Potsdam Institute for Climate Impact Research

How to scale up effective international climate finance by the EU

Tax coalitions and jurisdictional reward funds for the case of fossil fuel

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Abstract

This paper examines how donor countries can be motivated by self-interest to fund emission reductions in low- and middle-income countries (LMICs). While not solving the broader climate cooperation problem, we propose pragmatic measures that do not require global consensus on future climate risks or binding commitments. We quantify the unilateral benefits for donors—reduced climate damages and improved terms-of-trade from lower fossil fuel prices—resulting from financing fossil fuel demand reductions. To address project-level finance inefficiencies, we introduce jurisdictional reward funds targeting governments, which also generate implicit wealth transfers to LMICs. A self-enforcing coalition of fossil fuel importers, such as the European Union and China, could mobilize USD 66 billion annually for mitigation in LMICs, cutting emissions by 1060 Mt CO_2 per year and transferring USD 33 billion per year. LMICs additionally benefit from USD 78 billion in reduced climate damages and USD 19 billion from lower fuel prices. We explore coalition stability, geopolitical considerations, and how broader tax and reward mechanisms could further improve global climate, forest, and health outcomes.

Executive Summary

Climate finance is often framed as a moral responsibility of wealthy nations to help vulnerable countries deal with the effects of climate change. This report offers a different perspective: investing in climate action abroad is also in the self-interest of high-income countries. By focusing on this win-win approach, the report outlines how donor countries—particularly the European Union (EU) and China—can support climate mitigation in low- and middle-income countries (LMICs) in ways that directly benefit themselves economically, politically, and environmentally.

At the core of this new approach is the recognition that the global nature of climate change means that any reduction in greenhouse gas emissions, no matter where it occurs, helps all nations. In particular, for large economies like the EU and China, paying for significant emissions cuts in other countries can be in their own interest: these investments help lower climate damages (such as extreme weather events and sea level rise) that would otherwise also impact their own economies. Additionally, by helping to reduce global demand for fossil fuels, these investments can lead to lower world market prices for oil and gas—directly benefiting fuel-importing countries.

The report proposes a mechanism that combines new levies on fossil fuel imports with a system of performance-based financial rewards. Specifically, it recommends the creation of a "fossil fuel importers' coalition"—a group of countries that tax their fuel imports and use the revenue to fund "jurisdictional reward funds." These funds would pay LMIC governments for proven emission reductions at the national or regional level. Unlike traditional project-based funding, which often suffers from inefficiency, crowding out, and even fraud, jurisdictional funds reward measurable outcomes and avoid many of the pitfalls that have plagued earlier climate finance schemes.

Simulations in the report show that if the EU and China were to act together, they could raise around USD 66 billion annually through modest import taxes. This could lead to a reduction of over 1 billion tons of CO_2 emissions globally—about half the EU's current emissions from fossil fuels. At the same time, LMICs would receive substantial financial transfers, reduced climate damages, and improved trade conditions. These benefits are not just theoretical: even with conservative assumptions, donor countries would recoup their investments through reduced fuel prices and fewer climate-related damages at home.

An important innovation is the idea that coalition membership and tax levels automatically adjust based on who joins or exits. This makes the agreement both self-enforcing and flexible. The model also allows for future expansion beyond fossil fuels. For instance, taxes on airline tickets or luxury goods could also fund reward systems for preserving forests, boosting pandemic preparedness, or supporting clean technology innovation.

While political resistance to new taxes remains a challenge, this report argues that many of the perceived economic downsides can be avoided. For example, lower fossil fuel prices triggered by global demand reductions could offset the consumer impact of new taxes. In developing countries, reward funds can be designed to help governments use climate finance not only for emissions cuts but also for social protection, poverty reduction or adaptation. The result is a structure that aligns local and global interests, encourages cooperation, and can scale over time.

Ultimately, the proposed system offers a practical and politically feasible way to break through the current gridlock in international climate negotiations. It does not rely on moral appeals or idealistic visions of global unity. Instead, it is grounded in real-world incentives, using self-interest as a powerful driver for collective action. The European Union, with its policy capacity and global leadership, is uniquely positioned to take the first step. By launching the initial coalitions and reward funds, it can invite others—especially China—to join and scale up a new model of international cooperation.

If implemented successfully, this architecture could raise hundreds of billions of dollars per year for climate and other global public goods. It offers a rare combination of ambition and realism: a system that works for both rich and poor countries, and that turns narrow national interests into a force for the common good.

Contents

1. Introduction

Despite broad international consensus on the urgent need to scale up climate finance, a large and persistent gap remains between political commitments and actual financial contributions. At COP 29, governments agreed to mobilize USD 300 billion annually for climate-related purposes in developing countries by 2035—including emission reductions, the protection of carbon sinks, and adaptation measures. The funds of the private and public sectors combined should be increased to USD 1.3 trillion/year by 2035. In reality, however, current contributions fall far short, amounting to only USD 5 billion/year (Green Climate Fund, Thwaites 2024) and USD 2 billion/year from voluntary carbon markets (Porsbog-Smith et al. 2023). It is unclear how funds in the necessary order of magnitude can be incentivized or enforced.

This discrepancy is not merely a matter of administrative inertia or fiscal constraints. It reflects deeper structural issues within the global financial governance framework—most notably, the absence of enforceable obligations, questionable effectiveness of financial contributions, and pervasive free-riding behavior among potential donor countries. These factors undermine collective action and stall progress toward the agreed climate finance goals.

This report proposes a new approach to overcome, at least in part, the underlying weaknesses of the current climate finance architecture. At its core lies a shift in perspective: understanding and quantifying the national self-interest of potential donor countries in providing climate finance. By anchoring the debate in a framework of domestic benefits—rather than global responsibility alone—we identify the realistic financial envelope that countries may be willing to mobilize even in the absence of binding enforcement mechanisms. Thereby, we contribute to the literature on mutual interest aid surveyed by Heidland et al. (2025).

Our analysis shows that the scale of such self-interested contributions depends critically on two interrelated conditions. First, the incentives to free ride must be minimized through coordinated action among donor nations. Second, institutional mechanisms—such as jurisdictional reward funds that would incentivize governments via conditional transfers to achieve low emissions[5]—must exist to ensure that each dollar of climate finance yields credible and verifiable emission reductions. When these conditions are met, significant financial flows can be generated out of aligned national interests.

