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JØRGEN WETTESTAD
CATHRINE HAGEM

Shedding light on CO2 compensation:

why in Norway but not Sweden – and with what effects?

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Jørgen Wettestad
Fridtjof Nansen Institute
jwettestad@fni.no

Cathrine Hagem
Statistics Norway
cathrine.Hagem@ssb.no

FRIDTJOF NANSENS INSTITUTT
FRIDTJOF NANSEN INSTITUTE

Abstract

Climate policy ambitiousness has to be ratcheted up in the coming years in order to attain net-zero targets. This means increasing costs for industries and consumers and designing compensation measures becomes increasingly important. EU carbon trading has the indirect effect of increasing energy costs for energy-intensive industries. Since 2012, half of the European Economic Area countries have turned to specific CO2 compensation to counter such costs and, together with free allowances, avoid carbon leakage. Already amounting to millions of euros, such compensation is expected to increase substantially. However, the compensation mechanism has attracted surprisingly little research interest. Why do some countries establish such compensation, while others do not? And with what effects as to incentives and carbon leakage protection? This report studies the differing choices of Norway and Sweden: two neighbouring countries with significant energy-intensive industries. Only Norway decided (in 2012) to establish a specific CO2 compensation mechanism. This report highlights two central explanations: first and foremost, there was a significant underlying, 'structural', difference as to the allocation of EU ETS free allowances, with Norwegian industry somewhat 'under-allocated' and Swedish industry considerably over-allocated, indicating different needs for compensation. Second, in Norway key industries mobilized significantly through contacts with prominent politicians and parliamentarians, but less such mobilization took place in Sweden. As to effects, the Norwegian compensation seems to have had the intended results as to carbon leakage protection. But existing evidence is surprisingly scarce, seen in light of considerable compensation handed out and projected increasing amounts.

Keywords:
Carbon pricing; EU; CO2 compensation; carbon leakage; Sweden; Norway

Sammendrag

EUs kvotehandelssystem (EU ETS) og kvoteprisen der har den mer indirekte effekten at strømkostnadene øker for kraftkrevende industri (ettersom kraftselskapene sender noe av kostnadene ved kjøp av kvoter over til for brukerne i form av økte kraftpriser). Fra 2012 av har om lag halvparten av landene i EØS delt ut spesifikk CO2 kompensasjon for slike indirekte utgifter. Sammen med gratiskvoter så er denne kompensasjonen ment å motvirke 'karbonlekkasje', dvs. at bedrifter i EU/EØS flytter sin virksomhet til regioner og land med slappere klimapolitikk. Denne kompensasjonen beløper seg allerede til millioner av euro og forventes å øke i takt med økende kvotepriser. I lys av dette er det gjort overraskende lite forskning på CO2 kompensasjonsmekanismen. Vår studie er et bidrag til å bøte på dette og vi foretar en sammenlignende studie av Norge og Sverige. Disse nordiske naboene, begge med betydelig kraftkrevende industri, har valgt forskjellig: Norge har delt ut slik kompensasjon siden 2013 mens Sverige har valgt å ikke benytte seg av denne ordningen. Hvorfor har de så valgt forskjellig? Denne studien peker på to sentrale forklaringer: først og fremst finner vi en viktig, underliggende 'strukturell' forskjell mht tildelingen av gratiskvoter, slik at norsk industri har blitt tildelt komparativt sett betydelig færre gratiskvoter enn svensk industri. Behovet for kompensasjon i tillegg til kvotene har dermed blitt oppfattet som klart større i Norge enn i Sverige. For det andre, og i samspill med den 'strukturelle' forskjellen, så har norsk industri mobilisert og lobbet sentrale politikere og myndigheter for å få slik kompensasjon mye sterkere enn det svensk industri har gjort. Når det gjelder effekter så synes den norske ordningen å ha virket etter hensikten med hensyn til å motvirke karbonlekkasje. Men det er overraskende lite forskning på ulike typer effekter, ikke minst i lys av betydelig kompensasjon bevilget så langt og antatt økning framover.

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The Fridtjof Nansen Institute is a non-profit, independent research institute focusing on international environmental, energy and resource management. The institute has a multi-disciplinary approach, with main emphasis on political science and international law.

Contents/Innhold

1. Introduction

It is becoming increasingly clear that climate policy ambitiousness has to be ratcheted up in the coming years in order to attain net-zero targets. This means increasing costs for industries and consumers and makes the issue of how to design compensation measures that are both fair and still incentivizing increasingly important (see Green and Gambhir, 2019; Fæhn and Yonezawa, 2021; Nilsson et al, 2021). With carbon pricing, the main direct aim of systems such as the EU Emissions Trading System (EU ETS) and its carbon price is to induce a cost-effective low-carbon transition by 'greening' the practices of key target groups – regarding the EU ETS, primarily the power and energy-intensive industries thus far. However, from the very start of the ETS in 2005, it has been clear that the system has additional indirect effects for industries and consumers, such as increasing electricity prices and related political 'turbulence'– effects that might endanger a just low-carbon transition (Fabra and Reguant, 2014). This study focuses on the establishment of specific CO2 compensation, a mechanism established back in 2012 to work in conjunction with free allowances as the central EU response for avoiding 'carbon leakage', i.e. carbon-intensive production in the EU relocating to countries with less stringent (climate) policies (Böhringer and Lange, 2005; Böhringer et al., 2017; Kaushal and Rosendahl, 2020).

Almost half of the European Economic Area (EEA) countries – including Norway and several other countries with major energy-intensive industries such as Germany, Finland and France – have chosen to establish CO2¬-compensation schemes; most of them pay the maximum allowable amount to the eligible sectors (Næss-Schmidt et al., 2019; ERST et al., 2020). [1] EU recommends that member-states endeavour to keep the total compensation below 25% of auctioning revenues, EU (2020).

However, although substantial funds have already been disbursed, and such compensation throughout the 2020s is estimated to cost around seven billion euros in Norway alone (E24, 2022), there has been surprisingly little research on this mechanism and its effects (however, see Nilsson et al. 2021).

