For a fair and effective industrial climate transition

Support measures for heavy industry in Belgium, the Netherlands and Germany

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european trade union institute

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Contents

Abstract

Europe's industrial base needs to undergo a swift and persistent transformation towards carbon neutrality and circularity, but this transition must happen in a fair and socially just manner. In this working paper, we evaluate the support mechanisms for heavy industry which have been put in place over the past 20 years, comparing the state of play in the Netherlands, Germany and Belgium. We also compare recent developments in the industrial policy frameworks of these countries, considering European as well as domestic policy levers. We conclude that policy frameworks have largely been 'defensive', have lacked foresight, and have had negative distributional effects. Recent shifts in policy have opened up avenues for progress, but the level of ambition remains insufficient and uneven. Major economic incentives and support measures should cohere with a just transition, at the (sub-)national as well as the EU level.

1. Introduction

The decarbonisation of heavy industry is a crucial part of the fight against climate change. Basic materials such as steel, cement and chemicals account for about 18% of European greenhouse gas emissions, and about 20% of global emissions (Sartor and Bataille, 2019). Transitioning away from these sectors requires a combination of 'sticks' and 'carrots', in order to ensure that they decarbonise while also retaining an economically viable industrial base. At the same time, this transition must happen in a fair and socially just manner. In other words, we need to strike a balance between social justice, economic viability and hard environmental limits.

In this working paper, we evaluate the current industrial policy regime by 'following the money'. We look at the support mechanisms for heavy industry which have been put in place over the past 20 years, including measures related to the EU Emissions Trading System (ETS), energy tariffs and other taxes and subsidies. Who has benefited from these measures, and what have been their environmental and distributional results?

Such an approach is warranted for a number of reasons. Individual Member States are announcing new industrial strategies, while the EU is working on an overhaul of many relevant policies through the 'Fit for 55' reforms[1]. At both levels, the cost and financing of the transition is hotly debated, and the most politically salient discussions over industrial policy revolve around the need for 'some form of subsidy and/or CO2 price risk mitigation instrument' (Sartor and Lehne, 2020). Meanwhile, new national and European funds are becoming available through Covid-19 relief packages and stimulus programmes. In the context of this debate over new subsidies and protective measures, we need to investigate the support policies that are already in place, not only to see if there are lessons to be learned from them, but also to identify whether these existing measures are still coherent with new policy goals.

1. As part of the Green Deal, the Commission has announced a series of reforms and strategies to reduce emissions by at least 55% by 2030, bundled together in the 'Fit for 55' package. The reforms target a wide array of policy areas, including the Renewable Energy Directive, the Energy Taxation Directive and the Energy Efficiency Directive, and the European ETS, as well as a circular economy action plan, an EU biodiversity strategy, and agricultural reform. It will also include a carbon border adjustment mechanism. The European Commission presented its legislative proposals for 'Fit for 55' on the 14th of July 2021. This working paper was completed before this date. (European Commission, 2020).

In this working paper, we discuss these issues by comparing the state of play in the Netherlands, Germany and Belgium (with a focus on Flanders): three cases with a sizeable and to some extent comparable industrial base, whose socioeconomic (and ecological) structures are closely entwined while they simultaneously compete for investments. The paper expands on an earlier report, in which we offered a detailed analysis of the Flemish case (Bollen and Beys, 2020).

After evaluating the support systems which have been put in place over the past decades, we compare recent developments in the Belgian, German and Dutch policy frameworks, and examine to what extent they offer opportunities for industrial transformation.

We conclude that the balance between environmental, social and economic goals has so far remained elusive. Existing policy frameworks have been defensive, lacked foresight, had negative distributional effects, and often been opaque. The driving force behind this defensive set-up has been, and remains, fear of intra-European as well as international competition. Instead of coordinating an expedient just transition, states have relied on beggar-thy-neighbour tactics. New domestic policies in the Netherlands and Germany offer some approaches to escaping from this lock-in, but they are still under development.

The paper's second main argument is that we need to look at a wide variety of measures, including but also going beyond ETS. Instruments related to energy prices but also more general interventions related to taxation and other subsidies are all relevant. As the need for action becomes more urgent, all major economic incentives need to cohere with a just transition.

The structure of the text is as follows: we first briefly sketch out the challenge of transitioning heavy industry. Next, we compare 'legacy' support measures in Belgium, the Netherlands and Germany. We then look at the new industrial strategies that have been announced since 2019-2020. The final section discusses these results, and offers some ways forward.

1.1 Towards industrial transformation

The production of basic materials, including iron and steel, cement, aluminium and basic chemicals, leads to substantial annual GHG emissions. These emissions are released directly, through the heating of fossil fuels and process emissions, as well as indirectly through electricity use and the degeneration and incineration of the resulting goods (Material Economics, 2019). These products and processes are also linked to a host of other kinds of environmental damage, such as plastic waste and soil, water and air pollution. Decarbonisation, energy efficiency and a move towards circularity in these industries will all be necessary to meet European and global climate targets. At the same time, however, basic materials will also play an important role in abating climate change. We will need products like steel, plastics and cement

for constructing solar panels, retrofitted housing, windmills, batteries, and other building blocks of a successful transition.

In the EU (including our case study countries of Belgium, the Netherlands and Germany), heavy industry accounts for a substantial part of industrial emissions. These emissions are highly concentrated in a number of major firms. In Belgium and the Netherlands, 13 industrial plants account for above 70% of all industrial ETS emissions, and in Germany about 55 plants (6% of the total) account for over 65%. Since these major firms operate in several Member States at once, this concentration is also a cross-border phenomenon. Germany, Belgium and the Netherlands, for example, share firms such as ArcelorMittal, Shell, BASF, Air Liquide, Heidelberg Cement and others in their list of top-20 emitters.

Table 1 **ETS emissions from large* industrial plants**

	Belgium	Germany	Netherlands
Number of large entities (individual installations)	13	55	13
Percentage of industrial ETS emissions from large entities	71%	65%	79%
Large installations as a percentage of all ETS installations	11%	6%	2%

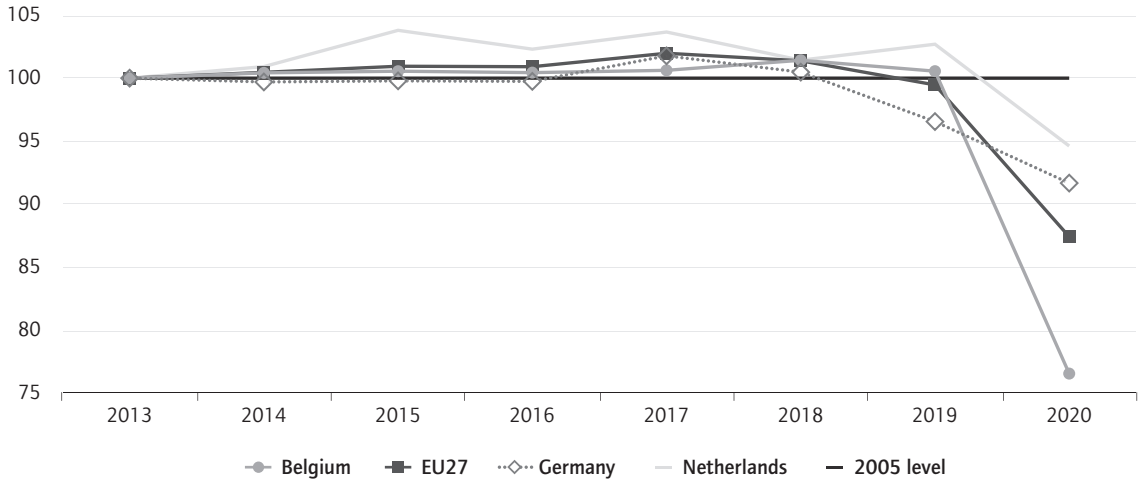
* Emissions > 500kt CO2 eq
Source: EEA

Although there have been important GHG reductions in the past decades, this development has levelled out since 2013, as demonstrated by Figure 1 (de Bruyn *et al.,* 2020). Although emissions dropped in 2020 because of the coronavirus crisis, they are expected to swiftly rebound to pre-crisis levels (Marcu *et al.*, 2021). Similarly, efficiency gains in energy use have been offset by increasing activity. Industry remains the largest energy consumer in these states[2], and total industrial energy consumption in Belgium and Germany is now higher than in 2005, while decreasing only modestly in the Netherlands (Adame, 2021).

Heavy industry is therefore currently not on track to deliver the requisite reductions in emissions and energy use. Further incremental improvements will not suffice. This will require a more substantial shift: we need to phase out or overhaul factories from the fossil age, and replace them with industrial plants that are consistent with these goals.

2. In 2018, industry (including non-ETS) accounted for 29% of final energy consumption in Germany, 35% in Belgium, and 15% in the Netherlands (Adame, 2021). If within Belgium we focus on Flanders, and also include non-energy uses, Flemish energy-intensive industry accounts for up to 55% of all Flemish energy use (Wyns *et al.*, 2018).

Figure 1 **Industrial ETS emissions since 2013**



Source: EEA

The economic and social stakes in such a transition are substantial. Basic industries account for roughly 11% of industrial employment (about three million employees) and 15% of manufacturing value added in the EU27, and their presence is seen as an important strategic and economic asset that strengthens the wider manufacturing value chain (Joas *et al.*, 2019; de Bruyn *et al.,* 2020). Transforming these industries will require substantial investments: a recent report estimates that about €410 bn in additional finance will be needed between 2021 and 2050 (McKinsey, 2020), along with technological advances, new infrastructure, and the development of new products, business models, production techniques, markets, and other interventions. A 'just' transition will moreover require worker-oriented support measures and retraining, as well as social dialogue and new forms of governance and coordination across sectors and policy domains (IndustriAll, 2016).

The insufficient progress that has been made in the past 20 years is due to a variety of factors. One of the major driving forces, however, has been the fear of competitive pressures. Globalisation through the free flow of capital and access to cheaper labour markets has led to increased production elsewhere in the world[3]. Fear of pricing domestic EU production facilities out of the market has severely hindered increasing climate ambition to the level necessary for the EU. But intra-European competition has also played a role, with Member States vying for investments.

3. For example, the production of steel in Europe has gone down by a factor of two since 1950, and continued its decline after a particularly significant drop during the 2008 financial crisis. At the same time, the *use* of steel per capita in the EU increased from 278 kg in 2012 to 310 kg in 2019 (Material Economics, 2019).

The supposed danger of 'carbon leakage' – that ambitious climate policies may chase away factories to places with more lenient GHG requirements – has been a crucial issue in these discussions. The empirical evidence on this argument, which draws a direct line between hampered competitiveness and an increase in global emissions, is mixed at best, as we discuss below. It is in fact becoming increasingly clear that economic and environmental sustainability will become more and more co-dependent. Yet the concern about competitive handicaps has nonetheless been, and remains, one of the most important political factors in climate policymaking. As we will demonstrate in the next section of this working paper, these tensions have led to the implementation of a number of support policies for heavy industry which have done too little to clear the path for a just industrial transition.

2. Existing support measures for heavy industry

Heavy industry has received substantial political and economic support from both the EU and the Member States to prevent the decline of industrial production capacity and to maintain an autonomous supply of essential basic materials.

This has led to similar support measures in all three of our country case studies, often with similar rationales and often also with comparable conditions attached. In the section below, we discuss three broad categories of intervention:

- ETS-related policies, including compensations for indirect carbon leakage, the allocation of free emission allowances, and a number of special exemptions for heavy industry;
- energy-related benefits, i.e. the various special tax regimes (on electricity, gas and other types of energy) for energy-intensive industries;
- other (tax) subsidies, including a specific 'green' subsidies as well as a wider variety of other, non-environmental tax breaks and support schemes.

We will briefly outline the set-up of the various support systems in each Member State, and attempt to quantify the size and direction of the associated benefits. Our analysis will then evaluate the rationale for these systems, as well as their environmental and social effects.

