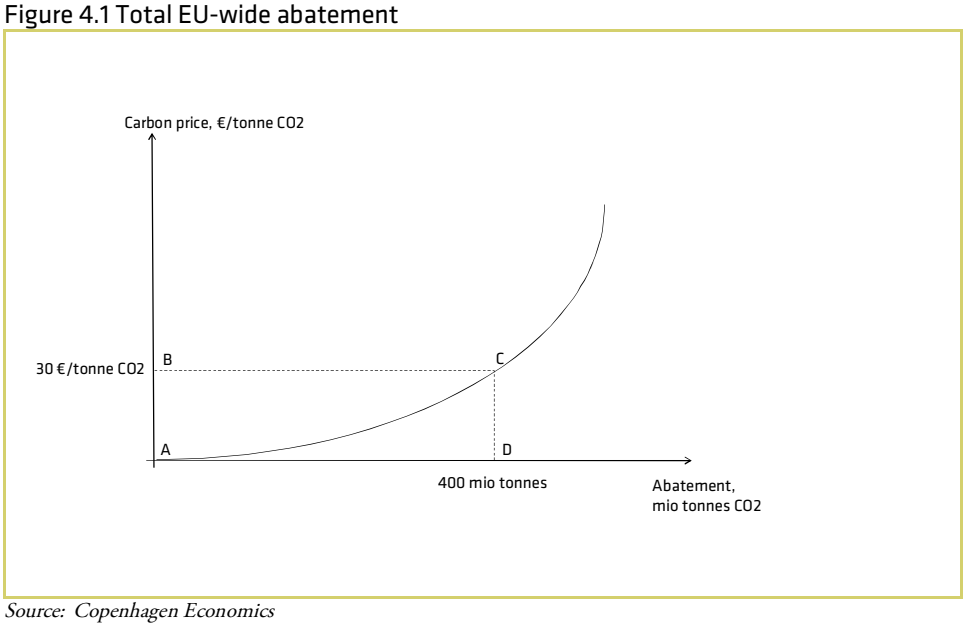
[26] Furthermore, the model assumes a uniform EU-wide corporate tax rate in order to 'purify' the treatment effect.

The current target is 20 per cent overall GHG emission reductions by 2020 compared to 1990 levels. However, there have recently been advocates for an even more ambitious target of 30 per cent reductions in 2020. The second dimension concerns the possibility to either acquire allowances immediately or on a year-by-year basis with limited storage between years. Since the distortion effects mainly arise due to net present value considerations of stored allowances, the full up-front purchase possibility will generate the largest distortion effects. The full up-front purchase possibility is not necessarily a realistic option given current ETS legislation but it allows us to calculate an *upper bound* on the distortion effects. Thus, we may be quite confident (given other modelling uncertainties) in claiming that the EU-wide economic distortion does not exceed 0.021 per cent or 2.5 million €, which is obviously a very small figure.

To get a feeling of the absolute numbers of the ETS abatement and distortion losses, we consider back-of-the-envelope calculations built around Figure 4.1 below. The first relevant number (not shown in the figure below) is current EU-wide emissions, which amounts to app. 2,000 million tonnes CO2 in the ETS sectors.[27] A reduction of 20 per cent, therefore, means abatement of app. 400 million tonnes CO2. Different studies suggest a carbon price of around 30 €/tonne CO2 for this abatement level.[28] The calibration of our own cost-abatement model suggests a carbon price of 28 €/tonne CO2, which is fairly close to the findings from other studies. In total, we would therefore see a turnover of allowances of around 12 billion € (30 €/tonne * 400 million tonnes). This amount is illustrated as the rectangle ABCD. The actual abatement costs only amounts to the area below the marginal abatement cost curve, i.e., the triangle ACD.[29] The standard geometry rule on calculating triangle areas would suggest a total abatement cost of no more than 6 billion €. In fact, our empirical model returns the figure 5.5 billion €, capturing the fact that the curve AC is not a straight line, but slightly downward bending.

[27] See e.g. the CITL database.
[28] EC (2008) and OECD (2009a)
[29] Formally, total abatement cost equals the integral of marginal abatement costs.

Figure 4.1 Total EU-wide abatement



Source: Copenhagen Economics

In order to provide a back-of-the-envelope estimate of the distortion loss, we need an estimate of how much current tax treatments lead to differences in perceived and actual costs. Already knowing that the only difference in tax effect is related to net present value considerations, we are not surprised to learn that perceived and actual allowance (abatement) costs do not differ by more than app. 2 per cent (much more on this issue below.) With a marginal abatement cost elasticity of app. 1, this 2 per cent difference in perceived prices leads to app. 2 per cent difference in actual abatement. Again remembering the triangle rule, we therefore arrive at a loss of approximately:

2 per cent * 2 per cent / 2 = 0.02 per cent,

which is extremely close to the model implied percentage loss of 0.021 per cent. Moreover, 0.02 per cent of 6 billion € equals 1.2 million €, this time exactly on spot with regard to the model estimate.

4.3. EUA's: Potentials for Tax arbitrage or double taxation

Regarding tax arbitrage due to tax planning by companies with affiliates in two or more EU MS, we cannot see a major risk for this becoming significant. In order to adapt this conclusion, we can imagine a company with affiliates (power plants) in two countries (C1 and C2), which differ in terms of tax treatment. The 'intuitive' economic benefit for the company could be a result of transfer (trade) allowances to affiliates in C2 that practises an immediate deduction of costs in tax base from C1, which practises time-of-use deductions. However,

we do not expect this 'traffic' to take place – at least not regarding EUA's or secondary CER´s – as we only see a limited potential benefit for the companies. This is due to two reasons:

First, the affiliate in the exporting country C1 would be short of allowances; hence the company would not be able to meet compliance or may decrease the activity. If the affiliate in C1 does not need the allowances for compliance but has only purchased them for the purpose of arbitrage possibilities, the importing affiliate in C2 could have purchased allowances in the first place instead of 'taken a detour' around C1. A slight variation of this could be that the C1-affiliate purchased allowances, actually believing that the allowances were needed, but due to a decrease in power prices generation decreased. If the C1-affiliate then hands over the allowances to the C2-affiliate where power prices are higher, it will be a transaction just in line with efficient allocation of allowances and has nothing to do with arbitrage.

Second, we do not see transfer pricing in order to 'manage the tax base' as an issue; the price of allowances is fully transparent and nearly equal all over Europe. A company may have the intention to shift the tax base to a country with favourable deduction possibilities by trading allowances at artificial (high) prices, but this can easily be revealed by authorities as the true market price is definitely observable.

These argument may also hold for secondary CER's, secondary CER's are quite analogue to EUA's in terms of CO2 abatement and transparency of market price.

4.4. CDM AND JI: TAX PLANNING AND DOUBLE TAXATION

In terms of CDM and JI, we distinguish between direct engagement in CDM and JI projects and trade of credits, where the former is project development/investment phase up to the point before the investment starts to generate secondary CER's/ERU's; that is up to the point where e.g. the United Nations' CDM Executive Board is to commence to issue CER credits. The later is with regard to trade of secondary CER's. We treat both phases in turn below. In this chapter, we finally raise some issues regarding opportunities for tax planning.

Direct engagement in CDM and JI projects

When we focus on abatement projects like CDM and JI's with regard to the development phase we have identified three issues one have to clarify, hence this might turn into real problems in terms of tax treatment.

First, the domestic tax treatment with respect to projects expenses and grant of emissions credits are not clear.

Domestic tax treatment of projects expenses: Before an allowance originated as CDM or JI becomes eligible for the EU ETS, an investor has to carry out a CDM or JI project generating emission credits. Most investors incur expenses before a project returns a benefit in terms of emission credits. Such expenses are associated with the certification process, including those incurred during the process of qualifying the project as well as those during the operational phase of the project. The tax treatment of such expenses depends on domestic tax law of each country, and in general two of the following alternatives exist. Under the first alternative, the expenses are treated as the acquisition costs of the emission credits, whereas under the second alternative the expenses are treated as operating costs. And further, each of the alternatives is subject to variations.

Under the first alternative, the expenses are treated as the acquisition costs of the emission credits. It is uncertain, whether tax deduction/depreciation will be allowed by the national tax authorities where no emission credits are granted.