Building on this foundation, we explore how the European Union and China could jointly launch an international climate finance initiative in the form of a “fossil fuel importers’ tax coalition.” Under this scheme, participating countries would impose a levy on fossil fuel imports and channel the revenues into climate finance mechanisms. Our simulations indicate that such a coalition could unlock financial flows of USD 66 billion annually, resulting in global emissions reductions of 1060

[5] “Jurisdictional” here means that outcomes are measured at the level of a jurisdiction, which could be national or subnational, and that the reward payments are made at the corresponding level. We will in this paper focus on the case where the reward payments are made to the governments of the corresponding jurisdiction. An alternative design option is to reward the jurisdiction via universal cash transfers to its population. The size of the transfer would still be made conditional on the aggregate outcomes in the jurisdiction, thereby incentivizing voters to support climate policy.

million tons of CO_2 per year—delivering tangible climate outcomes while remaining in the economic self-interest of the participants.

This paper is structured as follows: Section 2 assesses and quantifies the benefits of reducing demand for fossil fuels for donor countries, particularly the EU and China, and for low- and middle-income countries (LMICs). Benefits for LMICs consist of reduced damages from lower global warming as well as reduced fossil fuel prices; benefits for donor countries determine the maximum willingness to pay for climate finance. Section 3 focuses on the "spending side" by reviewing key problems of existing project-based approaches of climate finance and proposing jurisdictional reward funds as new institutions for channeling climate finance effectively at scale. To further increase financial contributions, Section 4 proposes an importers' tax coalition to reduce free-riding incentives among large players. We show that it is in the self-interest of the EU and China to join such a coalition and that the coalition would raise funds by a multiple. Section 5 integrates further normative considerations into this architecture which enables more funds to be channeled into low-income countries (relative to middle-income countries), while only marginally affecting the efficiency of the reward funds and the incentives of the importers' tax coalition. Finally, Section 6 discusses further important institutional aspects: how the proposed architecture interacts with existing domestic policies; how to deal with distributional effects; how the EU can initiate the first steps; and how to extend both the funding and spending sides to other sectors and international coalitions. These include climate finance coalitions based on aviation or maritime carbon pricing, or luxury goods taxation. By combining these sectoral coalitions with jurisdictional reward funds that target various global public goods—such as climate mitigation, forest protection, or pandemic preparedness—countries can earmark revenues for causes aligned with their own strategic priorities and political narratives.

The focus of this paper is to outline a realistic first step to scale up international climate finance in a rather narrow coalition of few fossil fuel-importing countries. Our modular, incentive-compatible approach offers a promising path forward. It pragmatically aligns national interests with global needs, creates new and scalable sources of climate finance, and lays the groundwork for a more robust and accountable system of financing global public goods that benefit the whole international community.

2. Why invest in climate finance? Benefits for donors and LMICs

Stabilizing global temperature levels requires a substantial reduction of fossil fuel combustion. Since global warming is determined by the cumulative amount of carbon emissions, there are strong incentives for countries to free ride. The benefits of individual mitigation efforts are distributed globally, while the costs are borne domestically (Barrett 2003, Nordhaus 2015). The free rider problem is further exacerbated by carbon leakage through international goods and fuel markets. When a country reduces its territorial emissions—such as by lowering fossil fuel demand—part of the reduction can be offset by market responses, including falling global fuel prices that stimulate increased consumption elsewhere (Jakob 2021, Sinn 2015). Free riding and carbon leakage provide strong disincentives for countries to engage in costly mitigation efforts, which may help explain why international commitments to global temperature levels fall short of actual emission trends (UN Gap Report).

One approach to overcoming the free-riding incentives is to engineer a coalition mechanism where a country's withdrawal from the coalition causes the remaining coalition members to reduce their contributions to the global public good (domestic mitigation/monetary contributions to global funds incentivizing mitigation). Kornek & Edenhofer (2020) propose a mechanism that generates such incentives via a relatively simple rule for conditional monetary contributions that coalition members have to make. The authors show that a version of the mechanism can achieve globally efficient levels of climate change mitigation.

The fuel importers' coalition mechanism that we propose in the current paper is less ambitious but has two key practical advantages. Firstly, the membership rules are renegotiation-proof in the sense that they are always consistent with the collective self-interest of the members. Secondly, the mechanism works despite informational constraints. It does not require any assessment of what climate policy countries would choose in absence of the mechanism.

While extensive research has explored the causes of collective action failure in climate change mitigation, few studies have examined the national incentives for unilateral action and how these could be leveraged in "minilateral" approaches, where a small number of countries strategically coordinate on specific aspects of climate policy. Schwerhoff et al. 2018 give a conceptual overview on potential unilateral benefits of climate policy that include technological and policy learning with associated cost reductions. Other works (e.g., Knopf et al. 2012) have emphasized the role of the historic responsibility of industrialized countries in contributing to global warming, which disproportionately damages vulnerable low-income countries. This may motivate countries to reduce emissions to some extent, even when others free ride.

Here, we focus on two clearly defined material benefits of climate policy that can be measured approximately well given the available empirical evidence: (i) reduced national climate damages and

(ii) improved terms-of-trade effects on the fuel market. The Technical Appendix provides formal derivations for the quantitative results of this paper. The numerical calculations are available in a separate spreadsheet (also including additional countries).

We start with the first channel: Unilateral actions reduce global emissions and global warming, which ultimately reduces climate damages in the donor's own territory. This incentive is particularly strong for large economies that are likely to experience a significant share of the global damages caused by climate change. To illustrate this effect, we use the (global) social cost of carbon of USD 200 corresponding to the range estimated in a rigorous and comprehensive assessment by the U.S. Environmental Protection Agency (2023).[6] This means that one mitigated ton of CO_2 reduces global damages from global warming by USD 200. We assume that climate damages scale with a country's GDP;[7] for example, USD 33 fall on the EU's GDP from the global damage. Hence, every ton of CO_2 avoided—regardless of where the reduction occurs—constitutes a benefit to the EU valued at USD 33. This means that the EU would benefit from paying for a marginal emission reduction anywhere —in particular in LMICs—when the marginal costs are below USD 33.

A mechanical reduction of fossil fuel use will, to some extent, be offset by the increase in demand in other regions due to carbon leakage effects. Given the rather inelastic supply and demand of global oil, carbon leakage on oil markets is roughly 80 percent in our central estimate; as coal supply and demand is more elastic, leakage rates are substantially lower. Leakage reduces the effective climate benefit from mitigation policies. Hence, the climate benefit for the EU of reducing oil demand drops to USD 7/tCO_2. Again, these figures refer to demand reductions anywhere in the world.

We now turn to the second channel that constitutes the flip side of the carbon leakage problem: Importers of fossil fuels experience a terms-of-trade benefit from reducing energy demand as global fuel prices drop. This benefit materializes as long as the economy has not been fully decarbonized and partly offsets the carbon leakage effect. The terms-of-trade effect is large for oil and constitutes a benefit for the EU of USD 37 for oil demand reduction corresponding to 1tCO_2. These results are obtained in a simple model with a globally integrated oil market. The quantitative importance of the terms-of-trade effects has also been highlighted in more sophisticated trade models (Bourany & Rosenthal-Kay 2025, Bourany 2025).