This issue is especially pertinent because of the significantly rising EU ETS price since 2018, peaking at a record-high level of above €90 in the autumn of 2021 and with prospects of further increases, despite the effects of the Covid-19 crisis and the war in Ukraine (see Carbon Pulse, 2021; 2022). An increasing carbon price means an increasing need also for designing compensation mechanisms that are socially fair without diluting the low-carbon transition incentives.

[1] EU (2012) states which kind of economic activities (specified by NACE-codes) may be eligible for CO2 compensation. No other sectors and subsectors will be considered eligible for such aid.

The establishment of a Carbon Border Adjustment Mechanism (CBAM) formally adopted by the EU in April 2023 indicates a gradual reduction of free allowances from 2026 on, implying also the gradual removal of CO2 compensation (European Council, 2023). All this adds to the need for better knowledge about such compensation schemes and their political dynamics.

This report conducts in-depth study of two neighbouring countries with significant energy-intensive industries that have still made strikingly different choices: Norway and Sweden. Why is this so? This is the first question addressed. Second, we also investigate existing knowledge about the possible differing consequences of these choices for industries in the two countries. These questions are addressed through qualitative process-tracing analysis, based on document assessment and qualitative interviews and descriptive statistics.

Our study highlights two central explanations for why only Norway chose to establish a CO2¬compensation scheme: first and foremost, there was a significant underlying, 'structural', difference as to the allocation of EU ETS free allowances, with Norwegian industry somewhat 'under-allocated' and Swedish industry considerably over-allocated, indicating different needs for compensation. Second, and probably related to this, in Norway key industries mobilized significantly through contacts with prominent politicians and parliamentarians, but less such mobilization took place in Sweden. As to effects, the Norwegian scheme may have had the intended results as to carbon leakage protection. But existing evidence is surprisingly scarce as to both leakage protection and incentive effects for the low-carbon transition, seen in light of considerable compensation handed out so far and not least projected significant increasing amounts. Hence, there is a clear need for substantial further research.

2. Analytical framework and methods

2.1. Analytical framework

First and foremost, we seek to explain *the differing choice of policies and mechanisms for countering indirect carbon pricing effects in Norway and in Sweden*. Norway established a specific CO2 compensation mechanism, but Sweden did not – despite the many similarities between these neighbouring Scandinavian countries, including significant energy-intensive industries.

How to explain this? At least four broad sets of domestic economic/political factors should be considered. The *first set* focuses on *the role of governments and party politics*. It is well documented that political parties and politics matter when it comes to prioritizing certain policy areas or the direction of policymaking (see Knill et al., 2012; Biesenbender and Tosun, 2014, p. 427). For example, countries with similar scores on national mitigation and damage cost variables may pursue different climate-change policies (Harrison and Sundstrom, 2010: 3; Bang et al., 2015, p.8) – which would indicate that domestic politics and priorities shape mitigation policies. Changes in government, political parties, party manifesto and party constellations can thus be expected to influence policy choice within the domestic system. This leads to the following hypothesis: *Norway established a specific CO2 compensation mechanism and Sweden did not because the Norwegian government and political parties viewed such compensation more positively than the corresponding actors in Sweden* (P1).

Following a standard political economy approach, the second set of domestic factors concerns *the structure, relative power and mobilization of industry and interest groups*. Energy-intensive industries are a particularly relevant interest group here. Differences in industry structures and economic interests across countries can result in variation in the dynamics of domestic interest-group policy. Energy-intensive industries are typically located in proximity to resources such as hydropower, and often involve strong companies with a dominant, cornerstone position in local communities. The position as an important provider of local employment gives such cornerstone companies a powerful bargaining position vis-à-vis political parties and politicians keen to attract and keep local votes. Norway has arguably more such companies with cornerstone positions in local communities than does Sweden. Our second hypothesis is thus: *Norway established a specific CO2 compensation mechanism and Sweden did not due to differing industry localization structures and the related higher political mobilization for compensation in Norway than in Sweden (P2).*

Thirdly, policy choice can be heavily constrained by the *path dependencies and lock-in effects* generated by previous policy programmes. Hence, the third set of domestic factors we consider is whether path dependencies and lock-in effects from previous policy choices have influenced subsequent policy choices (Pierson, 1993; 2000). A key point for path-dependency scholars is

that the timing and sequence of choices governing the development of a policy may constrain and impact future choices and political processes. A central feature of path dependency is 'increasing returns' – over time, policy choices become more stable and increasingly difficult to change. This leads to our third hypothesis: *Norway established a specific CO2 compensation mechanism and Sweden did not because such a mechanism was more in line with previous policies in Norway than in Sweden (P3).*

Fourth, national policy choice is also likely to be influenced by international factors and policies; in the case in focus here, the most relevant set of factors are *the follow-up of and interaction with relevant EU/European Economic Area (EEA) policies.* Central to such policies are the rules and guidelines regulating the allocation of free allowances and the establishment of CO2 compensation schemes. The member-states are free to choose whether or not to adopt a CO2 compensation scheme. But if they do, they must follow state-aid policy and the guidelines from EU.1 The CO2-compensation scheme is based on benchmarks for electricity consumption: efficiency, historic production, and the CO2 intensity of electricity produced from fossil fuels (CO2 emission factor).

The decision of whether to implement a CO2-compensation scheme is likely to be influenced by the EU rules for general allocation of free allowances to the industries in question. Some energy-intensive firms can be eligible for free allowances as well as specific CO2 compensation.[2] Allocations are based on historical production data and benchmarks for emissions from the production of products in various ways assumed to be vulnerable to carbon leakage.[3] The rules for free allocation of emissions allowances are determined by the European Commission (hereafter: Commission) and are harmonized across all member-states. In general, emission intensities will differ across firms, so firms with emission intensities well below the benchmarks may receive substantially more in free allowances than their actual emissions (over-compensation). In that case, it is reasonable to assume that the need for additional CO2 compensation to prevent loss of competitiveness will be reduced. The following hypothesis can then be formulated: *Norway established a specific CO2 compensation mechanism and Sweden did not due to EU allocation rules leading to a more generous allocation to Swedish than Norwegian industries and hence a differing need for CO2 compensation (P4).*

As to effects the approach is basically inductive, aiming for a summary of existing knowledge on how to design compensation measures that are both fair and still incentivizing a low-carbon transition (Green and Gambhir, 2019; Fæhn and Yonezawa, 2021; Nilsson et al, 2021).