Under the second alternative, the expenses are treated as operating costs. The possibility of deduction of expenses under this alternative is generally less dependent on whether the emission credits are actually granted or not.

Grant of emissions credits: By carrying out the projected abatement level, emission credits may be granted by e.g. United Nations' CDM Executive Board. Whether the grant of emission credits is regarded as taxable income or tax free also depends on domestic tax legislation. However, it seems reasonable to assume that where the first alternative (acquisition costs) applies, the emission credits are considered to be acquired for the expenses and therefore no (further) tax consequences arise. If, on the other hand, the second alternative (operating costs) applies, it is more uncertain whether the emission credits are considered as a taxable or tax free income.

The combination of applying the second alternative and where granted credits are considered as a taxable income, the consequence might be double taxation if instead a company alternatively purchased EUA's for compliance. Why is it so? By using granted credits, the operating costs can be deducted against taxable income, but the value of credits is added to taxable income. In this way the company will not get a deduction in real as in addition to a deduction the value of the CERs are added to taxable income. If instead the company use EUA's, the purchase cost can be deducted against income, hence the total costs are lower as no grants are added to taxable income.

Moreover, participation through a carbon fund or 'trust' may complicate this further. In some jurisdictions such funds are transparent for tax purposes, i.e. despite that the funds may be legal persons for company law purposes (e.g. legal owners of the granted emission credits and expenses etc.) the funds are not separate tax subjects. In other jurisdictions, these funds may be categorised as corporations or the like, i.e. subject to tax. If the qualification of

the fund or 'trust' differs from jurisdiction to jurisdiction, this may result in double taxation or double non-taxation.

Second, the perception whether the engagement in CDM or JI projects may constitute a permanent establishment may differ between national tax authorities. The determination of a 'permanent establishment' is important in terms of taxation.

Participation in CDM or JI projects often involves cross-border transactions as projects often are located in a host state different than the participants' state of residence. Consequently, it is relevant to determine, which of the jurisdictions – the host state (State of source) or the State of resident – is allocated the right to tax.

Tax treaties are bilateral conventions entered into by two jurisdictions to avoid international double taxation of income and capital. The risk of double taxation occurs as the vast majority of States levy tax on resident taxpayers on a worldwide basis, i.e. the taxable income includes both domestic and cross-border transactions profits. In order to prevent international double taxation, tax treaties establishes two categories of rules according to which the right to tax is allocated to one of the two contracting states. The first category of rules determine the respective rights to tax of the State of source and the State of residence with respect to different classes of income and capital. The second category of rules determines that the State of residence must allow a relief for double taxation if the State of source is allocated a full or limited right to tax.

The OECD Model Tax Convention constitutes the basis of most of the tax treaties. Thus, in respect to the interpretation of a specific tax treaty, the OECD Model Tax Convention and the Commentary thereon is normally applied. Therefore, we will only refer to the OECD Model Tax Convention in the following[30].

In this context it seems relevant[31] to determine whether the engagement in CDM or JI projects may constitute a permanent establishment. Hence, it follows from the OECD Model Tax Convention that the State of source only has the right to tax business profits (attributable to the CDM or JI project) if a permanent establishment is established[32], cf. box 4.1.

[30] Please refer to appendix for more on the OECD Model Tax Convention.

[31] It is also relevant to discuss whether Article 7 on Business Profit, Article 13 on Capital Gains and Article 21 on Other Income applies. As the scope of these Articles are outlined in the third version of our report "Study on the Tax Treatment of EU Allowances – The Issues of Corporate Income Taxation" it is left out of this memorandum.

[32] See Cahiers de Droit Fiscal International (2009)

Box 4.1 Article 5 of the OECD Model Tax convention

The wording of Article 5 of the OECD Model Tax convention is as follows: (our ***highlight***)

1. For the purposes of this Convention, the term 'permanent establishment' means a ***fixed place of business through which the business of an enterprise is wholly or partly carried on****.*

2. The term 'permanent establishment' ***includes especially****:*

a) a place of management;
b) a branch;
c) an office;
d) a factory;
e) a workshop, and
f) a mine, an oil or gas well, a quarry or any other place of extraction of natural resources.

3. A building site or construction or installation project constitutes a permanent establishment only if it lasts more than twelve months.

4. Notwithstanding the preceding provisions of this Article, the term 'permanent establishment' ***shall be deemed not to include****:*

a) the use of facilities solely for the purpose of storage, display or delivery of goods or merchandise belonging to the enterprise;
b) the maintenance of a stock of goods or merchandise belonging to the enterprise solely for the purpose of storage, display or delivery;
c) the maintenance of a stock of goods or merchandise belonging to the enterprise solely for the purpose of processing by another enterprise;
d) the maintenance of a fixed place of business solely for the purpose of purchasing goods or merchandise or of collecting information, for the enterprise;
e) the maintenance of a fixed place of business solely for the purpose of carrying on, for the enterprise, any other activity of a preparatory or auxiliary character;
f) the maintenance of a fixed place of business solely for any combination of activities mentioned in subparagraphs a) to e), provided that the overall activity of the fixed place of business resulting from this combination is of a preparatory or auxiliary character.

5. Notwithstanding the provisions of paragraphs 1 and 2, where a person – other than an agent of an independent status to whom paragraph 6 applies – is acting on behalf of an enterprise and has, and habitually exercises, in a Contracting State an authority to conclude contracts in the name of the enterprise, that enterprise shall be deemed to have a permanent establishment in that State in respect of any activities which that person undertakes for the enterprise, unless the activities of such person are limited to those mentioned in paragraph 4 which, if exercised through a fixed place of business, would not make this fixed place of business a permanent establishment under the provisions of that paragraph.

6. An enterprise shall not be deemed to have a permanent establishment in a Contracting State merely because it carries on business in that State through a broker, general commission agent or any other agent of an independent status, provided that such persons are acting in the ordinary course of their business.

7. The fact that a company which is a resident of a Contracting State controls or is controlled by a company which is a resident of the other Contracting State, or which carries on business in that other State (whether through a permanent establishment or otherwise), shall not of itself constitute either company a permanent establishment of the other.

Source: Deloitte (2010a)

Whether the State of source is entitled to levy tax on the CDM and JI project or not thus depends on the specific tax treaties and/or domestic tax legislation. It follows from the above, that the term 'permanent establishment' means a fixed place of business through

which the business of an enterprise is wholly or partly carried out. Thus, in order to constitute a permanent establishment, the place of business must serve a foreign taxpayer's business activity as opposed to other income-generating activities, i.e. the mere presence in a country is not sufficient. Consequently, for the engagement in a CDM or JI project to constitute a permanent establishment, it is a requirement that the project results in a *fixed place of business through which the business of the participant is wholly or partly carried on*. And *if* such a fixed place of business is considered for constituted none of the exceptions in Article 5 may apply, e.g. sec.4 f) according to which, the *maintenance of a fixed place of business solely for the purpose of carrying on, for the enterprise, any other activity of a preparatory or auxiliary character is not included in the term 'permanent establishment'*.

The analysis of whether a specific participant's engagement in a CDM or JI project constitutes a permanent establishment must be made for each concrete case, i.e. no general conclusion can be made in this regard. However, it seems reasonable to assume that a financial investor participating for the purpose of profit from sale of emission credits is more likely to be deemed to have a permanent establishment than a corporation subject to the EU ETS. Consequently, the result may depend on whether the participant is subject to the EU ETS and participate in the project with the purpose of acquiring emission credits for the use of compliance *or* whether the participants engage to the project for the purpose of profit from sale of the acquired emission credits.

If the States in question do not interpret the term 'permanent establishment' uniformly, it might result in double taxation as a consequence of different qualification, e.g. in the State of source the participation in CDM's or JI's is considered as constituting a permanent establishment and consequently the State of source is allocated the right to tax *and* in the State of residence the exact same participation is not considered as constituting a permanent establishment and consequently the State of residence is allocated the right to tax.

Third, as no clear market price exits on projects or with regard to CDM projects, the so-called primary CER, hence transfer pricing might be an issue.

The transfer of technology, know-how and services between associated enterprises in the context of CDM and JI projects will be subject to the transfer pricing legislation of the countries involved. The transactions must thus be valued in accordance with the arm's length principle, which is the cornerstone of the international transfer pricing regime.