Fig. 1 illustrates how both benefits add up to the overall benefits for the EU for the case of oil, assuming different supply elasticities that imply different leakage rates. The higher the leakage rate, the lower the climate benefit, but the larger the terms-of-trade benefit. As a result, the overall benefits are rather flat in the leakage rate.

[6] This number corresponds to a rather conservative estimate given recent scientific assessments (e.g., Moore et al. 2024) which is useful in our context to avoid overestimating the incentives from governments for climate policy.
[7] This is a reasonable approximation as larger wealth implies also larger (absolute) losses from climate damages and willingness to pay for non-market goods (e.g., health, biodiversity) increases with income (Drupp et al. 2024). In addition, trade and migration will also imply that heterogeneous local climate damages will partly spill over to other regions (Missirian & Schlenker 2017; Barrot & Sauvagnat 2016).

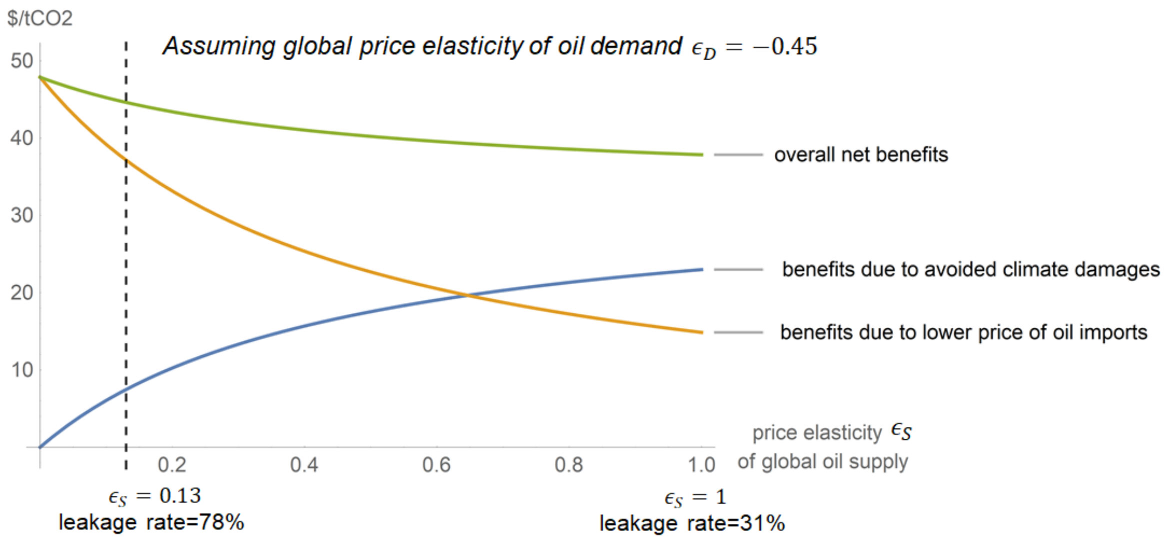

Figure 1: Unilateral benefit for the EU from a reduction of oil demand by 1 tCO_2 and decomposition into climate benefit and terms-of-trade benefit.

Note: Figure 1 shows benefits for different oil supply elasticities and the resulting carbon leakage rates. The dashed vertical line indicates our central value used for the subsequent calculations on oil.

The considerations and calculations above can be applied to other countries as well. Climate benefits are especially significant for large economies that bear a substantial share of global climate damages, while terms-of-trade benefits tend to be greatest for (large) fuel-importing countries. We illustrate these benefits in Tab. 1 for the EU, China and low-income countries for different fossil fuels. The numbers indicate that the EU and China have substantial unilateral incentives to reduce global fossil fuel demand, with marginal benefits ranging from USD 21 to USD 45 per ton of CO_2. Even if low-income countries did not finance any mitigation policies, they would benefit from reduced climate damages and improved terms-of-trade effects.

Table 1: Willingness to pay (USD) for demand reduction of 1 tCO_2 worth of fuel.

	Oil			Thermal Coal			Coking Coal			Natural Gas / LNG		
	EU	**CHN**	**LMICs**	**EU**	**CHN**	**LMICs**	**EU**	**CHN**	**LMICs**	**EU**	**CHN**	**LMICs**
Direct Climate Benefit	33	35	74	33	35	74	33	35	74	33	35	74
Leakage Rate	0.78	0.78	0.78	0.26	0.26	0.26	0.37	0.37	0.37	0.74	0.74	0.74
Effective Climate Benefit	7.5	7.8	16.5	25.18	26.80	25.18	21.1	22.0	46.7	8.7	9.1	19.2
Terms-of-Trade Benefit	37.2	31.8	30.4	0.49	1.09	0.1	3.2	10.3	15.0	22.5	12.2	11.2
Total Benefit	44.7	39.6	46.9	25.7	27.9	54.6	24.3	32.3	61.7	31.2	21.3	30.4

Tab. 1 shows a central estimate of this benefit, measured as willingness to pay in USD/tCO_2 demand reduction (we provide calculations for further countries like the U.S., India etc. in the Technical Appendix). The calculations already account for leakage effects on international resource markets. It is worthwhile to note that these benefits are cumulative when countries cooperate. The combined benefit of a coordinated demand reduction by the EU and China amounts to USD 85 per ton of CO_2 for oil and USD 54 per ton of CO_2 for thermal coal.

The unilateral benefits in Tab. 1 for large economies materialize independently of where the oil and coal demand reductions take place. If the EU and China were to focus only on domestic demand reductions in their own territories, however, they would not harness many of the low-hanging fruits of demand reductions that could be realized in other countries. This provides a strong rationale for the creation of global funds that finance demand reductions wherever they can be achieved most cost-effectively. If such a fund had perfect information to identify and incentivize the most cost-effective option, countries would have a self-interest in contributing to it—up to the point where marginal mitigation costs equal their marginal unilateral benefits. We relax this assumption and allow for information asymmetries between the fund and the receiving government in Section 4.

Tab. 2 shows the resulting financial flows to such funds and the resulting benefits for donating countries (EU, China) as well as LMICs and all countries globally. In the following, we always assume that such a fund only focuses on mitigation in countries other than high-income countries, i.e., only in LMICs.[8] In addition, we assume that countries can identify least-cost mitigation options in low- and middle-income countries and compensate exactly for the opportunity costs.[9] We consider three cases: one where only the EU contributes to funds according to its own national self-interest, one where only China contributes, and one where the EU and China collectively contribute according to their joint self-interest.