2.2. Methods

A central methodological tool in this study is qualitative process-tracing analysis, with examination of academic books and articles, relevant government reports and communications, reports from think-tanks and NGOs, and news articles from digital news services and newspapers. Further, we draw on quantitative analyses which present the main characteristics of industries in Norway and Sweden relevant for the impacts of such compensation schemes. We

[2]EU (2010) provided a list of sectors and subsectors considered to be exposed to significant risk of carbon leakage for the years 2013–2014 (specified by NACE-codes) and thereby entitled to free allowances.
[3] The harmonized free allocation rules are specified in EU (2011).

also draw upon seven interviews and e-mail communications with selected stakeholders and analysts in our two case-countries. All interviews were conducted through a video conference tool (Microsoft teams or zoom). The interviews and communications were conducted explicitly for use as fact checking and background information and hence the questions asked were tailored to the cases at hand and our own prime knowledge gaps. All interviewees and contacts were guaranteed anonymity. On the basis of this material we conduct a 'focused structured' comparison between processes in Norway and Sweden (see George, 2019), seeking to collect similar information for both countries and to compare them along the same dimensions. All in all, although we draw on statistics and interdisciplinary collaboration this is primarily a political science analysis.

3. Results: why did Norway and Sweden choose differently as to CO2 compensation?

3.1. Differences in the role of governments and party politics?

Norway linked up to the EU ETS in 2008. Prior to the third EU ETS trading period (2013–2020) and the anticipation of increasing carbon prices and related fears of carbon leakage, the Commission opened up for the establishment of specific compensation mechanisms. Norway was among the first to declare its intention to establish such a mechanism, announced in September 2012 by then Prime Minister Jens Stoltenberg. The government noted that the EU ETS had led to increasing power prices in Europe, also affecting the price of hydropower in Norway and weakening the competitive position of Norwegian energy-intensive industries. The Minister of Industry held that the compensation mechanism would ease the burdens for energy-intensive industries and ensure that 'good climate policy was combined with good industry policy' (NTB, 2012).

This mechanism, to be administered by the Norwegian Environment Agency, would include all 15 sectors singled out in the relevant EU guidelines, taking state aid guidelines into consideration. Producers of aluminum, ferro-alloys, chemical products, and pulp and paper were included. The mechanism was to start in mid-2013, initially continuing until 2020. Companies with long-term power contracts established before 2005 were not eligible for compensation, nor own power production. In 2013, 40 companies were granted compensation, amounting to €22 million (NOK 220 million).

In 2012/13, there was a Red–Green coalition in power in government, with Labour as the dominant party. As also was the case for coalition partner the Socialist Left Party, these parties had good contacts with trade unions in energy-intensive industries. Further, the Labour Party had a traditional stronghold in many industrial communities, such as the aluminum industry in western Norway. Concern for such industries was a central element in the government's industry policy. As noted by the Office of the Prime Minister, 'the Norwegian manufacturing industry is at the fore in the business sector when it comes to low emissions and energy efficiency. *We must ensure that the industry is able to develop further in an environmentally friendly direction, without strict climate regulations resulting in relocation of emissions and carbon leakage'* (NRK, 2012: our italics).

There is nothing to indicate significant disagreement among the parties in Parliament as to the establishment of a CO2 compensation mechanism. The 2012 proposition (*innstilling*) from the Standing Parliamentary Committee on Energy and the Environment showed generally broad agreement on the main principles for such support and the specific issue of a compensation mechanism – with the partial exception of the right-wing Progress Party. However, its representatives did not oppose a compensation mechanism: indeed, they endorsed it strongly (Parliamentary Standing Committee on Energy and the Environment, 2012).

Turning to Sweden, in 2011/12 the Conservatives, led by Prime Minister Fredrik Reinfeldt, were in government (the Alliance government). Its climate policy program had been negotiated earlier and was articulated in the Climate Policy Bill 2009/10. This bill aligned very clearly to the EU package (20–20 by 2020) at that time, and the key instrument was carbon pricing – either the EU ETS, or the carbon tax (for non-ETS sectors). The framing of the ETS involved neoclassical economics, communicated by powerful actors outside the government (see 'Konjunkturinstitutet') and within it (e.g. Finance Minister Anders Borg) (communication with Roger Hildingsson, April 2021; interviews, 2021).

In January 2012, Minister of Industry Annie Lööf presented the official Swedish position on the CO2 compensation issue in the Parliament. She emphasized that the EU ETS was a market instrument, and that compensation mechanisms would in principle run counter to the goal of harmonization and cost effectiveness. Such mechanisms could impede the functioning of the market. Moreover, given the rather low carbon prices at the time, the Swedish government saw no pressing need for such compensation – which many countries also might not be able to afford. The government promised to monitor the situation closely and remain in close contact with Swedish industries (Lööf, 2012).

Summing up, we find some striking differences as to the role of governments and party politics. CO2 compensation appears to have been a more prominent political issue in Norway than in Sweden, although it was never really a high-priority issue in either country. However, the positions of the governments in the two countries were markedly different: Sweden generally did not see the need for such a mechanism in the ETS – whereas the Norwegian government embraced the mechanism and was a frontrunner in implementing it.

3.2. Differences in the structure, relative power and mobilization of interest groups?

Here, we must first take into account the socio-economic/industrial structures in Norway and in Sweden. Both economies have sizeable shares of energy-intensive sectors, accounting for around 70% of total energy consumption in the manufacture industry in 2012.[4] However, Norway's energy-intensive industry is far more *electricity*-intensive than Sweden's. Electricity consumption constitutes around 65% of total energy consumption in the energy-intensive sectors in Norway, as against ca. 30% in Sweden. (See Fig. 1.)