2.1 The EU Emissions Trading System

The EU ETS sets a fixed 'cap' on emissions for the covered sectors, meaning that firms have to acquire emission allowances in order to 'produce' greenhouse gases. These allowances are either freely allocated to firms, or purchased through a system of auctions organised at the national level. Below the given 'cap', which is gradually lowered over the years, firms are free to trade emission allowances. Surpluses can also be stockpiled to anticipate future shortages or price increases.

To prevent the system from curtailing European industries' competitiveness, and for fear of the 'carbon leakage' this may lead to, many industries were given 'free emission allowances'. Firms that were deemed to be at risk of 'carbon leakage' often received greater allowances than necessary to cover their yearly emissions. Although the system has been reformed since 2012, heavy industry still received over 95% of its total emission allowances for free in 2019 (Marcu *et al.*, 2019). The allocation of free allowances to industries

on the carbon-leakage list is set to continue even after 2030, when it will be abolished for sectors that are not at risk of 'leaking' (see below) (*ibid*).

Industrial firms benefited from these support measures through a number of channels (de Bruyn *et al.*, 2016; Zachmann *et al.*, 2018). First of all, through the allocation of free emission allowances, wherein firms are freed from having to pay the full extent of the damage caused by their GHG emissions, undermining the 'polluter pays' principle. Since freely allocated emission allowances would otherwise have been auctioned, they also represent foregone revenues for the Member States. Secondly, many industries and firms have been given a surplus of emission allowances, especially during the first two phases of the ETS (2005-2012). This allowed them to generate 'windfall profits' by selling these surpluses, but it has also enabled them to 'stockpile' allowances that they can either use or sell when the price of ETS allowances starts increasing. In addition, they could also use (cheaper) international credits to comply with their emissions instead of buying (more expensive) ETS rights. Thirdly, free allowances have increased the scope for firms to 'pass through' the opportunity costs of the system to their customers by increasing prices, again allowing for windfall profits[4].

As noted, above, industry still receives about 95% of its emission allowances for free. We can determine the annual value of these allowances by multiplying them by the given (average) ETS price, which has shot up since 2018. Table 2 shows the value of these free industrial emission allowances since 2008, as well as the top five beneficiaries in each Member State.

The overallocation of emission allowances (firms receiving more allowances than they need to cover their emissions) has, however, been curtailed in the third trading phase (since 2013). Most sectors now have to purchase allowances to cover part of their emissions (de Bruyn *et al.*, 2020). Some exceptions include inorganic chemicals[5] and aluminium. The data shown in

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4. In theory, free emission allowances give producers an incentive to raise the price of their product until the revenues from actually producing and selling this output (i.e. from using allowances to emit CO2) are equal to the value of the emission allowances they were given (i.e. from selling the allowances). When forced to buy allowances to cover emissions, it is likewise rational to try to include this in pricing. Higher prices from firms that have to buy allowances, then also allow firms (in the same sector) that still receive most of their allowances for free to raise their prices as well. In practice, the extent of 'cost pass-through' can depend on a variety of factors. De Bruyn *et al.* (2016, 2021) have produced estimates of the actual extent of cost pass-through (classified as 'minimum', 'average' and 'high') for a variety of sectors in the ETS. Table 3 shows an 'average' cost pass-through rate.

5. For steel, the waste gases are used in the power sectors, which combusts them to produce electricity. The associated emissions are thus counted at the level of the power plants, while the free allowances for these gases are allocated to the steel industry. However, in return for the power produced from their gases, steel producers hand over a proportional amount of emission allowances to the power producers. This means that, in practice, these emission allowances should be deducted and that the emissions surplus in the steel sector is currently smaller than it appears (or even below 100%). De Bruyn *et al.* (2021) base their calculations for the steel sector (for the first trading periods) on an estimate of this transaction. Accounting for waste gases, the iron and steel sector currently also emits more emissions than covered by their free permits.

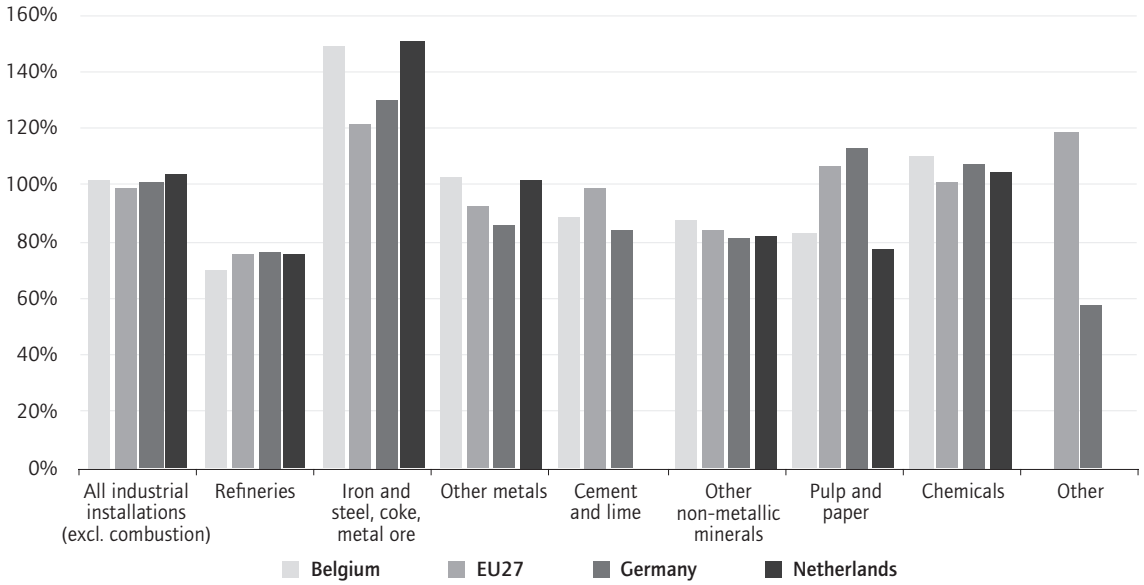
Figure 2 also show a surplus in the iron and steel sector, but the picture is more complicated here due to waste gas transfers. According to recent research by de Bruyn *et al.* (2021), the sectors that have still run a net surplus in emission rights between 2008 and 2019 include plastics, inorganic chemicals, petrochemicals and (especially) cement. Most other sectors are now running at a deficit, including the iron and steel sector once they account for waste gas transfers. However, there are substantial country-by-country differences. For example, in the cases examined here, over the period of 2008-2019 iron and steel was able to make additional profits from overallocation worth €247 mn in Belgium, while it was confronted with a net deficit in the Netherlands and Germany. Additional profits in the petrochemical sector were worth €106 mn in the Netherlands, €55 mn in Germany and €157 mn in Belgium.

Table 2 **Emissions and free allocations: top five ETS emitters in 2019**

	Emissions 2019 (tCO2)	Emissions 2008-2019 (tCO2)	Free allowances 2008-2019* (tCO2)	Sum of annual value of free allowances 2008-2019** (in million euros)
Belgium				
All industry				4 979
ArcelorMittal Belgium	4 496 365	32 575 093	50 113 017	498
Total Raffinaderij Antwerpen	4 004 998	44 703 299	39 326 351	477
BASF Antwerpen	2 825 810	21 896 385	23 854 762	234
Exxonmobil Petroleum & Chemical	2 151 350	23 541 069	22 796 691	269
CCB - Italcementi Group	1 375 955	14 802 067	15 672 455	188
Germany				
All industry				18 976
ThyssenKrupp Steel Europe AG	8 216 037	100 202 466	215 061 062	2 566
Hüttenwerke Krupp Mannesmann GmbH	5 108 311	55 141 841	89 269 339	1 077
HeidelbergCement AG	4 864 476	57 315 041	54 813 494	650
Salzgitter Flachstahl GmbH	4 510 068	53 236 027	88 194 916	1 083
ROGESA Saar mbH	4 207 263	51 802 689	77 446 862	928
Netherlands				
All industry				4 552
Tata Steel IJmuiden B.V.	6 348 738	74 892 151	127 464 167	1 502
Chemelot Site Permit B.V.	4 650 385	47 800 098	47 010 533	541
Shell Nederland Raffinaderij B.V.	4 357 580	51 526 499	48 112 957	592
Yara Sluiskil B.V.	3 447 301	27 602 095	26 583 661	275
DOW Benelux B.V.	2 495 557	30 751 581	31 544 936	366

* Not accounting for waste gas transfers.
** i.e. the sum of free emissions in one year times the average ETS price of that year.
Source: EEA

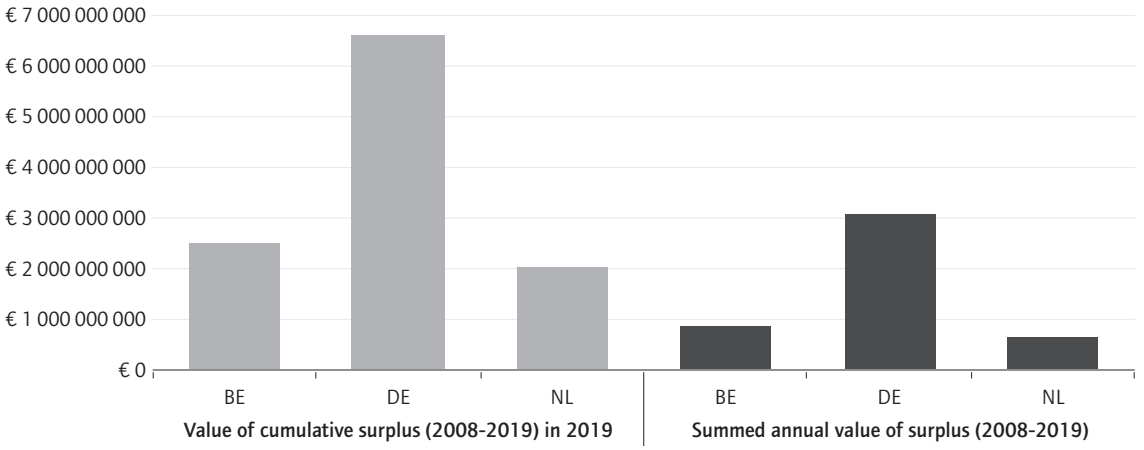
Figure 2 **Free allocations in relation to total emissions**



Source: EEA

Figure 3 shows (i) the 'windfall profits' that firms were able to make if they sold their surplus emission allowances during the same year in which they received them, and (ii) the current value of their accumulated surpluses, i.e. if they chose to save rather than sell them (not accounting for waste gas transfers).

Figure 3 **Annual and cumulative value of surplus industrial emission allowances**



Source: calculations based on EEA

By the end of 2019, if they had sold off their surplus allowances every year since 2008, industrial firms would have been able to reap €1 bn, €3 bn and €0.7 bn in profits in Belgium, Germany and the Netherlands, respectively. If they instead chose to stockpile their surpluses (for example, because they anticipated increasing prices), these allowances would have been worth (in 2019) €2.5 bn, €6.5 bn and €2 bn. It is impossible to determine to what extent firms actually sold or accumulated surplus allowances, since these data are not available. A rare exception is Tata Steel Europe, which includes the sale of ETS allowances in its financial reporting (covering its operations in the UK as well as in the Netherlands). Since 2007, its revenues from such sales have amounted to €646 mn (Sengers and de Vos, 2020).

Finally, de Bruyn *et al.* (2016, 2021) have calculated the rate at which a number of industries have passed through the costs of ETS between 2008 and 2019. They estimated the total gains for industry to be somewhere between €26 bn and €46 bn over this period, through price hikes passed down the value chain and on to consumers. They also made sectoral and firm-level calculations: the latter can be seen in Table 3.

