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A CO₂-border adjustment mechanism as a building block of a climate club

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KIEL POLICY BRIEF

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A CO₂-Border Adjustment Mechanism as a Building Block of a Climate Club



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- The EU steps up its efforts to curb its territorial CO₂-emissions. It is planning to introduce a carbon border adjustment mechanism (CBAM) to level the playing field and to raise own resources.
- However, unilateral European climate policy action, whether shored up with a CBAM or not, can only play a limited role in reducing global CO₂-emissions.
- A EU-CBAM cannot stop indirect leakage, it has ambiguous effects on other countries' mitigation efforts, and it poses the risk of conflicts with trade partners.
- The EU, together with the US and other like-minded countries, should push hard to establish a climate club with a common minimum price of CO₂ and a common CBAM applied to third countries.
- Such a framework would incentivize other countries to join while limiting leakage and reducing the risk of trade policy disputes.

OVERVIEW/ÜBERBLICK

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- A EU-CBAM cannot stop indirect leakage, it has ambiguous effects on other countries' mitigation efforts, and it poses the risk of conflicts with trade partners.
- The EU, together with the US and other like-minded countries, should push hard to establish a climate club with a common minimum price of CO₂ and a common CBAM applied to third countries.
- Such a framework would incentivize other countries to join while limiting leakage and reducing the risk of trade policy disputes.

Keywords: Climate Policy, Carbon Leakage, Carbon Border Adjustment, Climate Club

- Die EU verstärkt ihre Bemühungen zur Eindämmung ihrer territorialen CO₂-Emissionen. Sie plant die Einführung eines CO₂-Grenzausgleichsmechanismus (CBAM), um das Spielfeld zu ebnen und ihre Eigenmittel zu erhöhen.
- Allerdings können unilaterale europäische klimapolitische Maßnahmen, ob nun mit einem CBAM abgesichert oder nicht, nur eine begrenzte Rolle bei der Reduzierung der globalen CO₂-Emissionen spielen.
- Ein EU-Grenzausgleich kann das so genannte indirekte Leakage nicht stoppen, er hat unklare Auswirkungen auf die klimapolitischen Anstrengungen anderer Länder und birgt das Risiko von Konflikten mit Handelspartnern.
- Die EU sollte zusammen mit den USA und anderen gleichgesinnten Ländern daran arbeiten, einen Klima-Club mit einem gemeinsamen CO₂-Mindestpreis und einem gemeinsamen CBAM gegenüber Drittländern zu gründen.
- Ein solches Rahmenwerk würde Anreize für andere Länder schaffen, sich dem Klub anzuschließen, während es gleichzeitig das Leakage-Risiko begrenzt und das Risiko von handelspolitischen Streitigkeiten verringert.

Schlüsselwörter: Klimapolitik, Carbon Leakage, CO₂-Grenzausgleich, Klimaclub

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A CO₂-BORDER ADJUSTMENT MECHANISM AS A BUILDING BLOCK OF A CLIMATE CLUB*

Felix Bierbrauer, Gabriel Felbermayr, Axel Ockenfels, Klaus M. Schmidt, and Jens Südekum

1 REASON FOR THE EXPERT OPINION

The European Union (EU) and Germany are stepping up their climate policy efforts. The EU aims at reducing net greenhouse gas emissions to zero by 2050.¹ Emissions are expected to be at least 55 percent below 1990 levels by 2030; before, savings of at least 40 percent had been planned. The European Commission has even made climate action “the top political priority”.²

The EU sees itself as a pioneer and wants to promote decarbonization even if other major issuers do not step up their efforts. It is still unclear with which instruments the EU intends to implement its objectives. In particular, it has not yet been determined what role CO₂-prices will play. Nevertheless, on 12 December 2020, the European Council called on the Commission to make a proposal for a “border adjustment mechanism to ensure the environmental integrity of EU policies and avoid carbon leakage in a WTO-compatible way”.³ The Commission considers that such a system is necessary “in the absence of comparable increases in ambition by our partners”.⁴

Two proposals are currently being discussed in politics and the public: (i) a border adjustment mechanism that subjects imports to carbon pricing (and possibly exempts exports from domestic carbon pricing), and (ii) a consumption levy that makes domestic consumption of CO₂-intensive goods more expensive and provides for the continued free allocation of allowances.⁵ In both cases, the objective is to compensate for international differences in the

* This policy brief is a translated version of a report the authors have prepared for the German Federal Ministry for Economic Affairs and Energy in their functions as members of the ministry’s scientific advisory council.

¹ As a result, CO₂-emissions are taken into account; other greenhouse gases such as methane, nitrous oxide, halogenated hydrofluorocarbons, hydrofluorocarbons and sulphur hexafluoride can be converted into CO₂-equivalents and recorded. In the following, they are not discussed separately.

² See the press statement of Europäische Kommission from March 4, 2020, or its communication from September 17, 2020 (https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_20_335/IP_20_335_EN.pdf or <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0562&from=EN>).

³ Conclusions of the Council meeting of 11-12 December (<https://www.consilium.europa.eu/media/47296/1011-12-20-euco-conclusions-en.pdf>).

⁴ EU Commission Communication of September 17, 2020 (https://ec.europa.eu/clima/sites/clima/files/eu-climate-action/docs/com_2030_ctp_en.pdf). Very similar paragraph 18 in the EU Parliament Resolution of November 26, 2020 (https://www.europarl.europa.eu/doceo/document/TA-9-2020-0337_DE.pdf).

⁵ In the following, “domestic” refers to the European Union or the members of a climate club, and “foreign” refers to the aggregate of the remaining countries.

pricing of CO₂-emissions. Since the consumption levy is not a “border measure” in the meaning of trade policy, in the following we use term ‘CO₂-price adjustment’ when we refer to both instruments.

With these proposals, policymakers are addressing the so-called leakage problem that arises when reducing CO₂-emissions at home leads to higher emissions abroad. The aim is, on the one hand, to improve the effectiveness of European climate policy and, on the other, to avoid the dislocation of manufacturing. At the same time, however, such a system must not lead to new trade disputes which undermine the benefits of the international division of labor and the general willingness of countries to cooperate.

The discussion about leakage illustrates once again that the contribution of unilateral climate to solving an inherently global problem policy is severely limited. It follows that the central criterion in assessing any adjustment mechanism must be whether or not it promotes international cooperation, for example by establishing universal pricing of CO₂-emissions.

The Advisory Council of the German Federal Ministry for Economic Affairs and Energy has already stressed the need for international cooperation in previous opinions.⁶ As long as there is a lack of technological breakthroughs that make the use of fossil fuels uneconomic, a sufficiently large group of countries must cooperate to stop climate change. Cooperation is complicated by the fact that the climate is a global public good. Because reducing CO₂-emissions causes domestic costs, while benefits are spread around the world, individual countries have insufficient incentives to prevent CO₂-emissions; more so, the more other countries go in advance. It is therefore of utmost importance to involve a sufficient number of countries in a policy of ambitious emission reduction. This is an immensely challenging task.

William Nordhaus, who was awarded the 2018 Nobel Prize for his research on the economics of climate change, has proposed that a coalition of the most important countries that contribute most to CO₂-emissions and are similarly affected by climate change should agree on a common approach and introduce a common carbon price (Nordhaus 2015). This “climate club” could sanction countries that do not make their own efforts to reduce emissions by imposing a tariff on their exports to the climate club, thus stabilizing and enlarging the international coalition of willing countries. The Nordhaus proposal for such a tariff differs in design and intention from a CO₂-price adjustment mechanism, because it does not want to compensate for and reduce leakage by including the CO₂-content of imports, but to use customs duties as a punitive measure in the event of non-cooperation. The introduction of such punitive duties is not the subject of this opinion because it would be inadmissible under current WTO law and could lead to massive trade disputes. Instead, the Advisory Council proposes a carbon adjustment scheme that could reduce leakage and play a constructive role in stabilizing a climate club.

