La Fabrique de l'industrie
laboratoire d'idées

Carbon Border Adjustment Mechanism

Friend or foe of European industry?

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Executive summary

The European Union (EU) commitment to reach carbon neutrality by 2050 implies a robust and sustainable price signal on carbon emissions. The planned revision of the European carbon market – the EU Emissions Trading System (EU ETS) – will entail an increase of the CO_2 emissions reduction objectives and a decrease of free allocations handed to industry. These likely trends will put several energy-intensive industries in Europe at risk of carbon leakage. Taking all this into consideration, the European Commission reintroduced the idea of a Carbon Border Adjustment Mechanism (CBAM), discussed during the legislative process of the 2009 Directive on the ETS as an alternative to free allowances, which eventually seemed easier to implement.

Last autumn, the European Commission launched a public consultation on four possible CBAM scenarios and their configuration, ahead of a comprehensive impact assessment. Each of the four scenarios raises different issues in terms of legal feasibility and administrative applicability.

The first scenario is to introduce a tax based on the carbon content of imported products. This would require unanimous agreement of all EU member states and could potentially affect the tariff schedules adopted through trade agreements.

Working paper
17 June 2021

A second scenario is to extend the EU ETS to imports. Importers to the EU would be required to acquire EU emission allowances based on the carbon content of their products, thus paying the price set by the EU ETS.

A third scenario is to put in place a completely new system of allowances dedicated to imports that would mirror the EU ETS. It would work on the same principles, but these new allowances would not be tradable or fungible with current ETS allowances, so as not to alter its structure or internal equilibrium.

Lastly, the fourth scenario is to establish a carbon tax at the consumption level, which appears quite simple at first sight. However, this new tax would have to be articulated with the existing carbon pricing framework and existing instruments that limit carbon leakage to avoid a double carbon pricing on European products. This option would also require unanimous agreement of member states.

This paper aims to describe the possible consequences of these scenarios on manufacturing sectors and explain their responses to the Commission. Indeed, while it is commonly assumed that a CBAM would protect EU companies from 'climate dumping', our analysis shows that the envisaged introduction of a CBAM struggles to find the support of all industrial sectors. Working from a deep, comprehensive and systematic analysis of around 200 replies from industry representatives and companies to the Commission's consultation, as well as a number of interviews with stakeholders, we explain this apparent paradox.

Business leaders overall agree to address the risk of carbon leakage but have different views on how to achieve this. In particular, the consequences arising from each scenario and configuration are still little understood. While the exact parameters of the future mechanism are unknown, industry spokespeople find common ground as they question the efficiency of a CBAM and express their concerns over losing the benefit of free allocations at the risk of less efficient protection against carbon leakage – as well as that of possible commercial retaliation from trade partners if the EU decision were taken unilaterally.

So far, free allocations have been consistently integrated into industrial investment plans and have significantly helped industry overall to remain competitive and, in the case of some sectors, to increase profits (CE Delft, 2021) while greenhouse gas emissions were decreasing. The installation sites covered by the EU ETS effectively reduced their emissions by about 35% between 2005 and 2019 (European Commission, 2021). The ETS now offers a certain predictability that enables companies to plan investments in decarbonisation technologies. Therefore, it is not surprising that the introduction of a CBAM is perceived as destabilising for business if it comes bundled up with an accelerated suppression of free allocations and a certain number of unknowns.

The European Parliament recently concluded in a report that the configuration of a CBAM should be explored alongside the revision of the EU ETS to ensure that both instruments were complementary and consistent and to avoid any risk of 'double protection' of EU industries. Hence, the measures to be presented in July 2021 – the CBAM is part of the 'Fit for 55' package that aims to reduce emissions by at least 55% by 2030 and whose details are

not yet known – should provide greater clarity on how the two instruments would contribute to meeting European climate targets.

A CBAM is obviously a tool to help achieve carbon neutrality while preserving the competitiveness of industrial companies. However, to be compatible with WTO rules, it must undoubtedly appear to pursue an environmental objective.

Nevertheless, its achievability depends not only on its environmental benefits but also what effect it might have on competitiveness and its political and diplomatic feasibility. These will be mostly determined by eight more discrete design settings, regardless of the chosen scenario: coverage of trade flows, geographic scope, sectoral scope, scope of emissions, determination method of embedded carbon, crediting of foreign policies, use of CBAM revenue and coverage of primary and finished products. In turn, these design parameters will have different impacts on industrial sectors, depending on their emission intensity, the complexity and vulnerability of their value chains and their exposure to global competition.

Beyond all the concerns expressed, it seems important for industry stakeholders to be involved in this process from an early stage, including through participation in the pilot phase. This would ensure that the option retained by the European Commission is effective in fostering the decarbonisation of industry while duly reflecting the needs and constraints of all sectors.

Foreword

This document is based on the views expressed in the public consultation carried out by the European Commission between July and October 2020 and on the interviews conducted with industrial federations and companies between 16 March and 10 June 2021. This does not presume the official positions held by the Member States and federations in their official correspondence with the European Commission during the final stages of the negotiations.

Introduction

The European Union (EU) has committed to reach carbon neutrality by 2050 to align with the Paris Agreement goal to limit global warming to 1.5-2 °C. It has even increased its ambition and now plans to reduce by 55% its net greenhouse gas emissions by 2030 compared to the 1990 level (up from 40% of greenhouse gas emissions previously).

Pursuing this goal will likely lead to an increase in the carbon price through various mechanisms. For instance, the price of the allowance on the EU Emissions Trading System (ETS) would amount to €76 per tonne in 2030 (being around €50/tCO_2 in May 2020) according to the Center for Climate and Energy Analyses (2020). Nonetheless, there is still no international agreement on the cost of CO_2 emissions and not all countries have the same level of commitment to reduce their emissions – only 58 countries among the 183 parties who signed the Paris Agreement have announced a net-zero target (Climate Watch, 2021). Therefore, the asymmetry in climate ambitions and efforts around the world is set to last, raising the risk of 'carbon leakage'.

Carbon leakage refers to the transfer of domestic production to third countries with less stringent or no emissions constraints. Such action often results in an increase in global carbon emissions, thereby undermining the environmental benefits of European efforts. The measures in place so far in the EU ETS – namely free allowances and indirect carbon cost compensation for sectors at risk – have contributed to limiting carbon leakage in the first two phases of the ETS (from 2005 to 2012). However, in a context of increasing carbon price in the EU, as compared to non-EU producers, these measures may not be sufficient. Indeed, as the emission cap is set to decrease in the coming years, the number of free allowances should decrease too.