Table 3 **Additional profits from cost pass-through (average estimates) for top five emitters (2008-2019), in million euros**

Belgium		Netherlands		Germany	
ArcelorMittal Belgium	568	Shell Nederland	598	Thyssenkrupp AG	1 472
Total S.A.	455	Tata Steel Ijmuiden	676	Salzgitter AG	824
BASF	196	Chemelot Site Permits	271	BASF SE	416
ExxonMobil	191	DOW Benelux B.V.	191	ArcelorMittal S.A.	506
Cimenteries CRB	94	Yara Sluiskil B.V.	123	Heidelberg Cement	285

Source: de Bruyn *et al.* (2021)

Together, de Bruyn *et al.* (2021) estimate that additional profits from the ETS between 2008 and 2019 vary from €30 billion to over €50 billion (adding up cost pass-through, overallocation and international credits). The biggest source of this was cost pass-through, and the five sectors that benefitted most have been iron and steel, refineries, cement and lime, and petrochemicals. In the cases examined here, total additional profits were estimated to be €2 bn-€3 bn (Belgium), €5,5 bn-€9,7 bn (Germany), and €1,6 bn-€2,8 bn (Netherlands).

Apart from the (over-)allocation of free emission allowances, there is an additional ETS-related support mechanism for energy-intensive industries: 'indirect carbon leakage' (ICL) subsidies. The rationale for this system is that electricity production no longer (since 2013) receives any free emission allowances, and that these power firms could pass on their ETS-related costs to their customers. For large consumers of electricity, this heightened energy bill may again lead to competitive drawbacks and thus to ICL. The system allows Member States to provide a subsidy that compensates for these

indirect costs, but this support, both firm-specific and country-level, is bound by a number of criteria[6].

Furthermore, Member States are not obliged to use this subsidy, and they can provide compensation below the predetermined ceiling. They are also free to choose which funds they utilise to provide this compensation (i.e. whether they use auctioning revenues or the general budget). As with free emission allowances, the system again works against the 'polluter pays' principle. Moreover, in contrast to emission allowances, indirect carbon leakage subsidies concern a direct transfer of state funds.

Twelve Member States currently make use of this subsidy[7], and there remains national and even regional variation in its application. Finland, for instance, only distributes half the amount allowed by the state aid rules, and within Belgium, while Flanders has been using the system to its full extent since 2013, Wallonia introduced limited compensation only in 2018[8]. Table 4 shows

Table 4 **Indirect carbon leakage subsidies**

Main beneficiary firms or sectors (in million euros)					
Netherlands	2015-2019	Belgium (Flanders)	2015-2018	Germany	2013-2018
Tata Steel	31,9	ArcelorMittal Belgium	21,0	Chemical industry	566
Akzo Nobel	27,3	Ineos	17,0	Iron and steel industries	347
Chemelot Site Permit B.V.	20,7	BASF	16,2	Paper industry	274
Nyrstar Budel B.V.	17,8	Nyrstar Belgium	14,3	Non-ferrous metals industry	247
Dow Benelux B.V.	11,4	Vynova Tessenderlo	12,2	Clothing indsutry	0,8

Total annual ICL subsidies (in million euros)							
	2014	2015	2016	2017	2018	2019	2020
Netherlands	57	32	61	54	37	45	50
Belgium (Flanders)	49	29	39	46	31	35	89
Germany	184	242	287	201	218	230	566

Source: Rijksoverheid, Umweltbundesamt, VLAIO

6. These criteria comprise of a gradually decreasing 'maximum support' factor, a regionally set emission factor, the ETS price, and a benchmark related to electricity usage or production levels. These criteria have recently been reformed to make them more dynamic (see below).

7. Finland, France, Germany, Greece, Lithuania, Luxembourg, the Netherlands, Poland, Romania, Slovakia, Spain, and Belgium. The UK has also made use of ICL. Czechia will start providing compensation from 2021 on. The percentage of auction revenues being used for compensation differs quite substantially across Member States. For instance, Flanders used 48% of its share of Belgian auction revenues in 2020, France used 37% (€266 mn out of €711 mn), Germany used 17% (€564 mn out of €3,146 mn), the Netherlands 25% (€110 mn out of €435 mn), Spain 5% (€61 mn out of €1,225 mn) and the UK 4% (€57 mn out of €1,326 mn). In total, €655 mn out of €9,031 mn in auctioning revenues were used for indirect cost compensation in 2019 (7.3%), and €1,335 mn out of €11,558 mn (11.6%) in 2020 (Marcu *et al.*, 2021). Note that the Marcu *et al.* data do not fully match with the data we acquired for the table in the text, although we both obtained them from (differing) national sources.

8. Wallonia is the only region within the twelve Member States (see above) to cap the total amount of subsidies at €7.5 mn, regardless of auction revenues.

the total amounts distributed and the main beneficiaries of the funds in the three Member States under examination. For Belgium we only collected the Flemish data, and in Germany there are only sector-level figures.

2.1.1 Impact

These support mechanisms have led to significant benefits for a number of major firms. Although the system is EU-wide, it has nonetheless accrued to particular firms and sectors which are embedded in specific (though overlapping) domestic political economies. Some aspects of the ETS, in particular the system of ICL subsidies, have, moreover, fostered additional subsidy competition between the Member States.

In one sense, these measures have arguably contributed to their stated goal, as competitive disadvantages have not emerged as a result of the ETS system. The interplay between low emission prices (see below), the various support systems, and the opportunities for passing on costs have contributed to preventing carbon leakage (Joltreau and Sommerfeld, 2019). However, this way of setting up the system has come at an environmental and social price. Together, these measures have led to a significant redistributive effect in favour of major incumbent industries. Costs have been shifted away from the most polluting industries in a regressive manner, with the support mechanisms benefitting large industries at the expense of SMEs, consumers and governments (Zachmann *et al.*, 2018).

Moreover, as the European Court of Auditors has recently argued, these mechanisms have been poorly targeted. The carbon leakage list, at the heart of the various 'flexibilities', is a blunt instrument that does not allow for 'degrees of leakage risk': 'a more targeted distribution of free allowances would [...] have addressed the risk of carbon leakage, reduced windfall profits, and [...] improved public finances' (ECA, 2020). The compensation for indirect emissions has also been controversial in this regard. This system subsidises electricity use, and even more so when the purchased power has been produced in a more GHG-intensive manner. In addition, the subsidy has been overly generous: for the Flemish case we found that the actual 'emission factor' was far lower than that used in the regulation, and that the compensation did not take into account a variety of other factors, leading to overcompensation (Bollen and Beys, 2020)[9].

9. In addition, ICL does not take account of the fact that many industries get a substantial part of their electricity from their own power generation or that many large industrial firms have direct power purchasing contracts with energy firms; both factors probably further lower the extent to which indirect emission costs are passed through industrial electricity prices. In contrast, households lack this kind of market power and have arguably taken on an important share of the indirect costs. The system has been reformed this year, however, and there will now be country-specific emission intensity factors that should better reflect the actual indirect emission costs. These will first be applied in 2022, for electricity consumed in 2021.

These holes and flexibilities hollowed out the 'price signal' which the system was supposed to send out, especially during the first phases of its operation. Although the ETS has in the latest phase (2013-2020) performed largely within the targets it had set, following reforms that targeted the issue of excess allowances, this has mainly been thanks to decarbonisation in the power sector, where free allocations have (mostly) been removed since 2013 (Marcu *et al.*, 2021). In the industrial sectors, however, the decarbonisation rate has remained insufficient, and 'at the current pace, resource and energy-intensive industries are expected to reach climate neutrality sometime in 2060' (Carbon Market Watch, 2021). Even in the new phase of the ETS (2021-2030), free allocations will remain an important feature of the system. Sectors that are deemed at risk of carbon leakage (i.e. 95% of industrial emissions (ECA, 2020) will still receive up to 100% of their allocations for free in 2030. At an average CO2 price of €30 per tonne, this translates to about €200 bn given in free emission allowances between 2021 and 2030 (Carbon Market Watch, 2021).

This largely incremental and defensive set-up will no longer suffice: industries need to undergo truly transformational changes towards new production methods and circular value chains[10]. Since European and global climate action has only become more urgent since the start of the ETS, the system's competition-oriented flexibilities might turn out to have traded 'short-term gains for long-term pain' (Joltreau and Sommerfeld, 2019). At the same time, it is clear that the industrial transition will not be brought about by the ETS alone. A sudden surge in the carbon price (towards the levels necessary for green technologies to become profitable) could lead to the disappearance of European production instead of its greening, unless complementary policies are introduced. Carbon leakage in strategic sectors therefore remains a relevant and important consideration going forward. But we need to strike a better balance between competition, hard environmental limits, and social equity. A reform of the ETS in combination with a carbon border adjustment mechanism, as well as a number of supporting infrastructural, regulatory and financial interventions, should strive for such a balance. We return to this in the final section.

10. Current technology roadmaps highlight various alternatives: the electrification of production, the switch to biomass and bio-based products, the use of hydrogen for heat and as feedstock, and the development of techniques to capture and store or reuse carbon. Circular pathways include redesigning products to reduce material inputs, expanding the scope for repair, reuse and recycling, and other measures. Often these alternatives imply high upfront capital costs, further R&D, and investments in infrastructure such as pipelines, renewable energy, grid reinforcements and hydrogen production. See (amongst others) CE Delft (2020a) for an overview.

2.2 Energy taxation

As we outlined above, the energy usage of these industries is highly relevant for their own decarbonisation, as well as the broader energy transition. They consume (and produce) large amounts of electricity, gas and other fuels, and their path towards carbon neutrality will require them to electrify industrial processes (which means cutting fossil fuels, but also increasing electricity production) while reducing total energy usage.

At the same time, energy costs are an important part of these industries' operating costs, and energy prices are seen as playing a significant part in their competitiveness. Industrial energy prices have therefore been a highly sensitive issue in domestic debates regarding energy taxation, particularly in relation to the renewable surcharges that have been introduced to finance renewable energy subsidies.

This has led to extensive efforts at monitoring and comparing energy price dynamics (especially in gas and electricity), with a special scrutiny devoted to energy price developments in neighbouring states[11]. More importantly, Member States have implemented a variety of measures to suppress the energy costs faced by large industrial consumers.

Energy bills are determined by the price of the energy itself (i.e. the market price for electricity, gas, etc.), but also by network costs and a variety of taxes. This latter component is often used to fund specific energy-related policies. In particular, Germany, the Netherlands and Belgium have decided to fund their renewable energy subsidies (for wind power, photovoltaic (PV), CHP, etc.) by introducing new taxes on gas and electricity bills[12]. EIIs have received various compensations, rebates and other special regimes which suppress these costs.

There is an overarching European framework to harmonise the rules in Member States (and the room for manoeuvre they have) on these matters. The 2003 Energy Tax Directive (ETD) introduced a floor for a variety of energy taxes and excise duties, as well as rules on exemptions and reductions. The stated purpose of this Directive was to avoid harmful energy tax competition and to facilitate the use of taxation policy in support of environmental goals, competitiveness, and social policies (European Commission, 2019a).

However, the Directive allowed for considerable Member State flexibility and divergence. As the European Commission showed in its evaluation of

11. In Belgium, for example, the federal energy regulator (CREG) publishes annual reports on the energy price competitiveness of 'competition-prone' energy-intensive industrial users of gas and electricity. These analyses focus on developments in the UK, the Netherlands, France and Germany. The Netherlands and Germany have installed similar, regular systems of monitoring.

12. Although the precise functioning of these systems can be quite complex, there is generally a close link between a number of subsidies (especially for offshore wind, CHP, and other renewables) and specific energy taxes.

the ETD, the resulting domestic regimes have become diverse, opaque, and difficult to compare; moreover, the various exemptions 'weaken the incentives for investing in more energy-efficient capital stock and production processes in these sectors' (European Commission, 2019a). The ETD has, moreover, failed to stop further competitive distortions, and 'contributes to a limited extent to the wider economic, social and environmental objectives'.