[4] 70% in Norway and 76% in Sweden. Source: Statistics Norway (2021) and Energimyndigheten (2021). Here we define *energy-intensive sectors* as the manufacture of pulp, paper and paperboard; chemicals and chemical products; and basic metals (NACE codes 17, 20 and 24)

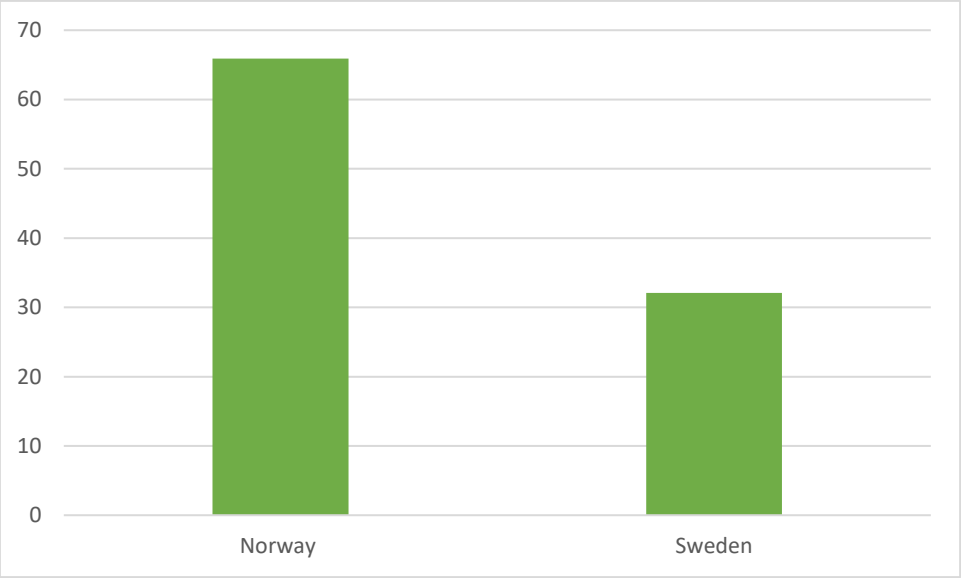

Figure 1. Electricity consumption as percentage of energy consumption in energy-intensive industries, Norway and Sweden, 2012. Source: Statistics Norway (2021) and Energimyndigheten (2021).

As the size of the energy-intensive industry in Sweden is substantially larger than in Norway, total consumption of electricity in the energy-intensive sectors is almost identical in both countries. However, the distribution across sectors differs substantially. As shown in Figure 2, *manufacture of paper pulp and cardboard* is the main consumer of electricity in Sweden, whereas in Norway it is manufacture of basic metals. This is important, given the differences in the EU rules on free allocation to these sectors, as discussed in section 3.4.

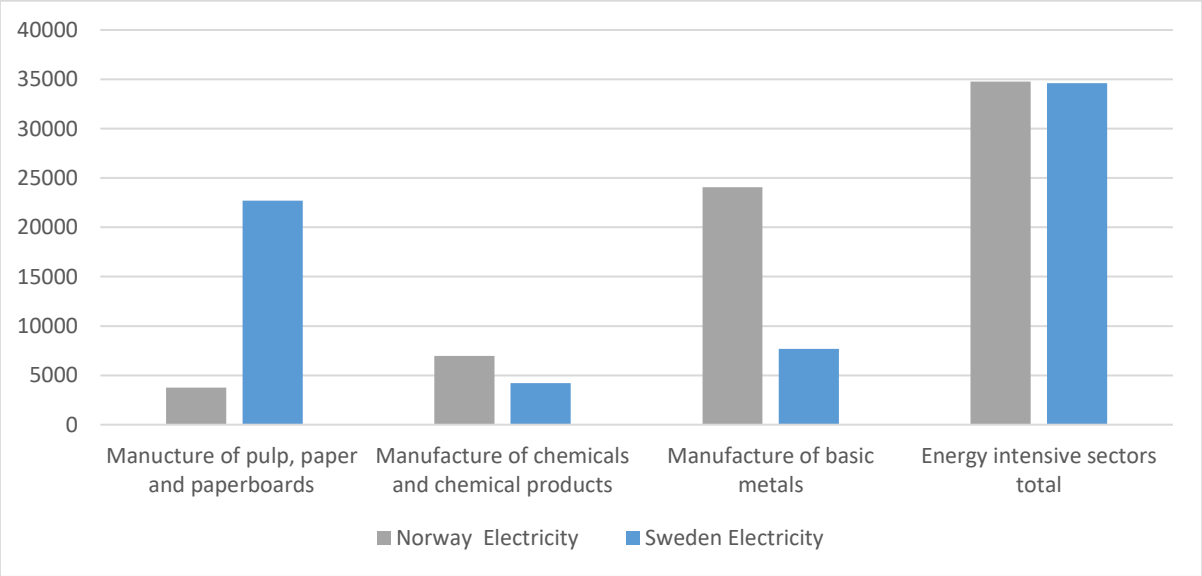

Figure 2. Electricity use in energy-intensive sectors, GWh, Norway and Sweden, 2012. Source: Statistics Norway (2021) and Energimyndigheten (2021).

In Norway there has been official concern for the position of energy-intensive industries, which constitute a substantial part of Norwegian industry, known for its long history of cheap hydropower. In 2012, Norway's energy-intensive industries stood for approx. 80% of the total electricity consumption of manufacturing industries; and basic metal production alone was responsible for 40%.[5] In 2021, Norway stood for ca. 3% of global aluminum production.[6]

Energy-intensive industries in Norway are typically located in proximity to hydropower resources. As Norway has a decentralized population, this has meant strong companies with a dominant, cornerstone position in rather small communities. One example is the aluminum producer Alcoa in Mosjøen, which employs some 7% of the active workforce in this northwestern municipality. Another cornerstone industry is the paper producer Norske Skog Saugbruk in Halden in southeast Norway, founded in 1859 and currently employing some 3% of the active workforce there.[7]

The position as an important provider of local employment has given cornerstone companies a strong bargaining position vis-à-vis political parties and politicians keen to attract and keep local votes. Especially in economically challenging times, as under the financial crisis that began in 2009, these industries occupy a near-veto-player position in Norwegian politics.