At the moment, the community of states is a long way from a global climate club. CO₂-prices have not yet established themselves as an instrument of climate policy in many parts of the world. According to World Bank calculations, only about 16.0 percent of global CO₂-emissions are currently subject to explicit pricing; if further projects are implemented as planned (such as

⁶ Wissenschaftlicher Beirat beim Bundesministerium für Wirtschaft und Energie “The Essential Role of the CO₂-Price for Effective Climate Policy” (November 2016) and “Energy Prices and Efficient Climate Policy” (June 2019).

a national emissions trading scheme in China), this share would rise to 22.3 percent. Where CO₂-prices exist, they are not coordinated internationally and vary in their rates. As a result, incentives arise to shift the production of carbon-intensive goods abroad and to meet domestic demand with imports. As a consequence, the EU's unilateral efforts may fail to reduce global emissions either fully or partially. There are also fears that value added would be lost to foreign countries. A CO₂-adjustment system intends to curb the relocation of production and to improve the effectiveness of European climate policy.

However, Europe is not the only region that is currently tightening its climate targets and wants implement appropriate measures to prevent any relocation of production. In the US, the new president wants to achieve climate neutrality by 2050, similar to the EU. The measures discussed in the US include, among other things, a carbon border adjustment mechanism.⁷ Other major emitters also want to step up their efforts, especially China, which has announced its intention to become climate-neutral by 2060.⁸

The central proposal of this opinion is therefore that the EU should use this dynamic to set up a climate club with as many partners as possible, especially with the United States, and to secure a common minimum price for CO₂-emissions by means of an appropriate adjustment mechanism applied to third countries. In trade between member countries of the climate club, border adjustment measures would be superfluous. An appropriate border adjustment system could (i) encourage outside countries to join a climate club, (ii) help protect the common economic area (= the climate club) from leakage, and (iii) reduce the risk of retorsion by key trading partners because they are involved in a multilateral approach from the outset. However, in order for such a climate club to incentivize the widest possible number of countries to cooperate, it is helpful if foreign countries regard the adjustment mechanism as a disruptive measure, the avoidance of which is desirable. This speaks in favor of border adjustment and against a consumption levy.

The present opinion proceeds as follows. Section 2 discusses the circumstances in which leakage is a serious problem. It emphasizes the importance to distinguish between direct and indirect leakage. The third chapter discusses the objectives to be pursued with an adjustment system and the extent to which this can be realistically achieved. The fourth part shows that even an ideal adjustment mechanism can only partially solve the problem because it does not prevent indirect leakage. The fifth section compares the two models currently under discussion – the border adjustment mechanism and the consumption levy. Finally, the sixth part proposes a climate club with a carbon border adjustment mechanism.

⁷ See the comments in the election program of current U.S. President Joe Biden: <https://joebiden.com/climate-plan/>. The program leaves open whether the USA will introduce a national CO₂-price. There have been repeated legislative initiatives to this effect in the past, all of which provided for a CO₂-adjustment mechanism. Legislative proposals in the U.S. that sought to establish a carbon price also regularly included a carbon adjustment mechanism, such as Section 768 of the 2009 Waxman-Markey Bill (American Clean Energy and Security Act) or the Energy Innovation and Carbon Dividend Act of 2019.

⁸ See relevant press reports, e.g. <https://www.theguardian.com/environment/2020/sep/27/china-carbon-pledge-put-energy-system-reverse-wind-solar>.

The Advisory Board makes the following recommendations:

1. The EU should use the dynamics triggered by the new American administration to set up a climate club with a minimum carbon price, together with the US and other major trading partners. Within this club, CO₂-price adjustment can be waived. The climate club should introduce a common CO₂-border adjustment mechanism with regard to third countries. This will incentivize countries to cooperate and to join the climate club.
2. The Advisory Council is skeptical regarding the introduction by the EU of a unilateral CO₂-price adjustment system. Such a system would entail high political costs and risks, without making an effective contribution to climate protection. Effective climate protection is only possible through multilateral cooperation. The political situation in the US opens a narrow window of two years in which the EU and the US should work together to agree on uniform principles for a multilateral solution in talks with major trading partners and the World Trade Organization (WTO). There is time pressure, but the free allocation of allowances, which provides some protection against leakage in the sectors most affected, will only be phased out gradually by 2030, so there is no reason for the hasty introduction of unilateral border adjustment.
3. The Advisory Council opposes the introduction of a consumption levy on individual goods. Although this could be introduced relatively quickly, it promises additional revenue for the EU or the member states in the short term. However, it is not suitable for promoting the willingness of other countries to cooperate or as an external safeguard to block leakage from a climate club. The levy would be an additional instrument which is conceptually at odds with the EU-ETS because it starts with domestic consumption (carbon footprint) and not production (territorial emissions) to which all international agreements relate. This would significantly increase the complexity of domestic climate policy.

2 DOMESTIC CO₂-EMISSIONS, INTERNATIONAL TRADE AND THE LEAKAGE PROBLEM

2.1 TWO TYPES OF LEAKAGE

Leakage refers to the displacement of CO₂-emissions abroad, which occurs when only one country or a limited group of countries introduces CO₂-pricing or other regulatory interventions aimed at reducing CO₂-emissions at home.

In the discussion about CO₂-price adjustment, the focus is on “direct” leakage. Direct leakage describes the shift in production of carbon-intensive goods abroad due to a change in relative prices. Unilateral pricing of CO₂-emissions leads to a change in the relative costs and thus the prices of goods and services. This has an impact on the structure of international trade, because countries with unilateral carbon prices lose potential comparative advantages in the production of carbon-intensive goods while they build comparative advantage in other sectors. In countries

without carbon prices, the opposite is happening. This mechanism is reinforced by the international mobility of companies. As a result, the production of CO₂-intensive goods, and thus the CO₂-emissions at home, are declining, but the relocation of production abroad there is driving up emissions.⁹ The direct leakage rate, i.e. the part of the domestic emission reduction that is not saved but is shifted abroad, is higher the greater the differences in the CO₂-prices of the countries, the higher the CO₂-intensity of production, the greater the foreign country relative to the domestic, the lower the trade costs (customs duties, transport costs, etc.) and the more price-elastic the demand and supply. It is therefore clear that different sectors of the economy differ in terms of the risk of leakage.

In addition to direct leakage, there is “indirect” leakage, which is induced by the change in fuel prices. If a single, sufficiently large country (“Home”) decides to phase out the burning of fossil fuels, then the reduction in demand for gas, oil, or coal reduces world prices for these raw materials. This makes their use in countries without climate policies more attractive. Their demand for fossil fuels rises as prices fall. Some of the emissions saved in Home are thus compensated by higher emissions abroad. With a given amount of reduced emissions, the smaller the domestic supply relative to foreign countries, the greater the price elasticity of the demand for fossil fuels, and the smaller the price elasticity of the supply of such raw materials. Indirect leakage would occur even if no other goods were traded internationally other than fossil fuels.¹⁰ CO₂-price adjustment can only address the problem of direct leakage, not that of indirect leakage. The latter can only be combated through global climate policy, for example through a transnational emissions trading system or internationally coordinated CO₂-prices.

2.2 TRADE IN GOODS, TERRITORIAL CO₂-EMISSIONS AND THE CO₂-FOOTPRINT

Whether countries are net importers or exporters of CO₂-intensive goods does not only depend on how high the respective CO₂-prices are. Countries with comparative advantage in industrial sectors are more likely to produce CO₂-intensive goods than countries whose comparative advantage is in services. In addition, how CO₂-intensive production is depends very much on the technologies used. It is important to distinguish whether the pattern of trade is driven by differential CO₂-prices or by “natural” determinants such as relative endowments of human or physical capital and land or technological capabilities. From an economic perspective, the former is problematic because it distorts efficient allocation; the latter is not.

The importance of international trade is best illustrated by comparing territorial CO₂-emissions with the CO₂-footprint of a country or region. The CO₂-footprint measures CO₂-emissions caused by domestic consumption. Territorial emissions are defined as the sum of all CO₂-emissions generated from the production of goods and services in a given year within the

⁹ Direct leakage is a variant of the so-called pollution haven effect, through which countries with lax environmental laws gain a comparative advantage in pollution-intensive goods (Levinson and Taylor, 2008).