Table 2: Contributions (out of self-interest) and implications on welfare and emissions without informational constraints. Note: Global benefits can be smaller than the sum of net benefits for donors and LMICs because terms-of-trade benefits are zero-sum among all countries.

	Oil			Thermal Coal			Coking Coal			Natural Gas / LNG		
	EU only	**CHN only**	**EU+ CHN**	**EU only**	**CHN only**	**EU+ CHN**	**EU only**	**CHN only**	**EU+ CHN**	**EU only**	**CHN only**	**EU+ CHN**
Funds Provided ($bn)	17.25	13.54	61.34	19.62	22.23	83.62	2.26	3.98	12.25	3.38	1.56	9.54
Net Benefits for Donors ($bn)	17.25	13.54	61.34	19.62	22.23	83.62	2.26	3.98	12.25	3.38	1.56	9.54
Net Benefits for LMICs ($bn)	36.21	32.08	68.29	85.09	90.58	175.67	11.46	15.20	26.66	6.57	4.47	11.04
Global Benefits ($bn)	30.78	27.66	51.59	216.36	245.77	414.72	22.12	28.72	47.03	10.41	7.27	16.49
Global Emission Reductions ($GtCO_2$)	0.17	0.15	0.33	1.15	1.23	2.38	0.12	0.16	0.27	0.06	0.04	0.09

Tab. 2 shows that the optimal unilateral contribution of the EU or China ranges between USD 2 billion and USD 22 billion, depending on the type of fuel considered. Hence, the terms-of-trade effect as well as the (partial) internalization of the avoided climate damage already provide sufficient incentives: the benefits for the two donors exactly equal the costs for financing demand reductions. The induced global demand reductions imply substantial benefits to LMICs due to reduced climate damages and improved terms-of-trade effects. This illustrates the potential win-win outcomes from

[8] This is plausible for two reasons: First, many high-income countries already have climate policies in place, so low-cost mitigation options might be rather scarce. Second, restricting climate finance to low- and middle-income countries constitutes a larger "warm-glow" benefit for the EU as welfare in these countries increases more strongly for every U.S. dollar of income transferred. This will particularly be relevant when climate finance involves implicit transfers (in the form of rents) to eligible countries as discussed in Section 4.
[9] For detailed calculations see the Technical Appendix. We assume quadratic abatement cost curves which are reasonable approximations for small changes around the status quo.

climate finance. Importantly, financial flows and (global) benefits increase substantially when the EU and China can cooperate and determine their jointly optimal level of climate finance.

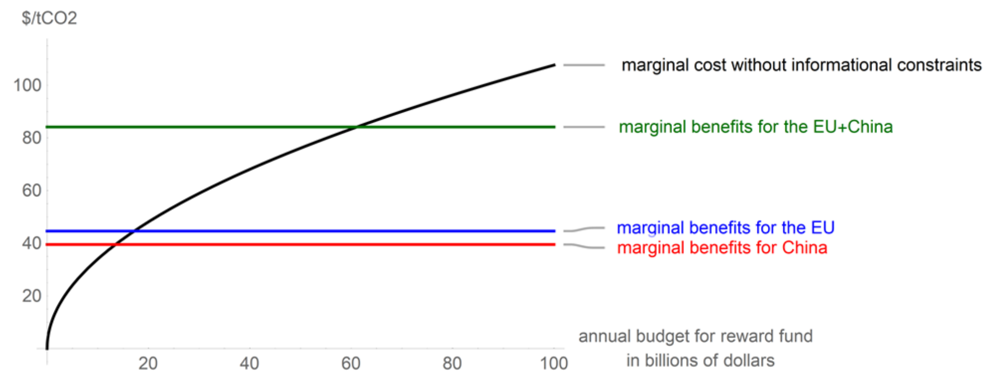

Figure 2: Contributions out of self-interest by the EU and China for oil demand reductions in LMICs.

Figure 2 compares the costs and benefits of reducing carbon emissions (measured in U.S. dollars per ton of CO_2 avoided) as a function of the budget available for a climate reward fund (shown along the x-axis in billions of dollars). This figure shows how the costs and benefits of emission reductions change as additional funds are invested into a reward mechanism that incentivizes mitigation. Fig. 2 also illustrates why cooperation between the EU and China creates compound effects: Because the marginal benefits of both actors roughly double when they maximize joint benefits (green line), optimal spending quadruples. The quadratic relationship is a direct result of the reduced free-riding incentive between the EU and China on the climate and terms-of-trade benefits.[10] Assessing the benefit structure in the case without cooperation, we find that only one actor would contribute to global demand reductions, whereas the other would free ride. Cooperation between the EU and China—maximizing their joint surplus—would first imply that both contribute (i.e., roughly doubling the available funds). In addition, when both actors consider that their own contribution affects not only their own benefits but also the benefits of the other, joint surplus maximization leads to another doubling of funds as marginal joint benefits are larger. Hence, cooperation increases climate finance by a factor of roughly four. We will outline a mechanism for how joint surplus maximization can also be made incentive-compatible and renegotiation-proof in Section 4.

10 See the Technical Appendix. for a formal derivation.

3. Towards more effective spending on global public good provision

Traditional climate finance mechanisms, such as the Clean Development Mechanism (CDM), have focused on funding individual projects that contribute to global public goods like climate mitigation. The core idea behind these project-based approaches is that funding should only be directed to projects that would not be viable without external support ("additional" projects). For example, a private wind farm should only be eligible for carbon credit funding if it can prove that it would not be profitable without it. The traditional approach corresponds to our calculations, where we assume perfect information by contributing countries to identify and incentivize these "additional" projects.

However, a growing body of empirical research suggests that this principle has often not been upheld in practice. In India, for instance, more than half of the wind farms funded under the CDM would have been built even without external support (Calel et al. 2025). Similarly, in the forestry sector, baseline emissions have frequently been set too high, making it appear as though reductions were taking place when in fact they were not: West et al. (2020) estimate that about 40 percent of forest carbon credits lacked additionality. Probst et al. (2024) find in a systematic review that "less than 16% of the carbon credits issued to the investigated projects constitute real emission reductions, with 11% for cookstoves, 16% for SF_6 destruction, 25% for avoided deforestation, 68% for HFC-23 abatement, and no statistically significant emission reductions from wind power and improved forest management projects."

Even if more accurate baselines were established, project-based mechanisms have a further downside: they may discourage domestic climate action. When governments observe that private firms are receiving substantial foreign funding, they may reduce their own efforts, effectively offsetting the external support (see Fig. 3 for a sketch of the mechanisms). This phenomenon is known as fungibility.

