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The European Union Emissions Trading Hybrid: Inefficiencies in the Revised Rules after 2013

by

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Abstract

There are two design variants of emissions trading: allowance trading (cap-and-trade) and credit trading (performance standard rate trading). We argue that the former is more efficient than the latter. The European Union Emissions Trading Scheme (EU ETS) is based on allowance trading. From 2013 onwards, a phased transition is planned from the allocation of tradable carbon allowances for free to sale by auction. Until 2027, an important part of the allowances will still be handed out for free, in particular to industries that compete on an international product market in order to avoid carbon leakage. The criteria upon which the allocation of those free rights is based will be shifted from historical emissions ('grandfathering') to energy-efficiency levels ('benchmarking'), which incentivises climate-friendly investments. However, complex credit-trading type of rules have been created, in relation to capacity expansion and plant closure, which are both inefficient and ineffective. Those new rules incentivise the continuation of inefficient plants, or the expansion of unused production capacity, to receive and sell a corresponding number of allowances. Moreover, these rules do not lead to the intended reduction of carbon leakage because of the opportunity costs of free allowances. The result is a sub-optimal EU Emissions Trading 'Hybrid'.

Key words: European Union Emissions Trading Scheme, revised rules, production capacity, plant closure, firm behaviour, carbon leakage.

JEL codes: D21; D62; K32; Q48; Q54.

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1. Introduction

The idea of creating pollution markets received considerable attention by some of the founding fathers of law and economics, such as Coase (1960) and Calabresi and Melamed (1972). The concept has moved from theory to practice and is now firmly embedded in environmental law. The European Union (EU), for instance, has been building up experience with carbon dioxide (CO_2) emissions trading since 2005 (e.g. Faure and Peeters, 2008). The EU Emissions Trading Directive determines the rules applying in the periods 2005-2007 and 2008-2012 (Directive 2003/87/EC). The EU has since adopted and approved a revised Emissions Trading Directive introducing some new rules to apply in the period 2013-2020 and beyond (Directive 2009/29/EC).

In this paper we aim to examine what rules are to change, how strict the emissions caps will be and how efficiently the reduction of CO_2 emissions will be achieved under the EU Emissions Trading Scheme (EU ETS). In this economic analysis of the coming changes in EU climate law, we will see that in particular the new rules applying to capacity expansion or the closure of a plant give rise to critical questions.

To throw some theoretical light on these new rules for trading emission rights in the EU, we will start in section 2 by looking at the systems in which emissions are traded with and without a fixed cap: allowance trading (cap-and-trade) and credit trading (performance standard rate trading), respectively. The reason for this, as we will show, is that under the prevailing rules on trade in CO_2 emissions there is already some merging of these two systems. We will demonstrate that this merging will only become more pronounced under the rules that are to apply from 2013 onwards, which leads us to argue that the EU ETS is increasingly becoming a hybrid system. Therefore, in section 3 we first discuss the current rules of the EU ETS that apply from 2008 to 2012 and in section 4 we then consider the new rules that apply from 2013 to 2020 and beyond. We analyse the economic consequences of these new rules for the behaviour of firms in section 5 and for carbon leakage in section 6. Conclusions are drawn in section 7.

2. Two emissions trading concepts

The term ‘emissions trading’, or ‘tradable emission rights’, is a collective concept. It soon leads to confusion because there are two trading systems that differ substantially both in theory and in practice (e.g. Nentjes and Woerdman, 2011; Weishaar, 2007; Dewees, 2001). In the one system trade is carried out subject to an emissions cap, which is referred to as ‘cap-and-trade’ or ‘allowance trading’. The other system is based on tradable emission reduction credits, also referred to as ‘credit trading’ or ‘performance standard rate trading’.

The cap-and-trade system imposes a cap on the annual emissions of a group of companies for a period of years. The emission rights are allocated to established companies for the entire period either for free or through an annual sale by auction. A combination is also possible. Newcomers and companies seeking to expand must purchase rights from established companies (or from a government reserve), while a company closing down a plant can sell its emission rights. An example of this is the system in the United States (US) for sulphur dioxide (SO_2) emissions trading applying to the power sector that was introduced in 1995 (e.g. Klaassen and Nentjes, 1997).