Their mobilization power was evident in 2011, when the cornerstone company Hydro warned of the need for a compensation mechanism in order to avoid industry re-localization and carbon leakage (*Dagens Perspektiv*, 2011). This was shown again in 2013, when the new Conservative government proposed a cap for such compensation: the industry mobilized in opposition, and won, through a Parliamentary coalition that included the Labour Party and the Socialist Left Party. No cap was introduced.[8]

Sweden has also a significant energy-intensive industries, such as forestry/pulp and paper and iron ore/steel production (e.g. the steel company SSAB). As shown in Figure 1, electricity is a less-prominent energy source than in Norway. However, about one-third of Swedish industrial energy consumption in 2012 was electricity, with the energy-intensive sectors (defined above), accounting for some 66% of industrial electricity use.[9]

As to mobilization, however, it is striking how the energy-intensive industry in Sweden has not argued strongly against carbon pricing policies. They have indeed raised concerns, which in the early 1990s led to substantial discounts from the carbon tax. These discounts were broadly supported also by economists and environmental NGOs. Due to competitiveness concerns, these industries have also been exempted from the electricity tax, which for a time was linked to the voluntary energy efficiency programs (see Stenquist, 2013). Moreover, the green certificates scheme, which had been established to promote renewable energy, was advantageous for the pulp & paper industry.

Later, these industries were exempted from the carbon tax in Sweden: they are regulated by the EU ETS, and double regulation was to be avoided. In general, this eased the opposition from industry. That is understandable, as other sectors (like transport and households) have had to

[5] Statistics Norway (2021).
[6] https://www.regjeringen.no/contentassets/49d2580072464762aa82aea1892ed29d/co2kompensasjon-vedlegg.pdf
[7] https://www.norskeskog.com/Business-units/Europe/Norske-Skog-Saugbrugs and reference in footnote 5.
[8] See https://www.tu.no/artikler/industrien-far-fullt-gjennomslag-om-co2-kompensasjon/233705
[9] Energimyndigheten (2021).

bear the chief burden of the carbon tax; the main opposition against energy and carbon taxes has come from rural interests, as expressed in various kinds of 'petrol uprisings' – as yet without any lasting impacts on taxation.

On the other hand, industry representatives have raised concerns about the specific design of the ETS and the impacts on Swedish industries. Notably, Jernkontoret (the Swedish Steel Producers' Association) has issued critical comments about free allocation (i.e. the carbon leakage list), the specific metrics employed and complaints about the decision against compensating industry for these costs (Jernkontoret, 2014; communication with Roger Hildingsson, April 2021; interviews, 2021). Moreover, a report from Adelphi & Ecofys (2018) noted some resistance from energy-intensive industries to the carbon tax, implicitly lobbying for lower rates and exemptions. Thus, there has been some energy-intensive industry lobbying also in Sweden, but apparently mostly for exemptions from the tax, with less emphasis on specific CO2 compensation. The steel industry is the main central exception here.

Summing up, we find that both countries have important energy-intensive industries, and the relative power of these industries does not seem to differ greatly between them. However, differences can be noted with regard to the mobilization of these interest groups. In Norway, key industries mobilized significantly through contacts with prominent politicians and MPs. There has been significantly less mobilization in Sweden.

3.3. Differences in path dependencies and lock-in effects from previous policy choices?

Examination of earlier climate-policy regulatory initiatives shows that Norway has a regulatory tradition of protecting industries exposed to international competition. A clear example is the design of the CO2 tax, established in 1991. Several industries with relatively high emissions (and also exposed to international competition), such as the metal-producing process industries, were partly or even totally exempted from the tax (Bruvoll and Larsen, 2004). Moreover, energy-intensive industry was exempted from the green certificate obligations introduced in 2012 (Hagem and Rosendahl, 2011), and has been partly exempted from the electricity tax, with a value of around ca NOK 5.7 billion in 2012 (Government of Norway, 2012).

Also Sweden has a regulatory tradition of protecting industries exposed to international competition. It has had carbon taxation since 1991, initially targeting fossil fuels at rates equivalent to around €25 per ton of CO2, currently at about €120 per ton. The tax has been described as the dominant instrument in Swedish climate policy, taxing energy emissions in transport, buildings (heating), industry, and agriculture (Åkerfeldt and Hammar, 2015; Adelphi & Ecofys, 2018; Criqui, Jaccard & Sterner, 2019). According to the World Bank, this represents 'by far the strongest carbon price signal in the world' (World Bank, 2017).

Particularly relevant in this connection is that the introduction of the carbon tax was accompanied by reductions in the energy tax. Later increases in the level of the carbon tax have often been compensated by other tax reductions, which have helped to keep the tax politically acceptable (Adelphi & Ecofys, 2018: 1). However, the international competitiveness of industry has been a concern all along: 'Industry has ever since the introduction of the tax faced a lower tax level on heating fuels than the household and service sectors' (ibid.). Moreover, from 2005 on,

industries covered by the EU ETS have not been subject to the CO2 tax: only one instrument is employed as an incentive for reducing GHG emissions (ibid.; Adelphi & Ecofys, 2018: 5)).

Summing up, although, the details differ, both countries have a tradition of shielding energy-intensive industries from potentially 'damaging' international competitiveness effects, not least in the form of lowered taxes or exemptions.

3.4. Different follow-up of and interaction with relevant EU/EEA policies?

This is indeed a complex issue, with several sub-dimensions. Although Norway voted against joining the EU back in 1994 (as in 1972), it rapidly became closely associated with the EU through the European Economic Area (EEA) agreement, together with Iceland and Lichtenstein. This meant that Norway became integrated in the European power market; it also meant that the power price pass-through of German coal producers and others affected Norwegian power prices, even though Norwegian hydropower had little or no CO2 emissions. In addition, Norway has had to implement very much of EU policy.

On the other hand, the EEA agreement also provides some regulatory leeway: EU policies must be assessed as EEA-relevant in order to become part of Norwegian legislation and policy. In the case of CO2 compensation, Norway took advantage of EU rules and quickly adopted a compensation mechanism, almost the maximum allowed size. Nor was Norway alone here: also Germany, Finland and the UK, among other, chose to do the same. By 2020, the Commission had approved CO2 compensation schemes in 15 member-states (EU, 2021: 20).

In section two we highlighted the role of free ETS allowances as a possible EU factor influencing the decision to establish a specific CO2 compensation mechanism, assuming that generous allocation of such allowances would reduce the need and interest for specific, additional compensation. We now turn to some pertinent differences between Norway and Sweden (see Fig. 3).