We will now proceed to analyse the preferential treatment received by heavy industry in Belgium, the Netherlands and Germany.

2.2.1 Preferential energy taxes for EII in Belgium, the Netherlands and Germany

For the purpose of this analysis, we can roughly divide the existing energy-related support mechanisms into two groups. The first group targets energy taxes that are unrelated to support policies for renewable energy. This includes exemptions for the use of energy goods in industrial processes, for self-produced energy, and for a variety of network costs. Some of these exemptions benefit electricity usage, but others subsidise fossil fuels. A second group of measures concerns taxes which finance renewable policies. Large industrial users have benefitted from the associated subsidies – for example, by investing in subsidised renewables themselves (see the next section) – but have largely been exempt from contributing to their funding.

To the greatest extent possible, we have tried to quantify some of these preferential regimes, both in general and for specific firms.

In Belgium, the system has become particularly complex because it has been partially regionalised, meaning the energy bill is composed of federal as well as regional components (for sources and calculations, see Bollen and Beys, 2020).

From the component that is not linked to renewables, industrial firms receive annual exemptions from the federal taxes on electricity (total annual cost estimate: €71 mn) and gas (€11 mn), as well as a tax exemption for gas that they use in CHP installations (€16 mn[13]). In addition, in cases where firms have signed an energy efficiency agreement (see below), there are lowered excise duties for gas for the non-energy (feedstock) use of gas in industrial processes and for electricity transmission. Finally, there are a number of lowered tariffs on gas oil and other motor fuels. A recent government report estimated that the Belgian industrial sector received about €3.3 bn in fossil fuel subsidies in 2019 (mostly related to natural gas), which accounts for 30% of all direct fossil fuel subsidies (FOD Financiën, 2021).

13. The latter exemption also applies to energy companies, but we have no way to tell how the benefit is split between them and industrial firms.

In the renewables support component, a variety of federal and regional taxes were introduced in the electricity bill to subsidise renewables. These were usually made 'degressive', meaning that the €/MWh decreases as total energy use increases[14]. In 2018 there were substantial exemptions related to the offshore-wind surcharge (€100 mn), the renewable energy surcharge (€270 mn), and to the CHP-subsidy surcharge (€31 mn). In addition to this 'degressivity', which automatically allocates benefits through the energy bill, an additional Flemish support system for the largest electricity users was introduced in 2018: the 'supercap'. This supercap puts a limit on the maximum renewable energy contribution these firms have to pay. The system was used by a handful of firms in 2019, at an additional cost to the state of about €13 mn[15].

The structure of the Dutch tariff system is somewhat less convoluted, with fewer separate regimes and exemptions. The basic structure and its effects are, however, similar.

Like in Flanders, energy taxes on gas and electricity are structured in a 'degressive' manner: tariffs automatically go down as consumption goes up. This applies to the 'basic' energy taxes (Energiebelasting or 'EB') as well as on the surcharge that was introduced to subsidise renewables: Opslag Duurzame Energie (ODE), raised through gas and electricity bills (VREG, 2020). For instance, in 2020 the EB was €97/MWh for the first 10 MWh, and only €0.55/MWh for all consumption over 10,000 MWh (10 GWh)[16]. There are no public estimates of who benefits the most from this tariff structure, or how much. But for one of the larger (but not largest) industrial firms consuming 250 GWh per year, this would amount to about €25 mn in annual tax reductions, when compared to the household tariff[17].

Energy-intensive industrial firms benefit from a number of additional exemptions (FORBEG, 2020): (i) they receive substantially lowered transmission costs through the '*volumecorrectie*' (up to 90%); (ii) they can get a refund ('*teruggaafregeling*') for all (EB and ODE) taxes paid on their electricity usage above 10GWh[18]; and (iii) electricity, gas or coal used in

14. The precise way this is implemented is quite complex and differs across federal and regional policy. See FORBEG (2020) or Bollen and Beys (2020) for more information.

15. About 20 firms used this 'supercap' in 2018 and 2019. In return, they have to pay a sum into an energy fund, based on a percentage of their gross value added.

16. In 2020, the tariff evolved in the following manner: €97.7/MWh (0-10 MWh), €50.83 (10-50), €13.53 (50-10,000), €0.55 (>10,000). Specifically for the renewable energy surcharge, the tariffs for the same user groups were €27.20, €37.50, €20.50 and €0.40 (>10,000) (VREG, 2020).

17. Based on the tariffs in VREG (2020), the calculation is: 250 GWh*€97.7/MWh = €24 mn at the household tariff, and (€97.7*10 MWh + €50.83*40MWh + €13.53*9,950 MWh + €0.55*240,000 MWh) = €0.27 mn at the industrial tariffs.

18. For a 250 GWh firm, the 2020 tax for its consumption over 250 GWh (i.e. 240 GWh) would normally be €0.95/MWh (EB+ODE); with the *teruggaafregeling*, this is reduced to zero, leading to an additional tax benefit of €0.95*240 000 MWh = €228 000 per year. Electricity taxes for EII are therefore essentially capped. For a very large (1 TWh) industrial installation this increases to about €940 000 per year.

industrial processes in the chemical and metal industries are fully exempt from energy taxes. The additional (meaning in addition to degressivity) annual costs of the latter two exemptions are €8 mn and €98 mn respectively. A further excise tax exemption for fuels used in refineries amounts to about €48 mn a year according to the last available estimate (from 2014) (Milieudefensie, 2020).

The German system is again more complex: even within the industrial sectors, there is a lot of variety in the final taxes and prices firms face. This is due to the existence of a variety of special regimes, which vary depending on such factors as the sector concerned, energy intensity, total annual consumption, peak loads, and even firms' pension contributions. EII, in particular, benefit from such reductions, including on grid charges, gas and electricity taxes, and energy used in industrial processes (Amelang, 2019b; PwC, 2020a; FORBEG, 2020).

EII have also received significant and highly contentious exemptions from renewable energies, of which the EEG-Umlage ('surcharge') (which was introduced to finance renewable subsidies) is the most significant. They benefit from strongly reduced (by 80-85%) and capped (maximum) rates. Germany has also subsidised other fossil fuels which benefit some EII, through the general exemption for non-energy use of oils (*herstellerprivileg* – 'manufacturer's privilege' – which benefits refineries) and the tax exemption for coal which also benefits the steel sector (Amelang, 2019b; Umweltbundesamt, 2017).

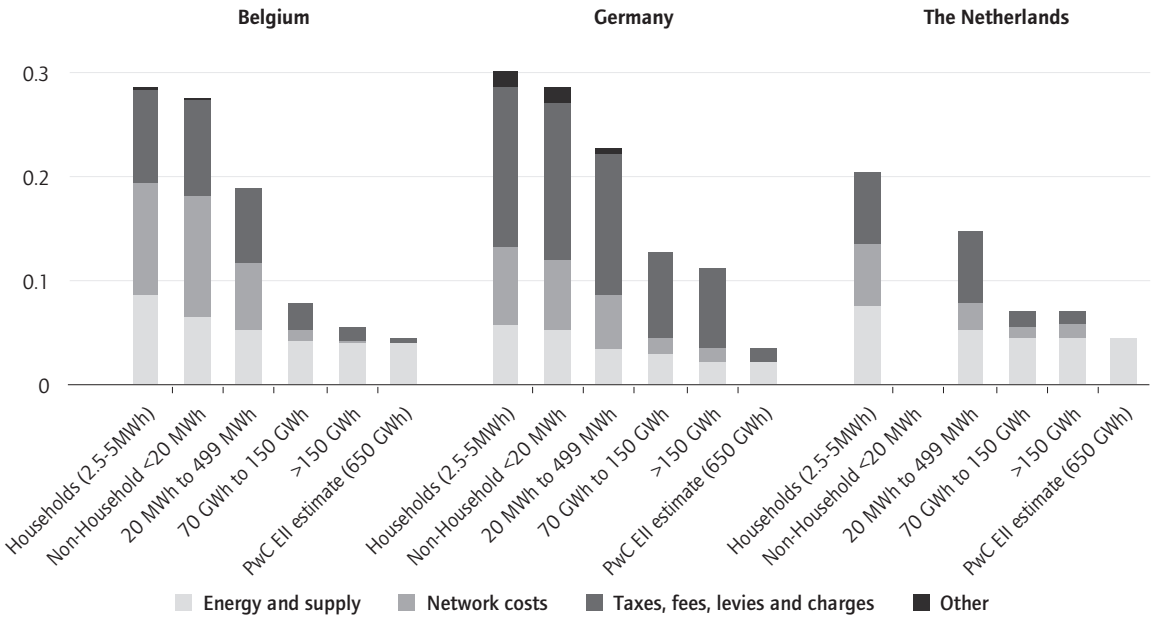
The costs of these exemptions for the federal budget can be quite substantial. For instance, the tax benefits for industrial processes cost about €1.2 bn in 2019, the EEG-Umlage exemption cost €5.4 bn, and the peak compensations cost about €1.5 bn (BWA, 2020; Bundesministeruim der Finanzen, 2020). According to our estimates, for a 250 GWh EII firm, the difference between the 'base' (household) rate and a low compensatory rate can add up to about €20 mn in annual tax savings[19]. This arguably still leaves a number of other exemptions out of the picture. As we discuss below, the beneficiaries of these benefits have been concentrated among EII, while the costs have been shouldered by households and other firms.

19. We are comparing the base rate and the rate for a large EII, as reported in VREG (2020) for the CHP surcharge (€2.80/MWh compared to €0.56/MWh), StromNEV19 (€3.05 ~ €0.25), the Offshore Surcharge (€4.16 ~ €0.83), the EEG-Umlage (€64 ~ €9.61) and the *Konzessionsabgabe* (€1.1 ~ €0). This ignores, amongst other things, the zero tariffs for electricity and gas used as raw materials and the benefits given to the electricity they produce themselves in their CHP installations.

2.2.2 Impact

As can be seen in Figure 4, this leads to substantial reductions in industrial energy bills in all three case countries, and a far lower price than the one paid by households, SMEs and smaller industrial consumers.

Figure 4 **Energy prices for SMEs, households and EII (€/Kwh)**



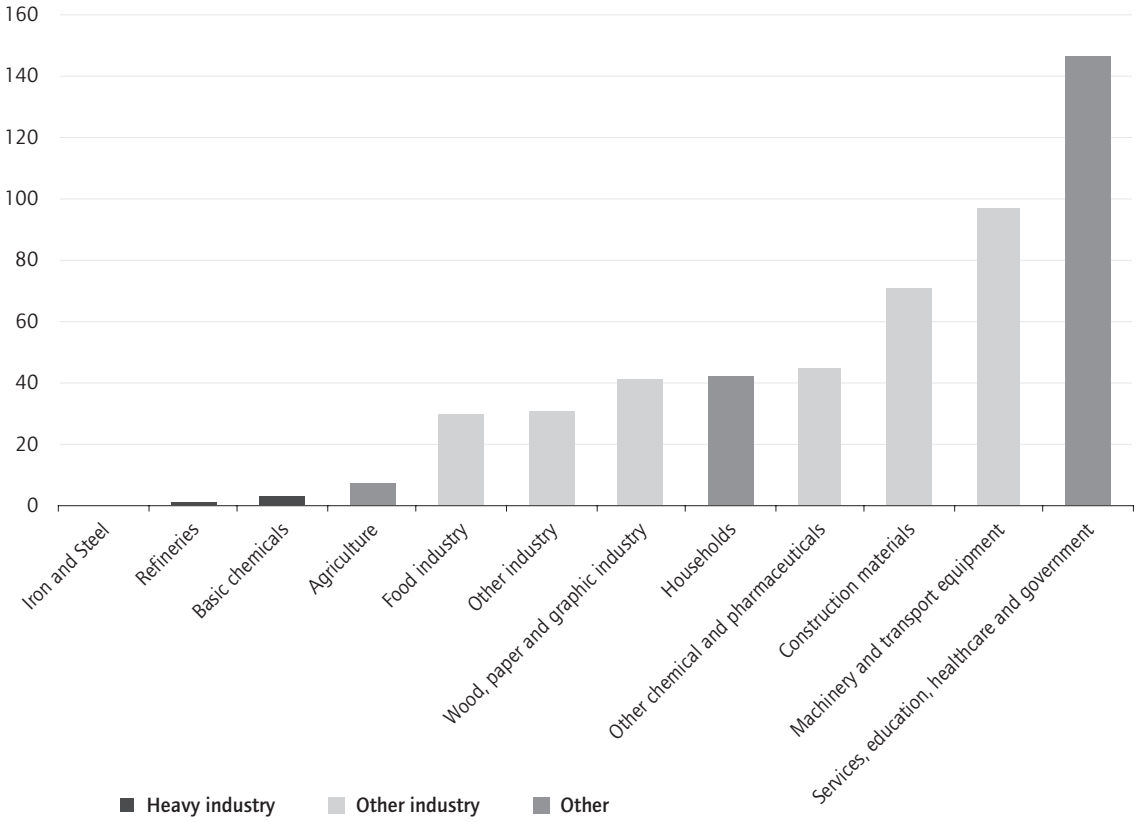
Note: 'PWC EII estimate' combines the energy tax level for a 650 GWh industrial firm as estimated by PWC (2020) with the >150GWh Eurostat commodity price (energy and supply).
Sources: Eurostat, PWC (2020)