The system of tradable reduction credits, on the other hand, is based on a mandatory emissions standard (permitted emissions per unit of energy consumption or per unit of added value) adopted for a group of companies. In this system emission reduction credits can be earned by emitting less than is prescribed by the emissions standard. These credits can then be

sold to companies who can use them to compensate their overrunning of the emissions standard applying to them. This system was also created by the Americans and has been under development since the late nineteen seventies (e.g. Le, 2009). A system of tradable nitrogen oxide (NOx) emission reduction credits has been in place for energy-intensive companies in the Netherlands since 2005.

What are the similarities and differences between cap-and-trade and tradable reduction credits in terms of effectiveness, efficiency and acceptance by companies? With respect to effectiveness we can be rather brief. As production and energy consumption rise, the emissions of companies bound by the emissions standard rise proportionally. This will not change if tradable reduction credits are added to the relative emissions standard. In contrast, an emissions cap and trade in emission rights is more effective because it imposes an absolute limit on emissions.

With respect to efficiency the analysis is a little more complicated but still unequivocal. In a system of tradable reduction credits companies paying high costs to achieve the emissions standard applying to them will transfer the abatement effort to companies able to comply with the emissions standard at a lower cost: efficiency improves. The emissions standard limits the emissions but the emissions within the standard remain unpriced. When selling credits the received amount of money is equal to the sum paid by companies that exceed the emissions standards to purchase the credits. For the group of companies as a whole the cost of the permitted emissions is nil. On this point the effect is the same as would be achieved with an emissions standard without trade. 'Standardised' pollution is for free and is allowed to rise if production or energy consumption increases, as long as the relative emissions standard is achieved. Consequently, there is no incentive to reduce CO_2 emissions by economising on fuel input or by slowing production. That does not earn reduction credits. Such credits can only be earned through reducing emissions per unit of energy or product.

On the contrary, in the trading system based on emissions caps, each emission unit has a price and reductions in these units are profitable. From an efficiency point of view, it is of no matter whether the emission rights are allocated for free or sold at auction. If the company uses the free rights to cover its emissions, opportunity costs are associated with them (e.g. Woerdman *et al.*, 2008). The company then foregoes the opportunity to sell its emission rights and gains revenues. The opportunity costs constitute a part of the cost price of the product. Because in the cap-and-trade system each unit of CO_2 has a price, reductions in CO_2 emissions are profitable regardless of the method by which they are achieved. In other words, it makes no difference whether such a reduction is achieved through cleaner exhaust gases, cuts in energy consumption or limiting production. There is an economic incentive to examine all possible options and to apply the most beneficial. This wider range of reduction possibilities in the cap-and-trade system leads to lower total reduction costs than in a system based on an emissions standard and trade in reduction credits. In simulations of trade in emissions, Boom (2007) finds that in a system based on trade in reduction credits the welfare loss can be as much as 20 percent more than in a system based on cap-and-trade.

With respect to acceptance the literature so far has mainly focused on acceptance by companies (e.g. Dijkstra, 1999). Tradable reduction credits produce cost savings for both buyers and sellers. The introduction of these credits to supplement an emissions standard can thus rely on the broad support of the companies. The sale by auction of emission rights under an emissions cap on the other hand may produce advantages of efficiency for the companies involved but the purchasing of rights costs money and in practice this sum exceeds the potential cost savings - which indeed must still materialise. Allocation for free has the same efficiency advantages as sale at auction. The established companies are handed the rights for free. But the relatively fast-growing companies amongst them are aware that they will not be permitted to produce higher emissions as they expand their production capacity. For this

reason, although they prefer free rights above sale by auction, they would rather opt for tradable reduction credits. However, to companies able to cut emissions more cheaply, the cap-and-trade system appeals more than does trade in credits because in the first system the demand for emissions is higher. There is in other words some divergence in the acceptability of the system based on trade under an emissions cap when emission rights are allocated for free.

3. Current emissions trading rules

After a European carbon tax turned out to be politically unacceptable towards the end of the previous century, the European Commission set its sights on emission rights allocated for free under a set emissions cap. The Commission got support from the European Parliament and from the Council of Ministers for such a cap-and-trade system for the period 2008 to 2012. In shaping the Emissions Trading Directive 2003/87/EC, however, two political compromises were made which are totally alien to the original concept of cap-and-trade as outlined above. First, member states are at liberty to decide that the rights shall lapse on the closure of a plant. As a result there is less incentive to shut down dated, inefficient plants. Second, rights also have to be allocated for free to newcomers and expanding companies.