In terms of transfers between 1) head offices and foreign permanent establishments, 2) permanent establishment in different Member States and 3) intra-group companies, consistency seems to appear as the arm's length principle and the domestic transfer pricing regime apply in all three situations in the following countries: Australia, Austria, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg (intra-group transactions), the

Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Some of the reporting countries (Austria, Bulgaria, Cyprus, Denmark, Estonia, France, Germany, Hungary, Liechtenstein, Lithuania, Norway, Portugal, Romania, Slovakia, Slovenia, Spain and the United Kingdom) have further reported that the domestic transfer pricing legislation generally is interpreted in accordance with Article 9 of the OECD Model Tax Convention.

Three of the reporting countries reported that even though the arm's length principle in fact applies, no specific transfer pricing legislation has been enacted (Ireland (formalized arm's length principle for intra-group trading transactions, has effect as of 1 January 2011), Latvia and Malta). Further it is reported that under Bulgarian and Maltese tax law, transfer between head office and foreign permanent establishments is not considered a transfer for tax purposes, since permanent establishments do not constitute separate legal entities. However, the arm's length principle applies in regard to intra-group transactions.

No guidelines on valuation of such mechanisms according to Article 9 of the OECD Model Tax Convention are made. Consequently, the valuation must be made in accordance with the general interpretation of the arm's length principle. The challenges and the uncertainties that may occur during the estimation of conditions that does not differ from those, which would have been made between independent enterprises, are not an issue occurring only in relation to CDM or JI projects. On the contrary, it is a general issue that often occurs when valuating unique or rare types of transactions for transfer pricing purposes.

Trade of credits (secondary CER´s)

This section deals with some of the tax implications that occur in relation to the general transactions involving the trade of credits. With regard to secondary CER's, we do not see any significant potential for tax arbitrage via transfer pricing as CER's are traded daily with clear and public market prices, cf. chapter 2.2.

However, regarding the qualification of emission credits for tax purposes there might be an issue. The qualification of emission credits is sufficient in relation to the determination of the tax treatment of sale and purchase of such. It follows from the comparative analysis reported in Deloitte (2010) "*Study on the Tax Treatment of EU Allowances – The Issues of Corporate Income Tax*" that the majority of the reporting countries have addressed that the qualification of emission credits for tax purposes is not yet clarified. As a best guess, it is reported that emission credits are expected to be treated similar to EUA's as outlined in our report referred to above.

However, Belgium has reported that the credits issued from CDM or JI projects are to be considered directly linked to the investment made and be considered as direct revenue of the

investment to the extent that the conversion into emission credit is a mere formality or a market price is available for these types of credits.

In Denmark, two opposing opinions have been presented in legal theory: (1) credits should be treated similar to emission allowances and (2) credits should be considered a financial instrument/derivative and subject to specific tax provisions regarding such financial instruments.

Generally, all of the reporting countries reported that as a best guess the taxation of emission credits from CDM and JI projects is expected to be similar to the tax treatment of EUA's. As a consequence of the uncertainty regarding the qualification of EUA's, the tax effects from purchase or creation of emission credits issued from CDM's and JI's are of a similar –or even more - uncertain nature.

Observations on tax planning opportunities

The possibility of arbitrage occurs due to inconsistent qualification and/or tax treatment of the income/gain in question in the relevant jurisdictions. As the qualification and tax treatment of participation in CDM and JI projects as well as the qualification and tax treatment of emission credits are subject to great uncertainties, several arbitrage opportunities may exist. However, it should also be noted that great uncertainties may prevent tax planning due to the lack of due process and may further result in double taxation and the avoidance of participating in CDM or JI projects.

Such potential tax planning opportunities can be divided into two main categories: (1) planning opportunities that occur due to inconsistent qualification and/or tax treatment of emission credits and participation in CDM/JI projects and (2) planning opportunities of more general character that also occur in relation to emission credits and CDM/JI projects. Below we have provided examples of both categories.

Examples of category 1 opportunities:

- Double non-taxation as a consequence of different interpretation of the term 'permanent establishment. The possibility of inconsistent interpretation of the term 'permanent establishment' especially occurs in respect to CDM and JI projects as these projects differ significantly from other types of projects. CDM and JI projects are unique as these projects only has a potential value due to legislation on the requirement of surrender of EUA's combined with the possibility of generation of emission credits (CER's and ERU's).
- Double non-taxation as a consequence of different tax characterisations and tax treatments with respect to domestic tax legislation and/or different qualification pursuant to tax treaties. This issue is relevant with respect to the qualification and tax treatment of the emission credits, i.e. tax treatment of the grant hereof, trading and used to offset emissions in the EU ETS. However, this issue is also relevant with respect to the tax treatment of expenses incurred in relation to the CDM/JI project, including the tax

treatment of expenses incurred in the beginning of the project phase, i.e. before the project returns a benefit in terms of emission credits, expenses associated with the certification process as well as expenses incurred during the operational phase of the project.

- Utilisation of the different characterisations in the various jurisdictions with respect to treating engagement in CDM or JI projects as acquisition of an asset (emission credit) that may be reported in the balance sheet and amortised/depreciated versus treating engagement in CDM/JI projects as a deductible expense. Although this difference may only be of a temporary nature, it could have a significant impact on cash flows of multinational groups.
- Utilisation of the different characterisations in the various jurisdictions with respect to treating emission credits as assets that may be reported in the balance sheet and amortised/depreciated versus treating emission credits as a deductible expenses. Although this difference may only be of a temporary nature, it could have a significant impact on cash flows of multinational groups.

Examples of category 2 opportunities:

- Centralising the possession of the group's participation in CDM or JI projects in one group company, which could serve as an intra-group 'creation centre'. If the group expects the creation centre to be profitable, it could be placed in a low tax jurisdiction or in an affiliated company with tax losses carried forward. If instead the creation centre is expected to be loss-making, it could be located in a profit-making affiliated company in a high tax jurisdiction.
- Centralising the possession of a groups knowhow, e.g. abatement technology in one group company, which could serve as an intra-group 'knowhow centre'. And as above, if the group expects the knowhow centre to be profitable, it could be placed in a low tax jurisdiction or in an affiliated company with tax losses carried forward. If instead the knowhow centre is expected to be loss-making, it could be located in a profit making affiliated company in a high tax jurisdiction.
- Generally, in respect to intergroup transactions the opportunity of tax planning occurs. Consequently, transfer pricing legislation is likely to apply in relation to such intergroup transactions. This scenario involves generally certain issues for tax purposes, e.g. estimation of an arm's length value/price. Such issues also occur in relation to CDM/JI projects, particularly in the case of transfer of knowhow or the like and in situations where the ownership of projects is transferred. In this respect, it should be noted that the OECD Transfer Pricing Guidelines do not contain any guidelines on the estimation of appropriate transfer prices in the context of CDM/JI projects.

From the analysis above the most important issue is with regard to inconsistent qualification and/or tax treatment of CDM/JI both in terms of cost incurred in the project phase, but also with respect to trade of secondary CER´s. The inconsistence may cause double non-taxation, double taxation and/or inefficiencies in terms of GHG abatement.

Chapter 5 POSSIBLE SOLUTIONS TO IDENTIFIED PROBLEMS

We have identified a number of potential problems in the current regime for taxation of EUA's and other market based climate policy instruments that may reduce their efficiency in abating emissions and/or create opportunities for tax arbitrage and/risk of double taxation. Chapter 5 discuss some possible solutions. Section 5.1 offers our summary of best practice for taxation at the national level. Section 5.2 reviews whether inclusion of ETS in a possible Common Consolidated Corporate Tax base might be helpful. Section 5.3 reviews the interaction of the ETS with the EUs directive on Interest and Royalties. Finally, we summarise our overall policy recommendations in section 5.4.

5.1. BEST PRACTICE SOLUTIONS

We have defined four questions that are crucial when reviewing the functioning of tax systems vis-à-vis ETS and put forward our recommendations for best practice.

