Grantham Research Institute on Climate Change and the Environment

Centre for Climate Change Economics and Policy

What does an EU Carbon Border Adjustment Mechanism mean for the UK?

SUMMARY

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Policy report

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Key messages

- A robust carbon pricing framework with anti-carbon-leakage measures is needed to support deep decarbonisation of industry on the pathway to net-zero greenhouse gas emissions.
- The EU has announced that a Carbon Border Adjustment Mechanism (CBAM) will be operational by the end of 2022. A failure by the UK to coordinate or keep pace with the EU's level of policy stringency for industrial sectors could risk important UK exports being penalised by the CBAM.
- This could entail large financial transfers from the UK to the EU, potentially amounting to €1 billion or more, with exporters of steel hit particularly hard.
- The product coverage of the CBAM has significant implications for the expected carbon leakage and competitiveness impacts, as well as for paid/collected fiscal revenue. It matters particularly for steel, where semi-finished products account for a significant share of sectoral trade-embodied carbon.
- As the EU is the UK's main trading partner in carbon-intensive goods, regardless of whether the CBAM considers only basic materials or broader products, the potential impact is significant. Around one-third of the total value of all UK goods exported to the EU could be affected.
- Joint implementation by the EU and UK of a CBAM covering imports but not exports would be more compatible with environmental objectives and trade law. However, it would disadvantage UK raw material exporters as they would not be able to pass on carbon costs in foreign markets. This would particularly affect exporters in steel and aluminium because they have a stronger trading relationship with non-EU countries.

High-level recommendations

- To decarbonise industry there needs to be a strong policy framework that includes a high carbon price and complementary leakage measures. The carbon price should rise to £75/tonne in 2030.
- Given strong trade linkages and integrated supply chains with the EU, uncertainty around UK's post-Brexit climate policy and particularly around anti-carbon-leakage measures further reduces the long-term investment security for carbon-neutral production processes for UK industry. As a priority, measures should be put in place to address this uncertainty and enable investors to recover the incremental costs of carbon-neutral investments.
- To reduce investment uncertainty, the UK should consider close multilateral cooperation with the EU on a robust policy package to support industrial decarbonisation, including linking of emissions trading systems, equitable CBAM design, the gradual phase-out of free allocation of permits, support for innovation, and carbon contracts for difference.
- Policies to address carbon leakage and prevent export sectors from losing global market share should focus on specific sub-sectors and may be differentiated. For example, leakage provisions that are tailored to steel and aluminium would be needed if the UK has a broad, import-only CBAM in conjunction with the EU CBAM. This could include different boundaries for product coverage.

Introduction

As more and more countries raise their ambition on climate action and commit to much stronger nationally determined contributions (NDCs) to achieving the Paris Agreement targets, there has been a resurgence in the debate around Carbon Border Adjustment Mechanisms (CBAMs) and the role they may play in preserving the effectiveness of climate action in high ambition countries. This summary report[1] explores how the European Union's CBAM, announced to come into force by the end of 2022, might affect the UK.

Why the UK needs to address carbon leakage in some industrial sectors

There is a long-standing concern that unilateral and ambitious climate policies may lead to carbon leakage in some industries. The risk of carbon leakage – where production shifts offshore to countries with less stringent climate policy – is typically focused on energy-, carbon- and trade-intensive industrial sectors. These are sectors exposed to international competition and considered to produce emissions that are 'hard to abate', where breakthrough low-carbon technologies either have not yet been found or are too expensive.

In the UK, industrial sectors accounted for 21% of total greenhouse gas emissions in 2019, which includes basic materials such as steel, cement, aluminium, plastic and paper. These sectors are characterised by capital-intensive processes with long investment timeframes. A robust plan and carbon price framework to support the low-carbon transformation of these energy-intensive sectors is therefore vital for meeting the UK 2050 net-zero carbon target. This may include a Carbon Border Adjustment Mechanism and the phase-out of free allocation of emissions permits, but additional measures such as the introduction of carbon contracts for difference for hydrogen production or a carbon consumption charge may be needed.