A Carbon Border Adjustment Mechanism (CBAM) is one possible solution to this issue, a proposal for which will be presented by the European Commission in July 2021. It consists of applying a price on imported products based on the amount of associated embodied carbon and the difference in carbon price between the EU and the country of origin. A CBAM thus levels the playing field between EU and third producers to ensure that the same price is paid for a given amount of carbon emitted in Europe as it is elsewhere.

The CBAM therefore sounds promising on many fronts. From an environmental perspective, it supports the European objective to achieve carbon neutrality. Moreover, it gives third countries an incentive to put climate policies in place and thus contributes to reducing global emissions. From an economic perspective, it solves the competition distortion that binds EU producers due to asymmetrical climate policies and different carbon prices.

Yet our paper shows that, at this stage of the process, industrial stakeholders do not fully support the introduction of a CBAM or its supposed design. By analysing the responses published by various industrial sectors, we shed light on the reasons for this apparent paradox.

Firstly, although the introduction of the CBAM was already envisioned in 2009 as an alternative to free allowances in the ETS,[1] this proposal has never been fully examined. During the various stages of the current consultation, industrial actors have had to give their opinion on four options that are still under discussion. It proves all the more difficult for them to fully support a mechanism that will affect their long-term visibility, at a time when they are making large decarbonisation investments, since it may reassess the allocation of free allowances, which are a key parameter of their investment plan.

Secondly, regardless of the chosen scenario, the precise characteristics of the CBAM and its scope of application are the most debated points. In turn, its final design parameters will have varying impacts on each sector. This is the reason why each industry has expressed a somewhat specific opinion on each CBAM configuration.

Bluntly put, in this uncertain context, the status quo appears to be one of the easiest consensuses for industry actors to arrive at. Any other option requires compromise – and a huge amount of work.

This paper aims to make this complex subject more accessible to private and public stakeholders and the general public, sometimes at the cost of some simplification. It is based on an original analysis of the responses to the European public consultation and on interviews with industrial stakeholders. It is a working document, the reactions to which will feed a second, more in-depth publication planned in autumn, following the European Commission's announcements.

The first section details the context of the CBAM and the challenges it faces along with the scenarios mentioned thus far by the European Commission. The second section underscores the importance of sectoral patterns in the responses to the proposed CBAM. The third section reviews the precise design parameters of the CBAM that will affect its effectiveness and the opinions industrial sectors have expressed about them.

1 – It was debated during the legislative process that led to the adoption of Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009. This Directive amended Directive 2003/87/EC to improve and extend the EU ETS.

One environmental objective and multiple challenges

The idea of a CBAM is not recent and was discussed at earlier stages of the EU ETS. However, this complex mechanism has always come up against potential incompatibility with WTO rules. Therefore, the first challenge for the European Commission is to configure a mechanism with a clearly identifiable objective: to accelerate the decrease in greenhouse gas emissions and decarbonisation on fair terms. The Commission faces other challenges, however, in particular finding a balance between emissions coverage and the administrative burden on European producers and importers.

Legal, technical and political challenges

WTO compatibility

The major legal constraint weighing on the CBAM is its compatibility with the regulations set by the World Trade Organization (WTO), which is mainly there to prohibit any differential treatment between similar products originating from different regions as well as between domestic and imported production. This means that a given amount of carbon must be charged the same price for comparable products and a differentiated charge cannot be applied between equivalent imports.

The CBAM could fall under the application of Article XX of the GATT, which specifies the list of exemptions in the name of environmental protection, if it is proven the mechanism seeks to combat climate change rather than introduce protectionist measures. A differentiation of products based on their carbon content would then be introduced. Furthermore, the amount of avoided carbon emissions will depend on the instrument's parameters.

Measuring embedded emissions

In theory, the carbon border adjustment must treat European importers and producers equally, so that they pay the same price for a given quantity of carbon emitted in Europe or in the country of origin of import. It relies on the calculation of the carbon content of imported products to which the difference in carbon price between Europe and the country of origin is applied. This difference depends on the country of origin and can vary over time. What's more, the precise embedded emissions of imported products can be difficult to calculate if their production relies on complex processes or is fragmented in several stages and in multiple countries. It also depends on whether only direct emissions are considered or if the carbon content includes both direct emissions and indirect emissions from purchased electricity and the production of intermediate inputs. It is important to note that the carbon content of the primary materials concerned by ISO 14060 standards and the EU ETS – such as cement and steel – are already known.

The administrative burden would then fall partly on the producers, who would be responsible for setting up the tools needed to measure and report emissions. There is therefore a trade-off to be found between environmental gain and administrative feasibility.

Political constraints

Finally, the procedure of adoption by the EU member states will depend on the type of instrument. As an example, whereas a tax requires unanimous agreement of all member states, the approval of a customs duty falls under a co-decision process involving the European Parliament and the European Council.

Four fundamental scenarios and eight main parameters

For the future CBAM to comply with these requirements, the European Commission has proposed four policy mechanisms, one of which will have to be chosen:

I. **A tax at the border on imported products.** This would require unanimous agreement by all EU member states and would potentially affect the tariff schedules adopted by the EU under international, regional and bilateral trade agreements – almost 70 are currently effective.

II. **An extension of the ETS.** Importers to the EU would be required to acquire EU emission allowances based on the carbon content of their products. The price would be established by the EU ETS: importers would therefore be assured to pay the same price as domestic producers in line with the WTO's principle of non-discrimination. This scenario might however entail additional legal and technical challenges, such as ensuring price stability after a sudden increase of the emission cap.

III. **A notional ETS, i.e. a specific pool of allowances for imported products.** It would work on the same principles, but these new allowances would not be tradable or fungible with current ETS allowances, so as not to alter its structure or internal equilibrium. This option, which has the backing of the French authorities, would comply with the non-discrimination requirement vis-à-vis third countries and directly tie in with the ETS. Some questions remain however on whether a decreasing emission cap would be applied to importers and how to synchronise the price of this specific pool with that of the EU ETS.