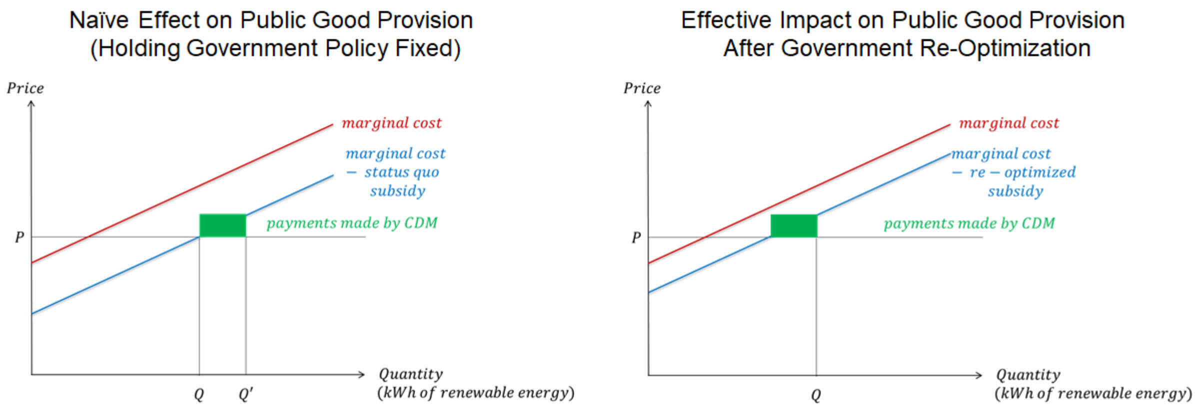

Figure 3: Crowding out of government policies by project-based climate finance when accounting for re-optimization of domestic policies.

Empirical research on development aid has extensively documented this effect: Lu et al. (2010) and Dykstra et al. (2019) show that increases in health aid lead to reductions in domestic health budgets. In some cases, the external funds substitute entirely for government spending, eliminating any net gain.

To overcome these issues, jurisdictional reward funds have been proposed as a more effective alternative (Kalkuhl & Stern 2025; Edenhofer et al. 2024). These funds operate at the country or regional level and offer financial rewards based on measurable outcomes, such as reductions in CO_2 emissions relative to a predefined reference level.[11] A prominent example is Norway's bilateral agreement with Guyana, under which Guyana received payments between 2009 and 2015 for maintaining low deforestation rates. These payments, tied to national forest cover outcomes, were shown to significantly reduce deforestation at remarkably low costs (Roopsind et al 2019).

Jurisdictional reward funds extend this logic into a multilateral setting: they pool donations from multiple sources and allocate payments annually based on countries' performance in delivering globally beneficial outcomes, such as climate mitigation. The goal is to better align national policies and incentives with global welfare. This approach could lead to significant efficiency gains, as donor countries with high willingness to pay for mitigation can channel resources to countries with low-cost abatement opportunities.

A central challenge in designing such funds is establishing baseline levels that are incentive-compatible. If baselines are based on a country's past emissions, it may be tempting to inflate emissions today to secure easier targets in the future, eroding dynamic incentives. One promising solution is to use machine learning methods to determine baselines on characteristics that cannot be manipulated by the national government. For that purpose, each country will be categorized with machine-learning methods according to characteristics like GDP, population, or geography, which are not only valid for this specific country but for a whole class of countries. This avoids the perverse incentives of "grandfathering"[12] past emissions and makes the process less susceptible to gaming.

[11] Emissions are estimated through a combination of remote sensing and ground-based inventories. Remote sensing tracks changes in forest cover using satellite imagery. The corresponding carbon emissions per change in forest cover are then estimated based on ground-based inventories consisting of field surveys and sampling where data on tree species, sizes, and densities is collected. In the context of fossil fuel consumption, quantities can be measured based on production and trade data, for example.

[12] "grandfathering" here denotes the approach where countries receive payments on the basis of how much their actual emissions are below their past emissions. Under such an approach there will be incentives for donors to reset the grandfathering in the future. If countries anticipate this, the prospect of such a reset will create an incentive for countries to increase their emissions. This countervailing incentive can wipe out much of the desired incentives that the reward funds create (see Kalkuhl & Stern 2024 for a quantification).

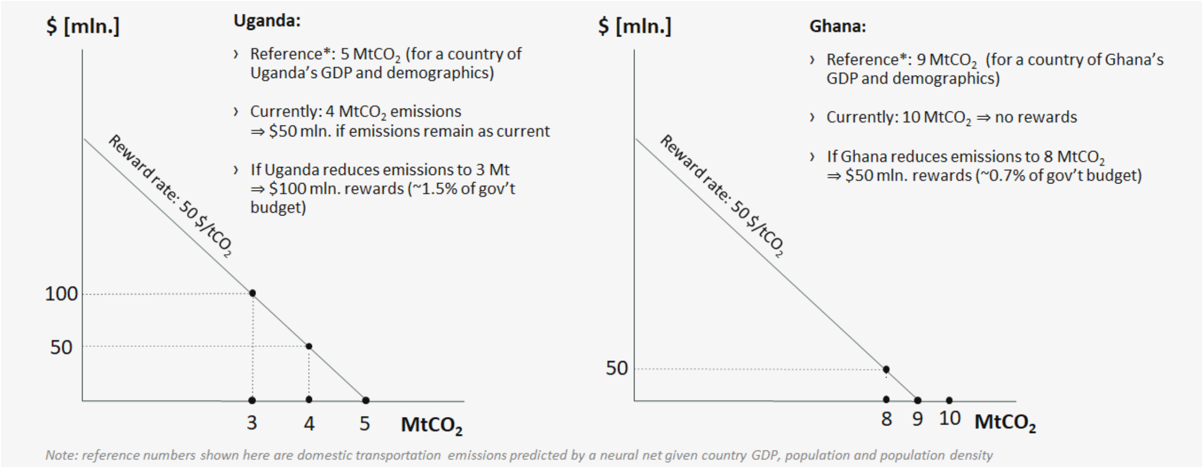

Figure 4: Illustration of the functioning of the jurisdictional reward fund.

Note: Numbers are for transport-related oil emissions in Uganda and Ghana. Reference (baseline) emissions are obtained from a simple predictive model (neural network).