These systems have had substantial distributional consequences; firstly, because their benefits have been concentrated. For Flanders, based on our estimations of the energy use and bills of six major ETS firms[20], they paid about 20-30 times less in various renewable energy surcharges per MWh compared to an average household. These six firms accounted (by our rough estimate) for about one fifth to one third of all energy-tax subsidies for which we found sufficient data (Bollen and Beys, 2020). In Germany (in 2017), only 4% of all industrial companies received exemptions, but these consumed 41% of all industrial electricity sold. This means that these benefits are also shared very unevenly even within the group of industrial firms (Amelang, 2019b). In the Netherlands, Milieudefensie calculated that industrial firms paid 16% of the renewables surcharge (€2,400 mn in 2020), but basic metal producers (mostly a single firm, Tata Steel) paid nothing, refineries about 0.5%, and basic

20. BASF, Borealis, Ineos, ArcelorMittal, Exxon, and Total.

chemicals firms about 2.6%. This means that heavy industry, including the 12 biggest CO2-emitters, contributed very little compared to SMEs and other sectors even though they account for a significant proportion of energy usage and GHG emissions (Milieudefensie, 2020). This can be seen in Figure 5.

Figure 5 **Renewable surcharge (ODE) contributions over CO2 emissions in the Netherlands, by sector**



Source: Milieudefensie

Secondly, the costs have been distributed in a highly regressive way. The total price tag of these systems is hard to estimate, but probably substantial. In Germany, one estimate put the annual expense (shouldered by households and non-exempt firms or SMEs as the costs are shifted to their energy bills) related to the preferential treatment for EII at €8 bn in 2017 (CLEW, 2019c). In each state, household and SME energy prices have risen because of increasing energy taxes, while prices for industrial users have remained suppressed[21]. This has made for a socially unjust tax, since poor households spend a greater proportion of their income on energy (Zachmann *et al.*, 2018).

21. At least in part because of the rollout of renewables, which push down the wholesale price of electricity.

These exemptions have also had an environmental impact. The tariffs and exemptions allowed by the Energy Tax Directive 'do not differentiate towards CO2 content of the fuels and are, on average, very low for business uses and use, in some cases (e.g. metallurgical and mineralogical industries) zero-tariffs. Therefore, energy taxation currently does not provide a stimulus for the transition towards carbon neutrality, at least not at the European level' (de Bruyn *et al.,* 2020). In other words, they have subsidised energy consumption by keeping prices low and have not benefitted renewables over fossil fuels. According to the Commission, half of all energy-related subsidies for EII (roughly €18 bn in 2016) went to fossil fuels (European Commission, 2019b). A substantial part of the remaining (renewables-related) subsidies were arguably financed through surcharges from which EII were exempt.

Countries have made some of these benefits conditional upon firms agreeing to voluntary energy efficiency schemes, such as MAJ3/MEE in the Netherlands and the *energiebeleidsovereenkomst* (EBO) in Flanders. However, our analysis of the Flemish system found that these agreements were lacking in conditionality, offering various benefits to firms while demanding very little in return (Snoeck, 2019; Bollen and Beys, 2020)[22]. In Flanders as well as in the Netherlands, the systems have underperformed even on their own terms in recent years, as energy efficiency gains in heavy industry have stalled (Cornelis, 2021; NRC, 2021). In Germany, various energy efficiency initiatives could not prevent the (overall) rate of progress in heavy industry from being the lowest of all German sectors (Lopez *et al*., 2019).

Have these exemptions led to competitive and economic benefits? On the one hand, the various exemptions and reductions have helped to keep industrial prices largely in check with those of global competitors (de Bruyn *et al*., 2020; Trinomics, 2020). On the other hand, empirical studies of the effects of energy prices and tax exemptions on economic performance have generally not shown a great impact (Blom *et al*., 2020). A study of German EEG exemptions for EII showed that these benefits led to higher carbon emissions while providing few short-term gains in exports or employment (Gerster, 2017), and a recent study of the effect of the French carbon tax on EII energy prices and competitiveness concluded that it led to a decline in energy use and carbon emissions without negative net employment effects at the sector level (Dussaux, 2020)[23]. This latter result was in part due to the fact that higher energy prices can be offset through efficiency gains. This ties in with the argument made by, amongst others, CE Delft that there is reason to believe that the intrinsic competitiveness of firms is actually beginning to tilt them in favour of greener and more efficient production: 'In the past, European energy-intensive industries have reacted to the rising labour

22. An analysis from the Belgian Confederation of Christian Trade Unions (ACV/CSC) came to similar conclusions, and also showed that there was little use of the social dialogue provisions included in the EBO (obliging firms to, among other things, report on their energy use and investments to work councils) (ACV, 2019).

23. This positive result at the aggregate level was caused by a reallocation of production and workers to the more energy-efficient firms within the sector (Dussaux, 2020).

costs by increasing labour productivity, thereby remaining competitive on the world market. A similar increase in energy and carbon productivity is needed to keep the European energy-intensive industries in pace with their non-EU competitors' (de Bruyn *et al.,* 2020: 47). Finally, the Commission has pointed out that although energy-intensive industries have used the threat of site relocation as a bargaining tool in order to obtain tax exemptions and reductions, it is not clear to what extent this threat has actually manifested. The choice of production location depends on a host of factors, among which energy taxation 'plays a limited role' (European Commission, 2019a)[24].

Again, as in the case of carbon pricing, these studies and remarks cannot fully outweigh the case for a prudent approach in these matters. Although the fixation on energy cost competitiveness needs some pushback, it remains plausible that high energy prices will have non-negligible effects, at least in the long run (which most of the current studies do not take into account) and in highly exposed sectors. But it is equally true that regressive subsidies of (fossil) energy consumption are unsustainable. The question is therefore how we can escape from the current beggar-thy-neighbour setup, in order to ensure a fairer distribution and push for greater electrification and efficiency while keeping costs manageable.

We return to this issue in the discussion section.

2.3 Other tax breaks and subsidies

There are numerous other subsidies, tax measures and financial instruments that EII benefit from. These include interventions that are available to firms in general, but which have often been designed to be attractive to multinational and (large) industrial companies in particular.

These non-ETS- or energy-related benefits seldom appear in analyses of carbon leakage risks, although they arguably play an important role in their operations and investment decisions. A more fine-tuned perspective on safeguarding industrial investment (in the face of environmental transformation) should therefore take them into account.

The same is true from an environmental perspective. Various tax preferences and subsidies benefit incumbent firms, including EII. The associated financial flows are considerable, but often not specifically geared towards environmental goals. And even when they are, they are seldom linked to strong firm-level transition frameworks or commitments. These subsidies should therefore be taken into account when assessing and designing old and new transition policies. They are also relevant from a redistributive perspective: some of

24. This argument is further strengthened now that the cost of capital for various green investments will become increasingly attractive, thanks to the various efforts of the European Investment Bank, the sustainable finance taxonomy, and the general tendency towards accounting for climate risks.

these measures are part of the competition for global investments, which erodes states' fiscal bases, socialises private costs, and benefits the owners of capital.

This concerns a broad group of support measures, and it is often difficult to find out whether certain tax breaks or subsidies have gone to industrial sectors (let alone specific firms). We will nonetheless attempt to shed some light on the size and (industrial) beneficiaries of these instruments in each country. In doing so, we will again make a rough distinction between (i) measures directly linked to environmental investments and (ii) a broad group of non-environmentally targeted subsidies.

In Flanders, the first group includes investment subsidies like Ecologiepremie+ and Strategische Ecologiesteun. According to our estimates, these support measures were worth €30 mn a year, of which about 20% went to six big ETS firms. For (industrial) companies that have signed a voluntary energy efficiency agreement, there is also an additional tax reduction for investments related to energy efficiency[25]. In the Netherlands the major environmental support mechanisms are SDE+ (now reformed, see below) and the tax scheme for energy investments (IEA). As part of the latter, about €60 mn in annual tax benefits were given to the industrial sector in 2019[26]. Some other, more minor subsidies include the annual subsidies for carbon capture and storage (CCS) projects by Shell (€8 mn in 2019). As we discuss in the next section, some of these instruments are now being reformed as part of the Netherlands' new industrial strategy. In Germany, this mostly included funds related to energy efficiency.

This category also includes subsidies for renewable energy and CHP installations. Although EII have largely been exempt from contributing to these subsidies through their energy taxes, they do benefit from them. They operate a considerable chunk of the subsidised CHP installations, and have also invested in renewable energy production. Although we can only provide rough estimates[27], six big ETS firms receive at least €20 mn in annual renewable energy subsidies in Flanders. For instance, Exxon can claim up to €7 mn in annual subsidies for its gas-powered CHP installations, while

25. Total tax deductions total about €400 mn a year, but we do not know how which firms have made use of this instrument. Industrial process efficiencies and CHP installations are also eligible under this deduction.

26. Calculations based on the figures included in https://www.rvomagazines.nl/eia/2020/01/besteding-van-het-eia-budget.

27. Our method for calculating this was somewhat indirect because we had to rely on incomplete public information. We had to judge by the names of installations included in a governmental database whether RE facilities were connected to industrial firms. We then assumed that these installations received annual RE subsidies in proportion to the ratio of their installed capacity per technology over total installed capacity. For example, an installation representing 20% of installed CHP capacity would receive 20% of subsidies. These data discount PV, for which the requisite data were not available. We therefore think it is likely to be an underestimation. See Bollen and Beys (2020) for more details and firm-specific data.

Arcelor can receive up to €3 mn for its windmills. In the Netherlands, a cursory search[28] showed substantial subsidies (SDE+) being granted to installations by Shell (a total maximum of €167 mn worth of geothermal and solar panels), Akzo Nobel (total max €136 mn, biomass and solar panels), and Zeeland Refinery (total max €12 mn, solar panels)[29]. We did not reproduce this analysis for Germany.