IV. **A carbon consumption charge.** This appears quite simple at first glance. However, this new tax would need to be articulated with the existing carbon pricing framework and with existing instruments that limit carbon leakage – such as free allowances – to avoid a double carbon pricing on European products. This option has some operational limitations regarding emission traceability, as do the three others, but here it is more complex as it involves the entire value chain: a trade-off would have to be found between administrative constraints and environmental effectiveness. Finally, social acceptance of a consumption tax might be lower than in the case of a mechanism directly targeting emission-intensive producers and importers. This option would also require unanimous agreement of member states.

These options raise different issues regarding internal EU legal feasibility and technical and administrative applicability. They should be explored alongside the revision of the EU ETS so as to ensure they are complementary and consistent, and to avoid double protection of EU industries. Table 1 below sets out the main advantages and drawbacks of each policy mechanism.

Table 1. Comparison of the four policy mechanisms under consideration

Mechanisms	Advantages	Drawbacks
Tax at the border	No impact on the ETS	Potential difficulties of synchronising the level of the tax with the price on the ETS Potential renegotiation of existing trade agreements Needs unanimous vote
Extension of the EU ETS	Based on already established ETS	Unclear impact on the functioning of the ETS in terms of price variation and cap
Notional ETS	No impact on the actual ETS (price or quantity of allowances)	Potential difficulties of synchronising the price on the notional market with the price on the ETS
Carbon consumption charge	No competitiveness distortion for exports, as products are charged where they are consumed Provides a signal to final consumers Likely compatible with WTO	Calculation of the embedded emissions made more complex as it includes the entire value chain Difficult to articulate with current ETS and carbon leakage protection measures Less socially acceptable as the final consumer is directly charged Needs unanimous vote

Sources: Direction générale du Trésor (2021), European Parliament (2021)

Furthermore, the final design of the CBAM will depend on several parameters that will, in turn, draw on various options. The European Roundtable on Climate Change and Sustainable Transition (ERCST) proposed eight design parameters: coverage of trade flows, geographic scope, sectoral scope, scope of emissions, determination of embedded carbon, crediting for foreign policies and revenue use. We have added a further criterion related to the type of product: primary and finished.

The final instrument may also draw on the exemptions to the GATT specified in Article XX and will have to be articulated with current measures, namely the carbon price on the ETS, the allocation of free allowances and the compensation of indirect carbon costs. The question of a rebate on exports will also be treated differently if it is a tax or a carbon market, for example.

The European Parliament, in its own-initiative report adopted in March 2021, expressed its support for a mechanism that will be flexible so as to follow the EU ETS price while ensuring predictability and less volatility in the price of carbon. The third option of a separate pool of allowances therefore seemed the most adequate way to address the risk of carbon leakage, according to this report.

Current compensation measures: the key to understanding industrial positions

Ahead of the CBAM proposal, the European Commission launched a public consultation from July to October 2020. It received 617 responses from European and non-European actors, 189 of which were from industrial companies and federations.[2] These responses reveal that the idea of a CBAM is struggling to attract full support from manufacturing industries, among which no consensus has been reached so far regarding a preferred policy instrument. It is important to note that the responses to the consultation indicate positions at a given moment; it is well known that they are working on finding common ground. Importantly, industry has been asked to express its opinion on a mechanism whose parameters remain unclear, including whether or not the free allowances provided under the ETS will be maintained for the sectors covered by a CBAM.

Sectoral preferences for policy instruments

The European-wide controversy surrounding the CBAM has been portrayed in many ways. Our analysis shows that responses to the EC consultation follow detailed sectoral patterns. We indeed applied a factorial data analysis method[3] on the responses from industrial actors to understand how and why they differed. The details of this analysis are presented in the appendix.

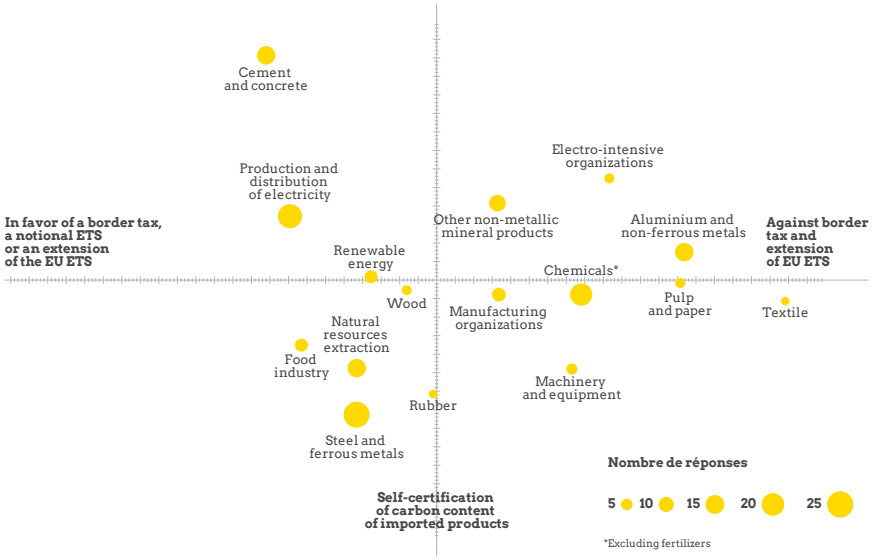
The first result of this analysis is that the sector partly explains the respondents' position *either in favour of or against the implementation of a CBAM.* The sectors that appear on the left side of the graph below were particularly in favour of the implementation of a tax applied at the border, an extension of the EU ETS or a notional ETS.[4] They deemed these three mechanisms to be the most effective to prevent the risk of carbon leakage. On the other hand, the further they are to the right of the graph, the more reluctant they are to accept a tax at the border or an extension of the EU ETS. Overall, this graph shows a distribution of sectors in favour of a CBAM on the left-hand side (e.g. cement) and against the implementation of a CBAM on the right-hand side (e.g. aluminium).

2 – We classified the responses to the public consultation into sectors and sub-sectors. The industrial sectors are: manufacturing, production and distribution of energy, extractive industry and renewable energy value chain. We categorised the manufacturing sectors into steel and ferrous metals, food industry, aluminium and non-ferrous metals, other non-metallic mineral products, wood, rubber, cement and concrete, machinery and equipment, pulp and paper, chemical industry, textile, manufacturing organisations and electro-intensive organisations.

3 – We computed the answers of the respondents by group of questions using a Principal Component Analysis then clustered these answers by a Multiple Correspondence Analysis in order to highlight the differentiating elements between the respondents. See appendix.

4 – Note that the respondents had the choice to answer none of the options, to be in favour of none of them or to be in favour of all of them.