At first sight these modifications make the cap-and-trade system look more like a system based on tradable reduction credits that also allows higher total emissions in case of firm expansion and does not allow the sale of emission rights when an installation closes. De Bruyn *et al*. (2008) point out that it is primarily the industry itself that advocated such modifications. This confirms our prediction that reduction credits are politically more acceptable than an emission ceiling with rights allocated for free. These authors also share our conclusion that the efficiency of trade in credits leaves a lot to be desired. They suggest, however, that cap-and-trade and the sale of rights at auction is the only way out of this situation. We believe otherwise. There is indeed a second option, namely the allocation of emission rights for free under a set emissions cap. In isolation, with regard to efficiency and effectiveness, this does not perform better or worse than the sale of rights at auction. The only nuance is that auctions are economically superior if auction revenues are recycled to reduce distortionary taxes: the so-called ‘double dividend’ hypothesis by Goulder (1995).

4. Future emissions trading rules

The EU recently set out the rules of play for emissions trading related to the period 2013 to 2020 and beyond under the revised Emissions Trading Directive 2009/29/EC. New in comparison with the previous period is, among other things, the phased lowering of the cap rather than a constant cap. What is quite surprising is the gradual conversion from the allocation of rights for free to sale at auction. Another change is that each member state is now obliged to allocate rights for free to newcomers and to those investing in extra capacity rather than this simply being an option for them. Furthermore, in all member states the surrendering of rights will be obligatory when a plant is closed or its capacity reduced.

The total emissions cap for 2013 and thus the number of emission rights has been determined for each member state. In the years after 2013 until 2020 the cap in each member state will be lowered by 1.74% a year. Ultimately all rights will be sold by auction: starting with 20% of the total in 2013, increasing annually up to 70% in 2020 and finally 100% in 2027. The process is to be speeded up in the power sector: in this sector all rights must be sold by auction in 2013, except in East European member states where this must be achieved by

2020. The revised Directive envisages that auctioning could start as early as 2011, but this turned out to be impossible to achieve: the European Commission recently proposed that auctions will start in 2012. Member states are free to decide how to spend the auction revenue, but the political intent is that at least 50% of this revenue be used for climate measures.

An exception has been made for CO_2 intensive sectors competing in an international product market with companies established in countries where no emissions cap applies: in principle 100% of the rights allocated to these sectors will be allocated for free during the entire period from 2013 to 2020. The number of emission rights available for this category shall decline in line with the total cap for all companies. The giving away of rights to established companies will take place on the basis of a carbon standard per unit of production multiplied by production in 2005 (or the average for 2005-2007 if this is higher). This standard, referred to as 'ex ante benchmark', is determined based on the average emissions of the 10% installations with the lowest carbon emissions per unit of product or energy output in an industrial sector in the years 2007-2008.

The EU's decision not, in principle, to allocate rights for free to companies but to sell them by auction, contradicts our earlier prediction. This is because the literature so far has mainly only addressed acceptance by companies. However, recent years have shown us that not only companies but also consumers can be powerful lobbyists. The lobbying by the regulated industrial sectors was counteracted by the unanticipated lobby of energy consumers, who refused to swallow the charging on of the value of rights allocated for free in the price of electricity (Woerdman *et al*., 2009). Consumers objected to having to pay for something obtained for free by the manufacturer. And the economic wisdom that it is efficient to do so, because of the opportunity costs of free allowances, meant hardly anything to them. We believe that this consumer opposition gave the European Commission the political room to make the transition to the sale of emission rights by auction.

Where rights are (still) allocated for free, regardless of the sector, newcomers and established companies expanding their production capacity (in excess of 10%) will be allocated rights for free subject to the same conditions as the established companies. A newcomers' reserve has been created for this category equalling 5% of the total number of rights. These rights will be allocated for free or sold by auction in the same way as this is done in comparable established plants. In the case of plant closure and a significant decline in production capacity the rights obtained for free will be surrendered. Any rights left over in any year will be sold by auction after deducting rights allocated for free and the newcomers' reserve. Any rights remaining in the newcomers reserve will also be sold by auction. The rule stipulating that all rights not allocated for free must be sold by auction is aimed at ensuring that the full quota of available rights enters the market each year.

5. Economic consequences

The question arises of how these rules for the allocation of rights for free will operate from an economic perspective. To answer this question a distinction must be made between two types of decision:

1. The corporate decision on how to use installed capacity: either for the producion of output or for getting free permits that subsequently will be sold.
2. The corporate decision regarding the expansion of capacity: expansion of capacity can be planned either for the production of output or for claiming additional free permits that will be sold for profit.