Figure 4 illustrates how such a reward fund works for the case of oil used in the transport sector in Uganda and Ghana. In Uganda, the reference level is set at 5 $MtCO_2$, based on the country's GDP and demographic profile. Uganda currently emits 4 $MtCO_2$, which earns it a reward of USD 50 million for being 1 $MtCO_2$ below the baseline. If Uganda further reduces emissions to 3 $MtCO_2$, it would receive USD 100 million, which corresponds to about 1.5 percent of its national government budget. Ghana, on the other hand, has a reference level of 9 $MtCO_2$ but currently emits 10 $MtCO_2$, and thus receives no rewards. If Ghana brings emissions down to 8 $MtCO_2$, it would receive USD 50 million, about 0.7 percent of its national government budget.

This example shows how the reward fund creates clear, outcome-based incentives for both countries—whether they are currently over or under their baseline levels—to reduce emissions.[13] The case of the bilateral reward funds for forest conservation by Norway shows that governments do respond to international financial incentives (Roopsind et al 2019).

Nevertheless, reward funds also create rents (or windfall profits), as in the case of Uganda, and might end up failing to incentivize some countries like Ghana due to an excessively demanding baseline. Both effects are unavoidable if the reward fund lacks perfect information about the domestic incentives of these countries and the benefits they derive from reducing oil demand. While improved methods for predicting baseline emissions can reduce both effects, the creation of rents and reduction of incentives cannot be avoided completely because of incomplete or asymmetric information. These rents constitute a transfer to countries that are eligible for the reward funds.

[13] In our modelling, we assume that governments react to incentives according to a standard economic model, where they maximize their net economic gain. An important objection to this approach is that high fuel prices impose substantial political costs. However, it is important to note that the political costs of high consumer fuel prices might just affect the *levels* of tax rates that are overall optimal for a government but not necessarily the costs of deviating from that. If high fossil fuel price *levels* cause political costs, then governments will set their tax rates at the levels that balance these costs both with the economic distortions of low fuel taxes, and the benefits of greater economic efficiency that comes from setting levels closer to that which reflects the local externalities. Reward payments shift this tradeoff in a way that can turn out to be equivalent to what happens in our simple economic model (see Kalkuhl & Stern (2024) for a model with this feature). Now it can be objected that there are not just political costs from having high consumer fuel price *levels,* but also political costs from consumer fuel price *increases*. However, the payments from the reward fund could facilitate the implementation of policies to compensate people for higher fuel prices, given that in our proposed optimized reward design, they turn out to be on average twice as high as the net economic costs of countries that respond to the incentive. Thus, our simple analysis might give plausible results.

When eligibility is restricted to LMICs, the informational rents increase global social welfare by channeling transfers from the EU to poorer countries. These transfers are a side-effect of the self-interested behavior of the EU to allocate scarce financial resources to its recipients.

In Section 5, we explore modifications in the design of the reward fund, skewing funding disproportionately to countries with the lowest levels of per capita income, thereby better harnessing the informational rents for welfare improvements. This comes at the cost of reducing the effectiveness of the reward fund in terms of emission reductions, thereby also decreasing donors' incentives. In Section 5, we will show results for a version of the reward fund that optimally resolves this tradeoff. However, until then, we will consider only the version of the reward fund that is optimized for simply maximizing the induced emission reductions.

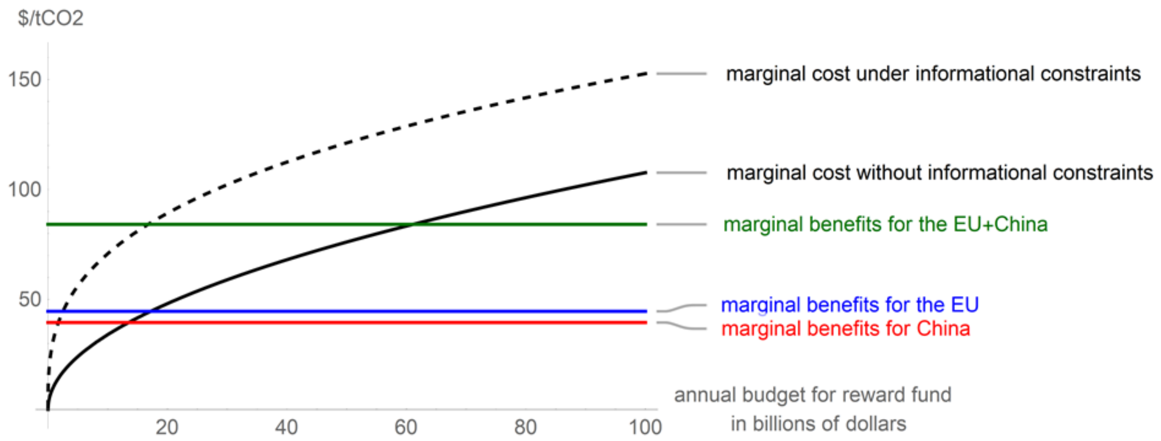

Figure 5: Contributions out of self-interest for oil demand reductions in LMICs, accounting for informational constraints.

In our subsequent calculations, we account for the informational constraints that increase the costs for marginal emission reductions by reward funds (see Fig. 5). The increase in the costs reduces incentives to contribute to the fund by the EU and China substantially. Unilateral contributions out of self-interest for oil demand reductions reduce to USD 3.0 and 2.0 billion. However, the value of cooperation increases more strongly than in the case with informational constraints: When the EU and China cooperate and maximize their benefits jointly, contributions increase to USD 19.9 billion, i.e., roughly by a factor of eight compared to a scenario without cooperation where only one of them would have an incentive to donate. Accounting for the informational constraints therefore makes it even more important to find ways to reduce free riding among potentially large contributing countries.

4. Building self-enforcing tax coalitions

The previous calculations highlight the significant value of enhancing cooperation among potential contributing countries, as coordinated efforts yield substantially greater funding flows and overall benefits compared to uncoordinated, unilateral actions. A key challenge is to design a cooperation mechanism that is self-enforcing, i.e., provides incentives for countries to join out of self-interest. We discuss several potential mechanisms for coalition formation in Section 5. Here we focus in some detail on specific fossil fuel levies implemented by a coalition of (large) fossil fuel importers. This design follows immediately from the terms-of-trade effect and climate benefits as outlined above.

The proposed Fuel Import Levy Coalition would consist of a group of countries that agree to impose a small, uniform percentage tax on the specific type of fuel they import. We illustrate the functioning of the coalition for the case of oil. Analogous tax coalitions could be set up in parallel for gas; we provide the calculations for this in the Appendix. The exact rate of this levy is calculated so that, together, the coalition raises precisely the amount of money to fund global demand reductions that are collectively optimal for the entire coalition. Each member country passes a law applying the coalition's formula to its imports and dedicates all of the resulting revenue to the respective fuel demand reduction reward fund. As new countries join or leave, the tax rate automatically adjusts, since it is always recomputed based on the combined parameters of the current membership. This self-adjusting feature ensures the fund is always sized to maximize the combined net benefits for the participating countries.