First, should allowances be categorised in national tax systems as (1) a commodity, (2) an intangible asset or (3) a financial asset, this being the three standard possible options? We argue generally that treatment as a commodity is the most natural solution and creates the least problems of implementation. We have to bear in mind that allowances are mainly aimed at fossil fired power plants or other huge consumers of fossil energy. These companies view allowances complimentary to other inputs into the productions process, hence different tax treatment of complimentary commodities are basically not preferential. Essentially, the purpose of these flexible instruments is to create a new trade 'commodity' with a common price within the EU, namely emissions of GHG, which is to be treated as any other operational expense.

Second, should firms be allowed to deduct their purchase costs for tax purpose (1) in the year when it is purchased or (2) when used to comply with ETS obligations? We argue that the best solution would be to deduct it when it is used. If the allowance is bought and 'used' within the same tax year, the distinction makes no difference. However, ETS allowances can be stored: if not used in year 1, they can be transferred for use in the subsequent years. Inherently, ETS allowances are not exposed to 'wear and tear', hence there are no costs associated with buying an allowance used for future compliance (besides financing costs plus risk of price changes). Indeed, this is a main argument against treating it as an intangible asset, an asset type that is typically allowed a linear depreciation of its value over its life time.

Third, should capital gains and losses on allowances be taxed when (1) realised or (2) when they accrue? Our verdict is more open here. Most analyses on tax systems are favourable to accrual based taxation as deferred taxation typically increases risk of non-compliance and tax arbitrage. Standard arguments against are adverse cash-flow consequences for firms (taxes have to be paid despite no incoming cash from sale) and uncertainty about the real market price of the asset/commodity. While the latter argument clearly does not apply to ETS al-

lowances that are traded on a real-time basis, the cash-flow problem could be an issue. Moreover, the tax systems in place in the EU uniformly use realisation principles for sales of other operational assets and commodities, so we would propose this principle also here.

Fourth, how should free allowances be taxed? Our focus is on the post 2012 regime where the allocation of free allowances are increasingly being restricted to energy intensive industries in international competition, i.e. the enterprises that are most likely to react to tax induced distortions from the ETS. There are essentially two options on the table: (1) taxed when received and deducted for tax purposed when used or (2) un-taxed when received but also no right of deduction when used. If received and used in same fiscal tax year, there is no difference from a cash-flow perspective. However, if the allowance is stored for use in later years, the non-tax system is preferential for the receiving companies as there is no up-front taxation, where option 1 is more in line with tax theory, hence all kind of benefits should be added to taxable income . Again, referring to the previous section, we argue in favour of accrual based taxation.

Summing up best practice, we would recommend the following:

- Treatment of allowances: commodity
- Depreciation: none should be allowed (no 'wear and tear')
- Time of deduction for auctioned allowances: when used
- Taxation of gains/losses: for consistency with rest of tax system, realisation
- Free allowances: more open discussion but preference for solution "not tax received, no later deduction when used"

5.2. Inclusion of ETS in a possible Common consolidated corporate tax base

The most 'prominent' problem identified by the Deloitte study is the difference in tax treatment by the national states. However, as indicated both by the numerical examples and the modelling of abatement curves in the previous chapter, this problem currently seems to be of modest character and may never become severe.

The idea behind the Common Consolidated Corporate Tax base (CCCTB)

Companies operating within the EU currently have to deal with up to 27 different and often overlapping tax systems. The complexity caused by this patchwork of national tax systems entails tax uncertainty, double taxation as well as compliance costs. To mitigate these problems, the European Commission has initiated the work towards creating a CCCTB.

The core purpose of the CCCTB is to establish a single consolidated computation of taxable corporate income for businesses operating within the EU. The CCCTB will make it possible for businesses to opt for taxation according to one set of common rules instead of national rules.

If a group decides to opt for the CCCTB, the total consolidated tax base of the group – computed according to the CCCTB rules – should subsequently be shared among the EU Member States, in which the group has activities, in order for the Member States to be able to tax their share of the total consolidated tax base with the tax rate applicable in the Member State.

Computing the tax base as a whole and individual country shares

Under the CCCTB the companies would be subject to corporate tax on their worldwide income. The taxable income would be broadly defined to include income of any kind, whether monetary or non-monetary, including not only trading income but also proceeds from disposal of assets and rights, interests, dividends and other profit distributions, subsidies and grants etc.

Deductible expenses would mean all expenses incurred by the tax payer for business purposes in the production, maintenance or securing of income including costs of research and development or in raising equity, or debt for business purposes. It is suggested that the definition of deductible expenses is accompanied by a list of non-deductible expenses.

How to recognize an asset for tax purposes is, however, not completely clear under the CCCTB rules. A brief definition is set out, which defines tangible as well as intangible assets as *"Resources held and controlled by an enterprise for use in the production or supply of goods and services, for rental to others or for administrative purposes which are expected to be used during more than one period"*. Further, the circumstances under which property, plant and equipment should be recognized as tangible assets have been described as: *"a) …it is probable that future economic benefit associated with the asset will flow to the enterprise; and b) the cost of the asset to the enterprise can be measured reliably."* These vague statements/definitions have been subject to criticism.

When the total consolidated tax base of the group has been computed according to the CCCTB rules, this tax base should be shared among the EU Member States, in which the group has activities in order for the Member States to be able to tax their share of the total tax base with the tax rate applicable in the Member State.

The CCCTB as a possible means to harmonise the tax treatment of ETS allowances

First of all, it would lead to difficulties/uncertainties if the tax treatment of ETS allowances should be deduced from the general CCCTB rules:

- Concerning any initial allocation of ETS allowances free of charge, such an allocation may in our view constitute taxable income, as gift/grants/subsidies are considered taxable income according to the CCCTB rules (unless a specific exception is inserted).

- Further, the qualification of the ETS allowances – as intangible assets, inventory, financials assets etc. – could in itself prove to be difficult. In addition, it must be considered whether any purchase price paid for ETS Allowances acquired at auctions should be capitalized and depreciated or instead deducted directly under the CCCTB.

If, however, the tax treatment of ETS Allowances is addressed specifically under a later CCCTB proposal, this could obviously resolve or reduce the difficulties/uncertainties with respect to the qualification and clarify how ETS allowances should be treated for tax purposes (provided that businesses actually choose to opt for the CCCTB rules, and that a reasonable amount of Member States decides to introduce the CCCTB rules).

In general, some of the main benefits of the CCCTB are considered to arise from consolidation, as this would allow loss consolidation among the affiliated companies of the group and free companies from compliance with intra-group transfer pricing rules. In this regard, it should, however, be kept in mind that transfer pricing issues are not particularly widespread when it comes to intra-group transfers of ETS allowances as the market price (arms length price) on ETS allowances across the EU is the same and transparent. In addition, it should be noted that only transfers between companies resident in Member States, which have adopted the CCCTB rules, would be freed from compliance with the transfer pricing rules, i.e. transfers involving affiliated companies in non-CCCTB Member States still have to adhere to the transfer pricing rules.

Concerning emission credits generated by projects in the context of the Clean Development Mechanism (CDM) or Joint implementation (JI), the CCCTB could potentially help clarify how such emission credits should be classified and treated for tax purposes, e.g. with respect to the initial allocation, provided that a later CCCTB proposal in fact addresses these issues. However, as it is the case with the tax treatment of ETS allowances in general, the potential benefit depends on whether businesses actually choose to opt for the CCCTB rules or whether a reasonable amount of Member States decides to introduce the CCCTB rules.

Optional use of the CCCTB

When discussing whether the CCCTB is a possible means to harmonize the tax treatment of EUA's, it is important to remember that under the proposed CCCTB system it is optional for businesses to apply the CCCTB rules. As a consequence, the introduction of the CCCTB would not necessarily entail that all companies/groups involved with the EU ETS would end up being taxed according to the CCCTB rules. In fact, it is most likely that at least some companies/groups would prefer to continue to apply national tax legislations. Moreover, the subjective scope of the CCCTB and the ETS is not identical.

Number of Member States joining the CCCTB

The introduction of a CCCTB has been subject to heavy criticism by some Member States. Originally, it was the intention that a directive proposal on the CCCTB should have been

put forward by the European Commission during 2008. However, the Irish referendums on the Lisbon Treaty put the presentation of the directive proposal (temporarily) on hold, as the CCCTB turned out to be a sensitive issue during the Irish election campaign. The newly appointed Commissioner for Taxation and Customs, Audit and Anti-fraud – Algirdas Semeta – has, however, recently stated that he wishes the work on the CCCTB back on track.