Ad 1. As long as the production capacity of the established company does not alter, the number of free CO_2 rights allocated to the company is determined beforehand. A rise or decline in production within the existing capacity does not affect the number of emission rights allocated to the company. As we already mentioned, there will then be opportunity costs attached to the use of emission rights to cover emissions generated in producing output, because by using the rights the company foregoes the revenues it would have made if it had sold the rights. Consequently, in principle, the opportunity cost is a part of the product price. Of course, it depends on the price elasticity of demand to what extent these opportunity costs can be priced in. For instance, the opportunity costs of free allowances are only partly reflected in a higher power price when the electricity market is oligopolistic (Woerdman *et al.*, 2009). But apart from this, the point that we would like to make here is that when planning production, emission rights act as allowances as in the text book model of a cap-and-trade system. When assessing the options for reducing CO_2 the limiting of energy intensive production is considered equally alongside increasing fuel efficiency or other technical measures. This results in an efficient allocation of emission reductions. The profits from producing and selling output will be compared with the profits that can be made by abstaining from production and selling the emission rights. Of the two options the most profitable one will be selected.

Ad 2. In the case of new companies and companies expanding production capacity firms also face the choice between producing and selling output and selling permits. If similar established plants are already receiving rights allocated for free, rights are also allocated for free to companies expanding their capacity. If the option of expansion for output is considered, the free permits granted for the additional capacity have an opportunity cost and together with the other production cost they have to be covered by the product price. The other option is to expand with the aim to sell the permits granted for the added capacity. Such investment is profitable if permit revenue exceeds the cost of creating capacity. No opportunity costs are attached to this because the rights themselves are sold.

The subsequent question is what impact this hybrid system containing elements of cap-and-trade and tradable reduction credits will have on the behaviour of enterprises under the EU ETS. This question has particular relevance with respect to sectors exposed to international competition where all rights are allocated for free.

In the short run capacity is given and consequently the number of emission rights is given as well. An emission right used up in production is sacrificed for generating output and can thus not be sold. The firm foregoes the revenue of selling the permit at its current market price. The permit price foregone is an opportunity cost. Together with the variable production costs it constitutes the cost price of output in the short run. In the long run, however, capacity is a decision variable. Investing in capacity has a double function. It creates the technical facilities to increase production. Next to that the same investment in capacity creates additional emission rights. The cost of an emission right is the cost of the capacity required for being entitled to the permit. Together with the variable production cost that cost of creating the complementary emission right constitutes the cost price of output in the long run.

The granting of rights for free in the event of capacity expansion and the surrender of rights in the event of a decline in capacity but not in the case of production limitation triggers undesirable strategic behaviour. This is illustrated in a numeric example. In this example the price of the product is given as € 90. For each unit of output one emission right is required. The price of an emission right is € 20. The fixed costs of capital invested in capacity are € 30, including normal profit, and the variable costs of raw materials, fuels and labour are € 50. Consequently, the full costs are € 100.

In the long run decision of planning capacity for output the management is aware that it has to earn back the variable production cost plus the cost of creating capacity and its

complementary emission rights, that is € 50 + € 30 = € 80. The profit margin is € 90 - € 80 = € 10. Investing in capacity in order to obtain rights allocated for free with a view to selling these rights is non-profitable in this numeric example. The revenue of € 20 is lower than the costs of € 30 in connection with capacity creation. New capacity is installed with a view to using it only for producing output. After capacity has been installed its cost can be deemed to be sunk costs. In the short run the available capacity can be used either for producing and selling output or for selling the emission rights that have been gained and are fixed in number. The variable costs of output consist of the variable production cost of € 50 plus the opportunity cost of permits of € 20. Together € 70. The profit from using capacity for producing output are therefore € 90 - € 70 = € 20. The other option is to sell permits at the price of € 20 for each emission right, which also yields a profit of € 20 when cost of capacity is sunk . In this case the firm is indifferent between using capacity for producing output or for selling permits.

Should the price of rights rise to € 25 while the product price remains € 90, selling permits is the most profitable use of installed capacity. With a further rise of the permit price, in excess of € 30, for instance to € 45 and price of output unchanged companies will view investing in capacity as a strategic instrument to obtain rights given that the sale of such rights will make a profit of € 45 - € 30 = € 15, which is higher than the profit margin of investing in capacity for output.