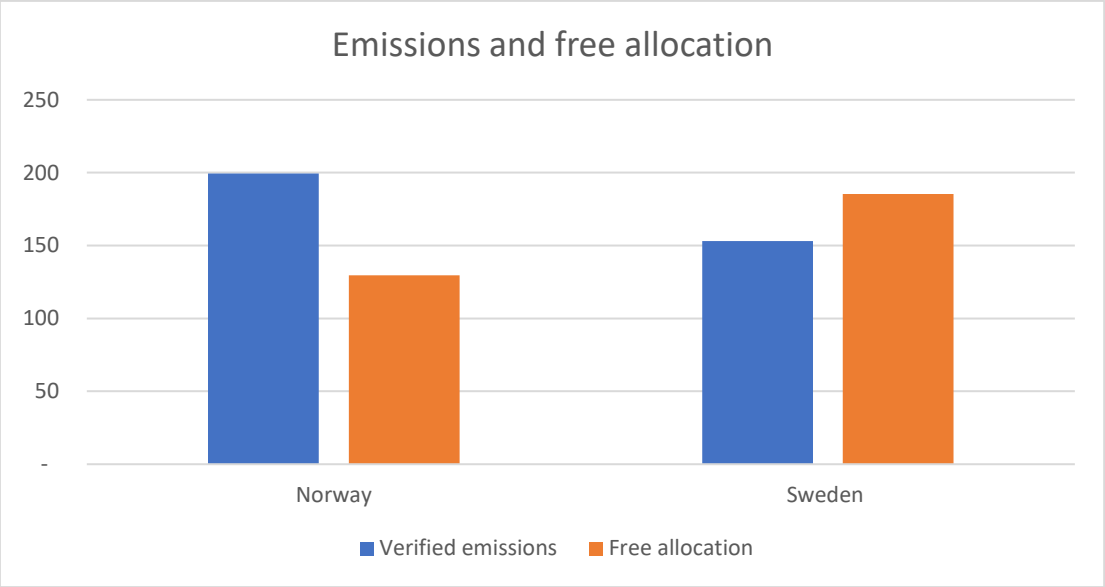

Figure 3. Allocation of free allowances to all stationary installations, and their CO2 emissions in the third phase (2013–2020), Norway and Sweden. Million tons of CO2-eqv. (Source: European Environment Agency, 2021)

Sweden's stationary installations received more free allowances than the actual emissions from these sources ('over-allocation'). *In total, for the third trading period (2013–2020), free allowances amounted to 120% of emissions in Sweden and 65% of emissions in Norway, from stationary installations.*

The rules for free allocation of emissions allowances per ton of production for each type of products are harmonized across the EU member-states. Under these rules, three sectors in Sweden received especially large allocations of free allowances relative to their emissions: production of pig iron or steel (140%), production of pulp (327%), and production of paper and cardboard (606%), as shown in Figure 4. The ratio of free allocation to emissions for those three sectors was significantly larger in Sweden than the average of the EU/EEA member-states combined, especially for the production of paper or cardboard.

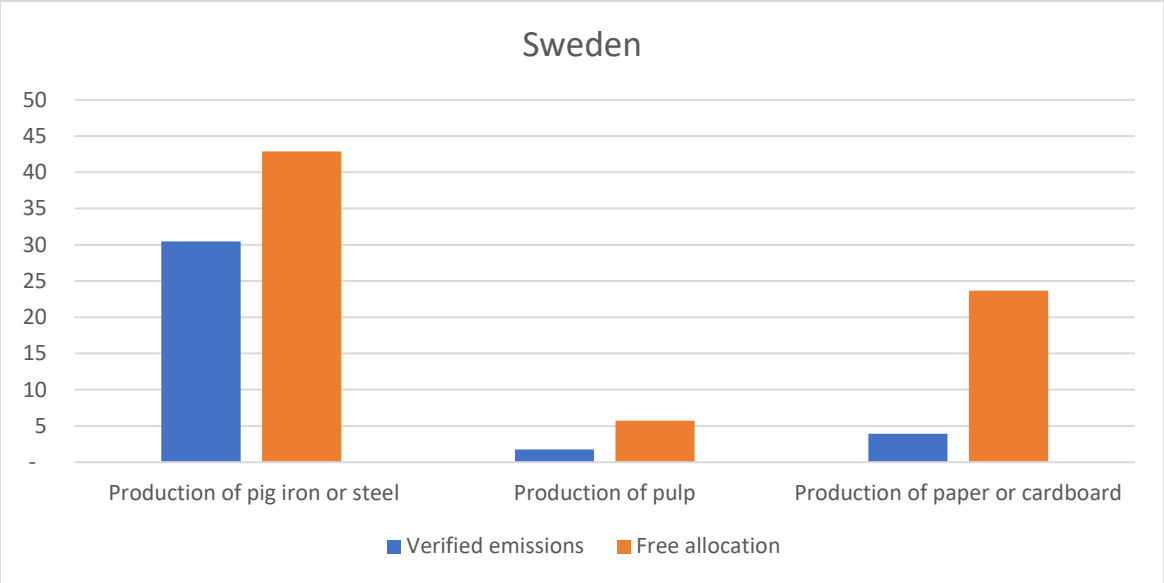

Figure 4. Free allowances and emissions, energy-intensive sectors in Sweden, third trading phase (2012–2020). Million tons of CO2 eqv. (Source: European Environment Agency, 2021)

By contrast, in Norway, none of the three main energy-intensive production sectors exposed to the risk of carbon leakages received more free allowances than their actual emissions (see Fig. 5). In fact, the free allocation of allowances relative to emissions has been some 10% lower for Norway than the average of all EU/EEA member-states for the three production sectors presented in Figure 5. (Source: European Environment Agency, 2021)