¹⁰ In their study for the German Federal Environment Agency, Görlach et al. (2020: 9) understand indirect carbon leakage risk as the phenomenon that climate policy makes the intermediate products of internationally competing industrial companies more expensive. We (and the relevant simulation literature) subsume this under direct leakage.

borders of a country or economic area.¹¹ International trade drives a wedge between the two measures because the amounts of CO₂ required to produce goods and services may differ from those embodied by the consumed goods and services. Figure 1 shows that, from 1990 to 2018, the share of territorial CO₂-emissions of the EU27 and of the US in global emissions decreased from 17 to 8 percent and from 23 to 15 percent, respectively.¹² China's share went up from 11 to 28 percent.

The figures also show the CO₂-footprints, often referred to as the amount of CO₂-emissions embodied in domestic consumption.¹³ The CO₂-footprints of the EU and the US are both higher than the territorial emissions. This means that the EU and the US are so-called "net importers" of CO₂, i.e. imports into the EU are associated with higher CO₂-emissions abroad than the CO₂-emissions generated in the EU during the production of exports for foreign countries. Because no CO₂ is imported, but goods in the production of which CO₂ was created, we speak of virtual CO₂-trade. The footprint has fallen in both places; in the EU27 it has decreased by 17 percent from 1990 to 2017. In fact, in the EU, the reduction of the carbon footprint has been by 6 percentage points lower than the reduction of territorial emissions. In Germany, the footprint has decreased by 24 percent, which is four percentage points lower than the rate of change for territorial emissions. In the US, too, the reduction in territorial emissions has exceeded the one in the footprint. Thus, a significant part of the territorial emissions has not been saved, but shifted abroad.

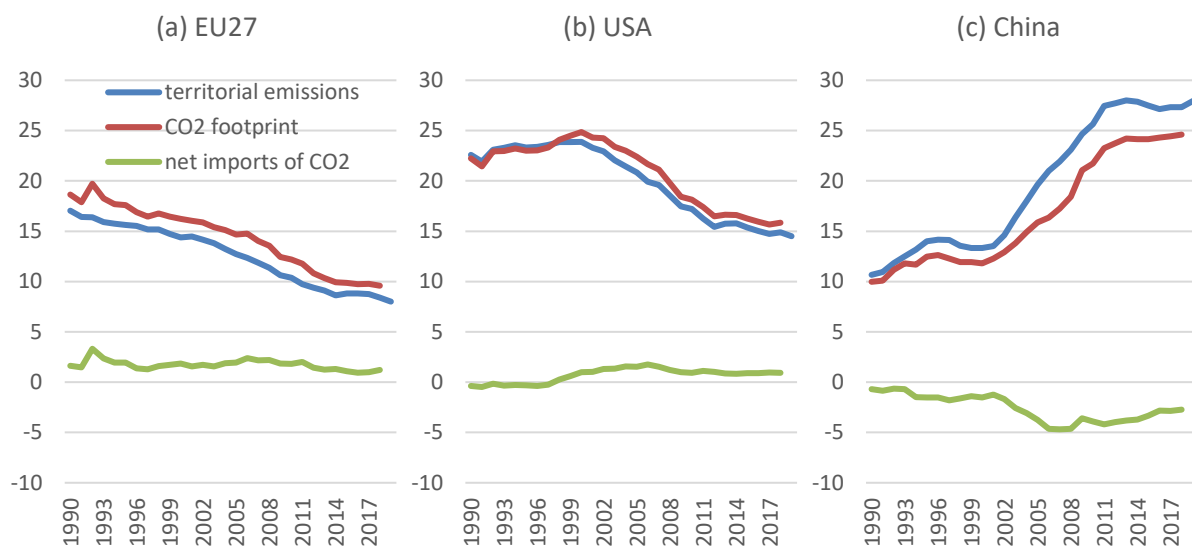
This can be seen in the development of net imports of CO₂-emissions, i.e. the difference between footprint and territorial emissions (Figure 1). As a share of world emissions, net imports have remained relatively stable; however, as global emissions went up, their absolute importance went up, too. The US are a net importer of goods and services; the fact that they are also a net importer of carbon is, therefore, not surprising. The case of the EU27 (and of Germany) is more surprising because, given internationally identical sectoral emission intensities, it should be net exporters of CO₂. The fact that, empirically, they are not, points to significant international differences in the structure of comparative advantages and in regulation.

¹¹ The official international CO₂-accounting is based on this concept. The reduction targets agreed in international agreements also refer to this measure. Furthermore, all systems of CO₂-pricing so far refer to the territorial concept.

¹² Note that due to different methodologies, data published by the Global Carbon Project (2019) differ slightly from official EU data (as reported, for example, by Eurostat or the European Environment Agency); see Friedlingstein et al. (2019).

¹³ Estimating the carbon footprint requires tracking the carbon content of goods and services produced abroad and absorbed domestically, the carbon content of goods and services produced domestically for absorption domestically, and the carbon content of goods and services produced domestically for absorption abroad. Thus, estimation requires knowledge of the direct and indirect emissions associated with the production of goods and services, both domestically and abroad. Because inputs are often imported from abroad and these inputs may include other inputs from other countries, the carbon footprint estimate uses a global input-output table for each year to capture global production networks. See Peters et al. (2011) or Aichele and Felbermayr (2012) for details on the exact methodology.

Figure 1: Estimates of territorial CO₂-emissions, carbon footprint and CO₂-imports as a share in yearly global emissions, in percent^a



^aThe numbers are based on CO₂-equivalents that also capture methane and other greenhouse gases. The EU is defined across 27 members (as of 2021). See Felbermayr and Peterson (2020) for absolute emission numbers.

Source: Global Carbon Project (2019), own calculations and presentation.

In 2018, the EU27 was the world's largest net importer of CO₂-emissions, with 436 megatons. The EU's territorial emissions accounted for circa 8.4 percent of global emissions in 2018, while its CO₂-footprint came to 9.6 percent of global emissions. The EU's net imports were therefore circa 1.2 percent of global emissions.¹⁴

2.3 HOW RELEVANT IS LEAKAGE?

How strongly would net CO₂-imports react to an increase in the CO₂-price in Europe? In the existing literature, the risk of leakage is analyzed with simulation studies on the one hand and econometric studies on the other. The former typically calculate the effect of hypothetical future scenarios, the latter estimate the effects of leakage in historical data.

The simulation studies report very different leakage rates. The leakage rate describes the share of emissions saved domestically that is shifted abroad. The estimated rates depend on the assumed CO₂-price paths, the details of the models used, and their parameterizations. If a macroeconomic view is chosen that takes indirect leakage into account, leakage rates between 5 percent and 30 percent are not atypical.¹⁵ This means that, in the worst case, a saving of one

¹⁴ The UK is a strong net importer of carbon (276 megatons in 2018).

¹⁵ The meta-analysis by Branger and Quirion (2013) analyzed 25 studies with a total of 310 estimates of leakage rates. Without border adjustment measures, the estimated leakage rates typically range from 5 percent to 25 percent (mean 14 percent). With border adjustment measures, leakage rates reduce to -5 percent to +15 percent (mean percent). The recent meta-study by Böhringer et al. (2018) finds that the average leakage rates of comparable climate policy regulations range from 10 to 30 percent.

ton of CO₂-in the EU only leads to a reduction in global emissions of 700 kg, because an additional 300 kg of CO₂-is emitted elsewhere. Within individual industries, significantly higher leakage rates can occur, especially if a CO₂-intensive industry with low trading costs is considered.¹⁶ While the studies typically allow for some substitutability of CO₂-intensive energy with capital, they do not allow for CO₂-pricing to lead to the deployment of entirely new technologies. This means that the models may overestimate the extent of leakage and the absolute value of welfare effects; see Gerlagh and Kuik (2014). The simulation studies also typically conclude that direct leakage is much less pronounced than indirect leakage.

The econometric literature typically finds much smaller leakage effects than the simulation studies. One strand of literature looks at the European emissions trading system and typically finds no evidence of leakage effects. However, this is not surprising: first, CO₂-prices in Europe have been very low for long periods of time; second, it is precisely the trading and emissions-intensive sectors that receive free allocation of emission allowances (and, in Germany, exemption from the levy due to the renewable energy sources act (EEG) and electricity price adjustment), which have reduced or even overcompensated for leakage incentives.¹⁷ This is often commented on with the remark that the measures taken so far to avert leakage have been successful. A second strand of literature looks not only at CO₂-prices, but at the totality of all cost-driving climate policy measures (such as regulation). Such studies find much stronger evidence for leakage effects.¹⁸ To the best of our knowledge, robust econometric studies on indirect leakage do not yet exist.

The existing studies have some problems. First, they rely on linear (logarithmic) approximations and extrapolations: Predictions based on the estimates, for example, of the effects of policies that are much more stringent than those evaluated in historical data, are therefore problematic. In particular, for fixed relocation costs, the incentives to relocate production increase disproportionately with the stringency of policies.¹⁹ Second, the studies draw inferences from the differential behavior of sectors, regions or industrial plants. Effects

¹⁶ These include, for example, the cement, clinker, steel, aluminum, oil refining, and electricity sectors. Partnership for Market Readiness (2015) provides a valuable overview of sector studies. These often find leakage rates at or even above 100 percent.

¹⁷ Sato and Dechezlepretre (2015) report that the costs imposed by the EU ETS are below 0.65 percent of material costs for 95 percent of European manufacturing sectors. Even in CO₂-intensive sectors, there is little evidence of leakage. Branger, Chevallier, and Quirion (2017) examine the effects of the EU ETS on the cement and steel sectors and find no evidence of leakage.

¹⁸ Aichele and Felbermayr (2012) find that the implementation of Kyoto commitments in a large panel of countries has led to a reduction in territorial CO₂-emissions of about 7 percent, but not to a reduction in the carbon footprint. This finding is compatible with a leakage rate of 100 percent, similar to Grunewald and Martinez-Zarzoso (2016). Aichele and Felbermayr (2015) look at the CO₂-content of sectoral bilateral trade flows and find that binding commitments under the Kyoto Protocol have led to an increase of about 8 percent in the implicit carbon imports of countries with emissions targets from countries without emissions targets and an increase of about 3 percent in the emissions intensity of their imports. The first effect is larger than the second, because it also captures the increased quantities of emissions-intensive goods produced, while the second effect measures how much “dirtier” they were produced than before Kyoto.

¹⁹ Modern foreign trade research has conclusively demonstrated that fixed costs play a very large role in relocation decisions (e.g., Bernard et al., 2012).

that affect all units of observation equally typically cannot be identified econometrically. Third, these studies do not take into account that expectations about the future CO₂-price path influence relocation decisions.

Nevertheless, the existing literature can be summarized as follows: First, direct leakage is currently still a minor but serious problem that will very likely become much more relevant with increasing differences in international CO₂-prices. If the EU's new CO₂-emission reduction targets are to be achieved via higher CO₂-prices, it can be assumed that the price per ton of CO₂ will rise to between 72 and 182 euros per ton as early as 2030.²⁰ These are prices that are a factor of two to seven above the current prices in the European emissions trading system and at which considerable leakage effects would have to be expected, especially in the particularly trade-intensive EU-ETS sectors. If other instruments are additionally used (e.g., subsidies), lower CO₂-prices are possible to achieve the target. However, this typically leads to substantially higher overall economic costs of achieving the target and, depending on the choice of instrument, can also lead to leakage. Second, indirect leakage via global commodity markets is likely to be at least as important for the effectiveness of European climate policy as direct leakage via product markets.

3 OBJECTIVES AND CONSTRAINTS OF BALANCING MECHANISMS

Various measures are currently being discussed in politics and in the public sphere that are intended to reduce the disadvantages of a unilateral European climate policy: (i) a CO₂-consumption levy while maintaining a free allocation of emission rights, (ii) the inclusion of imports in the EU emissions trading system, (iii) a punitive tariff in the context of a climate club (Nordhaus, 2015), which is intended to provide incentives for CO₂-pricing abroad, but is not based on the CO₂-content of imports.

Subsequently, instruments (i) and (ii) are considered in more detail. Different actors, observers, and stakeholders associate them with different goals such as:

- (1) Improving the effectiveness of a unilateral domestic climate policy;
- (2) Improving the efficiency of climate policy in the welfare-economic sense of a more efficient allocation of resources;
- (3) Achieving competitive neutrality, i.e., avoiding competitive disadvantages for domestic producers that would arise without adjustment mechanisms due to differentially high CO₂-prices;
- (4) Generating revenue for the nation states or the EU.

These goals are defensive in nature; they are concerned with preserving the effectiveness of domestic climate policy and preventing the dislocation of value added abroad. However, they are not directed at reducing global greenhouse gas emissions. The latter can only be

²⁰ Edenhofer et al. (2019). The figures indicate the 95 percent confidence interval.

effectively reduced through global climate policy. Therefore, an additional objective of outstanding importance is:

- (5) Improving other countries' willingness to cooperate to form a climate club.

Objectives (1) through (4) are frequently mentioned, while objective (5) is often omitted, although it is of critical importance for mitigating climate change.

In addition, the following constraints on an adjustment mechanism must be considered:

- (a) The mechanism must be administratively and politically feasible.

In particular, this means that the assessment basis for the CO₂-price must be as objective and unambiguous as possible. The mechanism should be transparent and predictable and should not lead to high bureaucratic costs in its implementation, either in the public administration or in the companies. It should induce as little lobbying as possible and not be susceptible to fraud. Finally, political economy aspects must be considered. Ultimately, a mechanism must be capable of gaining majority support in the EU; if it were to produce strong and undesirable distribution effects or give the appearance of doing so, this would jeopardize its political feasibility.

- (b) It should be consistent with existing WTO law.

According to Pauwelyn and Kleimann (2020) and Lamy et al. (2020), this can be established in two ways. (1) The adjustment mechanism is permissible if it is consistent with the core WTO-law prohibitions on discrimination—most-favored-nation treatment (GATT Art. I) and national treatment (GATT Art. III). Art. III contains the conditions under which countervailing measures applied to imports are allowed; the Agreement on Subsidies and Countervailing Measures governs countervailing measures applied to exports. For example, indirect taxes, such as VAT, may be adjusted at the border. However, there may be no de facto discrimination. WTO law requires that “like” products be treated “equally.” (2) Even if the above requirements are not met, the adjustment mechanism can be justified on the basis of the environmental exemption provisions of the GATT (Art. XX(b), XX(g)). The decisive factor for this is that the adjustment measure actually increases the effectiveness of climate protection efforts. Art. XX, on the other hand, does not justify trade restrictions to create competitive neutrality. The exemption of exports from an EU CO₂-price can therefore not be justified by Art. XX, because it—in itself—leads to an increase in CO₂-emissions. Furthermore, the measure must be as non-discriminatory as possible. A punitive tariff against countries that do not have a climate policy is probably not compatible with WTO-law because it violates Art. II GATT (Pauwelyn and Kleimann, 2020).²¹

- (c) It is designed to minimize the likelihood of retaliatory trade measures by foreign countries.

Even if the adjustment mechanism can be made WTO-compliant, there remains a risk that trading partners will respond to its introduction with retaliatory measures. Both

²¹ Adjustments to the WTO legal framework are of course conceivable in the long term and may be necessary in the interests of successful global climate protection. However, this issue goes beyond the current report.

the Trump administration and China have stated in the past that they would respond to the imposition of border adjustment with retaliatory measures.²² The experience with pricing CO₂-emissions in cross-border aviation is not encouraging (Horn and Sapir, 2020): trading partners such as the U.S. and China have persuaded the EU, under threat of sanctions, to forego the inclusion of non-European aviation segments in the European emissions trading system. A trade war caused by the unilateral introduction of a border adjustment regime could lead to significant welfare losses that are much larger than the positive effects of a border adjustment. In other words, the adjustment mechanism should be designed in such a way that it is accepted as well as possible in as many countries as possible.

- (d) The adjustment mechanism should be consistent with existing EU climate policy instruments and with other elements of an existing or future international climate policy.

This means that the adjustment mechanism should not call into question or jeopardize the framework of European climate policy—e.g. the EU-ETS or the phase-out of free allocation of allowances planned by 2030—or the fulfillment of the obligations of the EU and its member states under international law. In addition, it should be ensured as well as possible from the outset that the European system is compatible and combinable with systems abroad.

In the following, conceivable adjustment mechanisms are presented and then evaluated along the objectives and constraints mentioned. The focus is on the conditions of the EU-ETS; however, the considerations also apply analogously to other CO₂-pricing systems on which a climate club could agree. Before discussing the specific models discussed, it is useful to first discuss the textbook case of an ideal adjustment mechanism of a country with a uniform CO₂-pricing policy, where the constraints (a) to (d) are initially assumed to be met. Even with the help of an ideal mechanism, however, unilateral climate policies can only partially address the global climate problem because indirect leakage remains. The complete avoidance of direct and indirect leakage can only be achieved in a global climate club.

4 AN IDEAL CO₂-PRICE ADJUSTMENT MECHANISM

4.1 DESCRIPTION

An ideal adjustment mechanism to prevent direct leakage that is compatible with the above objectives subjects the CO₂-content of imports to domestic carbon pricing, while excluding exports.²³ In the context of the EU-ETS, this means that importers must purchase allowances for the CO₂-emissions emitted during production when importing goods. Exporters, on the

²² See, e.g., Financial Times, “US Threatens Retaliation Against EU over Carbon Tax,” January 26, 2020. However, the political environment is likely to have improved markedly in the meantime.

²³ When determining CO₂-content, all precursors (such as electric power) are included.

other hand, are reimbursed for the allowances acquired during the production of the exported goods. As long as there are no overly large-scale advantages of mass production, this mechanism ensures that suppliers from countries without domestic CO₂-pricing do not have a competitive advantage.²⁴ All goods sold are priced domestically according to their CO₂-content. The mechanism also establishes competitive neutrality on foreign markets, because producers from the EU are not burdened with additional costs compared to foreign competitors.²⁵ If the foreign country has its own CO₂-prices, competitive neutrality would be established if it uses a corresponding adjustment mechanism or if the domestic adjustment mechanism only covers the difference in CO₂-prices. In such a system, differences in CO₂-prices between countries do not lead to incentives to shift production to the country with the lower CO₂-price in order to supply the domestic market from there. And producers from within the country are not disadvantaged abroad compared to producers located there. A free allocation of certificates, as is currently still provided for in some sectors in the EU, is not needed.

The ideal adjustment system is constructed in the same way as the value-added tax system, in which, as is well known, imports are also charged with the domestic value-added tax rate, while exports are exempted. In both cases, the adjustment has the effect of taxing consumption rather than production. This is important in the context of leakage: consumers can hardly escape taxation by shifting their consumption to other countries, while producers can do so by shifting production. Thus, adjustment burdens (rather) immobile consumption instead of (rather) mobile production. Producers' location decisions are now no longer driven by differences in CO₂-prices. Conversely, consumers may be incentivized by the adjustment system to move to countries with low (or non-existent) CO₂-pricing. However, the high mobility costs of people relative to goods trade and the experience with VAT suggest that this is not an important factor.

However, shifting CO₂-pricing away from production (i.e., away from territorial emissions) to consumption (i.e., toward the CO₂ footprint) means that pricing no longer controls domestic emissions, but rather the CO₂-content of domestic consumption. This may pose a problem because all relevant international agreements on climate and environmental protection are based on the territorial principle, i.e., they limit the amount of territorial emissions. A CO₂-price adjustment scheme as sketched above would lead to the fact that territorial emissions can no longer be controlled by the CO₂-price.

How the adjustment is made depends on the type of CO₂-pricing. If it is done through a tax, the tax rate is added to the CO₂-content of imports (and refunded on exports). If it is implemented through emissions trading, where the price of CO₂ fluctuates over time, importers must purchase emission allowances equal to the CO₂-content of imports, while exports do not need to purchase emission allowances or are reimbursed for their cost.

²⁴ If there are strong economies of scale in production, there is the possibility that the production of CO₂-intensive goods is concentrated abroad, where the prices for such goods are lower due to the absence of CO₂-pricing, demand is higher, sales are greater, and therefore the cost advantages from a large production volume are higher.

²⁵ This is assuming that supply and demand elasticities and market structures in Germany and abroad are such that costs are passed on to end users in the same way.

4.2 TARGET ACHIEVEMENT

(a) Effectiveness of EU climate policy.

Under the (heroic) assumption that the pricing basis—the CO₂-content of imports and exports—can be determined exactly, the ideal border adjustment mechanism completely prevents direct leakage. Indirect leakage, on the other hand, cannot be prevented. Because the EU's carbon footprint exceeds its territorial emissions by almost one-fifth, the pricing basis increases through the mechanism: European emissions are 9.8 percent of global emissions, and the footprint is 11.8 percent. The reach of EU climate policy is thus increased with the measure. The ideal adjustment system gives consumers an incentive to consume less CO₂-intensive goods. Domestic and foreign producers that avoid CO₂-emissions when producing for the domestic market (for example, because they invest in new CO₂-saving production processes) fare better domestically than domestic and foreign producers that produce CO₂-intensively. At the same time, companies that produce domestically for export no longer have any incentive to cut CO₂-emissions, unless there is a climate policy abroad that is just as ambitious as that at home, as well as a border adjustment system. However, as long as the EU remains a net importer of CO₂-emissions (bound in goods) (which is not guaranteed in the long run), a larger share of global emissions will be subject to CO₂ reduction incentives, even if foreign countries do not engage in their own CO₂-pricing. In this way, the EU extends pricing in aggregate to additional goods with the adjustment mechanism described.

(b) Efficiency.

Any system of CO₂-pricing that has different CO₂-prices in different countries is inefficient compared to a globally uniform CO₂-price (with a comparable level). Even a unilateral climate policy secured with the ideal border adjustment leads to internationally different CO₂-prices and cannot prevent the indirect leakage. The avoidance of indirect leakage can only be achieved by an internationally uniform CO₂-price. However, with immobile consumers and given climate policies of countries, the ideal border adjustment reduces inefficiency because CO₂-pricing is extended and production leakage due to different taxation is prevented. However, this does not apply if there are strong economies of scale in the production of CO₂-intensive goods.

(c) Competitive neutrality.

The ideal border adjustment establishes competitive neutrality between domestic and foreign suppliers on both the domestic and foreign sales markets with regard to the pricing of CO₂. The adjustment mechanism does not address distortions of competition and costs arising from other climate policy measures at home and abroad, such as the German coal phase-out or standards in production.

(d) Source of income.

The ideal border adjustment expands the tax base of CO₂-pricing in the EU as long as the CO₂-content of exports (which is exempted from pricing) is significantly smaller than the CO₂-content of imports (which is subject to pricing). In 2018, with a CO₂-

content of net imports of 436 million tons of CO₂ and a CO₂-price of about 20 euros, border adjustment would have generated revenues of about 8.7 billion euros. This is an upper limit because border adjustment would lead to a reduction in net CO₂-imports. At the same time, however, CO₂-prices are expected to rise in the future. Despite the economic slump caused by the Corona pandemic, they already averaged around 25 euros in 2020 and currently stand at over 30 euros.

(e) Willingness of other countries to cooperate.

Is there a prospect that foreign countries will change their own climate policies in response to the introduction of a border adjustment system in the EU? Foreign countries could perceive unilateral EU measures as extraterritorial taxation and feel that their sovereignty has been violated. This could reduce the willingness to cooperate, even to the point of imposing retaliatory measures. It is also conceivable that an EU border adjustment could reduce the incentives of foreign countries to pursue climate policy themselves. This could be the case, for example, for a country that does not trade with the EU but loses incentives to pursue climate policy itself as a result of the extension of the EU carbon price to its footprint, because the stronger efforts of the EU make its own action seem less urgent and thus free-riding becomes more attractive. However, this effect cannot be quantitatively strong; the gain in effectiveness of EU climate policy is too modest for that. It is more conceivable that foreign countries will react by introducing or extending their own CO₂-pricing, because it is no longer possible to use the absence of ambitious CO₂-pricing as a locational advantage. This would improve the efficiency of global climate policy; the more countries introduce CO₂-prices, the less important the problem of indirect leakage becomes. The situation would be even better if the EU waived border adjustment—both on the import and export side—in trade with all those countries that coordinate CO₂-pricing in a joint climate club with the EU and adhere to a minimum price. This would provide a strong incentive for countries to join this very climate club and introduce a CO₂-price themselves.

4.3 FULFILLMENT OF THE CONSTRAINTS

(a) Administrative feasibility.

The central technical problem in implementing an adjustment mechanism is that the CO₂-content of a good can only be determined “objectively” at great expense, if at all. Foreign producers would have to have their CO₂-emissions certified by independent experts. This is expensive and vulnerable to fraud and bribery. Even if perfect monitoring of production were possible, there would be many attribution problems to which there is no clear answer and which would have to be negotiated with the states and companies concerned. For example, if a manufacturer claims to use only “green electricity” in its production, should no CO₂-emissions be imputed to it for its electricity, or should the electricity mix of its country be imputed, and if the latter, should the average or marginal electricity mix be imputed? If a country has an

emissions market with a cap on total emissions, but the CO₂-price in that country is lower than in the EU, should a producer in that country not be attributed any CO₂-emissions at all because moving production to that country would not increase total emissions, or should it be charged to compensate for its CO₂-price advantage? If a company uses different production processes that result in different CO₂-emissions, may it export the “clean” produced goods to the EU and the “dirty” produced goods to countries without border adjustment?

Numerous such issues must be negotiated for each good from each country, which requires a great deal of bureaucracy and is likely to be susceptible to lobbying and rent-seeking activities. Any fixing of costs, averages, exceptions, etc. creates winners and losers in the markets and among the countries involved. Consequently, the vulnerability to conflict, protectionism, fraud, and lobbying would be high. For political economy reasons, on the other hand, the border adjustment model would be attractive for the EU because it would seem to create a “fair” balance between domestic and foreign producers, with foreigners being burdened by the pricing of imports and domestic suppliers being relieved by the exemption of exports, at least compared to a situation without border adjustment but with a higher CO₂-price in the EU than abroad.

(b) Conformity with applicable WTO law.

Whether the ideal border adjustment is in conformity with WTO law depends very much on whether the CO₂-content of imports (and exports) can be determined in a non-discriminatory and unambiguous manner. Border adjustment to achieve competitive neutrality is legally compliant if CO₂-pricing can be construed as an indirect tax and if “like” products are also treated “equally” (GATT Art. III). Pauwelyn and Kleimann (2020) describe that WTO law allows for a very broad interpretation of indirect taxes, so that the EU-ETS or an EU CO₂-tax could be classified accordingly. In WTO jurisprudence practice, “equality” is attached to characteristics of products and not to production processes. This would mean that, for example, Chinese imported steel of a certain grade may not be treated differently from steel from the EU, even if the Chinese steel was produced in a more CO₂-intensive way. However, the authors point out ways in which the accusation of discrimination can be effectively countered. For example, the average CO₂-price of European goods could be levied on imports and foreign suppliers allowed to prove any lower CO₂-content. However, this would de facto treat the imported CO₂-content differently than the domestic one, which would contradict the principle of ideal border adjustment. Alternatively, one could base CO₂-pricing on imported emissions and require importers to purchase ETS allowances to the extent that CO₂-emissions were generated in the production of the imports. In this case, it would be the inputs used (coal, oil, gas) rather than the treatment of the goods that would have to be shown to be equal. However, whether the compulsion to purchase ETS allowances can be called an “indirect” tax is controversial; see Lamy et al. (2020) for a discussion.

If border adjustment cannot be justified under GATT Art. III, it could still be permissible under the exception rules of Art. XX. These allow restrictions on free trade if a measure is necessary to protect human, animal, or plant life or health or to conserve exhaustible resources. However, the measure must be proportionate. In addition, the so-called chapeau condition requires that any violation of GATT rules be justified by an Article XX objective. Climate protection and the prevention of direct leakage would be such a permissible justification. Establishing competitive neutrality emphatically is not. This has far-reaching consequences. For example, with a non-discriminatory design, it is possible to impose a CO₂-tax on imports because this prevents direct leakage. However, it is not possible to exempt exports from CO₂-pricing, because this exemption “only” serves competitive neutrality, but tends to lead to higher CO₂-emissions.

It is important to avoid any appearance of discrimination against foreign products. If the CO₂-content of imports is set at a flat rate, this must not discriminate against individual producers or individual countries that may emit less CO₂ in production. It would also not be possible to impose expensive verification procedures on foreign producers to determine the CO₂-content of their goods if this is not done for domestic producers because it is not necessary due to their participation in the EU-ETS.

(c) Retaliatory measures by foreign countries.

An EU-ETS with an ideal border adjustment that treats the CO₂-content of goods equally, whether domestically produced or imported, does not put foreign trading partners at a disadvantage compared to a situation without such a regime. Retaliatory measures would accordingly be difficult to justify; on the contrary, the unilateral introduction of a CO₂-price (especially without adjustment) will worsen domestic terms-of-trade and possibly lead to direct leakage of production abroad. However, it cannot be denied that the introduction of border adjustment in a situation where the EU-ETS is already in place will make the foreign country worse off. Thus, the potential risk of retaliation depends on which scenario (no CO₂-prices at all or unilateral CO₂-pricing without adjustment mechanisms) one interprets as the baseline. To avoid the appearance of putting foreign countries at a disadvantage, the EU could refund the revenue from border adjustment to supplier countries in a lump sum or pay it into a climate fund that finances climate policy measures in these countries or at the global level, without jeopardizing the characteristics of the ideal border adjustment. This would invalidate the argument that the actual goal of border adjustment is not climate protection but the generation of revenue through the taxation of foreign companies.

(d) Consistency with domestic and international climate policies.

The border adjustment system can be well incorporated into the EU-ETS. It is also compatible in principle with systems of CO₂-pricing in other countries and, in particular, with an emissions trading system in a climate club. However, countries implementing the ideal border adjustment can no longer use emissions trading to control territorial emissions resulting from domestic production. In exchange, they gain control over CO₂-emissions associated with domestic consumption. However, all

international agreements focus on territorial emissions. The EU aims to reduce its territorial emissions by 55 percent from 1990 levels by 2030, and has committed to do so under the Paris Agreement. However, with the ideal border adjustment, whether unilateral or in a climate club, it loses control over territorial emissions, which can then no longer be managed through the ETS.

4.4 ON EQUIVALENCE WITH A CONSUMPTION LEVY COMBINED WITH FREE ALLOCATION OF ALLOWANCES

Under certain conditions, the results of an ideal border adjustment can also be achieved with purely domestic instruments. If domestic production is completely excluded from the ETS, but domestic consumption is subject to a consumption tax based on the CO₂-content of the products, then a complete transition of pricing from territorial emissions to the CO₂-footprint also follows. Incentives to relocate disappear, direct leakage is prevented, and competitive neutrality is established. However, such a regime faces the same informational implementation difficulties as the ideal border adjustment. However, no explicit intervention at the border is necessary, making potential trade policy disputes less likely. The levy is imposed when goods are placed on the market, regardless of whether they originate from domestic or foreign production. Consumption taxes are common and compatible with WTO rules. A CO₂-consumption levy could be seen as a tax, making it subject to unanimity in the EU Council, or it could be classified as an environmental measure, where a qualified majority is sufficient.

However, the consumption levy also has massive disadvantages. The CO₂-content of a product depends on when this product was produced, where and how. A consumption levy cannot reflect this granularity, so climate policy incentives are diluted. Furthermore, a pure consumption levy is incompatible with emissions trading. And it would probably be perceived differently by trading partners and by citizens than a border adjustment. We will come back to these aspects later.

5 EVALUATION OF CURRENT PROPOSALS ON CO₂-PRICE ADJUSTMENT MECHANISMS

Due to the problems described in Section 4, the proposals currently under discussion deviate considerably from the ideal procedure. They all provide for a restriction of the adjustment procedure to a few, particularly emission- and trade-intensive goods and a more or less strong flat-rate calculation of the CO₂-contents of the goods.

If the adjustment procedure is limited to individual goods, then goods should be included for which CO₂-pricing leads to significantly higher costs that cannot be passed on to consumers in competition because they would otherwise switch to imported goods that are not burdened. Therefore, these goods should be both emission-intensive, i.e. cause significant CO₂-emissions

per unit of value, and be subject to intense competition with imported goods from outside the EU.²⁶

If the CO₂-content is set at product or industry-level flat-rates, the incentive to avoid CO₂-in production is eliminated because the CO₂-price to be paid is levied is independent of the actual CO₂-content of the good. In consumption, on the other hand, the incentive to avoid CO₂ remains. Because the flat-rate nature and limitation to individual sectors eliminate the emission mitigation incentives of foreign countries, they reduce the effectiveness of the adjustment mechanism. Moreover, the schemes should be WTO-compliant. In other words, the scheme must not discriminate against foreign products. In case of doubt, imports would have to be treated more generously than domestic products. This would be the case, for example, if CO₂-pricing of imports were based on the average of domestic production, but foreign producers had the right to demonstrate lower CO₂-emissions. Such a mechanism would be welcome because it would create incentives abroad to use climate-friendly technologies to gain access to the EU market at low cost. However, it could be vulnerable to fraud and rent-seeking activities, as in practice product-specific CO₂-levels can still only be incompletely tracked.