Despite the Commissioner's intentions, it is in our view not likely that a CCCTB directive – applicable to all Member States – would be adopted in the near future as this requires unanimity and as some Member States strongly opposes the creation of a CCCTB. However, if at least one-third of the Member States are in favour of the CCCTB, these Member States can decide to move on with introducing the CCCTB through the 'enhanced corporation procedure'. In that case, obviously, the CCCTB will only apply to the Member States involved in the 'enhanced corporation procedure'. This may further reduce the usefulness of the CCCTB as a means of harmonising the tax issues related to the ETS.

In our view, several factors indicate that the CCCTB is not an expedient, fast and realistic means to harmonise the tax treatment of ETS allowances within the EU:

- *First*, the CCCTB rules – in its current form – do not specifically address how ETS allowances should be treated. Accordingly, difficulties/uncertainty on the tax treatment could arise.

- *Second*, the CCCTB is intended to be optional, i.e. not all companies involved in the EU ETS can be expected to opt for the application of the CCCTB. Thus, these companies would still be subject to the differential tax legislations in the jurisdictions in which they have activities.

- *Third*, it is not realistic that CCCTB rules – applying to all Member States – will be adopted in the near future.

Accordingly, relying on the CCCTB as a means to harmonise the tax treatment of ETS Allowances within the EU could prove to be problematic. However, if the tax treatment of ETS allowances is addressed specifically under a later CCCTB proposal this could obviously resolve or reduce the difficulties/uncertainties with respect to the qualification and clarify how EUA's should be treated for tax purposes, provided that businesses actually choose to opt for the CCCTB rules and that a reasonable amount of Member States decides to introduce the CCCTB rules.

In our view, facilitating the adoption of a directive specifically targeted at harmonising the tax treatment of ETS allowances seems to be a more fruitful path to follow.

5.3. Interaction of the EU ETS and the Interest and Royalty Directive

In the previous chapter we discussed the risk of double taxation due to different interpretation of the provision of the OECD Tax Convention Model. We did not find evidence for risk of double taxation, although we cannot rule out that double taxation of cross-border transactions in the ETS market may occur. If transactions from allowance trading fall under The Interest and Royalty Directive, this may prevent double taxation. This paragraph addresses to what extent the Interest and Royalty Directive covers cross-border transactions under the EU ETS.

We conclude that income derived from EU ETS allowances, CDM's or JI's are not covered by the notion of interests under the Directive since ETS allowances, CDM's, and JI's do not qualify as debt claims. Furthermore, it is submitted that payments for the use of or the right to use ETS allowances, CDM's or JI's are not covered by the notion of royalties for the purpose of the Directive.

Scope of the Interest and Royalty Directive

According to the Interest and Royalty Directive, interest and royalty payments arisen in a Member State shall be relieved from any form of tax in the source state (i.e. no withholding taxes are levied) if the beneficial owner of the interest or royalty is a company or a permanent establishment resident in another Member State belonging to a company in a Member State. For the Interest and Royalties Directive to apply, both parties must qualify as a 'company of a Member State' as mentioned in the annex to the Interest and Royalty Directive, and being a taxable entity resident in a Member State. Another important requirement is the association between the companies as defined in the Directive. A company is 'associated' with another company if:

- It directly holds at least 25 per cent of the other company's capital; or
- The other company directly holds at least 25 per cent of its capital; or
- A third company directly holds a share of at least 25 per cent of both its capital and the other company's capital.

In conclusion, if these general requirements are met, interest and royalty payments between associated companies within the EU may avoid withholding taxation (but not income taxation).

The notion of interest

For the purpose of the Interest and Royalty Directive, the notion of interest is defined directly in the directive as

> *The term 'interest' means income from debt claims of every kind, whether or not secured by mort-gage and whether or not carrying a right to participate in the debtor's profits, and in particular, income from securities and income from bonds or debentures,*

including premiums and prizes attaching to such securities, bonds or debentures; penalty charges for late payment shall not be regarded as interest.

The Interest and Royalty Directive

As it appears from the definition, an interest is income from a debt claim. Thus, the essence is the interpretation of the notion of *debt claims*. The notion of debt claims seems broad as the wording refers to debt claims of any kind. It is our opinion that the broad interpretation of the notion of debt claim for tax purposes only includes loan of money, i.e. loan of assets are not covered by the notion of debt claims and consequently income from loan of assets does not qualify as interest covered by the Interest and Royalty Directive. However, this might be different if the loan itself is a debt claim, e.g. a loan of an interest bearing bond. As loan of ETS allowances, CDM's and JI's are loan of assets, it is hard to see that EU allowances, CDM's and JI's should be covered by the Directive in its current form. The background for the interest definition is explained in COM (1998)67 where it is stated that:

...The term 'interest' as used for the purposes of this Directive denotes in general all income from debt-claims of every kind. The definition is based on that used in Article 11 of the 1996 OECD Model Tax Convention on income and on capital, with the exception of income from government securities which is not relevant to this Directive. Penalty charges for late payment do not really constitute income from capital, but are rather a special form of compensation for loss suffered through the debtor's delay in meeting his obligations. These charges are therefore, as in Article 11 of the OECD Model Tax Convention, not regarded as interest for the purposes of this Directive...

COM (1998)67 final, p. 6

Due to this reference to the OECD Model Tax Convention, the notion of interest is intended to be similar to the notion used in Article 11 of the OECD Model Tax Convention.

The notion of royalties

For the purpose of the Interest and Royalty Directive, also the notion of royalty is defined directly in the directive. The wording in this regard is as follows:

The term 'royalties' means payments of any kind received as a consideration for the use of, or the right to use, any copyright of literary, artistic or scientific work, including cinematograph films and software, any patent, trade mark, design or model, plan, secret formula or process, or for in-formation concerning industrial, commercial or scientific experience; payments for the use of, or the right to use, industrial, commercial or scientific equipment shall be regarded as royalties.

The Interest and Royalty Directive

The quote specifies the notion of royalties for the purpose of the Directive. The use of the wording "*the term 'royalties' means…*" instead of, e.g., "*An example of royalties are…*" *or "payments of any kind received as consideration for the use of, or the right to use for in-*

stance…" indicates that the notion of royalties under the Directive is exhaustive. In other words, it appears from the wording of the Interest and Royalties Directive that only the payments directly mentioned in the definition (typed in italic above) are covered by the scope of the Directive.

The notion of royalties for the purpose of the directive is payments of any kind received as a consideration for the use of or the right to use the mentioned types of intellectual property. These mentioned types of intellectual property can in short be summarised as legal rights that primary follow from the protection of patents, trademarks, designs, copyrights or trade secrets etc. Thus, the mentioned rights are (mostly) legally protected, giving the owner the exclusive right to (cost-free) use and prevent others to use the intellectual property.

In some Member States, EU allowances are most likely to qualify as intangible assets for corporate income tax purposes, which follow from the comparative analysis carried out in our draft report on "Study on the Tax Treatment of EU Allowances - The Issues of Corporate Income Taxation". Payments for the use of or the right to use EU allowances might qualify as royalties for national corporate tax law purposes if the allowances qualify as intangible assets.

Regardless of the qualification of ETS allowances, CDM's or JI's pursuant to national tax legislation, the practical transactions involving the EU allowances, CDM's and JI's are not of a similar nature as transactions involving intellectual property and the payment of royalties covered by the scope of the Directive. In our opinion, payments received as consideration for the use of or the right to use ETS allowances, CDM's or JI's are not covered by the notion of royalties and no basis for such an interpretation of the notion seems to exist. Consequently, transactions under the ETS should not qualify as royalties for the purpose of the Interest and Royalty Directive.

5.4. POLICY RECOMMENDATIONS

As a whole, we find little evidence that the current construct of EU national taxes and bilateral OECD based bilateral tax treaties will lead to significant malfunctioning of the ETS system. In particular, welfare losses from tax induced distortion to the location of abatement activities will be absolute trivial compared to the massive levels of abatement the system will deliver and the overall yearly purchase costs of ETS allowances.