Secondly, there are many more general subsidies and tax breaks from which EII also benefit. In Flanders, EII have access to instruments like Strategische Transformatiesteun, a subsidy for major investments without any environmental criteria (€40 mn is granted annually, of which about 30% has flown to six big ETS firms). But a set of (Belgian) tax deductions is even more substantial, including tax benefits for R&D, property tax deductions for firms that have signed an EBO, the 'notional interest deduction' (a deduction from profit taxes which led to €1,700 mn in tax benefits in 2016, mostly for multinationals) and wage-tax subsidies (including the withholding tax deduction, leading to €2,800 mn in tax benefits of which almost half went to 100 big firms). Although these do not end up solely with EII, there is reason to believe that big industrial firms have reaped a considerable portion of the associated benefits (Bollen and Beys, 2020; Rekenhof, 2019). For instance, according to trade unions in the chemical industry, wage subsidies more than compensate for the employers' social security contributions (Della Vecchia, 2020)[30]. A similar picture arises in the Netherlands. On the one hand there are again a number of important, more 'generic' tax benefits related to investments and R&D[31]. On the other hand, there is a generally lax regime which has led the Tax Justice Network to brand it as one of the worst global corporate tax havens (Tax Justice Network, 2020)[32]. Many of these benefits will not have ended up with EII, but reporting has nonetheless shown that major firms such as BASF, Shell and Tata Steel have received substantial

28. We combined a search based on the address of ETS firms, as well as a search of ETS firms' names in a public database of RE subsidies.

29. The SDE+ subsidy works as an operational subsidy with a 'cap': that is, a maximum which cannot be exceeded by cumulative annual subsidies. Only this maximum is public information, not the actual subsidies allocated. These figures do not appear to include CHP installations.

30. The Commission has also launched state aid investigations against the Belgian tax regime for multinationals, including a case specifically targeting the tax benefits given to BASF.

31. Such as the WBSO, a tax deduction scheme for R&D investments. Over the period of 2011-2017, about 40% of its annual expenditure (€1.2 bn in 2017) went to large firms (de Boer *et al.*, 2019).

32. It estimates that the UK, the Netherlands, Luxembourg and Switzerland are together responsible for half of the world's corporate tax abuse risks, as measured by the index in 2019. It is important to note that many EU Member States are simultaneously victims due to the tax benefits given by other Member States. In the context of the debate on industrial support measures, we can note the example from Auerbach (2016) cited in Candau and Cacheux (2018): 'BASF has avoided €923 mn in taxes over the period 2010-2015. [...] BASF evaded the German income tax on foreign-source dividends by using Dutch holding companies, has used the Netherlands participation exemption to avoid taxes on intra-group loans, and has also used the Dutch innovation box to reduce the tax burden on intellectual property income. Lastly the group has used intra-group activities to shift profits to Puerto Rico and Switzerland.'

deductions in profit- and wage-related taxes in the past decade (de Waard, 2020; RTL Nieuws, 2019)[33]. We did not explore this any further for Germany.

Third, apart from direct fiscal measures, governments have also provided loans, equity or guarantees through state financial institutions (SFI). In Flanders, a notorious example was the regional state investment company's (PMV) decision to grant a €500 mn guarantee to chemicals multinational Ineos for a controversial new petrochemical installation. Flemish (and other Belgian) SFIs have also invested in a number of funds and major investment projects by steel and chemical firms, such as logistical investments by ArcelorMittal or the 'innnovation fund' of the petrochemical sector. In Germany, the KfW bank provided about €9 bn in loans to basic industries and €8 bn in loans to industry and services in 2019. Industrial firms such as Akzo Nobel and Borealis benefited from this system. Recently, as part of the Covid-19 relief subsidies, German multinational Thyssenkrupp also received a €1.1 bn credit line from KfW (Borealis, 2014; KfW IPEX-Bank, 2021b, 2021a). We did not investigate this in the Netherlands.

2.3.1 Impact

Some of the instruments listed above undoubtedly benefit environmentally sensitive projects – some of them by design, others incidentally. And although subsidies alone will not suffice for industrial transformation, various kinds of financial support will nonetheless be required to make fossil-free industrial production viable (de Bruyn *et al.,* 2020).

We do not aim to present a review of the effects and structure of these diverse measures here. Instead, we wish to make two more general remarks.

First, a considerable part of general economic support measures, including R&D benefits, investment subsidies, wage subsidies, profit-tax deductions and others, are given out without any kind of environmental conditionality. Many of these subsidies are inevitably flowing into industrial value chains that are not in line with climate goals.

Secondly, this situation arguably also concerns many of the 'environmental' subsidies or tax breaks that have been used to finance incremental improvements in existing installations. If these funds go towards improvements in the efficiency of factories that, in order for them to be in line with climate targets, will eventually need to undergo a substantial retrofit or that will even need to cease operations completely, in the long run this might

33. A related issue which was recently covered in the Netherlands are the tax benefits related to water prices. These are capped for industrial users, leading to about €10 mn in annual tax benefits for a firm like Tata Steel. This issue is equally relevant in Belgium and arguably (although we did not look into this) Germany, but we did not include it here. For the Netherlands, see reporting in BNNVara (2020).

not be money well spent. In other words, there is a danger that these funds will only increase the sunk costs in stranded assets.

In order to prevent business-as-usual from inflating these sunk costs any further, all general subsidies should be scrutinised to make sure they are not hindering a just transition, and environmental support measures (especially for EII) need to be geared towards transformative rather than incremental improvements. Otherwise, they will just lead to lock-in further down the road. As we discuss further in the concluding section, this requires subsidies and tax benefits to be tied to an economy-wide transition roadmap as well as sectoral and firm-level goals and commitments. From a just transition perspective, this also requires greater clarity about the goals, beneficiaries and effectiveness of such support measures.

It should be noted that Germany and the Netherlands have for some years been developing good practices in this regard. Germany has a regular cycle of evaluations and has boosted general transparency in relation to subsidies (e.g. through the Subsidy Report by the Federal Ministry for Finance (Bundesministerium der Finanzen, 2020) and the 'Environmentally Harmful Subsidies' report of the Umweltbundesamt (Umweltbundesamt, 2017). This was expanded so that *all* subsidy instruments are now scrutinised according to their 'sustainability', with social, environmental and economic criteria modelled on the Sustainable Development Goals (SDGs). The environmental criteria used are up for debate[34], and evaluations do not equal conditionality, but this mainstreaming of climate assessments is nonetheless laudable. Although the Netherlands has not introduced such mainstreaming of sustainability, it nonetheless has a developed culture of policy evaluations (with easily available databases for subsidies, also firm-specific). Flanders is lagging behind in both respects, lacking climate mainstreaming as well as a structural system of assessments and transparency.

These are modest steps in the right direction; we return to this in the final section. As we discuss in the next part, Germany and the Netherlands have since 2019 introduced and overhauled some of their support measures.

2.4 In summary: policies have been defensive and incremental

In summary, heavy industries have benefited from a wide variety of support measures, often designed to safeguard their competitiveness in a changing economic and environmental policy landscape. In general, we can conclude that these instruments:

34. For instance, several of the energy taxation subsidies for EII get a positive environmental review because they are deemed to have prevented 'carbon leakage', even when the subsidy's direct effect is environmentally harmful. Many of the energy subsidies for industrial firms are justified in this manner.

– were motivated by fears of carbon leakage to non-EU countries, competition over energy prices including among EU countries themselves, and (more generally) international pressures related to wages, tax benefits and other indicators;
– were tied to a 'race to the bottom' in international as well as intra-European competition;
– were oriented towards incremental improvements in energy efficiency and emissions (at best), often in incumbent and 'legacy' industries;
– gave out mixed environmental incentives (at best), at times increasing the sunk costs in stranded assets or subsidising continued use of fossil fuels, and therefore worked against the electrification and transformation of industrial processes;
– led to regressive distributional outcomes;
– were complex, opaque, and not subject to clear conditionality;
– were defensive and oriented towards safeguarding existing industries rather than proactively shaping our industrial future.

The rationale behind this defensive and efficiency-oriented system was the belief that basic industries could not be fully decarbonised, and that more efficient processes would counterbalance the competitive disadvantages of higher wages, energy costs, etc. As we further discuss in the final section, we urgently need to overcome this cautious and regressive status quo.

3. Recent reforms: towards a transformative industrial policy?

Since 2019, the three countries examined above have all announced shifts in their industrial policies. These new instruments and strategies will in some cases replace or reform the 'old' system we described above, while others have been introduced alongside the existing set of support measures.

3.1 The Netherlands

In 2017, the centre-right Dutch government announced it wanted to introduce a new Climate Agreement. This set off a number of multi-stakeholder[35] negotiations over the contents of this agreement (the so called 'climate round tables'). One of these 'round tables' was dedicated to the industrial sectors.

In June 2019, the Dutch Climate Law was enacted, which set (non-binding) GHG reduction targets of 49% (compared to 1990) by 2030 and 95% by 2050. The associated Climate Agreement (2019) further specified how this should be translated to sectoral goals and strategies. For the industrial sectors, the agreement stipulated a quantitative headline target of -59% in GHG emissions by 2030[36].

The government (a 'demissionary cabinet' at the time of writing) also clarified what its industrial strategy will be to attain these goals. In general, the principle of 'the polluter pays' is presented as the core of this strategy, although this is to be combined with a wider framework of taxes and subsidies as well as state-led coordination and investments in infrastructure. The government also foresees a sector-targeted strategy, with specific support for the development of CCS or CCU, hydrogen, the electrification of existing industries, circular economy policies and chemical recycling.

Although competitiveness is still front and centre in the strategy, it is framed in a different way: taking the lead in decarbonisation is what will give Dutch industries an edge over competitors. In the same vein, the Netherlands will push for stronger EU-level policies to reduce the risks of carbon leakage,

35. Including individual large firms, sector organisations, trade unions, environmental groups, government officials, and experts.

36. For more on the background and process of Dutch climate and industrial policy, see the recent report by the scientific bureau GroenLinks (GroenLinks, 2021).

while also seeking out economic and infrastructural cooperation with its neighbouring states.

The Dutch government included a concrete mix of policy interventions (Blom and de Bruyn, 2020; PwC, 2020b) in this strategy.

First of all, the Netherlands will introduce a national carbon tax for industrial emissions. This tax will be designed as a minimum price in comparison to the ETS system: the 'net' carbon price is the difference between this minimum ('gross') and the current ETS price. If the ETS price exceeds that of the national price, no additional tax will need to be paid. The Dutch minimum price will gradually increase. By 2030 the price will be quite substantial (€125/tCO2), and the system can also be seen as a 'penalty' rather than a tax. It is therefore not projected to become a substantial source of state revenue, since firms are expected to either do what is necessary to avoid the tax, or to reduce production because of the associated costs (Blom and de Bruyn, 2020). Firms can trade emission allowances (see below), and they can get reimbursements for earlier carbon-tax payments (for up to five years) by using excess allowances.

Not all emissions are taxed, however: a number of emissions are freed from the tax, based on their annual production and their GHG performance relative to the EU-level benchmark from the ETS (composed of the 10% most carbon-efficient installations)[37]. This means that only a certain proportion of each installation's emissions will actually be taxed. This proportion is further reduced during the first few years by the 'reduction factor', which will decrease to 0 before 2030. This reduction factor was already set to be >1 in the initial period, and was further relaxed (+20%) in response to the Covid-19 crisis. This means that most installations will probably have an excess of free emissions during the coming years.

Secondly, the Netherlands will get rid[38] of the compensation for indirect emission costs. As far as we know, they are currently the only country who will remove this system after having introduced it.

Thirdly, a number of subsidies will be introduced or expanded, in order to finance industrial decarbonisation efforts. The reformed SDE+ (to SDE++) is of particular interest here. Of its total budget of €30 bn (by 2030), a maximum of €550 mn per year will be made available for GHG-reducing investments in industry[39]. It is designed as an operational subsidy: it will cover the difference

37. Meaning that firms will receive the maximum amount of free allowances if their CO2 emissions per ton of product are at least as low as the 10% most CO2-efficient producers (i.e. those with the lowest CO2 emitted per ton of production) of a comparable product in the EU.