So far, carbon leakage concerns have been addressed in the UK by shielding industry from the full impact of the carbon price. The current solution (free allocation of permits to energy-intensive, trade-exposed [EITE] sectors) may have provided an adequate leakage protection while carbon prices were low, but it does not support the low-carbon transformation of these sectors, nor will it provide robust leakage protection going forward. Carbon prices are rising, free allocation is set to decline, and countries are striving for increasingly stringent climate targets. This combination of drivers has made the increasing interest in CBAMs inevitable.

Carbon Border Adjustment Mechanisms are gaining traction

A Carbon Border Adjustment Mechanism works by imposing a fee on carbon-intensive goods from countries with less stringent climate policy. The policy is gaining traction, in particular following the announcement made by the European Union that a CBAM will be adopted by the end of 2022, to ensure EU companies can compete on a level playing field and avoid carbon leakage.

Policymakers increasingly recognise that free allocation of permits diminishes the incentive for industry to invest in decarbonisation, and further measures are needed to drive forward deep decarbonisation in energy-intensive industries.

Strengthening measures to prevent carbon leakage will remain a challenge for countries like the UK and EU member states that have relatively high carbon prices today and have committed to net-zero emissions targets over the next few decades. Maintaining sufficient

[1] The full report, which contains detailed analysis and an Appendix explaining the methodology, is available at www.lse.ac.uk/granthaminstitute/publication/what-does-an-eu-carbon-border-adjustment-mechanism-mean-for-the-uk

carbon pricing ambition should be at the heart of any UK climate policy reforms. This will enable greenhouse gases to be reduced in a fair and cost-effective manner and prevent exports from strategically-important energy-intensive UK sectors being penalised by an EU CBAM. Carbon market linkage should also remain a high priority for the UK post-Brexit.

Two scenarios for the UK: high convergence and high divergence with the EU

It is not yet clear what the EU will do in terms of implementing the CBAM it has announced will be adopted by the end of 2022. We have hypothesised two emblematic scenarios for the UK – high convergence and high divergence with the EU:

- ***High convergence with the EU*:** Here, we hypothesise that the UK coordinates with the EU on all policies supporting industrial decarbonisation, and a CBAM is applied to UK imports from the rest of the world.
- ***High divergence with the EU*:** Here, UK ambition falls and the EU charges a CBAM on UK exports to the EU.

While the likelihood that the UK's exports are penalised by an EU CBAM is small given that the UK and EU share the net-zero by 2050 ambition, this analysis reinforces the need for continued high ambition and convergence with EU policies on carbon pricing and CBAMs.

Potential economic impacts for the UK under a high convergence scenario

Our analysis looks at recent data on the trade flows from relevant UK sectors, employment, gross value added (GVA)[2] and production. We provide rough estimates based on the carbon content of recent trade flows. These reflect upper bound effects because they do not account for the price rise in affected products and import substitution. In reality, the demand for affected imports is expected to fall in response to the CBAM-induced price rise.

We explore the potential impacts of a CBAM using two possible scopes:

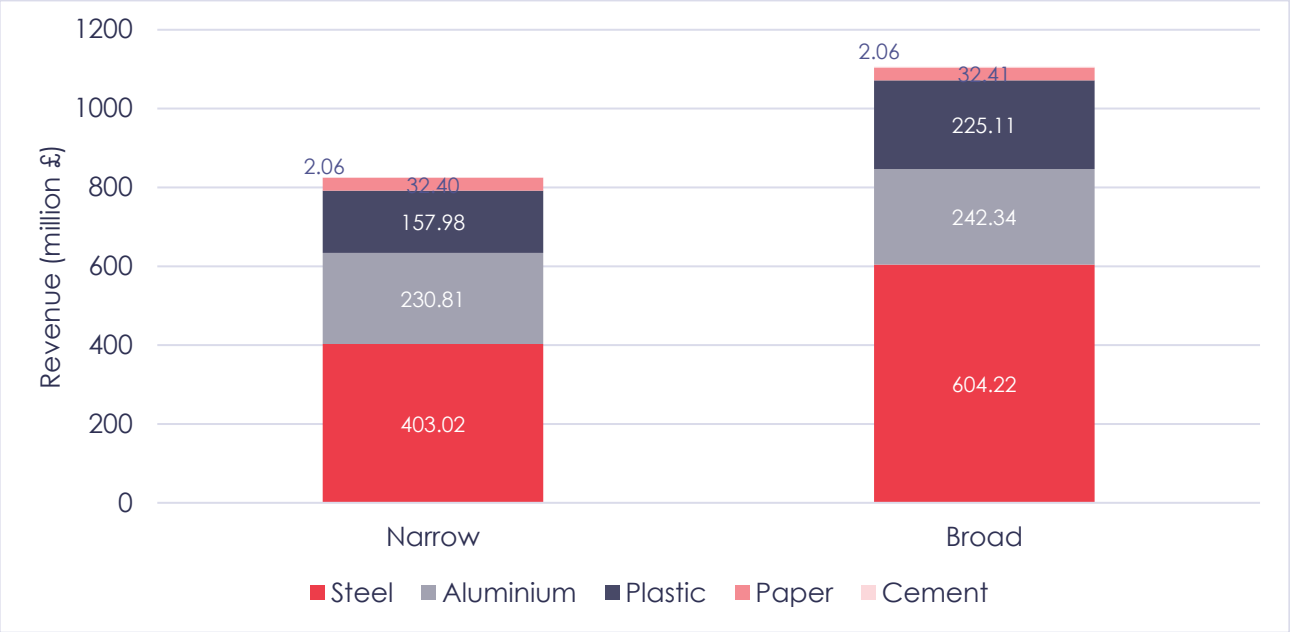
- ***The 'narrow' CBAM*** covers only raw material products, defined as those with content of at least one raw material greater than or equal to 90%.
- ***The 'broad' CBAM*** covers both raw material and semi-finished products with content of at least one raw material greater than or equal to 50%.

The impacts of the UK implementing and enforcing a CBAM (alongside the EU) on imports from non-EU countries are measured in terms of potential revenue to the UK exchequer.

The estimated economic impact is not trivial, even if only a narrow set of basic products are covered by the CBAM. Figure 1 below illustrates that if the UK enforced a CBAM on imports from non-EU countries on only raw materials of steel, cement, plastic, paper and cement, the tax revenues would be close to £800 million per annum, assuming an adjustment rate of €50/tonne of CO_2. If the scope were broadened to include semi-finished products, the tax revenue would increase to approximately £1.1 billion. These are upper bound estimates, and these impacts are likely to be moderated with some import substitution resulting from the price rise of imported raw materials. The biggest contributors are steel and aluminium, which account for almost 50% and 20% respectively of total revenue from raw materials and raw materials and semi-finished products.

[2] Gross Value Added (GVA) measures the contribution to the economy of each individual producer, industry or sector. It is the value of the amount of goods and services that have been produced, less the cost of all inputs and raw materials that are directly attributable to that production.

Figure 1. Potential annual CBAM revenue from UK imports from non-EU countries



Notes: 'Narrow' includes products with raw material content >=90%. 'Broad' includes products with raw material content >=50%. Revenues are 2010–2018 mean. The CBAM adjustment assumes €50/tonne carbon price in the EU and UK, full adjustment to all trading partner countries (no crediting of equivalent climate policies or exemptions for developing countries) and carbon intensities set to EU ETS allocation benchmarks (data from Pauliuk et al., 2016 – see Table 1, Annex).[3] *Trade volumes are average annual imports from non-EU countries between 2010 and 2018.*

It is important to stress that a CBAM should not be considered a revenue-raising instrument. Indeed, the measure should be viewed as environmentally motivated (a way to reduce emissions and preserve climate ambition) rather than fiscally motivated (a way to raise government revenue). Even though fiscal experts would recommend that all tax proceeds should be treated as general government revenue, to increase the international acceptability of the CBAM policy, the proceeds should be hypothecated towards low-carbon innovation and channelled towards mitigation and adaptation investments in Least Developed Countries (LDCs).

Implications for the UK under a high divergence scenario

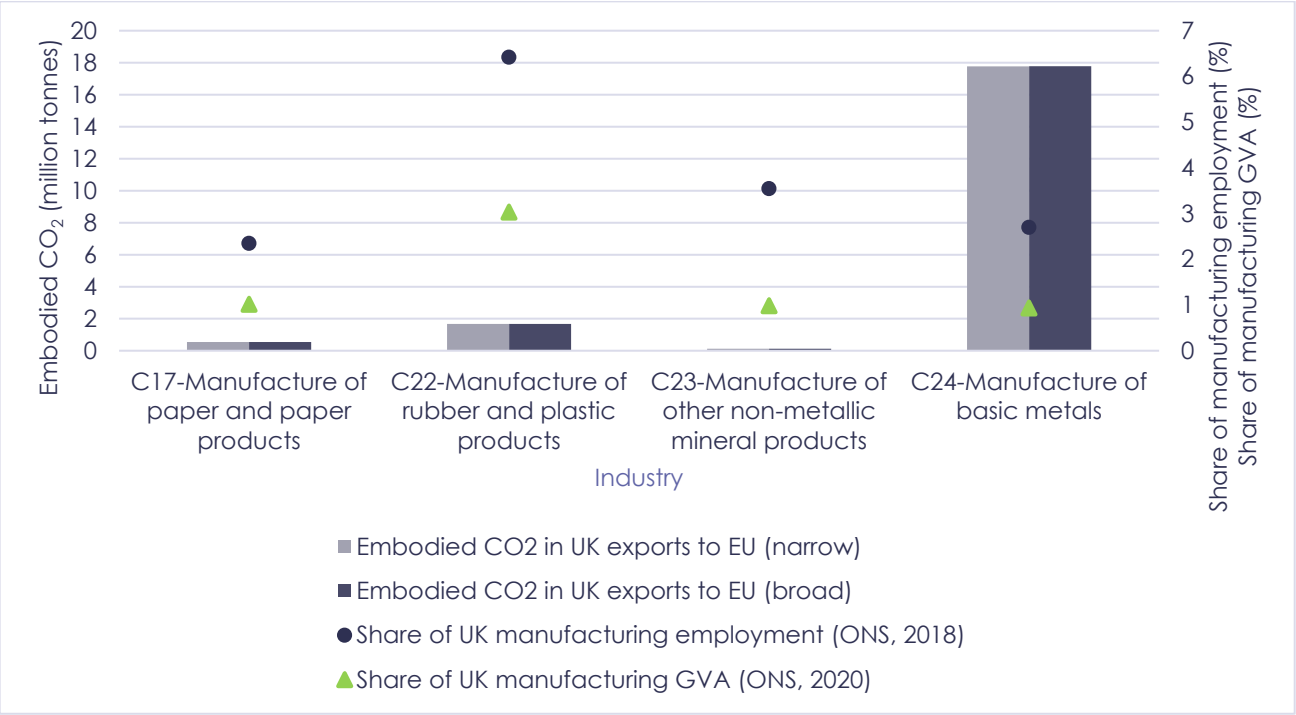
The EU trading block is the main destination for UK raw material exports. Between 2010 and 2018 the average annual value of UK exports of raw materials and semi-finished products to the EU was €58.9 billion, which equates to 13.5% of the average annual value of UK production over the period. If these exports were affected by an EU CBAM this would account for approximately 34% of the total value of all UK goods exported to the EU. This would suggest that it is important for the UK to retain its alignment on climate policy ambition with the EU, to avoid being charged a CBAM on UK exports.

[3] Pauliuk S, Neuhoff K, Owen A, Wood R (2016) *Inclusion of consumption of carbon intensive materials in emissions trading - quantifying the impact across commodity groups.* DIW Discussion Paper 1570. https://www.diw.de/documents/publikationen/73/diw_01.c.532381.de/dp1570.pdf

Importance of these sectors to the UK economy – value-added and employment

The importance of these industries to the UK economy can be assessed by examining each industry's share in manufacturing GVA or, alternatively, manufacturing employment – Figure 2.

Figure 2. Importance of industries to the UK economy



Notes: 'Narrow' includes products with raw material content >=90%. 'Broad' includes products with raw material content >=50%. Embodied CO_2 values are 2010–2018 mean.

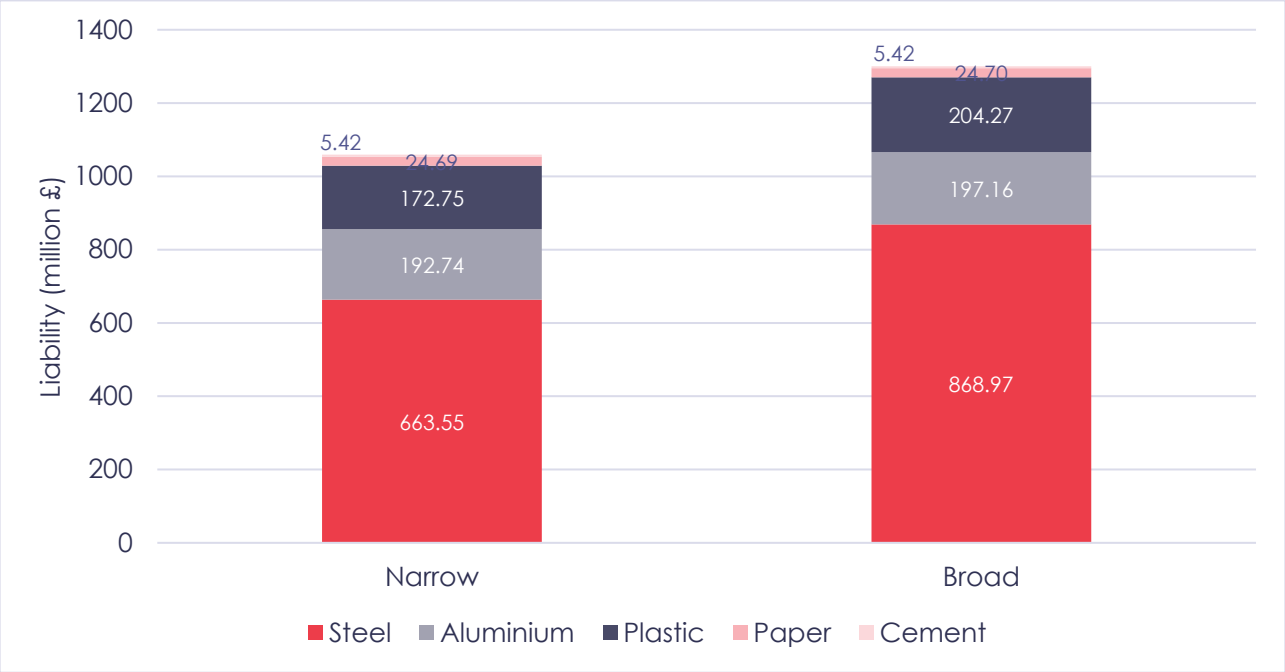
Manufacturing is a relatively minor component of the UK's service-sector-dominated economy, accounting for 10.1% of the total GVA and 8% of UK employment. Furthermore, Figure 2 shows that the industries examined here account for a small share of both manufacturing GVA and manufacturing employment. Of these industries, the manufacture of rubber and plastic products (C22)[4] has the highest share of both manufacturing GVA (at 3.03%) and manufacturing employment (6.42%). While manufacturing of basic metals (C24) contributes the largest amount of embodied emissions, it has the lowest share of manufacturing GVA (0.94%) and a low share of manufacturing employment (2.69%).

What are the economic impacts on sectors, industries and products in absolute terms and relative to export value?

In the unlikely event that the UK is fully subject to an EU CBAM, the potential liabilities would be large. Here, the economic vulnerability of a sector to a CBAM is largely driven by the carbon intensity of the traded materials. We estimate a potential liability that each sector, industry or product might face. We then examine the actual/relative impact of the CBAM in two ways: first, we look at the liability as a percentage of the monetary value of the trade flow; second, to put into context the importance of the EU market for each UK industry, we look at the liability against the export share of production.

[4] These numbers come from the Statistical Classification of Economic Activities in the European Community, commonly referred to as NACE.

Figure 3. Annual potential tax liabilities on UK exports to EU



Notes: 'Narrow' includes products with raw material content >=90%. 'Broad' includes products with raw material content >=50%. Liabilities are 2010–2018 mean. The CBAM adjustment assumes a €50/tonne carbon price in the EU, full adjustment to all trading partner countries (no crediting of equivalent climate policies or exemptions for developing countries) and carbon intensities set to EU ETS allocation benchmarks (data from Pauliuk et al., 2016 op. cit., Table 1, Annex). Trade volumes are average annual imports from non-EU countries between 2010-2018. The Appendix to our full report contains an additional scenario where the EU credits a UK carbon price of £22/tonne.

Across both scenarios, the largest tax liability is faced by the steel sector, followed by the aluminium then plastic sectors. Under the narrow CBAM scenario, the UK's raw-material steel, aluminium and plastic sectors would face £663.55m, £192.74m and £172.75m tax liabilities, respectively. When broadening the scope to include semi-finished products, tax liabilities across steel, aluminium and plastic are higher but remain the same for paper and cement. For the UK steel sector, broadening the product coverage to increase semi-finished goods increases the tax liability by 31% to £868.97m. For aluminium there is an increase of 2.2% to £197.16m and an increase for plastic by 18.2% to £204.27m. The larger increases for steel and plastic suggest that a CBAM on raw materials only does not significantly address leakage risk. In contrast, there is either a small or no change in liability for cement, paper and aluminium when the scope is enlarged. This shows that a narrow CBAM will capture almost all materials at risk of leakage in the cement, paper and aluminium sectors. A broad CBAM that covers only imports can result in the cumulation of charges for materials that are part of integrated value chains and cross the UK–EU border multiple times during the production process. To avoid being subject to the adjustment multiple times, a mechanism is necessary to account for the charge paid at earlier stages.

Our results are likely to reflect upper bound estimates for a number of reasons. First, manufacturing output and trade are likely to be adversely affected by an economic shock such as Brexit. Second, trade flows respond to prices and adjust over time in response to the policy. Third, the direct liability of an EU CBAM primarily falls on the EU importer, rather than the producer. While EU importers might absorb some of the charge, costs will inevitably be passed through the UK producers. Fourth, the EU CBAM design may incorporate exemptions for countries that are deemed to be taking equivalent climate

action, whether that is assessed at the national, sectoral or firm level. Exemptions may also be made on the basis of 'common but differentiated responsibilities', for example to least developed countries. Imports that are made with lower carbon intensities may be able to reduce the CBAM through an appeals process. The EU may also credit the UK carbon price, which would reduce the carbon price differential between the UK and the EU and consequently reduce the economic impact of an EU CBAM on UK exports. However, the issue of determining equivalence and comparing relative policy stringency and rules for policy crediting is complex and under-discussed, even though it is an important part of CBAM design.

Assuming the liability is paid, the relative price change[5] for each sector can be calculated as the percentage of the monetary value of the trade flow that the tax liability represents. Though the tax liability is greatest for steel in absolute terms under a narrow and broad CBAM, the relative price change is instead greatest for aluminium under a narrow CBAM and cement under a broad CBAM. This is because UK exports to the EU of aluminium have a much lower total value than steel and so the tax liability represents a relatively larger percentage of the value of the trade flow. Similarly, cement faces the lowest tax liability of all the commodities, but the relative price change for cement is relatively high for both groups, because the trade flow from the UK to the EU of cement has the lowest total value among these sectors. In contrast, plastic faces a high tax liability, but a small relative price change, due to the large total value of UK exports of plastic to the EU.

Table 1. Summary of liabilities and relative price change

Sector	**Monetary value of UK exports to EU (million £)**		**Tax liability (million £)**		**Relative price change (%)**	
	Narrow (Raw materials)	**Broad** (Raw materials and semi-finished products)	**Narrow** (Raw materials)	**Broad** (Raw materials and semi-finished products)	**Narrow** (Raw materials)	**Broad** (Raw materials and semi-finished products)
Steel	7,581.50	31,979.69	663.55	868.97	8.75	2.72
Cement	49.21	49.21	5.42	5.42	11.01	11.01
Paper	1,963.98	1,973.02	24.69	24.70	1.26	1.25
Aluminium	896.50	6,442.57	192.74	197.16	21.50	3.06
Plastic	7,541.68	12,193.61	172.75	204.27	2.29	1.68
Total (£ million)	18,032.87	52,638.1	1,059.15	1,300.52		

Industry-level analysis for the high divergence scenario

The extent of the impact on industrial sectors is largely influenced by two factors: economic liabilities caused by an EU CBAM and the strength of the trading relationship between the UK and the EU, which is indicated by the export share of production. We have combined these metrics in the charts below to aid understanding of the potential impact of an EU CBAM on UK exports.

[5] 100% cost pass-through provides an upper-bound cost estimate.

In Figure 4 the value of industry exports is indicated by the size of circle. On the basis of these two factors, the industry most directly hit by the CBAM would be manufacturing of basic metals (C24). This industry is an outlier in terms of both its export share of production and its tax liability. An export share of production of 1.73 conveys that the value of UK exports of raw material products to the EU in this industry exceeds the value of UK production, indicating that the UK re-exports products. This industry is also faced with a high tax liability of £800 million and contributes most significantly to the total value of UK exports of raw material products to the EU.

Figure 4. Potential impact of a narrow EU CBAM on UK exports from industrial sectors

Notes: 'Narrow' includes products with raw material content >=90%. Liabilities are 2010–2018 mean.

The UK should prioritise alignment with the EU on anti-carbon-leakage measures

A robust carbon pricing framework with anti-leakage measures is needed to support the deep decarbonisation of industry in the UK. This includes higher carbon prices than those currently in place. A carbon price that is consistent with achieving net-zero would start at £54/tCO_2 (with a range of £40–100) in 2021, reaching £75/tCO_2 (£60–140) in 2030. However, carbon pricing needs to be part of a broader framework to support the low-carbon transformation of these energy-intensive sectors. This includes high convergence and collaboration and market linkage with the EU, which would provide a common platform on which to collaborate with the EU on anti-leakage measures. Failure to sufficiently align with the EU risks undermining the role of UK carbon pricing in supporting deep decarbonisation in sectors that would otherwise be at risk of carbon leakage. Collaboration with the EU on carbon pricing and anti-leakage measures remains an area for close multilateral cooperation.

Conclusions

Overall, our analysis has shown that the potential impacts of an EU CBAM are focused on a few areas of the UK's economic activity. While the majority of vulnerable sectors account for small shares of emissions and employment, this does not mean that their potential emissions leakage can be ignored. In the unlikely event that the UK is fully subject to an EU CBAM, the potential liabilities would be large in absolute and relative terms (measured by the relative price change), with the manufacture of steel and basic metals (C24) particularly prone to leakage. This is due to the fact that the EU is the UK's main trading partner. The product coverage of the CBAM also has significant implications for the expected leakage and competitiveness impacts as well as paid/collected fiscal revenue. It matters particularly for steel, where semi-finished products account for a significant share of sectoral trade-embodied carbon.

This analysis reinforces the need to reduce uncertainty around the UK's post-Brexit climate policy and particularly around anti-carbon-leakage measures, while prioritising high decarbonisation ambition, carbon market linkage to nullify the impacts of an EU CBAM, and collaboration with the EU on anti-leakage measures.