However, the lack of clarity and transparency in terms of the treatment that Member States will apply to ETS allowances leads to unnecessary compliance costs. Auditing firms and firms with ETS compliance obligations spend time on guessing what explicit tax system will eventually emerge in countries that have not yet implemented specific tax provisions. Moreover, we noted some problems related to the tax treatment of the CDM and JI instruments.

The EU and its Member States have several possible options.

The first and least complicated is to *adopt a set of best practice rules for taxation*, a code of essentially voluntary character. In our view, it could focus on a few key principles already outlined. Allowances both in terms of EUA´s and CER´s should be treated as a commodity in national tax law and purchase costs deducted against the tax bill when used for compliance. Any gains or losses resulting from changes in the price of allowances should be taxed when they are realised, i.e. when sold. Accrual taxation is certainly possible but deviates from tax practice in Member States. The exception is financial institutions and professional traders where accrual taxation is the norm. We also suggest that taxation of free allowances is included in the best practice guideline. We have a preference for the model where they are not taxed with the counterpart that they cannot be deducted when used. In addition, it should be agreed in an appropriate OECD forum that ETS allowances in the context of bilateral treaties should be treated as business profits in line with the treatment as a commodity linked to firms ongoing production activities.

Moreover, our analysis regarding CDM and JI´s showed that the most important issue is inconsistent qualification and/or tax treatment of CDM/JI both in terms of cost incurred in the project phase, but also with respect to trade of secondary CER´s. The inconsistence may cause double non-taxation, double taxation and/or inefficiencies in terms of GHG abatement. In order to provide for more harmonised and consistent treatment the Commission should push for guidelines on proper tax treatment to be developed and discussed as well in appropriate international forums. These guidelines would provide the member states with the opportunity to harmonise rules and practises and, hence secure EU tax treatment that support the functioning of the market for GHG abatement and mitigate the opportunity for tax arbitrage.

A second approach is to link a more co-ordinated approach to the taxation of ETS allowances with the work to create a Common Consolidated Corporate Tax Base for businesses operating within the EU, abbreviated as CCCTB. The complexity for firms and authorities by having to operate in patchwork of 27 national tax systems entails tax uncertainty, double taxation as well as compliance costs that has led the Commission to initiate the work towards creating a CCCTB. If adopted, the CCCTB will make it possible for businesses to opt for taxation according to one set of common rules instead of national rules.

There are three problems associated with use of the CCCTB to solve the ETS taxation problem, which in our evaluation suggests that this is not a promising route. *First*, how to recognise an asset for tax purposes is not completely clear under the CCCTB rules. Indeed, the qualification of the ETS allowances – as intangible assets, commodity, financials assets etc. – could in itself prove to be difficult. *Second*, potential benefits depend on whether businesses actually choose to opt for the CCCTB rules and whether a reasonable number of Member States decide to introduce the CCCTB rules. As a consequence, the introduction of the CCCTB would not necessarily entail that all companies/groups involved with the EU ETS

would end up being taxed according to the CCCTB rules. *Third*, the near term probabilities of CCCTB being adopted and applied widely in the EU are not very high.

A third approach or perhaps rather aspiration would be if the ETS allowance could be said to fall within EU's directive on royalties and interests. We did not find evidence for risk of double taxation, but if transactions from trade of allowances falls under The Interest and Royalty Directive this may prevent double taxation. However, the conclusion in this review is that income derived from EU ETS allowances, CDM's, or JI's are not covered by the notion of interests under the Directive as neither ETS allowances, nor CDM's and JI's qualify as debt claims. Furthermore, it is submitted that payments for the use of – or the right to use – ETS allowances, CDM's, or JI's are not covered by the notion of royalties for the purpose of the Directive.

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APPENDIX

DESIGN OF MODELLING SETUP OF NON-UNIFORM TAXATION OF ETS ALLOWANCES

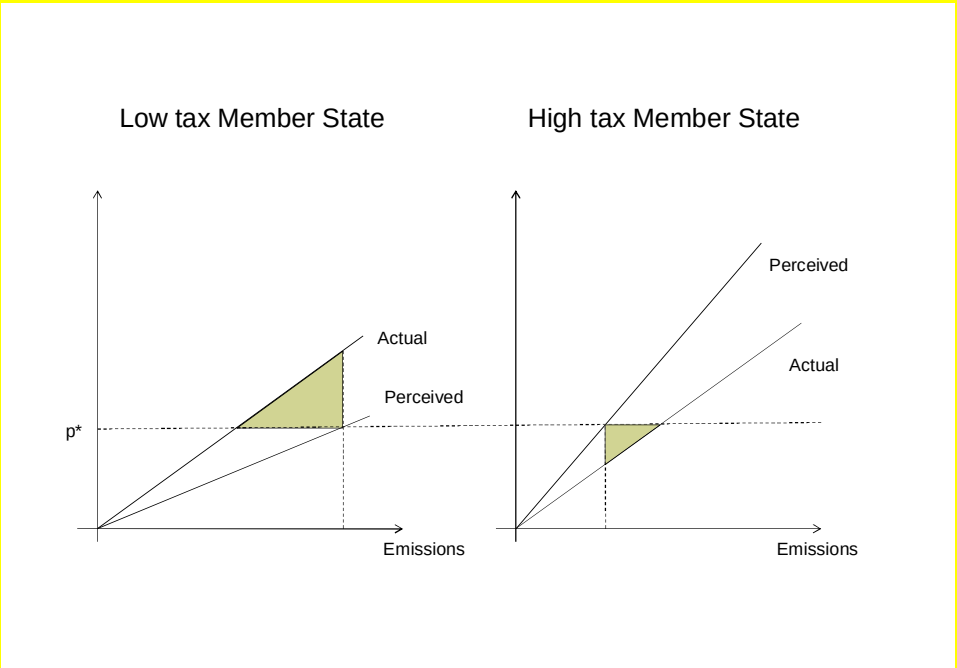
In the following, we demonstrate how the additional abatement cost figures from Table 4.8 above have been calculated. *First*, we theoretically explain how the distortion arises. *Second*, we demonstrate how we have aggregated tax regimes into comparable measures that are sensible to use in an economic model of abatement costs. *Third*, we describe the content of the economic model. *Fourth*, we present scenario and robustness analyses.

The economic issue

The Eu-wide market for carbon emission allowances, the ETS, is intended to facilitate the cheapest and most efficient carbon emission abatement for a given level of maximum pollution. For the efficiency result to hold, we need a common net allowance price across Eu-countries. Firms across Europe should have exactly the same incentive to cut on emissions. However, differences in taxation schemes may cause differences in net prices. This will lead to an inefficient allocation of allowances where cheap abatement in a high-tax country is substituted by expensive abatement in a low-tax country.

In the figure below, we demonstrate the welfare loss of non-uniform taxation. Each panel represents a small open economy – in the left panel taxation is more lax than the European average and in the right panel taxation is more rigid. This implies that industries in the left panel Member State will perceive marginal abatement costs below their actual (comparable) level. The opposite holds for the right panel industries. Thus, at the given allowance price, p*, industries in the left panel Member State choose to over-abate, while industries in the right panel choose to over-emit, and this creates welfare losses of the size illustrated by the shaded triangles. The situation of a large open economy influencing the allowance price is slightly more complicated to represent in a single figure, but the mechanisms are basically the same.