The numerical example indicates that decisions on expansion and use of capacity depend on the combination of product price and permit price in relation to the relevant cost. Table 1 summarizes the decision rules for expansion and use of capacity. The model underlying the table is and similar to that of the numerical example. Marginal costs are constant and prices of output and permits are data for the firm. The simplicity of the model makes that the firm either opts for output, or for permits. (In a future extension of the paper we hope to show that in a model with Cournot oligopoly, which in our view gives a more plausible representation of the real world, joint production of output and permit sales are feasible).

Table 1: Expansion and use of capacity

Long run decision	Short run decision
Profit margin of expansion of capacity: • for output $P_q - (C_v' + C_f')$ • for permits $P_p - C_f'$	Profit margin of using capacity: • for output $P_q - (C_v' + P_p)$ • for permits P_p
Choose expansion for output if $P_q - C_v' > P_p > 0$	Choose use of capacity for output if $P_q - C_v' > P_p > 0$

Applying the decision rules of table 1 results in an ordering showing that as product price P_q falls compared to marginal variable cost C_v' , marginal cost of creating capacity C_f' and permit price P_p a switching point is passed from where on it is more profitable to create and use capacity for generating and selling permits than for expanding production of output.

Table 2: Prices of output and emission rights in relation to costs of production and capacity

1.	$P_q \geq C_v' + C_f' + P_p$	Expand capacity for producing output Use capacity for output
2.	$C_v' + C_f' + P_p > P_q > C_v' + P_p$	Expand capacity for output Use capacity for output
3.	$C_v' + P_p = P_q > 0$	Use capacity for output or permit sales if $C_f' < P_p$: Expand capacity for output or permits if $C_f' > P_p$: Do not expand capacity
4.	$C_v' + P_p > P_q > 0$	Use capacity for permit sales If $C_f' < P_p$: Expand capacity for permits If $C_f' > P_p$: Do not expand capacity

Ad 1. When $P_q \geq C_v' + C_f' + P_p$, shifting terms gives $P_q - C_v' - C_f' \geq P_p$. The term at the left hand side (LHS) represents the profits from expanding capacity for output. Since profit from expansion of capacity for output exceeds permit price it will also exceed $P_p - C_f'$, that is the profit from expanding capacity to acquire permits for free. When it comes to the use of capacity that has been installed, including the expansion, it follows from in $P_q \geq C_v' + C_f' + P_p$ that $P_q - C_v' > P_p$. It means that the profit from producing and selling output exceeds the profit from selling permits.

Ad 2. From $P_q > C_v' + P_p$ it follows that $P_q - C_v' > P_p$. The profit from using available capacity to produce output exceeds the profit from using capacity to sell the permits. From $P_q > C_v' + P_p$ it also follows that $P_q - C_v' - C_f' > P_p - C_f'$. Expansion of capacity for output is more profitable than for selling permits, that is $C_f' < P_p$. The result is similar to case 1.

Ad 3. The firm is indifferent between output and permits in expansion as well as use of capacity. However, expansion is only profitable if $C_f' < P_p$.

Ad 4. When product price is so low that it cannot cover its variable cost, including the opportunity cost of permits, using capacity for output would yield losses, whereas selling emission rights still yields profits, provided their price is above zero. From $C_v' + P_p > P_q$, it follows that $P_p - C_f' > P_q - C_v' - C_f'$. Expanding capacity for permits is a better option than expanding for output; but it yields only a positive profit if $P_p > C_f'$.

In the short run the European scheme does not differ from a pure cap-and-trade system in use of capacity. In both types of programme the firm will give up using capacity for the production of output and sell its unused permits when the price of the product sinks below the variable production cost plus permit cost. A difference is that in cap-and-trade capacity will be curtailed or shut down in the long run to adjust it to lower output, whereas it will be maintained to retain permits in the European Trading Scheme. An even more dramatic distinction is the decision to expand capacity only with the aim to claim emission rights. That is a unique feature of the European Trading Scheme. It is profitable when the product price is below its variable production cost plus permit price and the cost of creating capacity is lower than permit price.

In general it can be said that the anticipation of high CO_2 prices in combination with low product prices makes it more likely that the capacity decision in the exposed sector will be taken for strategic reasons rather than with a view to production. In other words, the new EU rules create a bonus for risky investment behaviour. Indeed, the possibility of selling emission rights when product prices are disappointing enables companies to continue to make a profit, whereas this would not be an option if emission rights were not allocated for free in the event of capacity expansion. This encourages management to accept the increased risk attached to over-capacity.