38. Planned for 2022, but not yet confirmed.

39. Within this ceiling of €550 mn in annual subsidy flows, there is an additional ceiling for industrial CCS. Depending on a number of factors, however, CCS for existing industrial installations can still end up accounting for at most 70% of all industrial subsidies (Trinomics, 2019).

between the cost of emission reductions (Scopes 1 and 2) and the current price of CO2, with a cap on the total maximum subsidy over the project's lifetime. The projects that reduce emissions most for the lowest cost will be chosen. In addition, the tax reduction for energy-efficiency investments (the EIA, discussed in the section on tax measures) will be expanded to also cover GHG-reducing measures in industry. Industrial firms will be able to deduce 40% of their climate investments from their profit taxes.

Finally, these subsidies will be financed by increasing and displacing energy tax burdens. The ODE will go up, and will go up more for gas than for electricity. Following protest from environmental movements and trade unions, the increase in energy taxes will not fall primarily on households but will mostly be drawn from firms. However, since most energy-intensive industrial users will still benefit from a number of exemptions, the increase will mostly be felt by smaller and other industrial companies.

Apart from these domestic interventions, the government also foresaw a number of more ambitious positions on the EU-level reforms which are now being negotiated. In particular, the government has taken a stronger stance on the ETS, and is now supportive of a carbon border adjustment mechanism.

The Netherlands has decided on a mix of policy reforms, which are at least internally coherent in terms of the combination of 'carrots' and 'sticks' used. The introduction of an industrial carbon price floor and domestic emission reduction goals may be an important incentive as long as the ETS system is not sufficiently reformed. The nature of the new (or rather, expanded) subsidies also sets an interesting example. These operational subsidies explicitly take into account prevented emissions and carbon pricing, and are therefore an advance in terms of prioritising environmental and redistributive cost-benefit analyses over classic lump-sum subsidies. Following resistance from the Federation of Dutch Trade Unions (FNV) together with environmental movements in 2018 and 2019 (AD, 2018; Kager, 2019), the envisioned shift in energy taxes also corrects some of the distributional and ecological distortions from the previous system, by trying to move (additional) costs away from households and from electricity to gas.

The reforms have also drawn criticism. The current carbon tax still allows far too much flexibility for big industries, and it will take a long time before the penalties kick in, especially following the coronavirus-related relaxations. It is therefore reproducing some of the errors of the ETS (Kirsten, 2020). The 'polluter pays' principle is not fully reflected in the tax/subsidy reforms. It is the energy bills of households and (to a larger extent now) SMEs that will finance the subsidies for large industries, while the latter are still exempt from these energy tariffs. Meanwhile, the foreseen carbon price will probably not raise any funds itself (Milieudefensie, 2020). This has led to a number of alternative proposals, such as a flat tax on industrial CO2 to pay for industrial subsidies instead of the reformed energy tax (Blom and de Bruyn 2020). Another worry is that these subsidies will probably largely flow to existing industries, which may tilt them towards patching up 'legacy sites' (enough to maintain

operations throughout the 2030s) without bringing about the transformations necessary for the 2050 goals. On the other hand, the industrial section of the FNV criticised the removal of indirect emission compensations and the introduction of an additional carbon price, fearing job losses (FNV, 2021a)[40].

Our judgment of the Dutch reforms reflects the following statement by Carbon Market Watch: 'Overall, although the design of the Dutch national carbon levy is far from perfect, at least it's a step in the right direction' (2020, p. 4). Although much more ambition will be needed in the coming years, the reforms do introduce clear levers for more action, while opening up wriggle room to escape the competitive trap. However, we will have to see to what extent the new government follows up on these commitments, and how they are applied in practice. At the same time, the criticism from FNV's industrial section demonstrates the need for additional European measures (such as a carbon border adjustment mechanism).

3.2 Germany

Pressure for a shift in German industrial climate policy has been rising for a number of years, from grassroots campaigning by environmental groups but also from business. One landmark was the 2018 study commissioned by the German business federation BDI, which highlighted the various potential benefits of a more ambitious green agenda, signalling a shift in German industry's overall stance. A number of major firms and other branch organisations also called on the government to do more, while several of them announced their own plans for decarbonisation (Amelang, 2018). A further push factor was the coal phase-out agreement in 2019. There was also an important shift on the side of the trade unions (again aided by the coal agreement), which had previously held quite ambivalent positions. In 2019, IG Metall put out a joint position together with several climate organisations; its core message was that '*Die Uhr Tickt*' ('the clock is ticking') on the need for more ambitious climate interventions (IG Metall *et al.*, 2019).

In 2019, the federal government responded by adopting a new climate strategy, which included a climate law outlining emission reduction targets of -55% by 2030 and -100% by 2050 (Amelang, 2019a, Appunn, *et al.* 2021)[41]. The

40. The FNV has stipulated that it does not oppose the greening of industries as such, and that it wants Dutch industry to lead by example. It does, however, call for a level playing field, within Europe and internationally. Recently, FNV Staal has in fact presented a plan for an intensified and speedy greening of the countries' major steel plant, Tata Steel. According to the FNV, an acceleration of this transition is necessary to safeguard competitiveness in the light of ambitious decarbonisation projects such as that of the Swedish SSAB plant (FNV, 2021b).

41. In April 2021 Germany's constitutional court ruled that the government's climate action did not suffice, because it lacked concrete targets for the period after 2030. Soon after, the government announced that it would reform the Climate Action Law. It would now aim for carbon neutrality by 2045, introduce reduction goals for 2040, and further increase the (sectoral) targets for 2030 (Appunn *et al.*, 2021).

government also presented a new strategic vision for the industrial sectors, built on three 'pillars' (see below), a subsequent hydrogen strategy, and a number of governance networks[42] (BMWi, 2019).

The first 'pillar' concerned 'policies for better industrial competitiveness'. This included plans for cuts in corporate taxation and the introduction of 'tax monitoring' (to prevent German firms from facing heavier burdens than their competitors), while at the same time rejecting calls for corporate tax (data) coordination at the EU level. The need for energy cost competitiveness was also highlighted, as well as the dangers of carbon leakage. In response, the government foresaw a gradual reduction in grid charges and 'EEG surcharges' for industry, as well as the maintenance of indirect carbon leakage compensations. A monitoring group (consisting of economists, trade unions and business) would be established to assess industrial performance, particularly in relation to carbon leakage (BMWi, 2019). Environmental ambitions had to be first and foremost increased at the EU level.

The second pillar was dubbed 'strengthening new technologies, mobilising private capital'. Although the government noted that there was no lack of available funding as such, there was still a need to direct this capital to the appropriate destination. It therefore foresaw new incentives to make breakthrough technologies more attractive for private investors, and the creation of 'Future Fund Germany'. In addition, it also announced the creation of new subsidies targeting hydrogen, low-carbon industrial processes and CCS/CCU. Additional funding for battery cell manufacturing would also become available.

The third pillar was about 'maintaining strategic autonomy', and will not be further discussed here.

So far, the follow-up in terms of concrete policies has mostly consisted of large new subsidies. A number of new subsidies have been introduced mostly related to resource efficiency, industrial CCS/CCU, and industrial decarbonization (see the section on subsidies). The government has launched a hydrogen strategy which includes financing for industrial hydrogen as well as novel instruments such as *carbon contracts for difference* (Bundesministerium der Finanzen 2020, Fleiter *et al.*, 2021)[43]. Together these amount to over €5 bn in industrial subsidies by 2030 (see Table 5), but Fleiter *et al.* (2021) estimate that current budget allocations might move up towards €12 bn by 2030.

42. For instance, an 'Alliance for the Future of Industry', including employers, trade unions and the Ministry of Economic Affairs, was to become the 'central dialogue forum for industrial policy', next to a number of sectoral dialogues.

43. Carbon contracts for difference lower the risk of 'green' industrial technologies by countering the danger of low and volatile carbon prices. A CCfD subsidizes the differences between an agreed 'strike price' (e.g. €50 for every ton of CO2 that is avoided by the green technology in comparison to traditional technologies) and the carbon price in the market (i.e. the ETS price). This lowers the operational risks and the financing costs of the green technology.

In addition, there are new research funds dedicated to basic materials and energy intensive industries, as well as subsidy schemes for industrial energy efficiency.

As part of the coronavirus relief and stimulus measures, the government also announced (in the autumn of 2020) that it was going to introduce a further reduction in the EEG contribution. Moreover, industrial sectors included in the ETS, have been carved out of the new national carbon pricing scheme for heating and transport. Finally, there were also ongoing negotiations with industrial companies such as ThyssenKrupp who appealed for additional government support.

Table 5 **Estimated planned budgets for German industrial technology development programmes in million euros**

	2020	2021	2022	2023	2024	2025	>2025	Total
Industrial decarbonisation programme	80	310	500	500	500			1890
CO2 avoidance and use		120	120	100	80	80		500
Hydrogen CfDs			250	300				550
IPCEI Hydrogen		250	250	250	250	250	250	1500
EU ETS Innovation Fund		80	80	80	80	80	400	800
							Total:	5240

Source: Fleiter *et al.* (2021)

This industrial strategy has received a mixed response. On the one hand, according to Fleiter *et al.* (2021) the new subsidies that have been introduced amount to 'central milestones in establishing a policy mix for the transformation of the industry sector towards GHG neutrality'. On the other hand, according to the same authors the current policy mix would still not suffice (*ibid*). Additional funding, higher (and minimum) carbon prices, green lead markets and more ambitious circular policies are necessary. Similar criticism was raised by WWF Germany: 'The measures announced by the climate cabinet don't yet provide the framework for the upcoming industrial revolution towards greenhouse gas neutrality' (Amelang, 2019a) . A commentary by think tank E3G concluded that there was still a lack of 'concerted policy efforts' and few details on the chronology and the funding of the interventions that had been announced (Dethier *et al.*, 2020). A number of industrial sectors also responded (in 2020) with a call for greater ambition: 'companies including BASF, HeidelbergCement, gas supplier Linde and Salzgitter have said they are prepared for profound emissions cuts, but still lack the necessary market signal from policymakers' (Amelang, 2020).

So far, it does not seem as if the tensions between the need for a more ambitious transformation, fairness and competitiveness have been resolved or substantially altered by the new strategy. The compensation for indirect emission costs and energy tax exemptions have been maintained, while new subsidies have been introduced without any clear additional demands or

penalties pushing industry to do more. The government's discourse remains heavily focused on competitiveness, in part from an offensive perspective (e.g. gaining an edge in 'game-changing technologies'), but mainly still from a defensive perspective (e.g. safeguarding existing industries, preventing carbon leakage, etc.). As noted by Agora Energiewende: 'Industry protection must go hand in hand with the right incentives to lower carbon intensity. If Germany conserves current production in the name of protecting industry from the Energiewende's consequences, we will miss the boat on an international level' (Joas *et al.,* 2019).

3.3 Belgium

In contrast to the Netherlands and Germany, the Flemish government has so far not announced a new industrial policy or strategy. Nevertheless, in a context of ongoing general climate mobilisations (actively supported by trade unions[44]) and a contestation over specific industrial investments (notably related to environmental permits and Flemish subsidies for a new plant of petrochemical firm Ineos), the issue has remained on the table and there have been a number of new initiatives in recent years.

In 2019, the (previous) Flemish government launched the 'Moonshot' programme, which aims to stimulate innovative research into carbon-neutral industries by promoting cooperation between the major industrial firms (of chemicals, refineries, and steel) and research institutions. It offers an annual €20 mn subsidy (the total budget of €400 mn is spread out over the next two decades until 2040) for technological solutions, notably in the chemical industry. The funding is dedicated to, amongst other things, CCU/CCS, hydrogen, circular chemicals and industrial electrification.

The environmental movement welcomed the initiative, but was critical of its emphasis on CCU/CCS (BBL, 2019). It also criticised the lack of an overarching industrial roadmap to guide the priorities for funding, and the subsidisation of risky research without any clear ways for the government to reap some of the rewards (Beys, 2019).