Figure 0.1 Welfare losses from non-uniform taxation



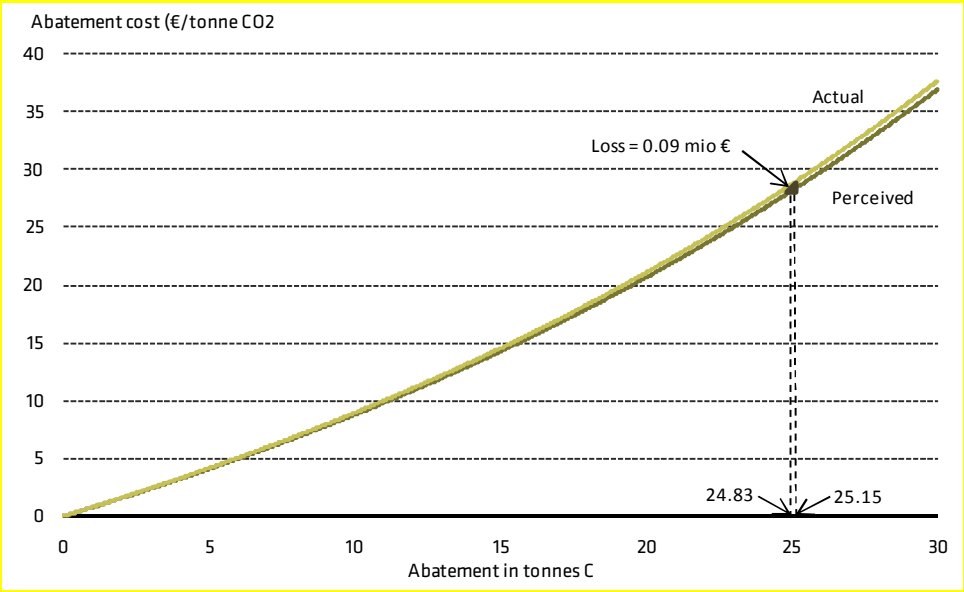
Source: Copenhagen Economics

The purpose of the empirical model is to assess the absolute magnitude of the problem at the EU level under current taxation schemes. That is, we will seek to measure the accumulated size of triangles across Member States.

We can use this graphic framework to see why the overall distortion losses are minor in magnitude. Consider Figure 0.2, showing the actual and perceived marginal abatement costs for Germany – the largest abater - and holding one of the more extreme tax equivalents of around -2 pct, c.f. Figure 0.4 below. Yet, the perturbation in marginal abatement costs from differential tax treatment is rather limited – the eye can hardly capture the difference between the two lines. Our model tells us that Germany should abate app. 24.83 million tonnes C, but the perturbation causes an actual abatement of app. 25.15 million tonnes C.[33] The additional (avoidable) abatement costs amounts to app. 0.09 million €, which is again an extremely small figure. Another way of acknowledging the limited size of the triangle is to note that abatement is app. 1per cent higher than first-best (25.15/24.83-1=1.2 per cent) and this happens at a cost perceived app. 2 per cent below the actual. This amounts to app. 1 per cent * 2 per cent / 2 = 0.01 per cent.

[33] The model counts abatement in carbon units, not CO2 units. The conversion factor is app. 12/44 and this has been applied to the vertical axis of the figure to obtain a standard CO2 allowance price.

Figure 0.2: Perceived and actual MAC's for Germany, 20 pct reduction scenario



Note: Marginal abatement costs curve for Germany as calibrated in the model.
Source: Copenhagen Economics

Aggregating tax regimes to tax equivalents

One of the main challenges in the empirical modelling is to quantify the impact from a given tax regime. In terms of Figure 0.1 and Figure 0.2, what we need to understand is how much the perceived abatement costs tilt away from the actual abatement costs on a country by country basis. Technically, what we aim at is a comparable measure of the angle between the two curves, a tax equivalent, capturing the differences in tax regimes. A high tax equivalent corresponds to a relatively unfavourable tax regime and vice versa.

In order to answer the question of how to quantify tax regimes, we first need to identify what general regimes apply throughout the EU. Since there are two types of allowances, grandfathered and auctioned, we need to separate the identification according to these. Our conclusions concerning tax regimes are the following:

- Grandfathered:
  - Allowances are treated under a separate heading on the balance sheet. Allowances will never enter the profit-loss account and therefore not create any tax effects.
  - Allowances are treated as income in the year of grandfathering. Used allowances will then figure as an expense. Thus, tax effects will only arise to the extent that allowances are stored between years.

- Auctioned[34]:
  - Allowances are considered a business expense in the year of purchase
  - Allowances are considered an intangible asset, which is to be depreciated when used. Alternatively, allowances are considered a business expense in the year of use.
  - Allowances are considered an intangible asset, which is to be depreciated linearly (and when used correcting for base)

In several countries there is uncertainty towards the applicable regime as several solutions can be equally valid, i.e., it is basically an accounting choice. Other countries have slightly different wording on the classification of auctioned allowances, but essentially all countries fall within either of the three mentioned categories from a practical, economic point of view (answering the question: when is what deductable from earned profits?). The complete list of country regimes is provided in Table 0.1. Apart from listing corporate tax rates, the table shows the applicable rules on a country by country basis. In cases, where several tax regimes may be applicable, we have answered 'yes' to the most favourable regime seen from a net present tax value perspective. This corresponds to accountants behaving economically rational.[35]

[34] According to the inquiry by Deloitte, Portugal does not allow any deductions or depreciation of expenses. This regime is not presented on the list.

[35] In reality, firms may have other considerations than just maximizing net present tax values for ETS allowances.

Table 0.1 Applicable corporate tax rates and rules for taxation of allowances

Country	Corporate tax rate	Grand-fathered EUAs as income	Deduction of auctioned EUAs	Time of deduction	Depreciation possible	Depreciation rate
AUT	0.250	no	no	NA	yes	0.125
BEL	0.340	no	yes	immediate	no	NA
DEU	0.298	no	yes	immediate	no	NA
DNK	0.250	no	yes	time of use	no	NA
ESP	0.300	yes	no	NA	yes	0.1
FIN	0.260	no	no	NA	yes	0.1
FRA	0.344	no	yes	immediate	no	NA
GBR	0.280	yes	yes	time of use	no	NA
GRC	0.250	yes	yes	immediate	no	NA
IRL	0.125	no	yes	immediate	no	NA
ITA	0.314	no	yes	time of use	no	NA
LUX	0.286	no	yes	immediate	no	NA
NLD	0.255	no	yes	immediate	no	NA
PRT	0.265	no	no	NA	no	NA
SWE	0.263	no	yes	time of use	no	NA
HUN	0.213	no	no	NA	yes	0.125
POL	0.190	no	yes	time of use	no	NA
CYP	0.100	no	yes	time of use	no	NA
CZE	0.200	no	yes	time of use	no	NA
MLT	0.350	no	yes	immediate	no	NA
SVK	0.190	no	yes	time of use	no	NA
SVN	0.210	no	yes	time of use	no	NA
EST	0.210	no	yes	immediate	no	NA
LVA	0.150	no	yes	time of use	no	NA
LTU	0.200	no	yes	time of use	no	NA
BGR	0.100	no	no	NA	yes	0.15
ROM	0.160	no	yes	time of use	no	NA

Source: Deloitte and EU Commission tax survey from 2009

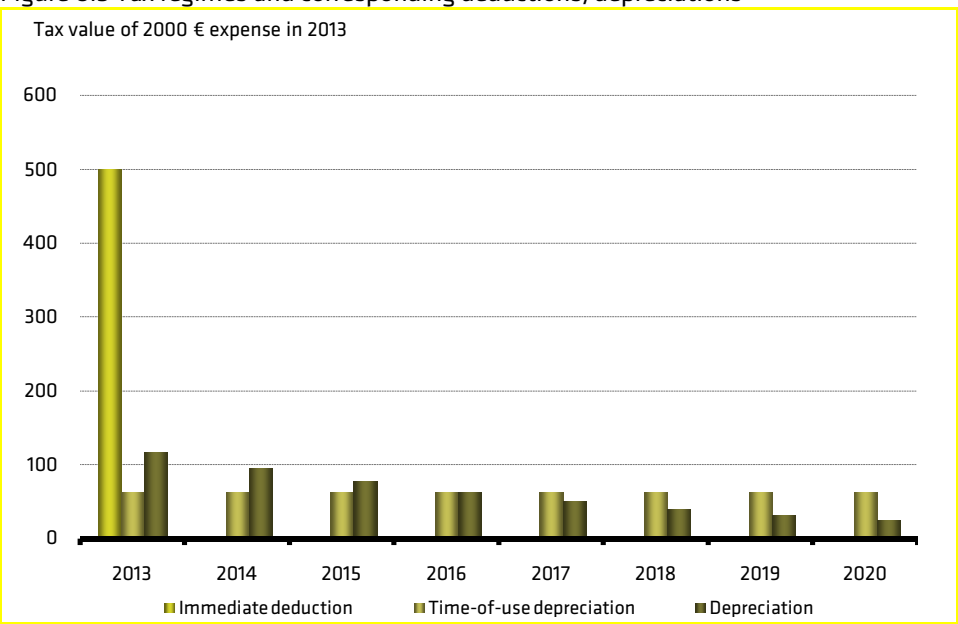
To focus the analysis on the pure tax effects, we consider the ETS Phase III (2013-2020) with a constant allowance price, since a non-constant price would only blur intuition. Moreover, we assume that firms have a strong desire to possess their necessary allowances for the entire period as soon as possible (in order to make valid investment decisions and other long term planning.)[36] In this way, we can consider differences in the net present value of

[36] Technically, we assume that this desire is stronger than the potential negative cash-flow effects related to purchase of all allowances at the beginning of the phase III period.

purchasing the necessary allowances as soon as possible when focusing only on the auctioned allowances (we discuss grandfathering below).