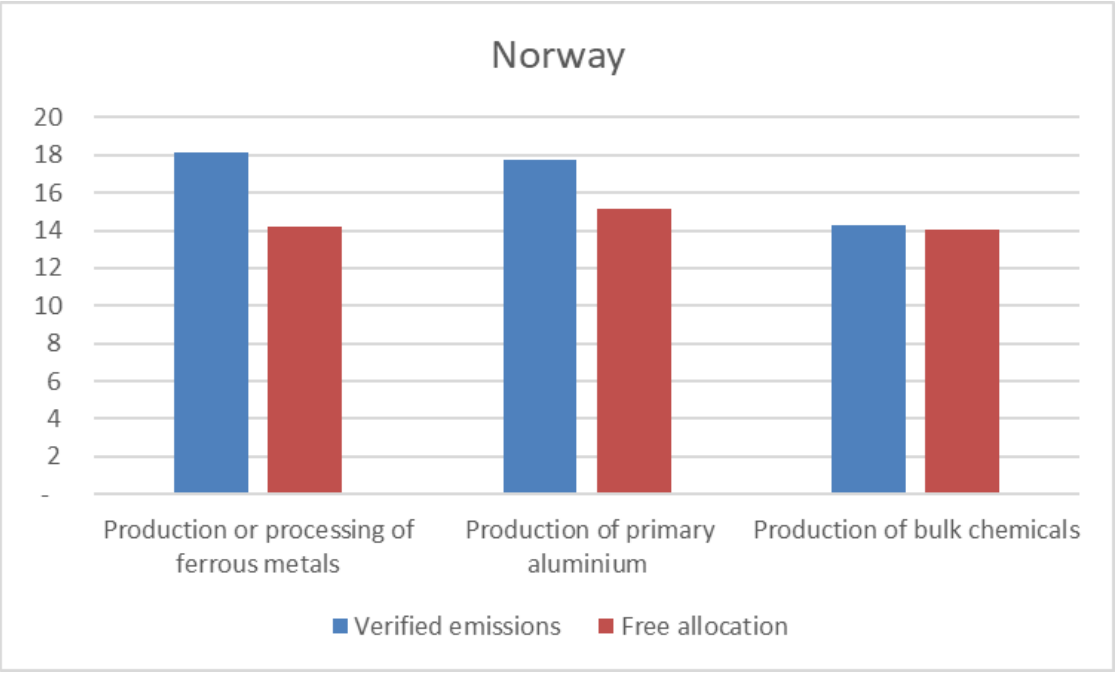

Figure 5. Free allowances and emission for energy-intensive sectors in Norway, third trading phase (2012–2020). Million tons of CO2 eqv. (Source: European Environment Agency, 2021)

Might the sizeable over-allocation of free allowances to certain Swedish production sectors explain why a CO2 compensation scheme was not established in Sweden? That could be a reasonable explanation if the same firms are eligible for both a large share of free allowances and CO2 compensation. Indeed, that is the case in Sweden. The three sectors that received especially large allocations of free allowances are also among the production sectors eligible for CO2 compensation (EU 2010; EU 2012). Moreover, these sectors are significant consumers of electricity – so they could have received substantial CO2 compensation, if the system had been implemented in Sweden. Production of paper and cardboard and pulp together were responsible for 43% of total electricity consumption in Sweden's manufacturing industry in 2012. The corresponding share for pig iron and steel was 14%.[10]

Due to the large over-allocation of allowances, the Swedish energy-intensive industry may have benefited greatly from the EU ETS system, and Swedish governments might have found it unreasonable to support these sectors even further by CO2 compensation. However, over-allocation of allowances does not necessary mean that firms are better off with an emissions-trading scheme than without one. If low emissions are due to major investments in abatement technologies, or increased use of more expensive input factors, the income from selling excess permits on the market may not offset the abatement costs completely.

However, Stenqvist and Åhman (2016) argue that this is not the case for the paper and pulp industry in Sweden. The industry benefitted greatly from the harmonized benchmark-based allocation implemented for the period 2013–2020. For instance, the benchmark for free allowances was based on energy-intensity indicators, with natural gas as the reference fuel (Ecofys, 2009). The Swedish paper and pulp industry started phasing out fossil fuels in the 1970s (Lindmark et al., 2011); as of 2013, the share of biomass in the industry's fuel mix was about 90% (see also Gulbrandsen and Stenquist, 2013; Nilsson et al., 2017; Hildingsson et al., 2019). This indicates that the Swedish paper and pulp industry has benefitted from the design of EU ETS rules. As noted above, EU rules recommend that member-states endeavour to keep the compensation below 25% of auctioning revenues (EU, 2018).

For Norway, however, CO2 compensation in phase 3 has constituted around 50% of the revenues generated from auctioning in that period. Due to certain juridical technicalities, Norway did not auction any allowances before 2019. The accumulated volume (from 2013 to 2018) was not auctioned until 2019 and 2020, which made the auction revenues in 2019 and 2020 exceptionally large. The Norwegian Environment Agency has calculated that if the auctioning had been spread evenly over the period, the CO2 compensation in 2020 would have been more than twice the auction revenues.[11]

As the energy-intensive industries' electricity consumption in Sweden is about the same size as in Norway, as is also the auction share, having a similar compensation scheme in Sweden as in Norway might be expected to imply that Sweden would also deviate substantially from the 25% threshold, and that auction revenues would not cover the CO2 compensation expenses. Hence, as our interviewees pointed out, the low (expected) auctioning revenues relative to CO2 compensation is also an argument against implementing a CO2 compensation scheme in

[10] Source: Energimyndigheten (2021)

[11] In none of the member-states was the 25% threshold reached (in 2019). On average, member-states spent 7.9% of their auction revenues on the compensation of indirect costs in 2019. However, member-states have been urged to keep a close watch on their budgets for this expenditure item in the coming years (EU, 2020).

Sweden. As for Norway, the government has an exceptionally strong financial position, thanks to its Petroleum Fund (the Sovereign Wealth Fund).

Summing up, we find a significant underlying, 'structural', difference as to the allocation of EU ETS free allowances, with Norwegian industry somewhat 'under-allocated' and Swedish industry considerably over-allocated, indicating different needs for compensation.

4. Discussion

We have noted several potentially relevant differences between the two countries which could shed light on their differing positions on establishing a specific CO2 compensation mechanism. First, there were some striking differences as to the role of governments and party politics. CO2 compensation appears to have been a more prominent political issue in Norway than in Sweden, although it was never really a high-priority issue in either country. However, the positions of the governments in the two countries were markedly different: Sweden generally did not see the need for such a mechanism in the ETS – whereas the Norwegian government embraced the mechanism and was a frontrunner in implementing it.