In essence, there are two specific proposals for what an adjustment process might look like: An import-side border adjustment and a CO₂-consumption levy.

5.1 PROPOSAL 1: IMPORT-SIDE BORDER ADJUSTMENT

Lamy et al. (2020) describe a border adjustment system that became known in the discussion as the “French” proposal. This proposes that importers in certain energy-intensive and trade-intensive sectors must purchase emission allowances (so-called EU Importers Allowances, EUIA), but in a special system separate from the EU-ETS, with the price of EUIAs indexed to the ETS price. This separation is considered necessary so that the ETS pricing is not influenced.²⁷ The amount of EUIAs to be purchased per unit of the good is set at a reference value based on the EU average of its CO₂-content, but exporters can claim lower CO₂-levels if they can demonstrate them. Foreign countries' CO₂-prices would be credited, either directly or through Mutual Recognition Agreements (MRAs). Very poor countries would be exempted to stay within the international law principle of Common but Differentiated Responsibility. Close monitoring of the processes by an independent agency is envisioned. The proposal calls for an end to free allocation of allowances: Pricing imports while freely allocating allowances to domestic producers would be contrary to WTO-law. The French proposal is to compensate exporters with a new instrument, which, however, remains unspecified. A legally very controversial way would be to reimburse CO₂-allowances for exports from the EU. The

²⁶ In the literature, such industries are often referred to as “energy-intensive and trade-exposed” (EITE). The selection of industries that receive free allowances in the EU under the output-based allocation mechanism is based only on emissions intensity, but not on trade intensity. As a result, some industries benefit from free allowances and could pass most of the allowance price on to consumers without losing market share to foreign competitors.

²⁷ This construction implies that the price of EUIAs is determined by the scarcity conditions on the EU internal market and that a variation in the demand for EUIAs has no effect on the price. The ETS does not yet provide for a portion of the available allowances to be used for imports.

revenues from the border adjustment system would be allocated to the EU as own resources. The system is to be tested in a pilot phase (cement and electricity),²⁸ during which the EUAs will be freely allocated. Thereafter, the system is to be extended to other products in several steps.²⁹

Target achievement—border adjustment

(1) Effectiveness:

The incentives for foreign producers to save emissions are initially limited due to the orientation towards European benchmark values, because the average CO₂-intensity of production in many countries is higher than that in the EU. The possibility of proving an individually lower CO₂-content of the respective produced good creates corresponding incentives for climate-friendly production methods, but raises a number of practical implementation problems. If exports were not exempted, incentives to save CO₂-emissions in production in the EU would remain intact, but domestic exporters would be at a competitive disadvantage. Direct leakage can only be partially avoided, indirect leakage anyway.

(2) Efficiency:

For the reasons mentioned above, the system does not lead to any significant improvements in allocative efficiency.

(3) Competitive neutrality:

Although the competitive disadvantages of domestic producers are reduced, the flat-rate assessment basis for imports means that domestic producers may continue to face considerable competitive disadvantages compared to CO₂-intensive foreign companies. On foreign markets, the system increases the competitive disadvantages of European producers because the free allocation of allowances is to be ended, but exports are not included in the border adjustment regime.

(4) Source of income:

In the initial phase, only low revenues can be expected. The proposed benchmarking with the possibility of being able to prove and claim lower foreign CO₂-contents means that even in full expansion, the revenues can remain significantly below those that would be generated in the ideal border adjustment mechanism. In addition, there are considerable additional administrative costs. The border levy is not seen as a tax in the French plan and is therefore not subject to the unanimity requirement in the EU.

(5) Willingness of other countries to cooperate:

A border adjustment, which is only applied to countries that do not have a sufficiently ambitious CO₂-emissions price, could strengthen the incentives for the introduction of

²⁸ The EU plans to better integrate neighboring countries into its own electricity grid by 2025. These countries (Tunisia, Egypt, Libya, Israel and Moldova) have no CO₂-prices.

²⁹ Two other proposals have emerged in the EU's consultation discussions that differ from the approach taken here in that the border adjustment is made with the help of a tax or genuine participation in the EU ETS. These proposals are very similar to the one by Lamy et al. (2020). An assessment would therefore be very similar.

such a price abroad. Border adjustment would thus be an instrument that could be used to reward cooperation and sanction non-cooperation. Here the EU is helped by the fact that many countries—rightly or wrongly—fear economic damage from a European border adjustment system and should therefore have incentives to avoid it. A real punitive tariff, as proposed by Nordhaus (2015), could be more effective in forcing cooperation, but it would amount to a breach of trade conventions and make it difficult for the EU to insist that others comply with the rules of the multilateral trading system.

Fulfilment of the constraints—border adjustment

(1) Administrative feasibility:

The domestic CO₂-content in the EITE industries can be determined relatively well on the basis of the ETS, at least if only the direct emissions are taken into account (and the emissions contained in intermediate products are not taken into account). However, the right of foreign suppliers to claim a lower tax base after proving the CO₂-content of their products can lead to abuse and fraud. In any case, it would make sense for the EU—whether it proceeds unilaterally or in a coordinated manner in a climate club—to invest in the best possible statistical recording of the CO₂-content of as many products as possible and to use modern technologies and the companies' own incentives to have better information for this purpose.

(2) Conformity with applicable WTO law:

Because the CO₂-content of imports is assessed on a flat-rate basis at the average CO₂-content of European production, but foreign suppliers can claim lower contents if they so wish, foreign producers are not discriminated against but are even placed in a better position. The proposed regime can presumably be justified on the basis of Articles I, II and III of the GATT and Article XX GATT. Adjustment of domestic exporters is problematic.

(3) Retaliatory measures by foreign countries cannot be ruled out:

The probability of retaliation depends on the manner of political communication; if border adjustment on imports is introduced as a “climate tariff”, disputes are foreseeable. Waiving border adjustment on exports reduces the likelihood of retaliation. Exemptions for countries with equivalent CO₂-pricing systems can also help.

(4) Consistency with domestic and international climate policy:

The French proposal is compatible with the ETS because allowances are purchased for imports outside the ETS and exports do not receive an exemption. It makes it possible to end the free allocation of allowances in the EU as planned. Border adjustment is in principle compatible with other systems of CO₂-pricing, especially if they are coordinated with each other in the context of a climate club.

5.2 PROPOSAL 2: CONSUMPTION LEVY

Ismer et al. (2020), Neuhoff et al. (2020) and Böhringer et al. (2017) have proposed a system that provides for a flat-rate consumption levy when CO₂-intensive goods (basic materials such as steel or cement) are placed on the domestic market, which is based on the weight of the goods concerned (and not on the specific CO₂-content). The consumption tax is the same for domestic and foreign products. At the same time, domestic production is subject to the ETS, but the free allocation of emission allowances according to the benchmark principle³⁰ is maintained.³¹ The excise duty would also apply if the raw materials are contained in other higher-value products; information on this could presumably be verified comparatively easily by customs. Exports would be exempted, as is usual with other excise duties. The free allocation of allowances under the benchmark system will not be terminated by 2030, as actually envisaged. This compensates exporters for their disadvantages in international competition, while at the same time CO₂-savings incentives remain in place.

Target achievement – consumption levy

(1) Effectiveness:

Due to the flat-rate nature of the assessment bases, the proposed system can only improve the effectiveness of EU climate policy to a very limited extent. Foreign producers have no incentive to save emissions because of the flat-rate determination of the consumption levy. Because the ETS would remain unchanged and the free allocation of allowances would be based on the benchmark principle, incentives to save CO₂-emissions in EU production would remain. Direct leakage can only be partially avoided; indirect leakage cannot be reduced at all.