Ensuring stable incentives requires that levy revenues be strictly earmarked for the reward fund. If a country were to attempt to offset the import tax by lowering its domestic fuel taxes, it would likely see an increase in fuel imports. Through general equilibrium effects, this would shift the burden of funding the fuel demand reduction reward fund onto the country itself, reducing the contribution required from other countries. By design, the coalition tax rate is adjusted to ensure that the total revenue meets the funding needs of the reward fund at the collectively optimal level. Since the revenues are raised through a fuel import tax, the burden is distributed among the coalition members in proportion to their fossil fuel imports. Thus, countries are still incentivized to maintain their other taxes on the fuel so as not to increase their share of the financing burden.

Numerical simulations show that with only the EU participating, the tax rate would be about 0.9 percent of import value (see Tab. 3). If China also joined, it would rise to roughly 3.1 percent, and adding India would push it to about 9.6 percent. It is important that the tariff rate of the coalition is always conditional on the membership of other countries. If India and China were to leave the coalition, the EU would have to reduce its import tariff rate again to the level (here 0.9 percent) that results in the reward fund being funded at its unilaterally optimal level. Numerical simulations indicate that the net benefit for the EU and China is high enough to join the coalition, whereas India's gains would fall short—unless India perceives the climate benefit of global oil demand reductions to be substantially larger than in our calculations.[14] As a result, the stable coalition equilibrium is likely to consist of the EU and China.

Table 3: Incentives to join an oil importers' tax coalition that contributes its revenues to jurisdictional reward funds on oil demand reductions. See Appendix for tables on other fossil fuels.

Coalition Members	Tax Rate of Coalition		Revenues Raised	Unilateral Benefit/Cost Ratio of Participating		
	%	**$/tCO₂**	**$bn**	**EU**	**CHN**	**IND**
EU	0.9	1.6	3.0	1.5		
EU+CHN	3.1	5.9	19.9	1.20	1.11	
EU+CHN+IND	9.6	17.8	32.7	1.09	0.996	0.49

For gas, we propose an analogous tax coalition. In both cases, the terms-of-trade effects make up most of the benefits for the donors. This automatically ensures that the ad valorem rates of the import taxes are moderate. If the EU and China were to reduce their oil and gas imports, then this would reduce the optimal funding level for the corresponding jurisdictional reward funds and thus also the required tax rates. For the case of coal, this is different as most of the donor benefits arise from the reduced climate damages. As a result, translating the proposal directly to the case of coal would imply very high coal import tax rates, particularly given that the EU's and China's coal imports are not as large as their oil and gas imports. For coal, we therefore propose instead a version of the coalition where the funding burden would be shared in proportion to the benefits that countries derive, as quantified by the simple formulae that we derive in the accompanying Technical Appendix. Coalition members, however, would be free in how they can raise these funds (e.g., through a domestic tax on coal use).

We provide further calculations of the coalitions' optimal funding levels for the jurisdictional reward funds for other fossil fuels in the Appendix, as well as the corresponding tax schedules for the case of gas. For oil, coking coal and natural gas, the stable coalition consists of the EU and China; for thermal coal, it would be the U.S. and China and the EU and China. According to our estimates, the U.S. would benefit the most from any amount of global coal demand reduction. This might suggest that the stable coalition that emerges would be the one involving the U.S. However, we show here the more conservative calculations with a coalition of the EU and China, given the current reluctance of the U.S. to consider climate benefits of coal demand reductions. Tab. 4 shows the implications of this mechanism on revenues generated, benefits created, and global emissions reduced for stable and self-enforcing coalitions.

[14] This can be explained by the costs and benefits that joining the coalition entails. In the case of oil, this is easiest to analyze for our calibration, where the benefits derived from global emission reductions are approximately proportional to the net oil imports, given that the terms-of-trade effect is substantially larger than the climate mitigation benefit net of leakage. Thus, we can view the net oil imports as the "size" of a player in the sense relevant for the coalition. The cost of complying with the membership obligation, i.e., of imposing the import levy and of directing the resulting revenue to the jurisdictional reward fund, is roughly proportional to the net imports of the fuel to the country. The benefit of joining the coalition consists of the increase in contributions of the other coalition members that is induced via the rules of the coalition, given that these rules stipulate that the contributions to the reward fund maximize the joint payoff of the coalition. The translation of these emission reductions into benefits for the country is itself proportional to the country's net oil imports. Thus, the benefits of joining the coalition scale more than linearly in the "size" (i.e., the net oil imports) of the country, whereas the costs of joining are proportional to the size of the country. Therefore, the larger a country, the more attractive is the benefit cost ratio associated with joining the coalition. Given that India is less than half the size of China, which is smaller than the EU, it makes sense that the benefit cost ratio for India to stay in the coalition with China and the EU is correspondingly smaller and thus insufficient to incentivize India to stay.

Table 4: Implications of fossil fuel importers' tax coalition on various fossil fuels on the benefits for developing countries (low-income country = LIC , lower-middle-income country = Lower MIC, upper middle-income country = Upper MIC) as well as global carbon emissions.

Fuel	**Oil**			**Thermal Coal**			**Coking Coal**			**Natural Gas**		
Stable Coalition	**EU+CHN**			**CHN+EU**			**CHN+EU**			**EU+CHN**		
	LIC	Lower MIC	Upper MIC	LIC	Lower MIC	Upper MIC	LIC	Lower MIC	Upper MIC	LIC	Lower MIC	Upper MIC
Rents ($bn)	0.18	2.35	7.42	0.07	3.27	11.50	0.00	0.92	4.94	0.01	0.46	1.99
Reduced Climate Damages ($bn)	0.10	1.16	4.59	0.97	10.86	42.98	0.29	3.27	12.95	0.02	0.23	0.92
Terms-of-Trade Benefits ($bn)	0.40	6.16	4.20	-0.04	2.18	-2.07	-0.10	2.28	3.13	-0.10	-0.05	2.17
Total Benefits ($bn)	0.68	9.66	16.21	0.99	16.32	52.41	0.19	6.47	21.02	-0.07	0.65	5.09
Revenues Raised by Coalition ($bn)	**19.89**			**29.68**			**11.71**			**4.93**		
Global Emission Reductions ($GtCO_2$)	**0.08**			**0.74**			**0.22**			**0.02**		

Note: Results are shown for the largest stable coalition. The member listed first has the greatest benefit. For thermal coal, U.S. + China is also a stable coalition. It would raise USD 45 billion and induce emission reductions of 0.95 $GtCO_2$; see online calculations and tables.

