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POLICY BRIEF

LIFE COASE – Collaborative Observatory for ASsessment of the EU ETS

Ex-post evaluation of emissions trading in 2023: focus on distributional and competitiveness effects

Highlights

- This policy brief reviews some of the latest studies on distributional and competitiveness effects that were presented at the International Conference on Ex-Post Evaluation of Emissions Trading organised under the framework of the LIFE COASE project.
- Two main barriers to carbon pricing recur increasingly in the relevant literature: fears about negative impacts on the competitiveness of businesses if carbon prices are imposed unilaterally at the national level; and concerns about fairness, especially in relation to low-income households.
- On average, low-income households are likely to be disproportionately affected by carbon pricing, but there are significant disparities

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within income groups. Factors like rural or urban residence, the energy efficiency of homes, and commuting requirements all influence how households are impacted.

- Revenues from carbon pricing are increasing and governments need to choose wisely how to spend them. Green investments in energy efficiency or low-cost renewables, as opposed to lump sum payments, reduce long-term costs for households and contribute to climate targets. Fairness and distributional issues are key to public perceptions and to the social acceptability of carbon pricing. Levels of support can be increased by devoting the revenues to green investments.
- The literature suggests that there is currently little evidence of negative effects from carbon pricing on productivity and employment. Little evidence of carbon leakage has also been reported. Some evidence of innovation was found in terms of directed technological change, which may increase competitiveness.
- As the caps in emission trading systems tighten and carbon prices rise, there is nervousness of larger impacts on competitiveness of EU industry. This particularly affects the energy-intensive sectors, which have to buy their permits instead of receiving them for free.

Introduction

Carbon pricing has long been economists' favoured tool of carbon emissions reduction. It is increasingly being applied, both as carbon taxes and through Emissions Trading Systems (ETSs). However, carbon prices are still typically low, and well below both mainstream estimates of the Social Cost of Carbon (SCC)[1] and the carbon prices estimated to be required to meet the temperature targets of the Paris Agreement.

Two main barriers to carbon pricing recur increasingly in the relevant literature: fears about negative impacts on the competitiveness of businesses if carbon prices are imposed unilaterally at the national level; and concerns about fairness, especially in relation to low-income households and individuals. Some of the latest studies in these fields have been presented at the International Conference on Ex-Post Evaluation of Emissions Trading, held on 20 June 2023 at the Florence School of Regulation[2] in the framework of the LIFE COASE project[3] and are summarised in this policy brief.

Distribution and fairness

The distributional issues related to carbon pricing are largely driven by perceptions of 'fairness' – to self, to others and in respect of governmental procedures for its introduction (Steckel, 2023). Most obviously, such issues can be considered between different income groups, e.g., between the richest and poorest groups (vertical distribution), but also looking at 'hardship cases' within different groups (horizontal distribution). Governments obviously have the option of changing the first-order distributional effects from carbon pricing by making transfers within or between groups, perhaps using the revenues from the carbon price, or by using the revenues in different ways. What they do with the revenues, and how they do it, is important not just for the distributional outcome but also for perceptions of procedural fairness.

1 The Social Cost of Carbon (SCC) tries to estimate the economic damages that is caused by emitting one ton of CO2 into the atmosphere.

2 The programme and other details of the conference, including the presentations, may be found at https://fsr.eui.eu/event/international-conference-on-ex-post-evaluation-of-emission-trading/. A first version of this policy brief can be found in the following deliverable of the project LIFE COASE: https://fsr.eui.eu/wp-content/uploads/2023/10/Deliverable-5.1_Summaries-of-Workshop-and-Conference-2023.pdf

3 More information about the project LIFE COASE can be found here: https://lifecoase.eui.eu

On average, low-income households are likely to be disproportionately affected by carbon pricing, but it is also crucial to recognize significant disparities within income groups. Factors like rural or urban residence, the energy efficiency of homes, car ownership and commuting requirements all influence how households are impacted. Governments need to choose wisely how to spend the revenues. There was a clear preference for green investments, such as energy-efficient renovations, rural transport initiatives, and electric vehicle adoption. These not only reduce long-term costs for households but also contribute to climate targets. Direct income support to households, in contrast, may not be as effective.