The criticism that the new EU rules on emissions trading are inefficient does not refer to the impact they have on production. Indeed, they bring opportunity costs into the picture when planning production. As a result, as far as production planning is concerned, the system operates along the same lines as the text book cap-and-trade system. Thus, these new rules do fulfil the criteria of economic welfare as far as the allocation of reductions in emissions between technical measures on the one hand and selective production limitation on the other hand is concerned. However, the lack of efficiency is apparent in the fact that investments can be made in capacity and capacity can be maintained which is not deployed for production purposes. From a social welfare point of view this constitutes a waste. This inefficiency does not arise in a pure cap-and-trade system.

A policy option currently under consideration by the EU is to (increasingly) limit the allocation of free allowances to the extent that production is reduced, but this would not end but only restrain the aforementioned perverse incentive. Economically superior is the rule that emission rights are not cancelled in case of either retiring an installation or reducing production capacity, but that these rights remain valid for the rest of the longer-term period for which they have been assigned: this would entail a stronger incentive to close dated, inefficient plants.

6. Carbon leakage

The fact that production under the new rules is the same as production under cap-and-trade, as we have just demonstrated, has direct consequences for effectiveness. According to the revised Emissions Trading Directive, the new rules have been designed for the purpose of preventing carbon leakage: the moving of companies, and thus emissions, to countries outside the EU without an emissions trading system. There is much discussion about the question how big this problem will be in reality. Various authors expect only a limited carbon leakage effect. The World Bank, for instance, has calculated that if the EU and the US reduce their emissions by 17% in 2020 compared to 2005 there will be an additional emissions increase in developing countries of 1% (Mattoo *et al*., 2009). Moreover, according to ECN, other cost factors than the relatively limited EU ETS compliance costs appear to be more important in the decision whether or not to relocate production abroad (Sijm *et al*., 2004).

How big or small the problem will be, carbon leakage will not be prevented by handing out free emission rights in the EU for new installations and for expansion of production capacity (e.g. Fullerton and Karney, 2009). An EU company that sustains its production, and thus prevents carbon leakage, has to earn back its emission rights, next to other costs, in the product price. Empirical research has confirmed that this also happens in practice. Pass-through rates of the opportunity costs of free allowances in various EU member states vary roughly between 30% and 100% (Gullì, 2008), with the exception of Italy where those rates were even higher. If companies would fail to pass through these opportunity costs production must be ceased. In that sense the EU ETS does not work differently from a pure

cap-and-trade system. Production limitation in the EU and thus carbon leakage occur to the same extent as in a cap-and-trade system.

The new EU rules have thus created a system that is in some circumstances not only inefficient as it triggers investment in unproductive capacity but which is also ineffective in combating carbon leakage. If the rules must be interpreted as a system for navigating subsidies to a sector exposed to international competition by helping these sectors to acquire additional rights for free, it is a particularly cumbersome and costly procedure. A cap-and-trade system combined with a direct lump-sum payment to the sector exposed to international competition to compensate it for the sales losses would be much simpler and would not trigger the inefficient investment behaviour noted above.

7. Conclusion

Emissions trading is an effective and efficient instrument for climate policy providing policymakers stick to the text book model. Unfortunately, they have not always done so, even creating perverse incentives. For the period 2013-2020 and beyond the EU plans to introduce a hybrid system for trade in CO_2 emissions that will trigger over-investment in energy-intensive production capacity. Furthermore, it creates an implicit subsidy for energy-intensive manufacturers that does not exclude the situation in which production is transferred to countries with no climate policy, as a result of which carbon leakage will persist.

The EU will therefore have to make a choice between either efficiency or carbon effectiveness. Efficiency implies cap-and-trade. Carbon leakage is accepted but there is no capital wastage. Carbon effectiveness is achieved by introducing tradable reduction credits in the exposed sectors. Costs are higher because not all opportunities to reduce emissions are seized. If, in time, the carbon emissions in the sector rise due to an increase in production, an interim tightening of the emissions benchmark will be needed.

Should such an option turn out to be politically unacceptable, the only remaining consolation is that the hybrid system in which emission rights are given away for free is a transitional arrangement. The sectors exposed to international competition will see their unique position being eroded as more countries start to accept absolute emissions caps. Moreover, the finish line of 100% auctioning of emission rights in all sectors in the EU Emissions Trading Scheme will be reached in 2027. This is just as efficient as a cap-and-trade system with rights being allocated for free but has the added benefit of government revenue to make room for tax reform.

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