Second, as to the structure, relative power and mobilization of interest groups, both countries have important energy-intensive industries, and the relative power of these industries does not seem to differ greatly between them. However, differences can be noted regarding the mobilization of these interest groups. In Norway, key industries mobilized significantly through contacts with prominent politicians and MPs. There has been less mobilization in Sweden, and those involved were not met with much sympathy.

Third, as to path dependencies and lock-in effects from previous policy choices, the details differ. However, both countries have a tradition of shielding energy-intensive industries from potentially 'damaging' international competitiveness effects, not least in the form of lowered taxes or exemptions – so this factor seems to have scant relevance to the differences regarding the establishment of a CO2 compensation mechanism.

Finally, as to the follow-up of and interaction with relevant EU/EEA policies, closer scrutiny reveals a significant underlying and more 'structural' difference as to the allocation of EU ETS free allowances. Basically, Norwegian industry has been somewhat under-allocated, whereas Swedish industry has been considerably over-allocated. In Sweden, the sectors that could have received substantial CO2 compensation according to EU ETS rules (pulp & paper, pig iron and steel) were over-allocated with free allowances. This might be a logical reason for not implementing a CO2 compensation scheme in Sweden; it could also shed light on why industry mobilization for such compensation has been only moderate in Sweden. Hence, both the differences in the positions of the government and industry lobbying are likely underpinned by the differing free allocation. Additionally, electricity is a more important source of energy in Norway than in Sweden, so that higher electricity prices are likely to have deeper negative impacts on competitiveness in Norway than in Sweden. Both these factors indicate a greater need for compensation in Norway than in Sweden.

5. Winding up: effects and implications

In the years after 2013 the Norwegian government has provided increasing compensation to some 45 companies. From 2016 on, Norway also actively lobbied for continuation of the compensation mechanism in the 2021–30 ETS phase and was very satisfied with initial success in 2018. However, this satisfaction was replaced by worry in 2021 when the proposal for a Carbon Border Adjustment Mechanism (CBAM) to replace free allowances and likely also compensation mechanisms gradually took shape (EU, 2021).

How important in practice, then, has the compensation mechanism been for avoiding carbon leakage in Norway? What have been the effects as to incentivizing the low-carbon transition? And what has the absence of such a mechanism meant for Sweden? Scattered evidence from Norway indicates a mixed picture. Some consultancy analysts, critical to the functioning and importance of the mechanism, have pointed out that Norwegian energy-intensive industries have probably been over-compensated in the third phase of the EU-ETS, receiving both substantial CO2 compensation and (allegedly)130 million free allowances. In addition, these industries have benefitted from several other measures, including special power-price deals as well as technology support (*Dagens Næringsliv*, 1 July 2017). The market value of the free allowances in phase three can be estimated to €1187 million – about twice the size of the CO2 compensation.[12]

An assessment report commissioned by the Norwegian Ministry of Climate and the Environment in 2019 noted that producing a counterfactual assessment of the functioning of the mechanism and its importance for investment decisions was a very tall order, given the many influential factors involved (Thema 2019, p. 3). Instead, the resultant report was based mainly on interviews with thirteen companies (which received 80% of total available funding) and survey responses from eight additional companies. A main conclusion was that the compensation mechanism *had* played a positive role for investment decisions, in interplay with several other factors. One case indicated that the profit rate margin would have been reduced by 10% without the compensation. However, the evidence also indicated that the importance of the mechanism had varied, with least importance for small companies (ibid., p. 5).

Ferrara and Giua (2022) conduct a firm-level analysis of CO2 compensation to firms within EU (excluding Norway). Their analysis suggest that the aid had not significant effect on average relative competitiveness, measured in terms of turnover per worker and the value of total assets per employees. Kaushal et al. (2023) employ a numerical CGE model to examine the welfare effects of supplementing free allowances in the EU ETS with a CO2 compensation scheme. The numerical simulations suggest that introducing CO2 compensation has regional and global welfare improving effects (due to reduced carbon leakages) if the emission reduction target is stringent enough.

On the other hand, the mechanism appears to have had little importance for decisions about production. Moreover, as the authors of the report point out, it does not provide a counter-

[12] Calculated by using the same EUA forward price per year as for the calculation of CO_2 compensation; see formula in EU (2012).

factual analysis showing that the mechanism has *actually counteracted* carbon leakage in Norwegian industries – only that the interviews and available evidence indicate that the mechanisms have had a *positive effect* in counteracting such leakage in Norway (ibid., 5–6).

What about Sweden? Interviews with Swedish stakeholders indicate some remaining dissatisfaction with the differing choices made by the two countries (interviews, 2021). However, the differences in industry structures and ETS allocations should be taken into consideration.

In conclusion, then, our study has shown that, in order to understand why some countries, adopt CO2 compensation mechanisms and others do not, it is important to take into consideration obvious factors like differences in governmental policies, but also complex and hidden differences in the more comprehensive interaction with the EU ETS, particularly regarding the allocation of free allowances. This factor seems to go a long way towards explaining why Norway saw a need for a compensation mechanism and established one, whereas Sweden did not. The lower revenues from auctioning allowances relative to potential CO2 compensation in Sweden were probably part of this picture.

On the whole, our examination of the cases of Norway and Sweden has shown the need for more in-depth knowledge. We need to know more both about the background for differing choices as to the establishment of such mechanisms and particularly the effects both regarding carbon leakage protections and incentives for the low-carbon transition. This is important, as considerable economic resources will likely be spent on such compensation in the 2020s. As noted, the compensation throughout the 2020s is estimated to cost around seven billion euros in Norway alone. But the stakes as to protecting European industry are also very high, in a situation with rising energy costs and carbon prices. There may be a good case for eventually phasing down such compensation in a nuanced manner, as some countries may need it more than others. It is essential to take into consideration the differing industrial and economic circumstances in the countries, as we have sought to do in this study.

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FRIDTJOF NANSENS INSTITUTT
FRIDTJOF NANSEN INSTITUTE

Fridtjof Nansensvei 17 | NO-1366 Lysaker | Norway
Telephone (+47) 47 48 06 80 |E-mail post@fni.no | www.fni.no