Steckel (2023) finds that carbon pricing is more progressive in poorer countries, when it is applied to transport, and when its wider economic effects are taken into account. Between groups, the key variable that determines whether the first-order effects of carbon pricing are regressive is expenditure on carbon-based energy. In richer countries, such energy expenditure is normally a higher proportion of poor households' expenditure than for rich households, so that the first-order effects are regressive, but this is not true for poor countries. Analysis using Steckel (2023)'s dataset, that excludes North America and most European countries, finds that carbon pricing is not regressive for the Sub-Saharan African countries except South Africa, for Latin American countries except Peru, and for most Asian countries, including China and the countries of South and South-East Asia, although there are regional differences within countries, and the effects in individual countries depend crucially on the design of the carbon pricing. Policy-relevant studies of carbon pricing therefore need to take regional and local differences into account.

Within groups, there can be huge variation in the first-order effects of carbon pricing. For example, while in Vietnam the median effect on the poorest quintile was 2.4%, 5% of that quintile experienced an effect of more than 7% – and it is often different characteristics across groups (e.g., rural vs. urban, or car ownership, as noted above) that generate the largest political impacts. In Latin American countries, while in the majority of countries energy expenditure was the most important variable in explaining the impacts of carbon pricing, for Costa Rica, the Dominican Republic, Guatemala and Mexico, the key explanatory variables were car ownership and cooking fuel. Unintended consequences from carbon pricing or subsidy reform can also be important, as when the removal of fossil fuel subsidies for clean cooking fuels causes a resumption of reliance on biomass for cooking, with its negative health and environmental effects. However, the first-order effects, within groups, between different characteristics, and unintended consequences vary so much according to the context that generalisations are not helpful, and each case needs to be assessed in its own right.

Much the same is true when governments seek to compensate for distributional effects through tax reform or social transfers, when much depends on the existing structure of taxation and the coverage of social transfer schemes. In each case, it is possible to design a system that is progressive overall, but which still misses out non-negligible proportions of the poorest and worst affected households. When transfers are used, a targeted transfer will be more beneficial for the majority of low-income households but will exclude certain 'hard-to-reach' poorer households, while a universal transfer, such as a lump sum per person or household, will be more inclusive. That said, where lump sum distribution has been tried, evidence from Canada suggests that people have an inaccurate perception of what sums they are actually receiving, and their perceptions tend to align more with their political orientation than with the reality of the situation and strongly affect the social acceptability of policies. Governments which wish to use carbon pricing should put effort into communication about what they are doing, and why and how they are using the revenues.

An interesting result on an alternative use of the revenue is that in some cases compensation schemes can be made twice as progressive by using (some of) the revenues to invest in basic infrastructure (e.g., electricity, sanitation, water) for the poor. However, the time lags for the investment benefits to become apparent may not help with the immediate acceptability of the carbon pricing measure.

Fairness and distributional issues are key to public perceptions, and social acceptability more generally, of carbon pricing. Apart from issues of cost, some of those who oppose carbon pricing do so

because they do not perceive it to be effective, although levels of support can be increased by devoting the revenues to 'green spending', and, perhaps, by avoiding the use of the term 'tax' and levying the carbon pricing upstream.

The EU's Social Climate Fund (SCF) is a prime example of an instrument that seeks to address distributional issues arising from carbon pricing, since it will channel part of the revenues from the EU ETS to support vulnerable groups affected by rising energy or transport costs. The fund, which is meant to come into force in 2027, allows for temporary direct income support and for investments in energy efficiency, renovation of buildings, clean heating, and cooling as well as low-emission mobility including public transport. Some major challenges persist with regard to revenue spending and the SCF. For example, more data and indicators are needed to identify individuals most at risk of being impacted by rising energy and transport costs.

One approach to carbon pricing in climate policy which has so far not won the support of policymakers is a mandatory global policy that applies to all countries. Yet a global survey, reported on by Fabre (2023), finds high levels of support for such policy, whether this entails dividing up the global carbon budget between countries on the basis of their population, or levying a global tax on millionaires to finance sustainable development in low-income countries. Focusing specifically on the Global Climate Scheme (GCS), an emission trading system in which a basic income is paid to all people out of the proceeds of emission auctions, Fabre (Fabre et al., 2023) finds a modest level of global support, with generally stronger support in European countries than in the USA. This support is broadly replicated for a whole range of other policies that would result in redistribution from richer to poorer countries to enable climate action in those countries. Moreover, further tests suggest that this support is sincere, that it is not the result of social desirability bias, and that the GCS would not be unpopular electorally. A remaining question is why such stated support has not yet translated into actual global policies along these lines. There is as yet no clear explanation as to why this is the case.

Another survey reported by Funke et al. (2023) examined differences in perceptions and attitudes in relation to carbon taxes and emissions trading, with the former hypothesised as being more salient to consumers and, perhaps, government, and the latter more relevant to businesses. Relative support for these two instruments varies in different European countries, but overall stands at about 40% for each. Preliminary work reported by Funke (Funke et al., 2023) correlated the support for each instrument across a wide range of characteristics and perceptions, some of the most significant of which are reported here.

For example, the possession of a college degree was positively correlated with support for a carbon tax but slightly negatively correlated with emission trading. Concern about climate change was, perhaps unsurprisingly, positively correlated with support for both tax and trading, with tax showing the more positive correlation. There was a positive correlation, too, between carbon pricing (both tax and trading) and those with a green voting preference, with tax again showing the stronger correlation. Those with liberal voting preferences showed a positive correlation with support for trading but a negative correlation with support for a tax. The belief in a strong role for government in the net-zero transition correlated with support for both tax and trading, with tax again the slightly stronger correlation. While perceptions that the instrument was easy to evade was correlated negatively with support for an ETS as expected, it was surprisingly correlated positively with support for a tax. Support for both instruments was correlated positively with perceptions of trust in government, but only for trading with perceptions of trust in business. Support for both instruments was also positively correlated (trading more than tax) with perceptions of equitable burden sharing, but only support for trading was correlated with perceptions that the instruments increased the government budget. Support for both instruments was strongly correlated (trading more than tax) with perceptions of both their effectiveness in reducing emissions and their positive effects on innovation. On the negative side, support for both instruments was negatively correlated (tax more than trading) with perceptions that they increased the cost of living and had a negative effect on the economy. Perhaps as a result of this, support for both instruments was negatively correlated with those in the lowest income tertile. Comparing a carbon tax and

the EU ETS directly, the most significant effects of a shift from a carbon tax to trading were perceived to be increased fairness of both burden sharing and ease of evasion, and lower effectiveness of emission reduction, negative effects on the economy, increases in the cost of living and increases in the government budget.

EU governments receive significant revenues from the EU ETS: revenues from auctions, 50% of which are intended to be invested in decarbonisation, and funds from the 10c derogation applicable to some countries to help them modernise their electricity sectors. Poland was the largest EU recipient of derogation 10c funds. Sobkiewicz and Kobyłka (Kobyłka et al., 2023) evaluated the impact of these funds in Poland from 2012-2020, focusing particularly on their impact on the level of investment and the development of infrastructure in the context of the energy transition and the achievement of sustainable development objectives.

The evaluation showed that the auction revenues were not invested in ways that brought about significant additional decarbonisation, and there were few investments in infrastructure. The 10c derogation funds financed 378 projects, but 82% of these were focused on coal-fired plants, and only 1% involved investment in renewables. Nor did the derogation funds fulfil the other required objectives of these funds, namely that they should contribute to diversification of the supply mix and should not cause distortion in the power market. These funds were allocated to the coal-fired power sector and resulted in a negligible (1%) increase in renewables. Neither funding source was therefore effective in contributing to the objectives for which they had been established. It may be that the changes to the regulations after 2020 will lead to an improvement in the way these funds are being used. At the same time, carbon prices in these systems are becoming both higher and more volatile, and this introduces both uncertainty for businesses in the business cycle and potential risks for the financial system.

A specially constructed model showed that the two main drivers of the ETS price and its associated volatility, in respect of the EU ETS, are 'abatement shocks' (i.e., the trajectory of emission reduction) and 'climate sentiment shocks' as a result of other climate policies (Benmir et al., 2023). Optimality in respect of carbon pricing is achieved when the carbon price follows the SCC. A comparison between this and the ETS price shows that the SCC is a factor of 10 less volatile than the ETS price. A carbon cap rule that adjusts the cap in order to make it as close as possible to the SCC is shown to reduce significantly the volatility in the carbon price from the ETS.

Competitiveness and industrial transformation

As noted in the Introduction, fears about the loss of economic competitiveness are a major barrier to the implementation of carbon pricing at the national level, in the absence of global harmonised carbon pricing. This economic concern spills over into environmental concern, because if low carbon prices in some regions incentivise the movement of economic activity there, carbon emissions in those regions may increase, offsetting the emission reduction in high-price regions – a phenomenon known as carbon leakage.

The literature cited at the conference on these issues is relatively clear: there is currently little evidence of negative effects from carbon pricing on productivity and employment (Trinks, 2023; Bremer, L. and Sommer, K., 2023); there is very little evidence of carbon leakage (Dechezleprêtre et al., 2019; Martin et al., 2014); and there is some evidence of innovation in terms of directed technological change, which may *increase* competitiveness (Calel, R. and Dechezleprêtre, A., 2016). However, as the caps in emission trading systems tighten, and carbon prices rise, there is nervousness in respect of the EU ETS of larger impacts on competitiveness, especially if energy-intensive sectors have to buy, rather than be freely allocated, their emission allowances in the future, as is foreseen. This has led to the introduction by the European Union of the CBAM,[4] with a view to 'levelling the playing field' between carbon-intensive imports and the EU's energy-intensive industry, by charging a levy on imports that reflects the embodied emissions and related carbon pricing of the exporting country.

4 See https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en#:~:text=On%201%20October%202023%2C%20the,importers%20ending%2031%20January%202024.

The EU ETS is of course just one emissions trading system, and in recent years, many other such systems have been established, or are under development. Wang (Ruijie, T. et al., 2023) explored emissions reduction in different sectors as a result of the introduction of the ETS in Beijing. Phase 1 of this ETS ran over 2013-2015 and involved firms with emissions greater than 10 $ktCO_2$. An interesting difference between the introduction of this scheme and that in Europe was that in Europe the criteria for being involved in the scheme were announced well in advance, whereas in China the criteria were only announced immediately before the scheme was introduced, so there was no 'announcement effect' before the scheme's introduction. In Phase 2, from 2016, the threshold for inclusion in the scheme was lowered to 5 $ktCO_2$. By estimating the emissions reduction in affected firms over 2013-2015 Wang (Ruijie, T. et al., 2023) showed that there was significant emissions reduction in industry, but no significant reduction in service sectors, with the reduction among heavy coal users being the largest of all. The main abatement mechanism seemed to be fuel-switching away from coal. A further piece of analysis indicated that the way emission allowances were allocated did not significantly affect emissions, except perhaps among smaller and service sector firms, for whom the transaction costs may have been non-trivial.

Bremer (Bremer and Sommer, 2023) explored many of the same issues, specifically competitiveness (employment and profits) and technology adoption (investments) in relation to Dutch manufacturing firms (actually coherent 'business units' in these firms) involved in the EU ETS, split into three cohorts, with Cohort 1 (the most energy-intensive) involved in the ETS's Phases 1, 2 and 3, Cohort 2 only involved in Phases 2 and 3 and Cohort 3 only involved in Phase 3. The findings of the regressions, which compared the companies in the ETS with matched controls, suggest (using a difference-in-difference [DiD] methodology) that Cohort 1 experienced some initial negative effect on employment in Phase 1, but that this disappeared in Phases 2 and 3, while this effect persisted through the three Phases when using a two-way fixed effects methodology (TWFE) (i.e., methodology matters). Neither method showed significant effects on profits but DiD did show a lasting negative effect on investment, which was absent in TWFE.

The impacts of the EU ETS on industrial competitiveness were also the focus of Cameron (2023), with the addition of the associated risk of carbon leakage. The literature on the risk of carbon leakage is divergent. Theoretical studies suggest that the risk is high, ex-ante modelling finds that it depends highly on input assumptions, such as elasticities, and ex-post evaluations suggest that it is small. It is possible that explanatory factors for this divergence may include the allowance allocation method (e.g., free allocation), the stringency of the policy (with ETS prices being low until quite recently) or the structure (e.g., the degree of monopoly) of the industries concerned. In terms of measuring the risk of carbon leakage, the European Commission's indicators (trade intensity, emission intensity, and qualitative assessment of threshold cases) have been found to overestimate the carbon leakage risk. The focus of Cameron (Cameron, 2023) was to explore the potential implications of market structure for carbon leakage risk, by using a hypothetical monopolist test for market power (asking whether the profit after a 5% price increase is higher than before the increase) and estimating substitution elasticities for different products (in this case hydraulic cement, clinker, and flat and long steel) over the period 2008-2018. The main results of this estimation suggest, somewhat counter intuitively, that "cement products are more substitutable between countries than steel products; sub-products do not vary substantially in terms of their substitutability"; and that steel is mostly traded in national markets while cement has mostly regional and sometimes global markets. The focus of this paper on substitutability is complementary to a focus elsewhere in the literature on pass-through rates of the value of emission allowances, and an interesting extension of this work would be to link the two concepts.

Arlinghaus (Arlinghaus et al., 2023) focused on the way in which climate policy, especially the EU ETS in Europe, affects the financial sector, given the price volatility of EU ETS allowances and the differential exposure of firms, and therefore banks, to the EU ETS. In Phase 3 of the EU ETS the introduction of the Market Stability Reserve and increase in the Linear Reduction Factor (LRF) in the supply of allowances put upward pressure on the EU ETS price. At the same time, the introduction by the European Central Bank of a Negative Interest Rate Policy (NIRP) in 2013-2014 constituted a

shock to the financial sector that was felt differentially by banks, with those with the highest deposits/assets ratios being the most affected. The result is that the most affected banks had a stronger incentive to increase their lending, and the paper analysed whether they did so differentially between ETS and non-ETS firms. The results of the analysis suggest that banks increased their lending in the short run to ETS firms more than to non-ETS firms, and reduced the required collateral for these loans, and their estimated probability of default, for these ETS firms. While the reasons for these results are unclear, one hypothesis is that, in line with the Porter hypothesis, the regulation through the ETS caused ETS firms to increase their innovation and investment.

Trinks (2023) investigated the possible carbon leakage from carbon pricing, covering 15 industrial sectors and 32 countries over 2000-2014, and using both explicit and implicit carbon prices, with the latter being estimated from other taxes (e.g., fuel duties) or other measures of climate policy, such as standards and regulations. Six dimensions of firm performance (sales revenue, investment, employment, profitability and firm exit) were regressed against these carbon costs, and only employment showed a significant but small reduction, with a USD 50/tCO_2 carbon price leading to a 2.5% reduction in employment. However, the results show considerable heterogeneity across different types of firms, with the greatest effect on employment being shown in small firms most subject to leakage risk, which also showed the largest increase in productivity, while large and capital-intensive firms in covered sectors showed the greatest (but still quite small) increase in investment. Both profit and the probability of exit were hardly affected at all for any type of firm, while the (negative) employment effects and (positive) investment effects were most clearly shown in EU countries. There is thus little evidence in this analysis for adverse economic effects and relocation from carbon pricing, and such small effects as are seen are concentrated in small sub-groups in sectors affected by leakage. One possible explanation for this is that carbon costs over the period were relatively low, and they may therefore have larger effects in the future if they increase significantly, although countervailing policy measures, such as the CBAM may mitigate this.

CBAM was the explicit topic of Wildgrube (2023), which first explored whether CBAM creates a 'level playing field' for the products (iron and steel, aluminium, cement, electricity, hydrogen, ammonia and fertilisers), to which, from 2027, it will apply. In principle, CBAM will equalise carbon costs for the covered products when sold in the EU. However, many other market distortions will remain, including carbon costs in export markets and special financial support in some EU countries for electricity and renewables. Importers may be disadvantaged by CBAM's incidence on imported *products*, whereas the EU ETS applies to *installations*.[5] In fact, given the huge differences that exist in markets in different countries, it may be that the focus on the level playing field is misleading, and may even stand in the way of industrial transformation, which has historically been a characteristic and driver of industrial development. To enable low-carbon transformation in the EU, perhaps, rather than worrying about trade effects of carbon pricing, the policy focus should be on installing low-carbon infrastructure, developing low-carbon technologies and providing regulatory certainty. Abroad, it may be that the EU should seek to encourage carbon pricing more flexibly than seeking to equalise carbon costs between its own products and imports in its own markets.

If the focus is to be on industrial transformation, then clearly research has a crucial role to play in the development of technologies and of scenarios as to how such transformation might take place and what it would look like.

Pommeret (2023) is another exploration of the trade effects of a border carbon adjustment (BCA), in the context of a wider piece of work on short-run transition risk from climate policy. Such risk could arise from multiple interacting causes including Keynesian shocks (investment), inflation, input substitutions, stranded assets, labour adjustments (with sectoral heterogeneity), technological

5 Imported goods in the sectors covered by CBAM will pay a carbon price on embedded emissions from 2027, taking into account carbon prices already paid in the country of origin. For the same sectors, free allowances will be phased out in the EU ETS to create a level playing field so European sectors will be exposed gradually to the full carbon price. However, market distortions may persist, as noted in the main text.

change, shocks on competitiveness, sufficiency/sobriety (lifestyle change), critical raw materials, social acceptability, and financial contagion. The focus of this paper was on the last of these, modelling how ambitious climate policies such as a carbon tax and BCA might transmit across borders, with and without financial frictions, leading to difficulties in financing investments. Scenarios explored the impact of an unexpected carbon tax of USD 80/tCO_2 being imposed in the home economy, both with and without financial frictions. Without these frictions, there is carbon leakage and negative economic impacts on the home country's polluting industry, as capital flows abroad and into the green sector at home. Introducing financial frictions exacerbates the negative economic impacts at home, reducing output also in the home non-polluting sector, but also has a negative impact abroad, the carbon tax shock being transmitted through both home and foreign banks, and resulting in a lower capital stock in both the polluting and non-polluting sectors. In this case, there is still carbon leakage, but it is smaller. The imposition of a BCA on foreign polluting goods amplifies all these negative effects but reduces leakage further. A conclusion of the paper is that it seems important to take account of financial sector linkages when assessing the impact of both carbon taxes and BCAs.

Feng (2023) concentrated on the practical details involved in CBAM, specifically on the procedures that might need to be followed by importers of goods in the covered sectors into the EU in order to verify the carbon intensity of their products. For simple products, it might be sufficient simply to calculate the carbon intensity of the power inputs to production. But for complex products, for example from the chemical industry, determining their carbon intensity would involve complex processes of life cycle assessment, involving multiple stakeholders. The complexity means that it is unlikely that a single 'one-size-fits-all' set of guidelines or regulations would be adequate, but at the same time a case-by-case approach may not be manageable. Feng (2023) proposed a "coordinated social governance scheme" involving guidelines from the government, a self-regulated assessment by industry, with professional third-party certification, and social reliance on competitors, NGOs or whistle-blowers within the company to expose poor or inadequate practices.

The USA's Inflation Reduction Act (IRA) seeks to stimulate innovation and boost low-carbon industrial transformation by directing federal spending and tax breaks amounting to $500 billion. Although the IRA was outside the scope of the conference, it may be seen as an alternative means to CBAM of accelerating the clean energy transition, while not disadvantaging domestic industry, although its national content requirements certainly also act as a barrier to trade. Moreover, the internalization of environmental externalities is better addressed by carbon pricing rather than subsidies. Perhaps some combination of carbon pricing and innovation support would be the best approach and would be better still if a single approach could be harmonised across countries. While such harmonisation has been achieved in some health-related sectors, e.g., pharmaceuticals or food standards, it would probably prove more difficult to achieve with carbon abatement.

Conclusions

Carbon pricing through emission trading seems to be outpacing carbon taxation as the pricing instrument of choice.

The main research questions and methods related to carbon pricing have not changed much over the years. However, there is a new focus on social aspects, perceptions, and public acceptability, especially in respect of the spending of revenues. CBAM is a new topic of research. There is a general need for better understanding and assessment of the real-world implications of carbon pricing policies, and of the interactions between different policies.

Social dimension of emissions trading

In respect of the distributional impacts of carbon pricing, the key issues seem to be the targeting of compensation schemes, and their communication to ensure that stakeholders, and particularly those most impacted by the schemes, are more aware of them. Notwithstanding evidence of a lack of awareness of carbon pricing and mechanisms for using the revenues therefrom, a global survey suggests widespread majority support for carbon pricing, which leaves the unanswered conundrum why policymakers have so far not succeeded in introducing a global carbon price.

In general, the social aspects of climate and ETS policies are gaining new importance, both in academia and in policymaking. There is a growing awareness that carbon pricing, especially when applied to heating and transportation, can have significant distributional consequences. Without appropriate redistribution of carbon pricing revenues, higher energy and fuel prices and a shift in labour markets may present a particular burden for low-income households. However, it appears that if only a part of the revenues that are generated in ETSs are redistributed to lower-income households, or on a lump-sum basis, carbon pricing can be made distributionally progressive. It is thus an important task of policy instruments seeking a just transition to use ETS revenues to achieve progressive outcomes.

Carbon pricing is likely to raise increasing amounts of money that, spent wisely, can benefit poor households, and accelerate the green transition. Both good design and better communication about social distribution measures are needed.

Competitiveness and carbon leakage

On competitiveness and the low-carbon energy transition more broadly, two very different approaches are being tried in Europe (CBAM) and the USA (Inflation Reduction Act).

There is a long-standing concern that carbon pricing might jeopardize the competitiveness of domestic industries and lead to carbon leakage. This risk arises from the difference in environmental ambition and stringency of climate policies across countries that would negatively impact the competitiveness of firms in countries with more ambitious climate goals, potentially shifting pollution-intensive production to regions with less stringent climate policies. Until now there has been little evidence of carbon leakage as a result of the EU ETS, but there are legitimate fears that this may not be the case as carbon prices increase and energy-intensive sectors have to start paying for their emission allowances. In fact, some recent evidence shows that both production and exports from energy-intensive industries in Europe have declined, while imports have risen, indicating a loss of competitiveness.

Furthermore, the evidence for carbon leakage identifies significant heterogeneity at the sector and firm-level, meaning that different countries, sectors, and firms within those sectors may be affected very differently from the loss of competitiveness that leads to carbon leakage. As a result, policies with flexibility in policy design are essential to tackle these differentiated impacts and to support affected firms that are concentrated in specific geographical areas or sectors.

Despite complexities in its implementation, the EU's introduction of CBAM could represent an initial step in addressing this challenge. The ongoing negotiations surrounding CBAM have already had significant repercussions in other ETSs, including those in the US and China. However, for this instrument to be effective in preventing carbon leakage, the EU's focus should be on safeguarding industries most vulnerable to carbon leakage, with an emphasis on investment rather than compensation measures. In parallel to CBAM, the EU should also intensify efforts in the realm of innovation policy and continue initiatives related to international cooperation, the reduction of fossil fuel subsidies, and the facilitation of trade policies.

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