In Figure 0.3 we assume that a firm needs 100 allowances throughout the period 2013-2020, and it is able to buy all these at the beginning for a price of, say, 20 €/tCO2. This amounts to an immediate expense of 2000 €. This amount can now be deducted through the profit-loss account at various points in time and various sizes depending on the tax regime.

Figure 0.3 Tax regimes and corresponding deductions/depreciations



Source: Copenhagen Economics

In the simplest and most favourable regime, the company deducts immediately and gain the highest possible tax value. If the corporate tax rate is 25 per cent, the 2000 € expense would contribute with 500 € tax savings and therefore a firm net present compliance cost of 1500 €. We observe this regime as the single bar reaching 500 € in 2013.

The equally simple, but less favourable, regime concerns depreciation at time of use. This amounts to depreciating 250 € per year during all eight years (assuming identical annual emissions) contributing with 250 € * 0.25=62.5 € in tax savings each year. We find this amount illustrated by the equal sized bars in the figure. Using a discount factor of 5 per cent, this method gives rise to a net present tax value of app. 424 €, thus an experienced compliance cost of 1576 €.

The last regime combines linear depreciation and depreciation from base (of intangible assets) when used. Thus, in the first period the firm will depreciate all used allowances and a fraction of the stored allowances. This regime implies a decreasing tax value over time as il-

lustrated by the deep green bars in the figure. The net present value amounts to app. 447 with same discount factor as above yielding compliance costs of 1553 €.

The experienced compliance costs in the three regimes were 1500 €, 1576 €, and 1553 €. Taking the first regime as reference this implies tax equivalents of 5.1 per cent and 3.5 per cent, respectively. This is, however, only applicable for auctioned allowances.

Turning to the grandfathered allowances, the basic issue is in fact quite similar as it centres around net present value effects. There are two regimes: in one regime (used by most countries) grandfathered allowances only enter (and exit) the balance sheet without any tax effects; in the other regime grandfathered allowances enter the profit-loss account as income when granted and expense when used. This would basically also imply a zero tax effect if all granted allowances are used in a given year. Drawing on historical data from the ETS compliance database, CITL, we see that storage of allowances between periods is not that widespread. In 2008, we experienced negative storage (emitters have drawn on previous stocks and/or have paid penalty for non-compliance), while the crisis year 2009 resulted in storage of 9 per cent, c.f. Table 0.2.

Table 0.2 Allocated and verified emissions, millions

Million tonnes	2008	2009	Total 2008-2009
Allocated emissions	1,956	1,967	3923
Surrendered CERs	82	78	160
Surrendered ERUs	0	3	3
Total allowances	2039	2048	4086
Verified emissions	2119	1873	3993
Surplus	-81	174	94
Surplus (pct)	-4 %	9 %	2 %

Source: CITL

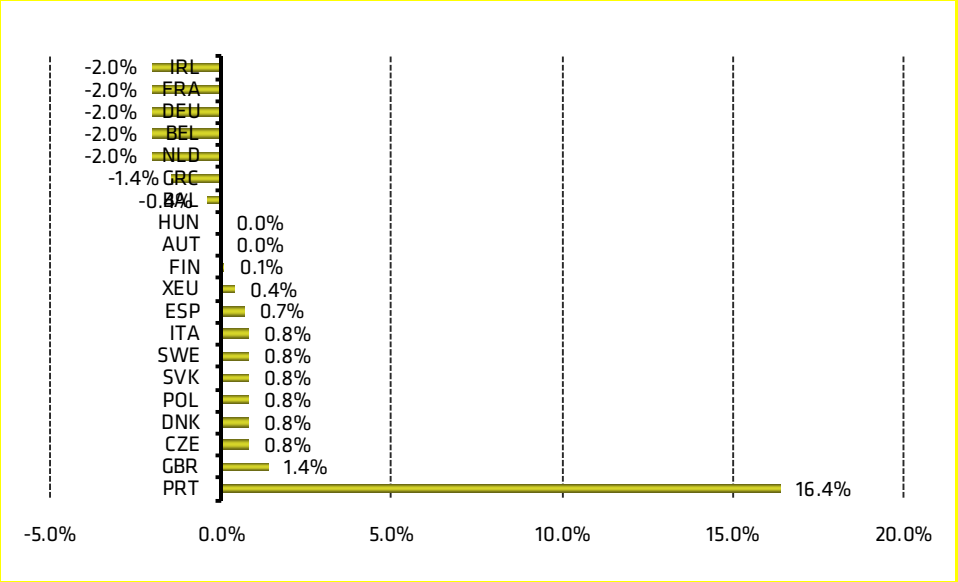
Thus, for the 5-10 per cent of allocated allowances which have been stored, firms located in countries with the income-tax-regime face a disadvantage in terms of negative net present tax value. A similar drawing as above could be made, but we hope the mechanism is clear by now. We emphasise that since the tax effect only concerns a small (and probably decreasing fraction) of grandfathered allowances together with the fact that it is only the net present value aspect giving rise to differences, the overall effect will be very limited.

Now, summarising the differences in tax regimes and calculating the corresponding tax equivalents, we get the picture drawn in Figure 0.4. We emphasise that the tax equivalents are calculated on the basis of an EU-wide corporate tax rate of 23.5 per cent.[37] In this way, we focus the analysis entirely on the differential treatment of allowances, not on other differences in tax systems. Apart from Portugal – characterised by no possibility to depreciate or deduct – most countries lie within a quite narrow band. The figure shows that a country like

[37] EC (2009).

Ireland (the first bar from above) perceives abatement costs 2 per cent lower than a hypothetical European average. The formulas for calculation of tax equivalents are presented below in the model description.

Figure 0.4 Tax equivalents



Source: Copenhagen Economics

The abatement cost model

We build an empirical simulation model around the abatement curves of EU Member States. The model considers the efficiency level of applying different country-level carbon taxes (or tax equivalents).

The model first constructs country level CO2 (marginal) abatement curves. The starting point for the construction of abatement curves are polynomials found in the economic literature.[38] These are then adjusted (after proper inclusion of the CDM market, see below) to the cost and market predictions of OECD and European Commission studies.[39]

In addition to abatement cost curves, we just need to put in the desired emission reduction targets and the tax equivalents from above. Keeping the focus on ETS Phase III gives rise to natural reduction targets of either 20 per cent by 2020 or the proposed 30 per cent target.

The abatement cost model has been augmented by a CDM module. The CDM module incorporates the fact that CDM's may be an equivalent source to abatement and treated similarly to allowances. Calibration of the CDM offer curve is based on another recent academic

[38] Böhringer et al (2008)
[39] EC (2008) and OECD (2009).

study analysing the likely shape of this curve.[40] In the CDM module we incorporate the fact that only 20 per cent of total abatement is allowed from CDM under current proposals for legislation.

To calculate the total welfare loss, we simply need to run the model with and without non-uniform taxation rules. The difference in abatement costs will exactly measure the welfare loss associated with non-uniform taxation across countries. In the following, we provide a more rigorous documentation of the model.

The basics of the model is completely similar to Böhringer et al (2008), who consider the efficiency level of applying different country-level carbon taxes for sectors covered by the ETS. In essence, the economic mechanisms at work are exactly the same in our and their study.

The model first constructs country level CO2 (marginal) abatement curves. The starting point for the construction of abatement curves is the polynomials from the above mentioned article. These are then calibrated (after proper inclusion of the CDM market, see below) to the cost and market predictions of OECD and Commission studies.[41] If we denote the parameters of the Böhringer abatement cost polynomials as a_{1i}, a_{2i}, and a_{3i} and our calibration constant as μ, we can write the marginal abatement curves as: