German Environment Agency

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Carbon Border adjustment in the EU (CBAM): Relevance of foreign trade and CO_2 - Costs

Analysis for the products cement, aluminium, steel, fertilisers

As part of the Fit for 55 package, the European Commission has proposed to supplement the EU Emissions Trading Scheme (EU ETS) with a Carbon Border Adjustment Mechanism (CBAM). For certain product groups, a CO_2 levy equivalent to the CO_2 costs of the EU ETS is to be paid by the importer upon import into the EU in order to counter the risk of production shifting to countries without comparable climate protection efforts (carbon leakage) and thus to enable more effective CO_2 pricing within the EU ETS. Imports are thus put on an equal footing with domestic production in terms of CO_2 costs. In connection with this, the free allocation for these sectors or products should and must be gradually reduced.

The proposed CBAM only covers imports, not exports. This analysis is based on the proposals by the EU Commission and the Council as of June 2022. It is intended to contribute to classifying the effects of the introduction of the CBAM on the affected industrial sectors in Germany in relation to exports.

The most important results:

- **Cement and the intermediate product cement clinker are characterised in their production by high CO_2 intensity and consequently high costs for the acquisition of emission allowances**. **However, the extra-EU export of cement and cement clinker from Germany is negligible** (max. 1 % of production). Under the assumptions made (see chapter 1), the costs for the purchase of certificates amount to 56-76 % of the average export value of cement clinker and are thus the highest among the products considered. In relation to (Portland) cement, this cost burden, depending on the clinker share and the CO_2 efficiency of clinker production, is 35-40 % of the average export value when using clinker produced in a GHG efficient manner and 47-54 % when using clinker produced on average.
- **Iron and steel products have the highest production and export value in** comparison to the other CBAM product groups. The export intensities vary depending on the product group: Comparatively **high extra-EU export shares are especially found in flat rolled products (5-15 %) and tubes and hollow sections made of steel (8-25 %).** The need to purchase emission allowances depends in particular on the emission intensity of the production route (blast furnace route based on crude ores or electric steel). In Germany, two-thirds of steel production is currently produced in blast furnaces. **The cost of purchasing certificates compared to the export value for steel products from the blast furnace** (assuming a scrap share of 20 % in relation to the pig iron input) **is between 11 - 16 % for flat rolled steel products and 4-6 % for pipes, depending on the efficiency of**

the plant. Not all products of the category "articles of iron and steel" (CN category 73) are covered by the CBAM according to the proposal of the EU Commission. Products that further process products covered by the CBAM without themselves being subject to the CBAM will presumably incur higher procurement costs if rising purchase costs for allowances in the EU ETS and CBAM costs are added to the product price for steel from the blast furnace route in the EU.

- **The extra-EU export intensity of aluminium products is comparatively high overall**, **but differs considerably depending on the product group**. While for most product groups no more than 10 % of the production is exported, up to one third of sheet and foil as well as tubes and tube fittings are exported outside the European single market. **Primary aluminium is** produced from alumina (aluminium oxide) and is associated with high energy consumption, as well as PFC emissions. Primary aluminium production is electricity-intensive, but according to the EU Commission's proposal, the indirect emissions from electricity generation should not be covered by the CBAM for the time being. **Despite the high emission intensity of primary aluminium, the costs for the purchase of certificates are manageable compared to the export value (4-5 %).** It is unclear whether the intermediate product of primary aluminium production - the production of alumina - is also covered by the CBAM. If so, the specific emissions of primary aluminium covered by the CBAM would be higher than assumed here. **Secondary aluminium** is produced from scrap and requires only about 5 % of the energy input compared to primary aluminium. The emission intensity is therefore only half that of primary aluminium. **Depending on how much secondary aluminium is used in production, the emission intensity and thus also the certificate costs are significantly lower than assumed here.** In Germany, half of aluminium production currently comes from secondary aluminium**.**
- **Fertilisers have comparatively lower extra-EU export intensities than the metal products considered**: up to 5 % of production is exported to third countries. The certificate costs could only be estimated for the basic materials ammonia and nitric acid - for ammonia they are significant (31-45 % of the export value depending on the GHG efficiency of the plant), but the export intensity of ammonia is very low (2 %) and significantly lower than the import intensity (13 %).

Content

1 Introduction and key assumptions

Since the introduction of the EU Emissions Trading Scheme (EU ETS), emissions from the energy and industrial sectors in the EU have been subject to a CO_2 price. The EU ETS is one of the central cornerstones for achieving the German and European climate protection goals. The CO_2 price is intended to create incentives for emission reductions. However, as long as the EU's trading partners for energy-intensive basic materials do not undertake comparable climate protection efforts, without adequate protective measures there is a risk that the production of the goods covered will migrate to countries with less stringent rules (carbon leakage). For this reason, industrial installations in the EU ETS currently receive a substantial part of the emission allowances they need free of charge.[1] However, this free allocation weakens the effect of the CO_2 price and thus the incentives to save emissions (European Commission 2021a, Explanatory Memorandum p.1f). In addition, the cap for emission allowances will continue to fall in the coming years, thus reducing the scope for free allocation, i.e. even without the introduction of a carbon border adjustment mechanism (CBAM), free allocation would decrease and the costs for the purchase of allowances would rise. According to the EU Commission's proposal, the CBAM is to gradually replace free allocation as protection against carbon leakage. The revenues from the ETS allowances that are auctioned instead are to flow into the EU Innovation Fund, where they are to benefit in particular the sectors covered by the CBAM. The CBAM will enable companies to better pass on the emissions trading costs in the EU internal market to the prices of their products, as in the future allowances will also have to be purchased in the EU for the emissions embedded in the imported products. Already today, many companies pass on part of their allowance costs (Neuhoff/Ritz 2019; Cludius et al. 2020).

According to the EU Commission's proposal, the CBAM only covers imports into the EU and not EU exports. If production in Europe incurs costs due to the EU ETS and the products are exported to countries where no comparable costs are incurred, this can reduce the competitiveness of European companies in these countries.

This paper aims to analyse the export intensities and relative purchase costs of the CBAM products and to create transparency here in order to better assess the impact of the introduction of the CBAM on the products concerned. Important key figures in this context are the extra-EU export intensity of the industrial products covered by the CBAM and the respective share of the costs for the purchase of certificates in the average value of the exports of the product group. For a final assessment of the carbon leakage risk, other aspects are also relevant in addition to these two factors, e.g. the possibility of cost pass-through, transport costs, the existence of relevant infrastructures or trade barriers. Changes in the funding landscape can also play a role in this context.

The **extra-EU export intensity** represents the ratio of the value of exports of the respective product to non-EU ETS countries to the value of production of the same product. It is based on Eurostat data for the years 2019/2020.[2]

[1] Companies are also currently purchasing certificates for their industrial plants. The demand differs, among other things, according to the greenhouse gas efficiency of the plant. In 2021, industrial plants purchased allowances for an average of 21% of their EU ETS emissions (see DEHSt (2022) p. VIII).

[2] The foreign trade classification 'Combined Nomenclature' (CN) can be found here https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=OJ:L:2021:414:FULL&from=EN and

https://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_CLS_DLD&StrNom=CN_2020&StrLanguageCode=EN&StrLayoutCode=HIERARCHIC.

We set the **specific costs for the purchase of certificates per tonne of product in relation to the specific export value of the product group** in order to estimate how this cost component relates to the export price of a tonne of the respective product. The specific export value serves as a proxy for the average price of a tonne of the exported good. It is determined from the value of exports (in euros) divided by the export quantity (in tonnes per product group).

In our view, the share of purchase costs represents **the maximum potential for a price increase due to higher costs.** This is based on the simplified assumption that in the case of predominantly output-based (dynamic) free allocation in the EU ETS no price pass-through takes place and in the case of reduced free allocation in each case at most the resulting additional costs are passed on. Insofar as the costs for the purchase of allowances are not (or can only partially be) passed on to the price due to the demand or competition situation, this variable represents the maximum possible potential profit reduction for exporting companies for this part of their production.[3]

The **method for estimating the cost of purchasing allowances** builds on the approach of Stede et al. (2021) and is described in more detail in Appendix A.1. The reference year is 2030, the last year of the fourth trading period in the EU ETS.

Central assumptions for determining the share of the purchase costs for certificates in the export value (in each case related to one tonne of product) are:

- The CO_2 price is 100 euros per tonne of CO_2 e.
- Due to the introduction of the CBAM, the free allocation will be reduced by 10 percentage points per year from 2026 onwards with otherwise unchanged allocation rules (extrapolation of the benchmarks applicable in the period 2021-2025; no cross-sector correction factor), i.e. in 2030 the free allocation will be 50 % of the respective benchmark.
- The export value per tonne of product of a product group is calculated from the value of exports in euros divided by exports in tonnes (based on Eurostat data 2019/2020).

The costs for the purchase of certificates per tonne of product refer exclusively to direct emissions. Indirect CO_2 costs, which may be included in electricity costs, are not initially covered by the CBAM according to the EU Commission's proposal and are therefore not included in the analysis.

The results naturally depend on the market conditions prevailing in the respective period. Energy and raw material prices, the demand situation on the sales markets and other market conditions have an impact on product prices and can therefore have a significant influence on the results.

[3] A price increase could also lead to reduced demand, which also leads to reduced sales and profits. However, the exact extent of price pass-through or the possible resulting demand response are not examined in this paper.

2 Cement and cement clinker

In the cement sector, foreign trade statistics distinguish cement clinker and four types of cement produced from the clinker: white and normal Portland cement, alumina cement and other (hydraulic) cement. In the EU Commission's CBAM proposal, all types were included except for alumina cement; the Council proposed adding this in its general approach on 15 March 2022 (European Commission 2021, Council 2022).

Portland cement has the highest production share and is also exported the most to non-EU countries, with exports of other cement in second place. In general, **cement in Germany** has **a very low extra-EU export intensity**. The export intensity for Germany of Portland cement (white and normal) as well as for hydraulic cement (alumina cement and other) is only 1 %. The export intensity of cement clinker is even lower at 0.1 %. [4]

Table 1: German foreign trade (non-EU) and production value for CBAM products from cement and cement clinker production

CN code	CN Description	Import (M €)	Export (M €)	Production (M €)	Export intensity*
25232900	Portland cement, normal or moderated (excl. white, whether or not artificially coloured)	0,03	51,9	5 995,8	0,9%
25232100	Portland cement, white, also artificially coloured	0,1	2,1		
25239000	Cement, whether or not coloured (excl. Portland and fused alumina cement)	0,6	25,7	1 797,6	1,4%
25233000*	Alumina cement	7,8	0,2		
25231000	Cement clinker	0,04	0,2	286,9	0,1%

Import and export data refer to trade flows with countries outside the EU and are given as averages for the years 2019-2020. CN codes with * mark additional product groups proposed by the Council.
The export intensity is given for both types of Portland cement together, as the production statistics do not report them separately. The same applies to the hydraulic cements (aluminous cement as well as other cements).
Sources: Eurostat PRODCOM and Eurostat COMEXT

The CO_2 intensity of cement and cement clinker is high, and the costs for the acquisition of emission allowances per tonne of product are therefore correspondingly high. The emission-intensive process is the production of the clinker, which is the main ingredient in cement production. Cement production itself is not covered by the EU ETS. The analysis assumes that the allowance costs associated with clinker production are passed on to the cement producers (see also Appendix A.1 for the calculation method).

A plant producing clinker as efficiently[5] as the product benchmark emits 0.693 t CO_2 per tonne of grey cement clinker, while a plant meeting the average efficiency in the EU emits 0.810 t CO_2 per

[4] The quoted statistics record the production sold. Since cement clinker is an intermediate product that is partly incorporated directly into cement production within the company, this tends to underestimate the production volume. The export intensity in relation to total production would thus be even lower.

[5] The term "efficient" is used here in the sense of the ETS Directive and the definition of product benchmarks used for free allocation (European Commission 2021(b). It does not relate to the efficiency of energy use in the plant.

tonne of cement clinker.[6] In the case of cement, the CO_2 intensity can be reduced by a low clinker content. The average clinker content in Germany is 71 %, which is lower than in Spain, for example (81 %) (VDZ 2021, GNR 2019). With a clinker proportion of 71 %, this corresponds to 0.492 t CO_2 per tonne of cement (efficiently produced clinker) or 0.575 t CO_2 per tonne of cement for clinker produced with average emissions. With a clinker share of 81 %, the emissions per tonne of cement are 0.561 to 0.656 t CO_2. As the free allocation is the same for plants regardless of their efficiency, the purchase requirement of emission allowances (EUA) depends on the emission intensity - at 50 % free allocation, the purchase requirement is 0.246 to 0.375 EUA per tonne of cement, depending on how efficiently the clinker was produced and how high the clinker content in the cement is.

Table 2: Specific emissions per tonne of product, free allocation and purchase requirement for GHG efficient and average installations

Product	Emission (t CO_2 / t product)		Free allocation (EUA / t product)	Purchase requirement of certificates (EUA / t product)	
	GHG efficient plant	Average plant		GHG efficient plant	Average plant
Cement clinker (grey)	0,693	0,810	0,347	0,347	0,464
Cement (71% clinker)	0,492	0,575	0,246	0,246	0,329
Cement (81% clinker)	0,561	0,656	0,281	0,281	0,375

Source: Own calculation Öko-Institut based on Stede et al. (2021), European Commission (2021b). The free allocation corresponds to 50 % of the product benchmark for grey cement clinker and was transferred to the downstream product cement, which is not subject to emissions trading, according to the clinker shares (see Appendix A.1 on the calculation method).

The costs for the purchase of certificates (after deduction of the free allocation) amount to €25-28 per tonne of cement in an GHG efficient plant and €33-38 in an average plant, depending on the clinker content (Table 3). For cement clinker, the emissions and thus the purchase costs per tonne are higher and are €35 or €46 depending on the plant. The certificate costs correspond to 35-40 % of the average export value per tonne of normal Portland cement with a clinker content of 71 %. White Portland cement has a higher export value, the certificate costs amount to 16-19 % of the specific export value per tonne of cement with the same clinker content. For cement production with a higher clinker content and poorer greenhouse gas efficiency, the certificate costs can amount to up to 54 % of the average export value.

[6] The current product benchmark in the EU ETS (2021-2025) for grey cement clinker is 0.693 t CO_2 per tonne of cement clinker, which is slightly lower than the average emissions of the 10 % most efficient plants in the EU (0.722 t CO_2 /t cement clinker in 2016/2017). The ETS benchmark was used as the basis for these calculations.

Table 3: Specific export values and costs for the purchase of emission allowances for GHG efficient and average plants, cement and cement clinker

CN	Product	Calculated specific export value	Cost for the purchase of certificates** (€ / t product)		Certificate costs** / export value	
		(€ / t product)	GHG efficient plant	Average	GHG efficient plant	Average
25232900	Portland cement, normal or moderated (excl. white, whether or not artificially coloured)	69	25 - 28	33 - 38	35% - 40%	47% - 54%
25239000	Cement, whether or not coloured (excl. Portland cement and alumina cement)	122	25 - 28	33 - 38	20% - 23%	27% - 31%
25232100	Portland cement, white, also artificially coloured	150	25 - 28	33 - 38	16% - 19%	22% - 25%
25233000*	Alumina cement	857	25 - 28	33 - 38	3% - 3%	4% - 4%
25231000	Cement clinker	61	35	46	56%	76%

**with a certificate price of €100 in 2030 and a CBAM factor of 50 %. The ranges given refer to different clinker shares - from 71 % (lower values) to 81 % (upper values). The specific export value per tonne is based on exports in euros divided by exports in tonnes in 2019-2020. CN codes with * mark additional product groups proposed by the Council.
Source: Öko-Institut's own calculation based on Stede et al. (2021), European Commission (2021b).

3 Iron and steel

The iron and steel products covered by the CBAM have the highest production and export value in Germany compared to the other sectors: the value of production was €134 billion and of exports €9 billion (average 2019/2020). The list of CBAM products is the longest of all sectors. Not covered by the EU Commission's proposal are 7204 iron and steel waste and scrap and 7202 ferroalloys. [7]

The export intensity differs depending on the product group. For example, only about 5 % of German production of metal structures such as bridge parts (CN 7308) is exported. For tubes and hollow sections (CN 7303-7307) the export intensity is 8-25 % depending on the group, for flat rolled products of iron and non-alloy steel (CN 7208-7212) 5-15 %. Due to the high number of CBAM products in the industry, in Table 4 only the 15 product groups with the highest export value are presented, data on all product groups can be found in Annex A.22.

Table 4: German foreign trade (non-EU) and production value for CBAM products from iron and steel production (top 15 measured by export value)

CN	CN Description	Import (M €)	Export (M €)	Production (M €)	Export intensity
7326*	Iron/steel articles n.e.c. (excl. cast)	1 306,8	1 761,3	10 118,7	17%
7308	Structures and structural parts, sheets, rods, profiles, tubes and the like prefabricated for construction purposes.	586,9	1 514,2	30 949,6	5%
7304	Tubes, pipes and hollow profiles, seamless, of iron / steel (excl. of cast iron)	161,3	784,4	3 691,2	21%
7225	Flat products of alloy steel other than stainless steel, width >= 600 mm	11,7	683,2	5 031,0	14%
7210	Flat products of iron or non-alloy steel, of a width >= 600 mm, clad or coated	49,2	663,5	9 809,6	7%
7307	Tube or pipe fittings, of iron or steel and tube or pipe joints, of iron or steel	392,5	595,3	2 296,9	26%
7306	Tubes and hollow sections, of iron / steel (excl. seamless tubes and tubes, outer diameter > 406.4 mm)	285,7	430,2	5 509,7	8%
7228	Bars, rods, profiles and sections of alloy steel other than stainless steel n.e.c;	208,5	426,5	2 888,6	15%
7208	Flat products of iron or non-alloy steel, of a width >= 600 mm, hot-rolled, neither clad nor coated	63,4	319,7	7 422,3	4%
7305	Tubes with outer diameter > 406.4 mm, made from flat rolled products	81,6	295,6	1 818,7	16%
7222	Stainless steel bars and profiles n.e.c.	131,7	288,1	2 046,9	14%

[7] Germany and the EU are net exporters of iron and steel scrap. Since scrap is exempt from the CBAM according to the EU Commission's proposal, it should be checked, if necessary, whether this poses a risk of circumvention possibilities of the CBAM .

CN	CN Description	Import (M €)	Export (M €)	Production (M €)	Export intensity
7216	Sections of iron or non-alloy steel n.e.c.	83,8	282,0	5 605,8	5%
7213	Wire rod of iron or non-alloy steel, coiled in rings at random	113,8	280,9	3 537,8	8%
7226	Flat products of alloy steel other than stainless steel, width < 600 mm	30,4	266,7	1 018,2	26%
7219	Stainless steel flat products, width >= 600 mm	88,0	196,1	7 825,0	3%

Import and export data refer to trade flows with countries outside the EU and are given as averages for the years 2019-2020. CN codes with * mark additional product groups proposed by the Council.
Sources: Eurostat PRODCOM and Eurostat COMEXT

Emission intensity and CO_2 costs of iron and steel products differ significantly depending on whether they are produced in the blast furnace or electric arc process. In Germany, about 68 % of crude steel is produced in the blast furnace process, in the EU on average about 58 %. The following evaluations are based on the assumption that the steel products mentioned below were produced in the blast furnace process because this process predominates in Germany. However, some of these products and product groups are also in Germany primarily produced using the electric arc process. These have significantly lower needs for purchasing allowances or lower certificate costs in relation to the calculated export values of the products.

The **emission intensity of iron and steel products from the blast furnace route** is lower the more scrap is used in the process. If no scrap were used at all, a tonne of crude steel produced in plants with emissions at the level of the product benchmark would have specific emissions of 1.669 t CO_2, a tonne of steel produced in an average plant would have 2.024 t CO_2. In practice, some scrap is always used in the oxygen steel converter. If 20 % scrap is added in the production process, the emission intensity drops to 1.335 t CO_2 or 1.619 t CO_2 per tonne of steel (see Table 5). The calculation of specific emissions follows the system of product benchmarks in the EU ETS and includes emissions from the intermediate products coke and sinter, but not emissions from the use of electricity.[8]

Table 5: Specific emissions per tonne of steel, free allocation and purchase requirement for GHG efficient and average plants using 20 % scrap (t CO_2)

Product	Emission (t CO_2 / t product)		Free allocation (EUA / t product)	Purchase requirement of certificates (EUA / t product)	
	GHG efficient plant	Average plant		GHG efficient plant	Average plant
Steel	1,335	1,619	0,668	0,668	0,952

Source: Own calculation Öko-Institut based on Stede et al. (2021), European Commission (2021b). The free allocation corresponds to 50 % of the product benchmark values for coke, sinter and pig iron (see Annex A.1 for calculation method).

[8] The calculation is presented in Appendix A.1. In accordance with the logic of the benchmark definition, the specific emissions only take into account the difference between emissions from the combustion of waste gases and the combustion of natural gas.

Efficient[9] installations that cause emissions in line with the product benchmark and use around 20 % scrap in the process must purchase 0.668 allowances per tonne of product if the free allocation is reduced by 50 %, which corresponds to costs of € 67 per tonne of product at an allowance price of € 100. **Depending on the product group, the CO_2 costs of these efficient plants amount to up to 11 % of the average export value**. For flat rolled products, the average export value per tonne of product is smaller than for pipes, for example. Accordingly, the **certificate costs compared to the export value are lower (up to 4 %) for pipes than for flat rolled products.**

Table 6: Specific export values and costs for the purchase of emission allowances for GHG efficient and average plants, iron and steel

CN	Product	Calculated specific export value	Cost for the purchase of certificates** (€ / t product)		Certificate costs** / export value	
		(€ / t product)	GHG efficient plant	Average	GHG efficient plant	Average
7326 *	Articles of iron or steel, n.e.c. (excl. cast)	6 269	67	95	1%	2%
7308	Structures and parts, sheets, rods, profiles, tubes and the like prefabricated for construction purposes.	3 116	67	95	2%	3%
7304	Tubes, pipes and hollow profiles, seamless, (excl. of cast iron)	2 353	67	95	3%	4%
7225	Flat products of alloy steel other than stainless steel, width >= 600 mm, hot or cold rolled	963	67	95	7%	10%
7210	Flat products made of iron / non-alloy steel, width >= 600 mm, hot/cold rolled, clad or coated	812	67	95	8%	12%
7307	Pipe fittings, pipe stoppers and pipe connectors,	14 355	67	95	0%	1%
7306	Tubes and hollow profiles, (excl. seamless tubes; outer diameter > 406.4 mm)	2 376	67	95	3%	4%
7228	Steel bars and profiles, of alloy steel other than stainless steel n.e.c.	1 605	67	95	4%	6%
7208	Flat products of iron / non-alloy steel, width >= 600 mm, hot-rolled, neither clad nor coated	604	67	95	11%	16%

[9] The term "efficient" is used here in the sense of the ETS Directive and the definition of product benchmarks used for free allocation (European Commission 2021(b). It does not relate to the efficiency of energy use in the plant.

CN	Product	Calculated specific export value	Cost for the purchase of certificates** (€ / t product)		Certificate costs** / export value	
7305	Tubes and pipes with outer diameter > 406.4 mm, of flat-rolled products of iron/steel	1 525	67	95	4%	6%
7222	Stainless steel bars and profiles n.e.c.	4 218	67	95	2%	2%
7216	Sections of iron or non-alloy steel n.e.c.	808	67	95	8%	12%
7213	Wire rod of iron or non-alloy steel, coiled in rings at random	594	67	95	11%	16%
7226	Flat products of alloy steel other than stainless steel, width < 600 mm, hot or cold rolled	1 451	67	95	5%	7%
7219	Flat products made of stainless steel, width >= 600 mm, hot-rolled/cold-rolled	3 362	67	95	2%	3%

*assuming an EUA price of €100 in 2030 and a CBAM factor of 50 %. The export value per tonne is based on exports in euros divided by exports in tonnes in 2019-2020. CN codes with * mark additional product groups proposed by the Council. Source: Öko-Institut's own calculation based on Stede et al. (2021), European Commission (2021b).

At €95 per tonne of product, the certificate costs for average plants are considerably higher compared to efficient plants. Depending on the product group, this corresponds to up to **16 % (flat rolled products) or up to 6 % (pipes) of the export value of the products**. The differences by product group follow the same pattern as for efficient plants.

Excursus: Iron and steel products not covered by the EU Commission's proposal

Not all products within CN category 73 (articles of iron or steel) are covered by the CBAM under the EU Commission's proposal, although they are presumably made of 100 % iron or steel. These product groups are likely to be predominantly produced in installations that are not covered by the EU ETS. Therefore, these installations have no need to purchase allowances and do not receive a free allocation. However, they do purchase iron or steel, the production or import of which has incurred CO_2 costs through the EU ETS or CBAM and, assuming price pass-through, leads to higher procurement costs in further processing. Since imports of these product groups are not subject to the CBAM, the competitiveness of European manufacturers of these processed products could be impaired compared to imports (as well as the competitiveness in non-EU countries if no comparable CO_2 price is charged). In the following, the import and export intensity and the certificate costs are examined for two selected product groups whose production value in the EU is comparatively high: "Woven fabrics of iron or steel wire" (CN 7314) and "Screws, bolts and nuts" (CN 7318). A complete overview can be found in Annex A.3.

Table 7: German foreign trade (non-EU) and production value for products not covered by CBAM (product group 73: goods of iron or steel)

CN	CN Description	Import (M €)	Export (M €)	Produc -tion (M €)	Import intensity*	Export intensity*
7314	Woven fabrics, including endless bands, netting and fencing, of iron or steel wire	56	94	3640	2%	3%
7318	Screws, bolts, nuts, coach screws, screw hooks and similar articles, of iron or steel	1585	2408	5904	27%	41%

Import and export data refer to trade flows with countries outside the EU and are given as averages for the years 2019-2020.

Sources: Eurostat PRODCOM and Eurostat COMEXT

While the import intensity of fabrics and braids is very low at 2 %, the import intensity of screws, bolts and similar goods is higher (27 %) and the export intensity even exceeds this (41 %).

Assuming that the CO_2 or certificate costs calculated according to our method are passed through at 100 %, i.e. that they increase the procurement price for iron and steel by the same amount, the CO_2 costs included in the procurement price correspond to 4-6 % of the import value for fabrics and braids and 5-7 % for screws and similar products.

In addition to CN groups 72 and 73, other products from group 84 (e.g. vehicle and machine parts) and groups 8707 and 8708 (car bodies and motor vehicle parts) sometimes also consist of almost 100 % steel or aluminium. However, it could become much more difficult to include them in the CBAM because the number of products and their precursors covered by the CBAM as well as the volume of trade flows would increase significantly.

Table 8: Import value and CO_2 cost included in procurement, iron and steel goods

CN	Product	Calculated specific import value	Passed on costs** (€ / t product)		Increased procurement costs** / import value	
		(€ / t product)	GHG efficient plant	Average	GHG efficient plant	Average
7314	Woven fabrics, including endless bands, netting and fencing, of iron or steel wire	1 581	67	95	4%	6%
7318	Screws, bolts, nuts, coach screws, screw hooks and similar articles, of iron or steel	3 588	67	95	2%	3%

**assuming an EUA price of €100 in 2030 and a CBAM factor of 50 %. Import value per tonne is based on imports in euros divided by imports in tonnes in 2019-2020.

Source: Öko-Institut's own calculation based on Stede et al. (2021), European Commission (2021b).

4 Aluminium

According to the EU Commission's CBAM proposal, eight groups of aluminium products are to be covered by the border adjustment mechanism. The Council proposal extends the list to 14 product groups. This covers all aluminium products except scrap and waste (CN 7602)[10] and household articles, sponges and cleaning cloths (CN 7615).

Table 9: German foreign trade (non-EU) and production value for aluminium CBAM products

CN code	CN Description	Import (M €)	Export (M €)	Production (M €)	Export intensity
7606	Sheet and strip, of aluminium, of a thickness > 0,2 mm	904,4	1 897,9	7 618,7	25%
7607	Foils and thin strips, of aluminium, with a thickness of <= 0.2 mm	230,7	600,2	2 560,6	23%
7610*	Constructions and construction parts	201,3	583,8	13 811,6	4%
7616*	Aluminium articles n.e.c.	382,7	574,3	2 721,0	21%
7604	Bars "rods" and profiles, n.e.c.	411,8	452,3	6 424,8	7%
7601	Aluminium in raw form	1 140,9	233,7	4 908,4	5%
7612*	Collection containers, barrels, cans and similar containers, capacity <= 300 l	46,8	157,0	2 202,3	7%
7608	Aluminium tubes	58,0	114,5	407,3	28%
7603	Powder and tinsel, made of aluminium	24,3	43,9	326,9	13%
76090000	Pipe fittings, pipe stoppers and pipe connectors, made of aluminium	28,0	30,7	97,7	31%
7605	Aluminium wire	24,8	21,1	284,2	7%
76130000*	Aluminium containers for compressed or liquefied gases	31,0	16,6	-	-
76110000*	Collection containers, barrels, vats and similar containers, capacity > 300 l	2,2	16,3	137,6	12%
7614*	Stranded wire, cable, rope and similar goods	1,9	1,4	96,8	1%

Note: 76130000 Aluminium containers for compressed or liquefied gases are included in the production statistics together with iron and steel containers, therefore no data are given here.

Import and export data refer to trade flows with countries outside the EU and are given as averages for the years 2019-2020. CN codes with * mark additional product groups proposed by the Council.

Sources: Eurostat PRODCOM and Eurostat COMEXT

The aluminium products on the CBAM list have very different export intensities, ranging from 1 % to 31 % (see Table 9). The highest export value of €1.9 billion is recorded for sheet

[10] Germany and the EU are net exporters of aluminium scrap (Eurostat PRODCOM and Eurostat COMEXT). As scrap is exempt from the CBAM, it should be examined, if necessary, whether this poses a risk for circumvention possibilities of the CBAM.

and strip (> 0.2 mm thickness; CN 7606), followed by foil (< 0.2 mm thickness; CN 7607) with €0.6 billion. Both product groups have a rather high export intensity (23-25 %). In contrast, other product groups with a high export and production value (constructions, bars and profiles, aluminium in raw form and containers under 300l capacity) have a much lower export intensity (4-7 %). Pipes and pipe fittings have a lower export value, but are also characterised by a high export intensity (28-31 %).

Primary aluminium is extracted from alumina (aluminium oxide) by means of fused-salt electrolysis (BGR 2020). This process is very energy-intensive and, in addition to CO_2 - also causes PFC emissions - per fluorinated hydrocarbons are highly potent greenhouse gases. Secondary aluminium, on the other hand, uses scrap as the main input factor. The energy demand and thus the emissions from secondary aluminium production are considerably lower than for primary aluminium. According to Hübner et al. 2020, the specific fuel demand of secondary aluminium production is about 52 % of the demand of primary aluminium production.[11] The specific direct emissions would thus only be about half as high as for primary aluminium. Many products are made from a mixture of primary and secondary aluminium, and the mixing ratio depends on the quality requirements, e.g. in terms of purity of the end product. Since there is a lack of reliable data on how high the proportion of secondary aluminium is in the product groups, we base the further calculations on the assumption that the products are made from 100 % primary aluminium. This leads to a significant overestimation of the specific emissions, because secondary aluminium accounts for more than 50 % of aluminium production in Germany.[12] According to the industry association, mainly rolled products and castings for the automotive industry are produced from secondary aluminium (WV Metalle 2022).

Table 10: Specific emissions per tonne of aluminium, free allocation and purchase requirement for GHG efficient and average plants (t CO_2)

Product	Emission (t CO_2 / t product)		Free allocation (EUA / t product)	Purchase requirement of certificates (EUA / t product)	
	GHG efficient plant	Average plant		GHG efficient plant	Average plant
Aluminium	1,598	1,816	0,799	0,799	1,017

Source: Own calculation Öko-Institut based on Stede et al. (2021), European Commission (2021b). The free allocation corresponds to 50 % of the product emission value for primary aluminium and anode consumption (see Appendix A.1 for calculation method).

It is not clear from the EU Commission's draft whether the CBAM will also include emissions from the production of the required alumina. This is supported by the fact that integrated plants will then be treated the same as plants that purchase alumina. Against this is the fact that alumina does not appear in the CBAM list (CN 28182000). If it were included, the direct specific emissions would be approx. 38 % higher.

[11] Secondary aluminium production uses proportionally more fuel than electricity than primary aluminium production. The total energy demand, including electricity, for secondary aluminium production is only 16 % of the demand for primary aluminium production.

[12] The need to purchase emission allowances is also correspondingly lower. The level of allocation (i.e. the ratio of free allocation to emissions) is slightly higher for secondary aluminium production in Germany than for primary aluminium (DEHSt 2021).

Table 11: Specific export values and costs for the purchase of emission allowances for GHG efficient and average plants, aluminium

CN	Product	Calculated specific export value	Cost for the purchase of certificates** (€ / t product)		Certificate costs** / export value	
		(€ / t product)	GHG efficient plant	Average	GHG efficient plant	Average
7606	Sheets and strips with a thickness of > 0.2 mm	2 986	80	102	3%	3%
7607	Foils and thin tapes with a thickness of <= 0.2 mm	4 663	80	102	2%	2%
7610*	Constructions and construction parts	12 059	80	102	1%	1%
7616*	Aluminium articles n.e.c.	21 848	80	102	0%	0%
7604	Bars, rods and profiles, of aluminium, n.e.c.	6 152	80	102	1%	2%
7601	Aluminium in raw form[13]	1 891	80	102	4%	5%
7612*	Collection containers, barrels, cans and similar containers. capacity <= 300 l	7 643	80	102	1%	1%
7608	Tubes	12 205	80	102	1%	1%
7603	Powder and tinsel	7 174	80	102	1%	1%
7609 0000	Pipe fittings, pipe stoppers and pipe connectors	49 091	80	102	0%	0%
7605	Aluminium wire	5 111	80	102	2%	2%
7613 0000*	Container for compressed or liquefied gases	24 584	80	102	0%	0%
7611 0000*	Collection containers, barrels, vats and similar containers, capacity > 300 l	9 721	80	102	1%	1%
7614*	Stranded wire, cable, rope and the like, of aluminium	4 998	80	102	2%	2%

*assuming an EUA price of €100 in 2030 and a CBAM factor of 50 %. the export value per tonne is based on exports in euros divided by exports in tonnes in 2019-2020. CN codes with * mark additional product groups proposed by the Council.
Source: Öko-Institut's own calculation based on Stede et al. (2021), European Commission (2021b).

[13] Waste and scrap melted and cast into ingots or similar forms are treated as metal in crude form in foreign trade statistics. This item may therefore have different compositions of primary and secondary metal and be associated with different CO_2 intensities. For this calculation, as for the other products listed here, it was assumed that the product category was produced from 100 % primary aluminium.

Direct emissions in primary aluminium production, taking anode consumption into account, are 1.598 t CO_{2e} per tonne of aluminium for plants that produce as efficiently[14] as the respective product benchmarks (primary aluminium, anode consumption); average plants emit 1.816 t CO_{2e} per tonne of aluminium. However, this value does not include emissions from the production of alumina or indirect emissions from electricity generation. Primary aluminium production is characterised by very high electricity consumption. Indirect emissions (from electricity generation outside the plant under consideration) are not part of the EU Commission's CBAM proposal and are therefore not considered here. Companies in Germany can receive support for the CO_2 costs included in the electricity price as part of the electricity price compensation.

With the assumptions made, the cost of purchasing certificates is €80 for plants that produce as efficiently as the benchmark and €102 for average plants. However, the value per tonne of product is much higher for aluminium products than for cement. **The certificate costs for direct emissions of CBAM products are manageable at up to 4 % of the export value for efficient plants and up to 5 % for average plants.** Moreover, this is a conservative estimate that assumes 100 % primary aluminium. The actual costs are lower depending on the proportion of secondary aluminium**.**

[14] The term "efficient" is used here in the sense of the ETS Directive and the definition of product benchmarks used for free allocation (European Commission 2021(b). It does not relate to the efficiency of energy use in the plant.

5 Fertiliser

Of the chemical products, fertilisers are included on the CBAM list. **Nitrogen fertilisers have the highest total export value (€180 million) and also the highest export intensity (5 %);** followed by fertilisers containing nitrogen and phosphorus and/or potassium (€100 million export value; 4 % export intensity). **For ammonia, the import intensity is significantly higher (13 %) than the export intensity (2 %).** Ammonia and nitric acid are often used as intermediate products. The table only records the production volume sold, but not the quantities that are used directly, for example in fertiliser production. The export intensity is therefore somewhat overestimated.

Table 12: German foreign trade (non-EU) and production value for CBAM products from fertiliser production

CN code	CN Description	Import (M €)	Export (M €)	Production (M €)	Export intensity*
3102	Nitrogen fertilisers, mineral or chemical	31,3	179,6	3 595,2	5%
3105 (without 31056000)	Fertilisers, mineral or chemical, containing two or three of the fertilising elements nitrogen, phosphorus and potassium; other fertilisers (excluding CN 31056000 Fertilisers of phosphorus and potassium).	43,7	100,4	2 451,8	4%
2814	Ammonia, anhydrous or in aqueous solution	67,7	8,7	517,7	2%
28080000	Nitric acid; Nitrating acids	0,6	6,9	161,0	4%
28342100	Potassium nitrate	0,5	0,0	26,1	0%

Import and export data refer to trade flows with countries outside the EU and are given as averages for the years 2019-2020.

Sources: Eurostat PRODCOM and Eurostat COMEXT

In the EU ETS, product benchmarks are defined for the precursors ammonia and nitric acid. Ammonia plants whose emissions meet the benchmark emit 1.570 t CO_2 per tonne of ammonia. The emissions of the average plants are 1.947 t CO_2 - the purchase requirement is accordingly 0.785 to 1.162 allowances per tonne of ammonia.

Nitric acid has a lower emission intensity. An average plant emits 0.2 t CO_2 per tonne of nitric acid, a plant corresponding to the best 10 % of plants in the EU even emits only 0.04 t CO_2. The benchmark is much higher, at 0.2 t CO_2 per tonne of product. Average plants and plants whose emissions meet the benchmark have an purchase requirement of 0.1 EUA per tonne of nitric acid. Efficient[15] installations, which correspond to the average of the 10 % best installations in the EU, can sell allowances as the allocation exceeds the emissions.

[15] The term "efficient" is used here in the sense of the ETS Directive and the definition of product benchmarks used for free allocation (European Commission 2021(b). It does not relate to the efficiency of energy use in the plant.

Table 13: Specific emissions per tonne of ammonia and nitric acid, free allocation and purchase requirement for GHG efficient and average plants (t CO_2)

Product	Emission (t CO_2 / t product)		Free allocation (EUA / t product)	Purchase requirement of certificates (EUA / t product)	
	GHG efficient plant*	Average plant		GHG efficient plant*	Average plant
Ammonia	1,570	1,947	0,785	0,785	1,162
Nitric acid	0,038	0,205	0,115	-0,077	0,090

*Plant whose emissions correspond to the product benchmark (ammonia) or emissions of the 10 % most efficient plants (nitric acid). In the case of nitric acid plants, the product benchmark is higher than emissions from the most efficient and even average plants.

Source: Own calculation Öko-Institut, European Commission (2021b).

In the case of ammonia production, the purchase requirement causes considerable costs of €79-116 per tonne, amounting to 31-45% of the calculated export value of a tonne of ammonia. In contrast, the specific export value per tonne of nitric acid is higher and the purchase requirement for certificates causes costs of €9 per tonne of product for an average plant. Accordingly, the certificate costs are low in relation to the specific export value (2 %). The 10 % best plants in the EU do not have any allowance costs, but can generate income from the sale of allowances even after reducing the free allocation by 50 %.

Table 14: Specific export values and costs for the purchase of emission allowances for GHG efficient and average plants, fertilisers

CN	Product	Calculated specific export value	Cost for the purchase of certificates* (€ / t product)		Certificate costs* / export value	
		(€ / t product)	GHG efficient plant	Average	GHG efficient plant	Average
2814	Ammonia, anhydrous or in aqueous solution	257	79	116	31%	45%
2808 0000	Nitric acid; Nitrating acids	549	-8	9		2%

*assuming an EUA price of €100 in 2030 and a CBAM factor of 50 %. In the case of nitric acid/nitric acids, GHG efficient plants can achieve €8 per t of product through sales. Therefore, the figure is shown with a negative sign.

Source: Own calculation Öko-Institut, European Commission (2021b).

6 Literature

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A Appendix

A.1 Calculation of CO_2 intensities and certificate costs

We set the **costs for the purchase of certificates (emission allowances) in relation to** the value of exports in order to estimate how this cost component relates to the price of the products. The specific export value serves as a proxy for the average product price of a tonne of the exported good; it is determined from the value of exports divided by the export quantity in tonnes per product group. In our view, the share of purchasing costs represents the maximum potential for an associated price increase if the costs are passed on in full to the product price. This is based on the simplified assumption that, in the case of output-based free allocation, no price pass-through is otherwise assumed and, in the case of partial coverage of the required allowances by free allocation, in each case exactly the costs for the allowances still required are passed on. If the costs for the purchase of allowances are not or only partially passed on to the price, this quantity represents the maximum possible potential profit reduction of the exporting companies for this part of their production.

The CO_{2e} intensities were calculated using a simplified approach according to Stede et al. (2021) with current data on specific emissions from the benchmark curves for the EU ETS (European Commission 2021b). A simplified assumption was made that the CBAM product groups consist of 100 % of the corresponding material such as aluminium or steel. The free allocation is based on the benchmarks for the allocation period 2021-2025.

Product benchmarks for free allocation exist for a number of the products considered. In this case, values for the emissions of average installations and efficient[16] installations could be adopted unchanged on the assumption that the emissions of efficient installations correspond to the product benchmark (even if the average emissions of the 10 % best installations deviate from this value in some cases) (European Commission 2021b). This concerns ammonia, nitric acid and cement clinker.

If, on the other hand, several input materials are required for the manufacture of a product, i.e. different product benchmarks and the input quantities of the primary products have to be taken into account, the emissions of the benchmark and average plants were calculated using the following method:

Cement

Emissions from cement production depend primarily on the clinker content. Cement production itself is not covered by the EU ETS. The emission values for cement were estimated as follows: emission clinker * clinker share in cement. In contrast to Stede et al. (2021), two different clinker shares were used (71 % and 81 %).

Aluminium

For primary aluminium production, 1.935 t of alumina (aluminium oxide) and 0.429 t of anodes are used per tonne of aluminium. An emission intensity of 0.312 and 0.408 t CO_2 / t was

[16] "The term "efficient" is used here in the sense of the ETS Directive and the definition of product benchmarks used for free allocation (European Commission 2021(b). It does not relate to the efficiency of energy use in the plant".

assumed per tonne of anode (benchmark and average plant, respectively). The benchmark for primary aluminium is 1.464 t CO_2 e / t, the average emissions are 1.641 t CO_2 e / t. Since the emissions from electricity generation are not recorded by the CBAM, indirect emissions were not included, in deviation from Stede et al. (2021). This results in the following formula for emissions from primary aluminium:

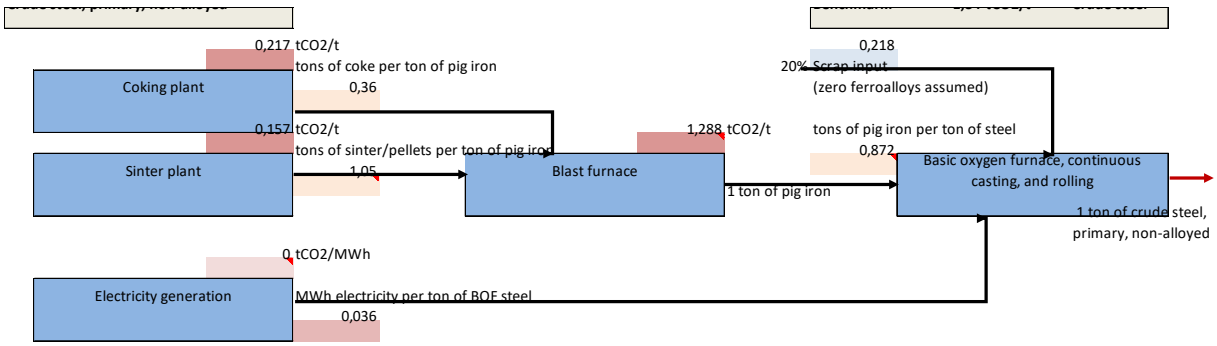
Emission per tonne primary aluminium + emission per anode * 0.4 t anode / t raw aluminium.

This value does not include the emissions from the production of the primary product alumina. If the emissions from alumina production are included, the specific emission per tonne of primary aluminium increases by 1.103 t CO_2. This corresponds to an increase of 38 % of the specific emissions of a benchmark plant. The additional emissions are calculated as follows: One tonne of alumina has a specific emission of 0.57 t CO_2 (BGR 2020). To produce one tonne of primary aluminium, 1.935 t of alumina are used (Stede et al. 2021). Accordingly, the specific emission of the primary product alumina is 1.103 t CO_2 per tonne of primary aluminium. This value is to be classified as conservative. According to DEHSt evaluations, the specific emissions per tonne of alumina are often higher than the value according to the BGR. A derivation via the energy input also results in somewhat higher emissions per tonne of alumina: With an energy input of 12 GJ, a fuel share of 90 % and the emission factor of natural gas (0.056 t CO_2 /GJ), specific emissions of 0.05 t CO_2 / t alumina result.

Steel

The comparative emissions for steel production are based on the blast furnace route. Emissions from coke and sinter production and the scrap used are included (see Figure 1). Emissions from the combustion of co-produced waste gases in the process are included according to the benchmark definition, i.e. only the difference between emissions from the combustion of co-produced gases and the combustion of natural gas for electricity generation is considered.[17] Emissions from the use of electricity are not included, as in the case of aluminium. Based on Stede et al. (2021), we assume 0.4 t of coke and 1.1 t of sinter or pellets per tonne of pig iron. In our calculation, 0.87 t of pig iron and 0.22 t of scrap are used per tonne of steel (corresponds to a scrap share of around 20 % in relation to the pig iron input).

Figure 1 : Calculation of the emission intensity of crude steel (GHG efficient plant)



Source: Own representation based on Stede et al. (2021)

[17] The co-produced gases are used in special power plants for electricity generation. However, since electricity generation does not receive any free allocation in principle, only the difference to emissions from electricity generation from natural gas was taken into account in the benchmark. The emission intensity is therefore lower than in calculations that take total emissions into account. However, this approach is suitable for determining the purchase requirement. For further explanation, see DEHSt 2021, section 2.4.

The calculation of the emission intensity is based on Stede et al. (2021), but has been further developed and is therefore lower for the following reasons:

- Electricity is rated 0, as indirect emissions are not taken into account in the EU Commission's CBAM proposal.
- A value of 20 % in relation to pig iron was assumed for the proportion of scrap in blast furnace steel. This results in a slightly higher share of pig iron in the crude steel (0.872 instead of 0.85 t of pig iron per tonne of crude steel).

A.2 Data Iron and steel: Products covered by CBAM

Table 15: German foreign trade (non-EU) and production value for CBAM products from iron and steel production

CN code	CN Description	Import (M €)	Export (M €)	Production (M €)	Export intensity
	CBAM products	3 479	8 771	134 383	7%
7201	Pig iron and spiegeleisen, in ingots, blocks or other crude forms	30	38	300	13%
7203	Iron products obtained by direct reduction from iron ores and other sponge iron, in lumps, pellets or similar forms, and iron of a purity >= 99,94 % by weight,	85	0	3	0%
7205	Grains and powders, of pig iron, spiegeleisen, iron or steel (excl. Ferro-alloy grains and powders, turnings and filings of iron or steel, radioactive iron powders [isotopes] and certain small-calibre defective balls for ball bearings)	91	94	404	23%
7206	Iron and non-alloy steel, in ingots or other primary forms (excl. waste ingots, continuously cast products and iron of heading 7203)	7	4	5 667	0%
7207	Semi-finished products of iron or non-alloy steel	39	75	824	9%
7208	Flat products of iron or non-alloy steel, of a width >= 600 mm, hot-rolled, neither clad nor coated	63	320	7 422	4%
7209	Flat products of iron or non-alloy steel, of a width >= 600 mm, cold-rolled, neither clad nor plated	13	62	4 646	1%
7210	Flat products of iron or non-alloy steel, of a width >= 600 mm, hot-rolled or cold-rolled, clad or coated	49	664	9 810	7%
7211	Flat products of iron or non-alloy steel, of a width of < 600 mm, hot-rolled or cold-rolled, not clad, plated or coated	31	160	5 772	3%
7212	Flat products of iron or non-alloy steel, of a width of < 600 mm, hot-rolled or cold-rolled, clad or coated	61	163	1 450	11%
7213	Wire rod of iron or non-alloy steel, coiled in rings at random	114	281	3 538	8%
7214	Bars and rods of iron or non-alloy steel, not further worked than forged, hot-rolled, hot-drawn or hot-extruded, whether or not twisted after rolling	134	103	4 243	2%

CN code	CN Description	Import (M €)	Export (M €)	Production (M €)	Export intensity
7215	Iron or non-alloy steel bars and rods, cold-finished or cold-finished, whether or not further worked, or hot-finished and further worked, n.e.c.	77	59	1 002	6%
7216	Sections of iron or non-alloy steel n.e.c.	84	282	5 606	5%
7217	Wire of iron or non-alloy steel, in coils or rolls (excl. wire rod)	86	106	2 405	4%
7218	Stainless steel in ingots or other primary forms (excl. waste ingots and continuously cast products); semi-finished products of stainless steel	9	11	1 040	1%
7219	Flat products of stainless steel, with a width of >= 600 mm, hot-rolled or cold-rolled	88	196	7 825	3%
7220	Flat products of stainless steel, with a width of < 600 mm, hot-rolled or cold-rolled	53	162	2 503	6%
7221	Wire rod made of stainless steel, coiled in rings at random	34	6	282	2%
7222	Stainless steel bars and profiles n.e.c.	132	288	2 047	14%
7223	Stainless steel wire, in coils or rolls (excl. wire rod)	56	63	413	15%
7224	Alloy steel other than stainless steel in ingots or other crude forms (excl. waste ingots and continuously cast products); semi-finished products of alloy steel other than stainless steel	20	39	2 820	1%
7225	Flat products of alloy steel other than stainless steel, of a width >= 600 mm, hot-rolled or cold-rolled	12	683	5 031	14%
7226	Flat products of alloy steel other than stainless steel, of a width < 600 mm, hot-rolled or cold-rolled	30	267	1 018	26%
7227	Wire rod of alloy steel other than stainless steel, wound in coils at random	45	65	1 004	6%
7228	Bars and rods, of alloy steel other than stainless steel, n.e.s.; hollow drill bars and rods of alloy or non-alloy steel	208	426	2 889	15%
7229	Alloy wire other than of stainless steel, in coils or rolls (excl. wire rod)	37	61	562	11%
7301	Sheet piling of iron or steel, whether or not perforated or made from assembled elements; profiles obtained by welding	14	15	155	9%

CN code	CN Description	Import (M €)	Export (M €)	Production (M €)	Export intensity
7302	Railway or tramway track construction material, of iron or steel, such as rails, guide rails and racks, switch blades, frogs, switch connecting rods and other crossing or point material, sleepers, fishplates, rail chairs, angles, sole plates, clamping plates, gauge plates and tie rods and other material specially prepared for the laying, joining or fixing of rails	16	64	1 063	6%
730300	Tubes and hollow sections, of cast iron	3	44	350	13%
7304	Tubes, pipes and hollow profiles, seamless, of iron or steel (excl. cast iron)	161	784	3 691	21%
7305	Tubes of circular cross-section and of an external diameter > 406,4 mm, made from flat-rolled products of iron or steel "e.g. welded or riveted".	82	296	1 819	16%
7306	Tubes, pipes and hollow profiles "for example, welded, riveted, seamed or with simply butted edges", of iron or steel (excl. seamless tubes and tubes of circular internal and external cross-section and external diameter > 406,4 mm)	286	430	5 510	8%
7307	Fittings, pipe fittings and pipe unions "e.g. elbows, sockets", of iron or steel	392	595	2 297	26%
7308	Structures and structural parts "for example, bridges and bridge elements, lock gates, towers, lattice masts, pillars, columns, scaffolding, roofs, roof trusses, gates, doors, windows, and their frames and linings, gate thresholds and sills, shutters and blinds, railings", plates, rods, profiles, tubes and the like, prefabricated for structural purposes, and of iron or steel (excl. prefabricated buildings of heading 9406)	587	1 514	30 950	5%
7309	Reservoirs, casks, vats and similar containers, of iron or steel, for any material (excl. compressed or liquefied gases), of a capacity > 300 l, not fitted with mechanical or thermal equipment, whether or not lined or heat-insulated (excl. Containers specially designed or equipped for one or more modes of transport)	26	125	3 369	4%
7310	Reservoirs, casks, drums, cans, boxes and similar containers, of iron or steel, for any material (excl. compressed or liquefied gases), of a capacity <= 300 l, not fitted with mechanical or thermal equipment, whether or not lined or heat-insulated, n.e.c.	80	145	3 821	4%
7311	Iron or steel containers for compressed or liquefied gases (excl. Containers specially designed or equipped for one or more modes of transport)	32	69	832	8%

CN code	CN Description	Import (M €)	Export (M €)	Production (M €)	Export intensity
7326 *	Articles of iron or steel, n.e.c. (excl. cast)	1 307	1 761	10 119	17%

Import and export data refer to trade flows with countries outside the EU and are given as averages for the years 2019-2020.

CN codes with * mark additional product groups proposed by the Council.

Sources: Eurostat PRODCOM and Eurostat COMEXT

A.3 Data Iron and steel: products not covered by CBAM

Table 16: German foreign trade (non-EU) and production value for products not covered by the CBAM (product group 73: goods of iron or steel)

CN	CN Description	Import (M €)	Export (M €)	Production (M €)	Import intensity*	Export intensity*
7312	Stranded wire, cables, ropes, slings and similar articles, of iron or steel	103	198	1107	9%	18%
7313	Barbed wire of iron or steel; twisted wire or strip	1	0	25	4%	1%
7314	Woven fabrics, including endless bands, netting and fencing, of iron or steel wire	56	94	3640	2%	3%
7315	Chains and parts thereof, of iron or steel	122	480	973	13%	49%
7316	Ship's anchors, draglines, and parts thereof, of iron or steel	1	0	15	8%	2%
7317	Pins, nails, drawing pins, staples, curled or bevelled staples	45	38	368	12%	10%
7318	Screws, bolts, nuts, coach screws, screw hooks and similar articles, of iron or steel	1585	2408	5904	27%	41%
7319	Sewing needles, knitting needles, lacing needles, crochet hooks, needles for embroidery and similar goods	8	3	13	61%	26%
7320	Springs and spring leaves, of iron or steel	171	517	2702	6%	19%
7321	Space heaters, boiler cookers, kitchen cookers, grills, braziers, gas cookers, plate warmers	270	90	1387	19%	6%
7322	Radiators for central heating, not electrically heated, and parts thereof, of iron or steel	21	76	1135	2%	7%
7323	Household articles, kitchenware, and parts thereof, of iron or steel	431	216	1093	39%	20%
7324	Sanitary or toilet articles, and parts thereof, of iron or steel	70	151	801	9%	19%
7325	Articles of iron or steel, cast, n.e.c.	140	129	639	22%	20%

Import and export data refer to trade flows with countries outside the EU and are given as averages of the years 2019-2020.
Sources: Eurostat PRODCOM and Eurostat COMEXT

Table 17: Import value and CO_2 cost included in procurement, iron and steel goods

CN	Product	Calculated specific import value	Calculated specific export value	Passed on costs** (€ / t product)		Increased procurement costs** / import value		Certificate costs* / export value	
		(€ / t product)	(€ / t product)	GHG efficient plant	Average	GHG efficient plant	Average	GHG efficient plant	Average
7312	Stranded wire, cables, ropes, slings and similar articles, of iron or steel	2 301	4 757	67	95	3%	4%	1%	2%
7313	Barbed wire of iron or steel; twisted wire or strip	1 411	5 619	67	95	5%	7%	1%	2%
7314	Woven fabrics, including endless bands, netting and fencing, of iron or steel wire	1 581	3 961	67	95	4%	6%	2%	2%
7315	Chains and parts thereof, of iron or steel	3 658	9 867	67	95	2%	3%	1%	1%
7316	Ship's anchors, draglines, and parts thereof, of iron or steel	5 130	5 009	67	95	1%	2%	1%	2%
7317	Pins, nails, drawing pins, staples, curled or bevelled staples	1 296	5 899	67	95	5%	7%	1%	2%
7318	Screws, bolts, nuts, coach screws, screw hooks and similar articles, of iron or steel	3 588	8 043	67	95	2%	3%	1%	1%
7319	Sewing needles, knitting needles, lacing needles, crochet hooks, stitches for embroidery and similar goods	14 807	40 023	67	95	0%	1%	0%	0%
7320	Springs and spring leaves, of iron or steel	5 059	6 824	67	95	1%	2%	1%	1%
7321	Space heaters, boiler cookers, kitchen cookers, grills, braziers, gas cookers, plate warmers	3 819	10 470	67	95	2%	2%	1%	1%

CN	Product	Calculated specific import value	Calculated specific export value	Passed on costs** (€ / t product)		Increased procurement costs** / import value		Certificate costs* / export value	
7322	Radiators for central heating, not electrically heated, and parts thereof, of iron or steel	3 260	4 598	67	95	2%	3%	1%	2%
7323	Household articles, kitchenware, and parts thereof, of iron or steel	4 915	10 731	67	95	1%	2%	1%	1%
7324	Sanitary or toilet articles, and parts thereof, of iron or steel	9 751	7 783	67	95	1%	1%	1%	1%
7325	Articles of iron or steel, cast, n.e.c.	1 970	2 825	67	95	3%	5%	2%	3%

**assuming an EUA price of €100 in 2030 and a CBAM factor of 50%.

Import value per tonne is based on imports in euros divided by imports in tonnes in 2019-2020.

Source: Öko-Institut's own calculation based on Stede et al. (2021), European Commission (2021b).

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