Figure 1. Mapping of sectoral preferences on the policy instrument and on the verification method of carbon content

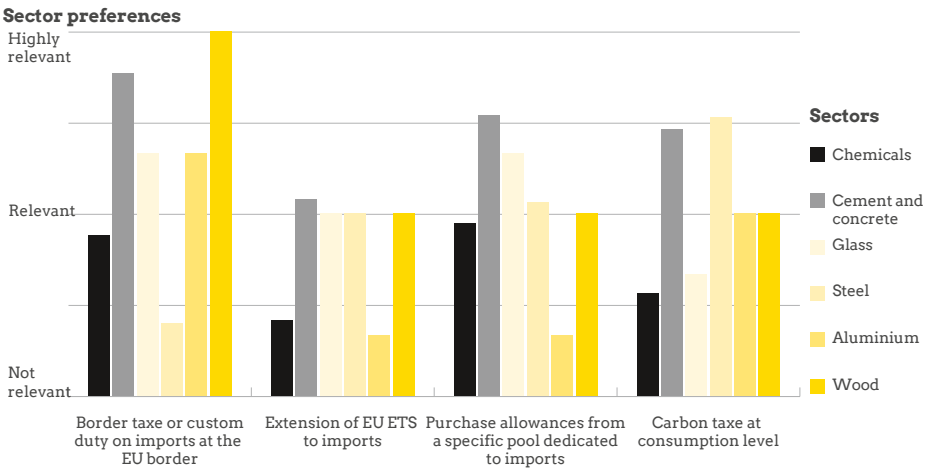


Source: Public consultation on the CBAM by the European Commission from July to October 2020

The second result is that respondents are also scattered according to their preference for the carbon emissions certification method. Hence, the sectors in the lower section of the graph incline towards self-certification.

Based on the public consultation, we also looked at the sectoral preferences expressed at that time among the four policy instruments. Steel and aluminium respondents expressed different evaluations of the policy instruments in the consultation questionnaire, whereas aluminium actors found a border tax and a carbon consumption charge more relevant than the other two instruments. A border tax was the least preferred instrument for steel respondents. In addition, respondents from electro-intensive sectors (except steel respondents) rather opted for a tax at the border.

Figure 2. Preferences of some electro-intensive manufacturing sectors on the policy scenario



Reading note: For each option, respondents were asked to indicate whether they considered an option to be 'not relevant', 'relevant' or 'very relevant', regardless of the other options. Source: Public consultation on the CBAM launched by the European Commission from July to October 2020.

Risks raised by industrial stakeholders

The above results obtained from the public consultation were completed with interviews with industrial companies and federations to understand their position and explain their preferences. An important result emerging from these interviews is that the industrial sectors' preferred legal instruments among the four options are not based on their own specificities or the characteristics of their value chain but rather on administrative and legal considerations.

First, the question of whether free allocations would be removed for products covered by a CBAM is a central consideration determining the position of industrial actors. The European Commission has not communicated yet on the phase-out of free allocations during the implementation of the CBAM.[5] It is clear however that, under the revision of the ETS, free allocations are doomed to decrease due to the reduction of the cap and the new rules for calculating the benchmark.

Two positions seem to stand out. Some industrial actors favour a complementarity between the CBAM and free allocations, without double protection. They consider that it is legally possible to maintain free allocations while a CBAM is in place for the sectors it covers.

Others are opposed to a CBAM and prefer to keep free allocations, as they contribute to limiting carbon leakage and maintain competitiveness in the first two phases of the ETS (Glachant & Mini, 2020). They consider that uncertainties surrounding the CBAM's functioning and efficiency are too important. For instance, if the CBAM only covered imports, it would not compensate their export prices and would therefore undermine their competitiveness on foreign markets. However, they claim that they need long-term visibility to make large investments in low carbon technologies – a predictability that will be unsettled if the CBAM turns out to be an alternative rather than a complementary measure to current carbon leakage prevention provisions. They are also in favour of keeping compensation measures of indirect carbon costs, since they see their electricity costs increasing so long as they electrify their production to reach their decarbonisation goal.

Indirect carbon cost compensation on the ETS

Indirect carbon costs correspond to the carbon cost in the electricity price paid by industrial actors for their power consumption.[6] Electricity prices on the wholesale power markets are set as the variable cost of the marginal production unit. They include a carbon component that results from the pass-through of carbon prices due to the purchase of EU allowances. This is often a gas- or coal-based power plant as this sets the marginal price on the market according to the merit order of the available power plants to meet the demand at any time.

5 – A recent report from CE Delft suggests increasing investment subsidies or implementing a CBAM with a phase-out of free allocations, to internalise the carbon price along the value chain (CE Delft, 2021).

6 – Energy-intensive producers purchase their electricity two of three years in advance under the form of contracts composed of a volume of electricity at a given price, which enables them to secure their production costs.

Companies pay the indirect carbon costs related to the marginal production plant, which is expected to rise as a result of the carbon price increase. This is a major concern for energy-intensive producers as energy costs represent a large part of their production costs. It is worth noting that the indirect carbon costs of producers do not exactly cover their specific indirect emissions, which are calculated on the national energy mix.

The guidelines of the EU ETS allow EU member states to partially compensate indirect carbon costs of companies in sectors at risk of carbon leakage. This aid – derived from auctioning revenues – is limited to 75% of indirect carbon costs and does not cover the least efficient technologies. In return, companies are asked to make additional decarbonisation efforts. Not all member states compensate their producers for indirect carbon costs.

They also express concerns about the risk of retaliation from trade partners as well as compatibility problems with WTO rules. The risk of retaliation seems particularly high in sectors for which trade defence measures were put in place by the EU following changes in competition (such as in the steel and aluminium sectors). In this context, industry actors tend to prefer to keep the actual compensation measures in place.

Thirdly, they identify a number of risks of circumvention of the CBAM, detailed below (resource shuffling, carbon cost absorption, trans-shipment strategies, carbon leakage transferred to downstream producers, substitution with carbon-intensive imported products). Some sectors are more or less exposed to these risks that contribute to their different position in relation to the CBAM.

To sum up, industries were asked to choose from four scenarios, yet the majority of respondents shared a common demand to keep the benefits of current free allocations. This reaction is partly explained by the consultation process itself, which was launched when many aspects of the CBAM and other regulatory proposals were yet to be unveiled.

The detailed parameters of the CBAM in relation to sectoral specificities

In the previous section, we pointed out that preferences among industrial actors regarding the four basic scenarios had little to do with the specificities of industrial sectors. However, they play an important role when it comes to the detailed settings of the CBAM. Indeed, while all sectors recognise the need for a measure against the risk of carbon leakage, each one tends to opt for a specific design related to sector-specific characteristics.

The accurate configuration of the mechanism will be a key determinant of its environmental and economic efficiency. This is particularly the case for features such as the scope of emissions, upstream and downstream product coverage, the sectors covered and the method of calculation of carbon content. For instance, depending on their own characteristics (see Table 2), some sectors argue for a CBAM that would include a broader coverage of the emissions or of the products in the value chain. However, they recognise that the more extensive the CBAM, the more technically difficult it will be to implement.

The European Commission must then consider the stakeholders' specificities to find common ground.

Coverage of trade flows

The CBAM will cover imports in any case, but the question remains whether equivalent measures will be needed to preserve the export competitiveness of European producers. It is unclear if this option would, on the one hand, be compatible with the WTO and, on the other hand, impact the measure's environmental efficiency. Indeed, such an exemption might deter EU producers from reducing their emissions related to the production of exported products.[7] Still, it appears the only possible way to avoid a distortion of competitiveness on foreign markets for EU exporting companies.

Consequently, industrial sectors and in particular those whose revenues heavily rely on exports, such as the chemicals, fertilizers, pulp and paper, aluminium and refined petroleum products, might benefit from measures that level the playing field on foreign markets. As an example, the European think tank ERCST suggested keeping free allocations for European producers and requiring foreign producers to pay a carbon charge based on the part of emissions of the imported product not covered by free allocations (the EU benchmark would determine the level of emissions covered by free allocations). Some sectors also pointed to this solution as a feasible and legally compatible answer, considering that one tonne of CO_2 would only be charged once. Note that this discussion regarding trade flows coverage does not apply in the case of a carbon charge at the consumption level.

7 – Note that the European Commission's green taxonomy system requires companies to report the green share of their revenues as an environmentally sustainable activity, which may limit this risk (European Commission, 2021).

Table 2. Sectoral characteristics

Sectors	Ratio of direct emission to total emission intensity[8]	Value chain			Trade exposure and competition			Specific risks and challenges
		Complexity	Level of integration	Downstream vulnerability[9]	Importations[10]	Exportations[10]	Substituts	
Cement	95%	Low	High	Low	2.6%	7%	Steel, glass	Increased imports of cement and clinker (high emission-intensive input)
Steel and ferrous metals	40% – 100%[11]	Medium	Medium	High	19.7%	15.6%	Aluminium, cement, and wood, plastic	Carbon cost absorption and resource shuffling strategies from foreign competitors, due to global excess capacity Increased imports of semi and finished products from countries with less carbon constraints
Fertilizers	93%	Low-Medium	Medium	High[12]	29.5%	21.3%	-	Potential resource shuffling Exposure to trade of finished fertilizers Large investments required to replace vast majority of EU existing ammonia plants to achieve 2050 net-zero target
Electricity		Low	High	Low	3.4% of consumption	3.3% of production	Fuels	Increased imports at the border from countries with fewer carbon constraints
Refined petroleum products	92%	Medium	High	Low	24.5%	27%	Electricity and low-carbon fuel	Impossible to pass through carbon costs due to price determined by regional reference price Potential large impact on production costs as energy costs represent 50% of operating costs
Pulp and paper	47% – 51%	High	Varied	Medium	Pulp: 44.7% Paper: 8.0%	Pulp: 38.7% Paper: 25.3%	Plastic	Large exposure to international trade (including exports) Competition of pulp and paperboard imports Potential large impacts on production costs due to high indirect costs
Chemicals	10% – 82%[13]	High	Medium	High	38.1%	33.6%	Paper, ferrous or non-ferrous metals	Competing downstream products from efficient producers with less carbon constraints
Aluminium and non-ferrous metals	14% – 83%	High	Low	High	36.3%	23.7%	Steel, glass, paper and board, plastics, wood	Impossible to pass through carbon costs due to price determined by a global reference price Risk of resource shuffling Potential large impact on production costs as electricity represents 37% of total primary aluminium production costs Subsidised production over-capacity from China (OECD, 2019)

Source: ERCST, Marcu, Mehling, & Cosbey (2021), European Commission (2021)

8 – Source: (European Commission, 2021).
9 – Risk of carbon leakage on downstream segments of the value chain following the application of a CBAM on upstream production (ERCST, Marcu, Mehling, & Cosbey, 2021).
10 – Imports as a share of domestic consumption and exports as a share of domestic production (ERCST, Marcu, Mehling, & Cosbey, 2021).
11 – Primary production from iron ore being more energy and carbon intensive than secondary production.
12 – See (PwC, 2020).
13 – Depending on the chemical products covered by the EU ETS.

Scopes of emissions

Greenhouse gas emissions are categorised into three 'scopes'. Scope 1 covers direct emissions from owned or controlled sources (typically process emissions); scope 2 covers indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the company, while scope 3 includes all other indirect emissions that occur in a company's value chain. The CBAM will necessarily include scope 1 emissions, but the issue is much less clear for scope 2 and 3 emissions. Moreover, it is difficult to assign the CO_2 content of purchased electricity to industrial consumption.

All stakeholders agree that covering a broader scope of emissions jointly entails a better environmental impact and significant additional administrative and technical constraints. For instance, including emissions related to electricity consumption requires information on the energy source used in the production process. The longer the value chain, the more complex it will be to factor in these indirect emissions. This is the reason why most company representatives assert that a balance must be found between environmental efficiency and technical constraints.

However, sectors with high electricity costs can expect to see their energy costs increase as the carbon price rises and as they will rely more and more heavily on electrified production processes to reach their decarbonisation target. This is the case for ferrous metals, non-ferrous metals, pulp and paper, chemicals and refined petroleum products. These sectors therefore warn that the CBAM should maintain a level-playing field with foreign producers and advocate for an extensive coverage of emissions.