The new (autumn 2019) government's policy declaration did not devote much attention to the industrial transition. It announced that it would continue the Moonshot programme, and that it would reform its main 'soft' policy instrument: the EBOs. The latter would potentially be expanded beyond

44. See Calu (2021) for an overview of some recent developments. The nexus between environmental challenges and industrial policy has also been on the agenda of the Belgian trade unions. In Flanders, the circular economy and industrial transition have featured in the congress positions of the interprofessional as well as sectoral trade unions. They have also conducted research on this topic, see for example the toolkit developed by ABVV Metaal around resource scarcity (ABVV, 2018; Bostyn n.d.; ACV, 2019). During the Covid-19 crisis, environmental unions and trade unions have continued to jointly call for green and social rescue and stimulus policies, including through the Climate Coalition's memorandum for a Belgian Green New Deal (Klimaatcoalitie, 2021).

just covering energy efficiency to also include climate and circularity, but no further details have emerged at the time of writing[45]. The government also stated that it would continue to make use of the compensation for indirect carbon leakage to the maximum extent allowed by state aid rules.

So far, its most important initiative has been to order a roadmap of potential technological trajectories for the Flemish industrial transition (Vlaio and Deloitte, 2020)[46]. Although the study was conducted by external consultants, it was developed in close discussions with industry and the government. As such, it can be seen as the first step towards an industrial policy framework – and this warrants a closer look at its set-up and conclusions.

Maintaining competitiveness is a cornerstone of the roadmap: although it offers a vision of 'green competitiveness', it pleads against domestic targets that go beyond the ETS and against 'running ahead'. The Netherlands and Germany are seen as instructive examples and important partners, but also as Flanders' main competitors. The roadmap also assumes that existing and planned 'installations' (e.g. in plastics, petrochemicals, and refineries) will remain in place until 2050: it does not investigate scenarios that include plant closures, and assumes a heavy role for CCS/CCU. The scope of the study was also largely constrained to technological aspects of the transition, the analysis of related (investment) costs remained limited. Although the potential use of subsidies such as CCfD was noted, it seems most financing is expected to come from various EU funds.

Finally, as part of Flanders' share in Belgium's 2021 Next Generation recovery program, submitted with the EU, a number of funds have been allocated to industrial hydrogen and CCS/CCU.

It remains to be seen how these tentative steps will be translated into more robust policies in the coming months and years. The government has announced it will present a new, more policy-oriented roadmap over the course of 2021. Perhaps this will lead to more ambitious follow-up.

45. With the exception of a recently introduced new subsidy that finances 'climate audits' in these firms.

46. The roadmap was produced by independent research outfits, but industries were part of a steering committee that could decide on the assumptions and goals of the study. There was no trade union involvement, and environmental organisations were only engaged in a second-tier consultation group.

4. Discussion and recommendations

4.1 Discussion

As we have tried to show in this paper, a lot of effort has been expended, and is still being expended, on defending incumbent industries. An important part of this support is built into the ETS. But there are other significant avenues of support that are available at the domestic level, including through energy taxation, the use of Member States' climate funds to subsidise the electricity bills of EII, and a variety of other subsidies and tax exemptions. As our analysis has shown, these instruments are often characterised by beggar-thy-neighbour competition, regressive distributional effects, and poor or incomplete environmental conditionality. A major motivating drive behind these measures has been to safeguard and attract industrial investments and competitiveness.

The clock continues to tick, however, and there is an increasingly urgent need for steps to be taken towards implementing circularity and decarbonisation. We need to do this without gutting Europe's industrial base or causing social dislocation, but also without further increasing sunk costs in unsustainable activities.

At the moment, of the three cases we analysed, we find that the Netherlands has introduced the most far-reaching reforms in its industrial policy, combining additional industrial carbon taxes with targeted subsidies and a shift in energy taxation. But even here there remain significant doubts over its ambition and implementation, as well as over the fair distribution of costs and benefits. Germany, meanwhile, has proposed a new strategic vision and a number of new subsidies, but is not currently indicating a move towards a similar overhaul of its policies. Finally, Flanders is trailing behind on both counts, and its policy agenda is still in a preparatory phase, consisting of a number of studies and ad-hoc subsidies.

Although the Netherlands has moved from a wholly defensive towards a more offensive 'green competitiveness' perspective, ensuring the survival of existing industries remains front and centre in all three states. Clearly, in order to make any progress, society needs to escape this stranglehold of industrial competition. The focus here has often been on extra-EU competition, and the associated need for instruments such as carbon border adjustments. But some of the paralysis is actually caused by intra-European competition, as well as domestic policies and the balance of power entrenched in existing arrangements within the Member States.

Action is needed at both levels, and cross-border cooperation as well as EU-level harmonisation should 'level the playing field' externally as well as internally.

4.2 Recommendations

Others have already outlined many of the concrete policy levers we need to engage to make the industrial transition happen. They have made clear that industrial transformation is feasible, and that it involves not only risks but also many opportunities for sustainable industrial activity and employment in Europe. However, a deep and just transition will require a combination of strategic coordination, R&D, carbon taxes, new subsidies, training programmes, social dialogue, public infrastructure and other interventions (e.g. Joas *et al.*, 2019; de Bruyn *et al.,* 2020; IndustriAll, 2016; Material Economics, 2019; Sartor and Lehne, 2020; Wyns *et al.*, 2018). Here, we will limit ourselves to some thoughts on the aspects of coordination, competition and redistribution.

First of all, it is clear that there is still a need for a shift in our basic economic paradigm. Instead of shaping our climate policies so they do not hamper competitiveness, we need to put climate transformation first and then work out how to attain these goals in an economically viable and socially sustainable way. This means that we should incentivise industrial firms to implement necessary changes while simultaneously protecting them from any free-riders and competitors undercutting them. But this should also entail a shift in our vision of what a competitive industry will (and should) look like by 2030-2050. Even in an economic sense, the dangers of moving too fast may have been oversold compared to the dangers of moving too slow. As CE Delft has argued: 'competitiveness in a decarbonising global economy will primarily be determined by the capacity to deliver products with drastically reduced emissions. Shielding EIIs from higher carbon costs may therefore only be a short-term fix and may risk leading them into a lock-in. A more long-term oriented policy framework should build up or extend leadership in the area of low-carbon industrial technologies' (de Bruyn *et al.*, 2020).

This emboldened vision then needs to be translated into concrete strategies. This first requires Member States to develop transition frameworks for their industrial sectors. These roadmaps should lay out a clear path towards long-term and intermediate goals[47], including a coherent set of policy interventions that will bring these goals about. They should also anticipate the redistributive and social effects of various scenarios, and what interventions will be required to make sure the transition is fair. The governance of these roadmaps must include regular and transparent monitoring, but also systematic discussions with trade unions and the environmental movement.

47. See, for example, the roadmaps developed by E3G and Agora Energiewende (Sartor and Lehne, 2020).

These roadmaps should be combined with sectoral and firm-level plans and obligations. Voluntary tools like the current energy-efficiency agreements should be reformed into industrial 'climate pacts', in which industrial firms and branch organisations develop transition goals and outline the steps they are planning on taking within various timeframes (e.g. 5/10/20 years). Spain has recently announced it will introduce some version of such corporate transition planning (Cerrillo, 2021).

Their progress in terms of decarbonisation, circularity and energy use is then measured and monitored, and industries' access to subsidies and tax measures, especially those related to energy subsidies and decarbonisation, should then be linked to their adherence to these commitments.

In designing the mix of 'carrots and sticks' that then drive industries forward, the 'polluter pays' principle should retain priority. Industry can and should finance much of its own transition, for instance by introducing some form of carbon taxation. One approach could be to introduce 'dual income' carbon taxes like in the Netherlands, where a domestic carbon price complements the ETS and can be used to fund industrial subsidies.

In addition, targeted support instruments should be introduced to cover the surplus costs from green investment. Instead of common 'lump sum' subsidies or investment-related tax benefits, operational subsidies similar to the ones introduced by the Netherlands offer a more effective and fair way forward. Germany's intention to use 'contracts for difference' in its hydrogen subsidies is also an interesting case. As we have outlined in a different report, the state should also seek to share in the benefits from its co-investment in R&D and operations, rather than just bearing the risks (Bollen and Vanaerschot, 2019; see also Diepvents, 2021). Public banks offer instruments in support of this, as Germany's experience with the role of KfW in the Energiewende has demonstrated (Geddes *et al.*, 2018).

At the same time, existing support measures should cohere with the transition roadmap. This entails an environmental and social evaluation of all subsidies, tax breaks and other support mechanisms, along the lines of Germany's subsidy monitor[48]. It should also mean that existing instruments are reformed to orient them towards climate action. In Belgium for example, there have been pleas to reform the notional interest deduction in favour of a green investment support mechanism (Boussemaere *et al.*, 2019; Wyns, 2019). This also means that support measures should be tied to clear goals and commitments, for instance through the industrial climate pacts described above. They also require better targeting. As we discussed before, for example, various energy and ETS-related benefits are linked to a blunt distinction between 'leakage'-sensitive sectors and others. They seldom achieve the effect

48. Mapping money flows is also an important part of boosting the transparency and governance of the transition. Annual stocktaking, akin to the 'landscapes of climate finance' exercise performed by the I4CE in France, would be a useful instrument.

of other support measures with the same goals and beneficiaries. EU policies should support this 'race to the top' – as a driving force in their own right, but also by removing sources of external and internal zero-sum competition.

First of all, the EU should move forward with the development of some kind of external adjustment mechanism. This could, for instance, include a carbon border adjustment mechanism for the steel and cement sectors, and (eco-) standards for the chemicals and aluminium sectors. Crucially, the introduction of such measures needs to be combined with a phase-out of freely allocated emission allowances, and a further strengthening of the ETS. Furthermore, all funds raised through ETS auctions should be used for investments in a just transition, and the funds spent on ICL should be redirected towards environmental investments in industry and social 'flanking' measures.

Secondly, a reform of the Energy Tax Directive (planned but failed in 2011) is overdue. Energy taxes should be further harmonised, and exemptions removed or tied to environmental goals to create a true level playing field. Fossil fuel subsidies should be phased out.

Thirdly, by developing its own capacity to spend (directly, through the European Investment Bank, as well as through programmes such as Next Generation EU), and by setting monetary policies in line with the transition, the European institutions can play a decisive role in funding large-scale environmental transformation. Reforming the Stability and Growth Pact and the European Semester is, furthermore, crucial to allow for a wave of government investment from the Member States.

Finally, states should further develop opportunities for regional cooperation. A more circular and decarbonised economy will lead to an increase in the flow of goods, energy, chemicals, and other throughputs. Rather than considering one another solely as competitors, states should intensify cross-border cooperation, in order to prevent infrastructural bottlenecks and to reap the rewards from mutual learning and symbiosis. Flanders, the Netherlands and the German state of North-Rhine Westphalia have already set an example in this regard, having set up a trilateral forum for regional cooperation in the chemical sector.

Such initiatives should be further expanded, for example through the working out of strategies on cross-border infrastructure, cooperation on green investment and climate-neutral technologies, and the development of markets and standards. States can also work on a more expansive mapping of the different compensation schemes and competitive drivers in the region, and explore a common approach to their respective industrial strategies and different support schemes. They might, for example, choose to align the duration, focus and volume of their subsidies. Finally, and crucially, developing a level playing field on energy prices and subsidies should aim for a race to the top, rather than a race to the bottom.

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Abbreviations

CCS/CCU	carbon capture and storage or usage
CHP	combined heat and power
EII	energy-intensive industries
ETD	Energy Taxation Directive
ETS	(EU) Emissions Trading System
ICL	indirect carbon leakage
mn/ bn/ tn	million/ billion/ trillion
MWh/ GWh/ TWh	megawatt-hour/ gigawatt-hour/ terawatt-hour
R&D	research and development
SME	small and medium-sized enterprises

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