(2) Efficiency:

For the reasons mentioned above, the system does not lead to any significant improvements in allocative efficiency.

(3) Competitive neutrality:

A consumption tax has a neutral effect on competition as long as it provides for the same burden for domestic and foreign products. If, however, domestic companies have to participate in emissions trading on top of this, this can provide further incentives for climate-friendly production, but only at the cost of an additional burden on domestic compared to foreign companies. How heavy this burden is depends on how far the CO₂-emissions of the company concerned are from the benchmark (the

³⁰ The allocation of free certificates is based on the average CO₂-emissions for the production of a product of the 10 percent of the most climate-friendly companies that produce this product with the lowest CO₂-emissions. With a free allocation of x per cent, a company thus receives x per cent of the certificates that the company with the most climate-friendly production needs per production unit, multiplied by its own production volume in a base year. The remaining certificates must be purchased on the market. In this way, incentives to reduce emissions are maintained “at the border”.

³¹ Domestic production is thus burdened twice by the excise duty and the ETS, but the double burden is to be reduced by the free allocation of allowances. According to Lamy et al. (2020), free allocation is potentially a WTO legal problem that already exists, but which would be alleviated by a consumption levy.

CO₂-emissions of the least polluting companies). In addition, the flat-rate assessment of the import base can lead to further potentially significant competitive disadvantages for domestic producers compared to CO₂-intensive producing foreign companies. On foreign markets, in contrast to the border adjustment, nothing changes for European producers compared to the current status quo, because the free allocation of certificates (and additionally in Germany the exemption from the renewable energy sources (EEG) levy) is maintained and exports are exempt from the consumption levy.

- (4) Source of income:
The consumption levy can be seen as a tax or as an environmental measure, which has implications for its classification under EU law. If it remains limited to a few sectors, the expected revenues are low.
- (5) Willingness of other countries to cooperate:
A consumption levy would probably have a rather detrimental effect on other countries' willingness to cooperate. The levy cannot serve as a positive or negative incentive tool for joining a climate club, as it is independent of the place of production. Moreover, the EU would be alone with such a consumption levy: none of the existing US legislative proposals contains such a levy, while all proposals provide for border adjustment.

Fulfilment of the ancillary conditions – consumption levy

- (1) Administrative feasibility:
The introduction of a consumption levy would be administratively much simpler than border adjustment. However, if it were to be classified as a tax under EU law, unanimity in the EU would be required for the introduction (and a possibly desirable abolition in the future) of this measure.
- (2) Conformity with applicable WTO law:
The CO₂-excise tax, which levies the same tax rate per unit of weight on both domestic and foreign goods, would be compensable under WTO law like other excise taxes. However, the continuation of the free allocation of allowances may pose a problem under subsidy law (Lamy et al., 2020).
- (3) Retaliatory measures by foreign countries:
Due to the clear WTO legal conformity and the absence of intervention at the border, the probability of retaliation is probably low. But if the free allocation of allowances is seen as a subsidy, retaliatory measures within or outside the WTO system cannot be ruled out.
- (4) Consistency with domestic and international climate policy:
With the consumption levy, the system introduces an additional instrument of emissions control into German and European climate policy. At the same time, it adheres to the ETS without, however, opting out of the practice of free allocation of allowances as planned. Conceptual differences and interdependent effects of the two

instruments complicate climate policy control. The consumption levy is an instrument of price control, the EU-ETS one of quantity control. The consumption tax controls domestic consumption (CO₂-footprint), the EU-ETS the CO₂-emissions of domestic production. The consumption levy dampens demand equally for all suppliers, while emissions trading only imposes additional costs on domestic companies, which cannot be completely avoided even through free allocation of allowances. The complexity of domestic climate policy is significantly increased, coordination at the international level is made more difficult.

6 CONCLUSIONS AND RECOMMENDATIONS

The global climate crisis cannot be solved by unilateral efforts of individual countries or regions alone. As long as there are no technologies in the energy sector that are cheaper than burning fossil fuels, global greenhouse gas emissions can only be curbed through global cooperation on mitigation. Any climate policy approach that does not include all major countries must be scrutinized to see whether it strengthens or weakens the incentives for global cooperation.

The introduction of a unilateral adjustment system, as suggested in the EU Council of December 2020, carries risks of retaliation and cannot effectively reduce global greenhouse gas emissions: Even under ideal circumstances, an adjustment mechanism cannot prevent indirect leakage through global energy markets. Thus, at best, it can be an instrument to curb direct leakage. In practice, however, not even this is true. This is because none of the proposed systems can completely prevent the distortions in international competition caused by widely differing CO₂-prices, because the CO₂-content of goods is at best difficult to determine objectively and would therefore require numerous exceptions and the use of flat-rate simplifications. For these reasons, the effectiveness of unilateral climate policy can only be increased slightly and direct leakage can only be partially prevented. Moreover, there is a danger that the instrument be used in a protectionist manner, that it provokes retaliatory measures, that it serves as a gateway for lobbying and fraud, and that it ends up being detrimental to climate protection because it weakens international willingness to cooperate.

The EU has decided to phase out the free allocation of allowances to the most exposed sectors by 2030. This means that leakage will only gradually become a threat, even as CO₂-prices rise. Time should be used to step up efforts for a multilateral approach (EU with US and other major trading partners (Australia, Canada, Korea, Japan, ...)). The moment is right for this. The new US President Biden, with the support of both houses of Congress, will set the course for a new climate policy in the US in the coming months to achieve climate neutrality by 2050. Japan, Canada and South Korea also committed to this goal a few months ago. They follow 66 other states that have made commitments. All these states face the same problem of leakage.

Therefore, the EU should push for the creation of a climate club whose member states commit to a common minimum CO₂-price. Within this club, adjustment measures can be waived, while the members of the club implement border adjustment vis-à-vis third countries.

This can provide incentives for cooperation.³² The larger the club, the lower the risk of trade tensions and the greater the chance of reforming WTO law in a way that supports climate protection. And the larger the club, the more indirect leakage will be reduced through a common border adjustment.³³ Whether border adjustment alone creates sufficient incentives for participation in the climate club is questionable. If the incentive effect of the border adjustment system is not sufficient, the use of climate tariffs could become necessary to stabilize a climate club of the nations with the largest emissions worldwide. This may require a revision of WTO rules to pursue global climate policy goals using trade policy instruments. Complementary climate diplomacy efforts for a climate club, for example in the framework of development cooperation or in the context of free trade agreements, are in any case appropriate.

A consumption levy is not consistent with the existing EU-ETS. It is also not suitable as an instrument to promote the willingness of other countries to cooperate and as an external safeguard for a climate club. The Council therefore rejects such a levy.

In addition to these key recommendations, it is important to the Council that preparations for the introduction of an adjustment system, possibly in the context of a climate club, should be started quickly. This includes improving the information base through the use of new technologies for CO₂-tracking, developing institutional designs that give market participants an incentive to correctly document the CO₂-content of imports, and cooperating with companies as well as civil society actors who themselves have a great interest in a better data situation.

Official international CO₂-accounting is based on the concept of territorial emissions. The reduction targets agreed in international agreements refer to this measure, as do all systems of CO₂-pricing. If one consistently switches to a pricing of the domestic footprint, whether unilaterally in the EU or multilaterally in a climate club, then cap-and-trade systems no longer control territorial emissions but the footprint. Fulfilment of the commitments made is therefore no longer guaranteed, even under ideal circumstances. To prevent this problem, a separate set of certificates must be earmarked for adjustment measures, but this could lead to different CO₂-prices for domestically produced and imported goods. If one does not want this, one would have to change the international treaties to national footprints. If the climate club becomes sufficiently large, however, this problem will disappear by itself.

Finally, it is important to the Council that a CO₂-border adjustment should not be introduced with the aim of gaining own resources to finance the EU's tasks. This would not constitute a sustainable and stable source of revenue. A successful adjustment mechanism would make itself superfluous because it would encourage other states to introduce a CO₂-price comparable to that of the EU.

³² Cramton et al. (2017) describe the challenges and solutions of international climate cooperation and the role of minimum prices, climate clubs and sanctions for stable cooperation.

³³ Der Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung drew similar conclusions in its Annual Report 2020 (paragraph 432). See also Wolff (2020).

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