Importantly, a CBAM covering both direct and indirect emissions would need to account for the specificities of the European wholesale electricity markets, which adds complexity to the measure. Indeed, some stakeholders argue that the carbon cost in electricity prices does not correspond to – and is higher than – the average carbon intensity in the electricity consumed. This anomaly relates to the fact that the electricity price is set by the variable cost of the marginal production unit in the merit order to meet the demand on regional wholesale electricity markets. This marginal production unit is often fulfilled by a natural gas or coal power plant. Therefore, the carbon cost applied to this fossil energy source is included in the electricity price paid by industrial sites, regardless of the actual carbon content of their electricity supply.[14] An EU producer in most cases pays higher indirect carbon costs than if they were calculated based on the emissions of the average energy mix of the production country. In other words, there is a mismatch between indirect emissions and indirect costs, since the carbon cost of the marginal unit of production is higher than the average carbon cost. For sectors that are highly electricity-intensive such as non-ferrous metals and chemicals and pulp and paper, and where electricity accounts for a large proportion of operating costs, this may be problematic. Table 3 summarises the sectoral preferences regarding emissions coverage and relates them to current indirect emission intensity and the value chain complexity of industries.

14 – The indirect emissions of a product are estimated using the country-average energy mix as it is impossible to exactly know where the energy comes from.

It will be all the more complex to determine the indirect carbon cost for importers since there are several regional power markets in Europe and the value of the cost pass-through is different from one market to another.

One solution advocated by electricity-intensive sectors is to keep the current compensation measure of indirect carbon costs to complement a CBAM. They argue that it would be legally compatible.

Table 3. Scope of emissions and sectoral preferences

Sectors	Indirect emission intensity	Complexity of the value chain[15]	Sectoral preferences for scopes 1 and 2	Sectoral preferences for scopes 1, 2, 3
Aluminium and non-ferrous metals	High	High	The stakeholders estimate that it would not solve the distortion of competitiveness due to indirect carbon costs higher than the estimated carbon content in electricity consumed.	Technically difficult
Chemicals	Medium	High	The stakeholders estimate that it would not solve the distortion of competitiveness due to carbon costs higher than the estimated carbon content in electricity consumed.	Preferred option but complex
Pulp and paper				
Steel and ferrous metals		Medium	To be discussed, depending on the efficiency of the measures to protect against carbon leakage and whether current compensation measures are maintained	
Cement		Low	Preferred option to include both	
Refined petroleum		Medium	Preferred option to include both if the protection is equivalent	
Fertilizers	Low	Low		
Electricity		Low		

Coverage of primary and finished products

According to European Commission communications, a CBAM would initially cover primary materials as their carbon content is more easily estimated than that of finished products – it is already known for some goods covered by the EU ETS – and as this is generally the most carbon-intensive part of the value chain.

Nonetheless, as long as the CBAM is focused on primary products only, it increases the costs of inputs for downstream segments – either because European upstream suppliers lose the benefit of free allowances and pass

15 – ERCST, Marcu, Mehling, & Cosbey, Border Carbon Adjustments in the EU : Sectoral Deep Dive (2021).

through the carbon costs or because foreign suppliers have to pay a carbon adjustment charge at the border, which leads to a risk of downstream carbon leakage (via loss of market shares, substitution by imported products, etc.). This cost increase may or may not be passed on to the end user, depending on the producer's margin, the market structure, exposure to international trade and the way prices are fixed. Sectors with complex value chains or carbon-intensive upstream inputs are quite concerned with this risk. They claim that the CBAM should include downstream semi-finished and finished products. Table 4 synthesises the sectoral preferences regarding the coverage of primary products or the entire value chain depending on the downstream segments' level of exposure to carbon leakage. Here again, a trade-off should be found between economic efficiency and technical complexity.

The aluminium sector is a good example. Its complex value chain is characterised by electricity-intensive upstream production while it faces competition from imported semi-finished and finished products. Downstream aluminium transformers would be at risk of carbon leakage (due to substitution by imported goods from countries with lower carbon constraints) if the CBAM applied to primary aluminium only.

Table 4. Coverage of products along the value chain and sectoral preferences

Sectors	Downstream part of the value chain's exposure to carbon leakage[16]	Sectoral preferences to cover primary products only	Sectoral preferences to cover the entire value chain
Aluminium and non-ferrous metals	High		Preferred option to avoid carbon leakage on downstream segment but add complexity
Chemicals			
Steel and ferrous metals			
Fertilizers			Preferred option for the coverage of finished products
Pulp and paper	Medium		Preferred option
Cement	Low	Preferred option as easier to calculate carbon content	
Refined petroleum		Short term option preferred as easier to calculate carbon content	Long term option regarding additional complexity

16 – Source: ERCST, Marcu, Mehling, & Cosbey, Border Carbon Adjustments in the EU : Sectoral Deep Dive (2021).

Coverage of sectors

The dilemma pointed out above regarding the coverage of primary versus finished products is observable in almost identical terms when it comes to determining which sectors are to be covered by the CBAM. In theory, all industries should be covered to grant the highest protection possible against carbon leakage. However, administrative complexity and the amount of data required to calculate the embedded emissions content of each and every product make it difficult to tackle them all at once. The few sectors involved in the pilot phase will most presumably be producers of primary products – which will include the most carbon-intensive activities – such as cement, steel, fertilizers and electricity.

Still, an excessively segmented approach might increase the **risk of carbon leakage**. Indeed, covered sectors could face **competition from non-covered substitutes:**[17] aluminium, steel, glass, paper and plastics are substitutes used in packaging; steel and aluminium in the automotive sector, etc. The objective of a CBAM is to make more competitive less carbon-intensive products, not to promote arbitrary substitutions with cheaper, more carbon-intensive products. The extent of this substitution effect will depend on certain CBAM parameters (covered steps of the value chain, maintaining of free allocations for the covered products and their potential substitutes, etc.). A complete impact assessment is necessary to investigate this point further.

It sounds logical that voluntary participation in the pilot phase might help industrial representatives contribute to the final definition of the mechanism. According to responses from all businesses and organisations to the public consultation, the top five priority sectors to be covered by the CBAM are the producers of cement, lime and plaster; electricity; basic iron, steel and ferro-alloys; basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber, and articles of concrete, cement and plaster. Some of these include those that seemed open to participating in the pilot phase – provided that free allowances are preserved during a transition period. Sectors with complex products and large exporters prefer not to be part of the pilot phase due to uncertainties surrounding the mechanism.

Calculation of embedded emissions

The calculation of the carbon content of any given product should ideally be based on its particular characteristics. This requires actual emissions data from the producer – and from the producers of all inputs used in the production process if the CBAM is to cover more than just direct emissions. If the carbon charge can be specifically calculated in that way for each product, then the CBAM will be highly effective both from an environmental and a competitiveness point of view. However, the fragmentation of the value chains and the multiplication of production stages make it complicated to implement.

An easier alternative then is to resort to a default value of carbon content, based on a reference level for direct emissions such as a European product average

17 – If the measure does not cover all primary materials.

carbon intensity,[18] a product benchmark issued by the country of origin, or a global benchmark. This approach might be legally acceptable provided foreign producers are allowed to demonstrate that the carbon content of their product is actually lower than the default value.

This brings up two further issues. First, producers of high-carbon products (i.e. containing more carbon content than the default value for this product) might be discouraged to decarbonise their production if it is more cost-effective to pay the carbon tax rather than invest in low carbon technologies (namely if the carbon charge based on the default value is cheaper than their actual marginal cost of carbon abatement). This was highlighted as a significant risk by the pulp and paper, chemicals and steel sectors as well as other manufacturing sectors if the EU ETS benchmark or the EU average were used: it would undermine the rationale of the CBAM as companies would have no incentive to decarbonise and foreign producers might unfairly benefit from the decarbonisation of the EU industry.[19]

Second, another problem regarding indirect emissions was highlighted by some highly electricity-intensive sectors, such as aluminium and non-ferrous metals. These industries face imports from foreign producers that make both low and high carbon-intensive products in such large quantities that they are able to meet their European demand with low carbon goods. Foreign producers could export the least carbonated part of their production to Europe while continuing to provide carbon-intensive products to other regions.[20] This **resource shuffling** effect could lead to EU carbon leakage and undermine efforts to decrease global emissions.

This risk has been confirmed in the case of aluminium production exported from China, where excess production capacity can be combined either with hydroelectric or coal-fired power plants. Chinese producers are thus able to direct their hydroelectricity-based aluminium production to the EU market while the cheaper, coal-based production is shipped to other markets. To lower that risk, European producers claim that the measure of carbon content should not be determined specifically for each industrial site but as an average for each country.

On top of that, foreign industries with a high bargaining power will also be able to circumvent the CBAM via **carbon cost absorption**. In other words, they can absorb the carbon cost as long as the contribution margin of the concerned activity is positive: they just need to sell their goods at a price that ensures their variable costs are covered.[21] This temporary strategy would allow them to prioritise maintaining market share over maximising profit. This competitive counterattack would obviously erode European efforts in reducing global emissions.

18 – For instance, a reference value for direct emissions could be the average emissions of the 10% worst performing producers, as envisaged by the European Commission.

19 – This is the case for all sectors in Europe that invest in low carbon technologies and already have lower carbon production processes.

20 – This would indeed incite foreign producers to supply low carbon goods to Europe and therefore contribute to decreasing the EU's carbon footprint.

21 – In general, foreign producers with higher margins than EU producers can afford customs duties while maintaining their competitiveness.

Some industrial stakeholders propose another option that may be a transitional scenario considered by the European Commission:[22] using European average emissions as the default value for the carbon content of imported products and charging importers a financial contribution applied to the part of the emissions not covered by the free allocations (the EU benchmark would be used to determine the number of free allocations). As mentioned earlier, this also depends on how easy it is to calculate the carbon footprint of products. For instance, refined products, fertilizers and cement have well-established methods. The calculation is more complex for sectors that are fragmented, highly depend on the energy mix, rely on different production processes (such as primary and recycled production) or simultaneously produce various goods (as in the case of refined petroleum products).

The issue of verification of emissions is uncontroversial though: stakeholders agree that emissions should be verified by a third party, independent of the EU. The methodology and the data to be used are still unknown.

Crediting for foreign policies

To be compatible with the GATT, the carbon price applied by the CBAM on imported products must consider climate policies in third countries. More precisely, any company importing to the EU should not pay twice for the same quantity of CO_2 contained in a given product. This principle sounds simple and sensible. Yet this requires establishing some kind of framework of comparison between domestic and foreign carbon pricing measures. It raises the question of whether only carbon-pricing policies or also non-pricing regulatory measures including investment subsidies should be accounted for – the latter being more difficult to evaluate in practice for each trading partner.

Geographic scope

Some experts and stakeholders argue that the CBAM should not cover all trading countries and that there should be some exemptions for less-developed countries that have limited financial and technical means to develop low carbon technologies. While this guideline sounds fair, some manufacturers are concerned about the risk of trans-shipment through exempted regions to circumvent the charge. This trans-shipment strategy would, again, undermine European efforts to reduce emissions and would not incentivise exempted countries to implement climate policies. It is worth noting that anti-dumping measures exist in some sectors for specific products and countries. A study should be carried out to ascertain how, if at all, these measures might address this risk.

22 – According to a document leaked on Euractiv in June 2021 (Euractiv, 2021).

Use of revenues

Finally, it is commonly admitted – since it was stated in the EU Green Deal – that the CBAM should contribute to the EU budget, support the transition towards a low carbon economy and address the target of carbon neutrality. How the revenues will be invested in practice is still unclear though, a 'technical' point that is of utmost importance for industries. Overall, industrial actors would prefer revenues to be used to support the decarbonisation of emitting sectors in Europe – since these investments are significant – and a decarbonised electricity source – as production processes will be more electrified. This scenario might raise a compatibility issue with the GATT. CBAM revenues could also be used to make this transition acceptable for the final consumers, in particular from a social perspective. A third option would be to contribute to international climate funds for developing countries: this would be in line with the objective of preventing carbon leakage but would be less popular among European economic actors.[23] We can recall that in its 2021 Work Programme, the European Commission mentioned having a proposal for CBAM as an own resource (European Commission, 2020). The European Parliament in its report recommended using the revenues 'to support global and European climate action' for carbon neutrality and to ensure WTO compatibility (European Parliament, 2021).

23 – An idea that could be explored is the possibility of proposing loans, derived from carbon tax revenues, to developing countries to invest in low carbon technology. Savings made by industrial actors in developing countries on any future carbon tax payments would go towards paying back the loans.

Key issues to be agreed

To sum up, some major issues regarding the detailed parameters still need to be solved. The CBAM aims to avoid the risk of carbon leakage so as to support the European ambition to decarbonise its economy. At first glance, it seems that the more emissions covered, the greater the environmental impact. However, with growing administrative costs and technical issues, a trade-off appears likely.

Table 5 summarises the main parameters on which the industrial sectors are struggling to find common ground. The main options considered for each of these control parameters are listed, from the most pragmatic to the most ambitious, along with their challenges.

Table 5. Major pending issues for debate

Which sectors? Sectors covered	**Producers of simple products** • Ideally covers all sectors but simpler to start with primary carbon-intensive products as pilot sectors: emissions can be easily measured and data is available • Potential risk of distortion of competitiveness with substitutes	**All ETS sectors** • Potential risk of distortion of competitiveness with substitutes not covered, regardless of whether the chosen product is less carbon intensive
What part(s) of the value chain? Primary vs finished products	**Primary products only** • Target high CO2 emission-processes in the upstream part • Could simplify administrative procedures because easier to calculate carbon content	**Entire value chain** • Avoids a shift of carbon leakage to the downstream part • More complex to calculate carbon content because products are diversified
Which emissions? Scope of emissions	**Includes scopes 1 and 2** • Complex because requires data on the energy sources • Solution debated to reduce the distortion of competitiveness for electricity-intensive sectors • Two issues: (i) mismatch between indirect emissions and indirect cost; (ii) no single electricity price and carbon cost pass-through in Europe	**Includes scopes 1, 2 and 3** • Additional administrative costs and technical issues • Potentially necessary if only the downstream part is covered
What carbon base? Calculation of embodied emissions	**Default value** • European, country of origin or global production average default value • Challenge: provide sufficient incentive to decarbonise (while avoiding the risk of resource shuffling) and make it compatible with WTO rules	**Actual emissions** • Carbon content calculated using reliable data verified by an independent third party • Significant administrative and technical challenges for fragmented value chains and diverse products used in many sectors • Risk of resource shuffling

Conclusion

Given that most of the details of the CBAM are unknown at this stage, industrial stakeholders are tending to find common ground in questioning its effectiveness. They all face a high degree of uncertainty and concern over losing the benefit of free emission allowances, a well-established system that provides long-term visibility. They also anticipate the risk of being hit by possible trade retaliation from third countries.

Some sectors are willing to participate in the pilot phase, which will enable them to make suggestions in view of establishing a satisfactory CBAM, despite its anticipated complexity. Others, which are in the majority, have rather expressed their concerns for the time being.

It is important to bear in mind that the CBAM is part of a package – entitled 'Fit for 55' – aimed at reducing European greenhouse gas emissions. The design of the CBAM will not be the only determining factor in the package. Among other things, it will have to be consistent with other measures, including the revision of the ETS. In other words, some of the challenges raised by the CBAM can also be addressed by the other measures presented by the European Commission.

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Acknowledgments

The authors would like to thank all the people who offered their valuable input to this working paper, especially Bruno Ageorges (UFIP), Stefan Ambec (Toulouse School of Economics), Mourad Ayouz (EDF), Jasmine Barahman (Fertilizers Europe), Gildas Barreyre (Seqens, UNIDEN, EFCG), Tine Bax (ENGIE), David Berman (Air Liquide), François Boisseleau (ENGIE), Jean-Luc Brossard (PFA), Emmanuel Brutin (Cembureau), Franck Chevallier (UFIP), Mélisande Couespel (A3M), Marc David (Air Liquide), Stéphane Delpeyroux (ArcelorMittal, A3M, UNIDEN), Laurent Dublanchet (Air Liquide), Sylvie Duchassaing (EDF), Luc Elie (Université Paris 13), Guillaume Gillet (ENGIE), Pierre Gilliot (FACE), Yvan Hachez (ENGIE), Joachim Hein (BDI), Antoine Hoxha (Fertilizers Europe), Jan Peter Jebsen (Eurometaux, Hydro), Sylvain Le Net (Franche Chimie), Vincent Lefebvre (Cem'In'Eu), Bernard Lombard (CEPI, AEGIS Europe), Emanuele Manigrassi (European Aluminium), Philippe Mouttou, Emmanuel Normant (Saint-Gobain), Cillian O'Donoghue (Eurometaux), Jean-Philippe Perrot (Solvay, UNIDEN), Olivier Riu (COPACEL), Charles-Henri Robert (CEFIC) and Nicolas de Warren (UNIDEN and Arkema) for their time.

Appendix: data analysis

The data were collected during the European consultation on the proposed Carbon Border Adjustment Mechanism that took place between 22 July 2020 and 28 October 2020. We have considered only the contributions from the 289 companies and professional organisations (out of more than 600 responses). Among these, we restricted our dataset to the manufacturing (142 responses), energy production and distribution (24 responses), extraction (15 responses) and renewable energy (8 responses) industries to obtain a dataset of 189 observations. Among the approximately one hundred questions asked (grouped into 15 major questions), we were interested in those that asked for an opinion among the options proposed and the parameters (by ticking a box rather than typing an answer).

The questions were then recoded on integer scales. Respondents were asked to rate the four instruments under consideration for the CBAM, without asking to order these policy instruments. The choice was made to use the original data without trying to normalise the possible answers to one question, which means that some actors may have given the same answer to the four options or may have not given an answer to any of the instruments. We also complemented the dataset with explanatory variables that will allow us to detect trends: we classified companies by type of organisation (trade and business associations, companies and groups, trade unions and professional associations), by country of origin, by industry sector (using INSEE's NAF classification) and by product traded, and we added a variable equal to one for electro-intensive sectors. Finally, in order to limit the number of missing values, the 25 organisations that answered the first question only (a very general question on the current climate policy context) were not included.

The method is based on the factorial analysis of data: we aimed to project each observation onto only the first few principal components to obtain lower dimensional data – there were originally more than a hundred questions and thus dimensions –, while preserving as much of the data's variation as possible. The idea was then to cluster the individuals to understand what might explain the differences between their responses to the consultation.

Following the composite indicators methodology (Joint Research Centre-European Commission, 2008), composite variables were constructed for the major topics of the consultation questionnaire that were relevant to our study, namely the proposed options of policy mechanism, the coverage of emissions, the calculation and verification of carbon content, the possibilities for exemption and rebate. We performed a Principal Component Analysis (PCA) for each of the preceding topics followed by a Hierarchical Clustering on Principal Components (HCPC). Hence, based on their responses to each question, organisations were grouped into clusters by topic.

We thus obtained a new dataset, composed of 11 composite variables corresponding to the relevant themes identified in the questionnaire to which we added supplementary variables (the other questions in the questionnaire as well as the explanatory variables described above). A Multiple Correspondence Analysis (MCA) was performed on this dataset followed by another HCPC. The final clusters of individuals were then obtained.

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