Key implications are as follows: Low-income countries benefit substantially from the terms-of-trade effect and the rents induced by information asymmetries; in addition, they benefit substantially from reduced climate damages caused by the decrease in thermal coal demand. In general, upper-middle-income countries tend to benefit from rents and reduced climate damages by one to two orders of magnitude more than low-income countries, primarily because of their larger economies. They experience, however, relatively small losses from the terms-of-trade effect from reduced thermal coal demand since they are net exporters of coal. Overall, most revenues are generated by the importers' tax coalition on thermal coal, as this coalition has a very strong self-interest in paying for global coal demand reductions to reduce climate damages that also fall on the coalition. The coalition achieves sizable global emission reductions of about 1 $GtCO_2$, which constitutes about 40 percent of the EU's current emissions from all fossil fuels. The oil importers' coalition raises about USD 20 billion/year and is mainly driven by the EU's and China's terms-of-trade motives. Corresponding global emission reductions are rather low due to lower financial contributions and lower demand elasticities.

We have conducted additional sensitivity analyses to assess the robustness of the stability of the coalition and the magnitude of revenues, benefits, and emission reductions. As discussed in Section 2 and illustrated in Fig. 1, the combined climate and terms-of-trade benefits for the EU and China are relatively stable for different assumptions on oil supply elasticities and resulting leakage rates. Tab. 5 summarizes the results for three elevated scenarios: the first considers additional geopolitical benefits for the EU from reduced oil and gas prices; the second, lower (perceived) climate benefits due to lower social cost of carbon; and the third considers a combination of both.

The first case accounts for the geopolitical benefits for the EU from reduced oil demand, and thus oil prices, due to lower revenues from Russian oil exports.[15] Reduced revenues from Russian oil exports can limit the Russian spending on military aggression against Ukraine, thereby reducing the EU's

[15] For simplicity, we assume that apart from the EU, no other country derives geopolitical costs or benefits from revenue accruing to Russia.

need to fund the Ukrainian defense and reconstruction. A recent assessment by Beaufils et al. (2025) estimates the benefit of a marginal reduction of (European or global) oil demand to be 37 percent of the oil price, which corresponds to USD 62/tCO_2.[16] This benefit is higher than the combined terms-of-trade effect and climate benefit for the EU (see again Tab. 1). The substantial increase in geopolitical benefit leads to a higher willingness to pay by the EU for global oil and gas demand reductions. This is reflected by an increasing tax rate and, subsequently, higher revenues for the coalition of the oil and gas importers by a factor of six and five, respectively. Total revenues over all fossil fuel importers' coalitions then increase to USD 210 billion, implying global emission reductions by 1.42 GtCO_2.

Table 5: Sensitivity analyses on global benefits, revenues, and global emission reductions by importers' coalitions.

	Central Estimate (oil+thermal coal+coking coal+gas)	**Taking into Account Geopolitical Benefits of Oil and Gas Demand Reductions for the EU**	**Low Global SCC (50 \$/tCO_2)**	**Taking into Account Geopolitical Benefits + Low Global SCC**
Overall Net Global Benefits (\$bn)	14+138+41+3 =196	133+153+54+25 =366	1.5+5.1+ 2.9+ 0.2 =9.65	79+9+7+15 =109.92
Revenues Raised by Coalition (\$bn)	20+30+12+5 =66	131+35+17+27 =210	12+1+2+3 =19	104+3+4+23 =134
Global Emission Reductions (GtCO_2)	0.08+0.74+0.22+0.02 =1.06	0.28+0.81+0.28+0.05 =1.42	0.06+0.11+0.07+0.01 =0.25	0.24+0.18+0.12+0.04 =0.58

Note: Results are shown for the sum over four fuel coalitions (oil, thermal coal, coking coal, gas) with the EU and China as stable coalitions.

In our second sensitivity analysis, we consider lower climate benefits (global SCC of USD 50 instead of the USD 200 from our baseline calibration), which will reduce China's and the EU's willingness to pay for global demand reductions for coal. The incentives for oil and gas reductions are only relatively weakly affected as they primarily arise due to the terms-of-trade effect. As a result, revenues over all fuel coalitions decline to USD 19 billion and emission reductions are only 0.25 GtCO_2. The third case combines both assumptions, implying that revenues and emission reductions still increase compared to our central estimate.

These considerations emphasize the importance of establishing several tax coalitions and distinct reward funds. If, for example, all fossil fuels were taxed at a uniform rate and only a few reward funds were available, participation rates would be unnecessarily low. In addition, an architecture with different tax coalitions and diverse reward funds can overcome the barriers of cooperation because mutual benefits can be harnessed at much lower costs.

[16] For natural gas, we apply the approach in Beaufils et al. (2025) to calculate a geopolitical externality of 43 percent ad valorem, or USD 92/tCO_2.

5. Prioritzing welfare and poverty reduction

From a global social welfare perspective that also aims to reduce global poverty and inequality, it would be beneficial if reward funds could be more "generous" to poorer countries and increase payments to them. Nevertheless, a two-fold countervailing consideration exists: (i) firstly, global funds would not operate as effectively in terms of induced emission reductions as if they disregarded this additional distributional motive, implying less global mitigation; (ii) secondly, and relatedly, reduced effectiveness of the funds reduces the willingness to pay by the importers' coalition to tax fuels and earmark revenues for the fund.

It is worthwhile to note that the calculations and considerations above focused on mechanisms that harness the maximum willingness to pay for fossil fuel demand reductions that ultimately contribute to a global public good (climate mitigation). As a consequence, the optimal design of jurisdictional reward funds aims to maximize emission reductions for a given financial budget. Since low-income countries contribute less than one percent of global carbon emissions from fossil fuels, their (absolute) demand reduction potential is very limited. This explains why they receive only little transfers (in the form of rents) from jurisdictional reward funds as shown in Tab. 4.

Therefore, we illustrate how reward funds can be adjusted to maximize global social welfare, taking incentives for contributing countries into account. Fig. 6 illustrates the resulting adjustment of the payments for an oil demand reward fund financed by the EU and China: Rather than distributing the fund's income proportionally to baseline emissions (dashed line), a welfare-maximizing reward fund (that accounts for incentives of contributing countries) allocates substantially more funds to low-income countries and less to upper-middle-income countries, while lower-middle-income countries receive almost equal funding than in the non-welfare adjusted case. Note that although the skewing of funds to low-income countries reduces contributions from the importers' coalition by 30 percent and therefore implies 21 percent less global emission reductions, overall global welfare is increased and optimized. Contributing to the welfare-adjusted fund is still in the self-interest of the importers' coalition.

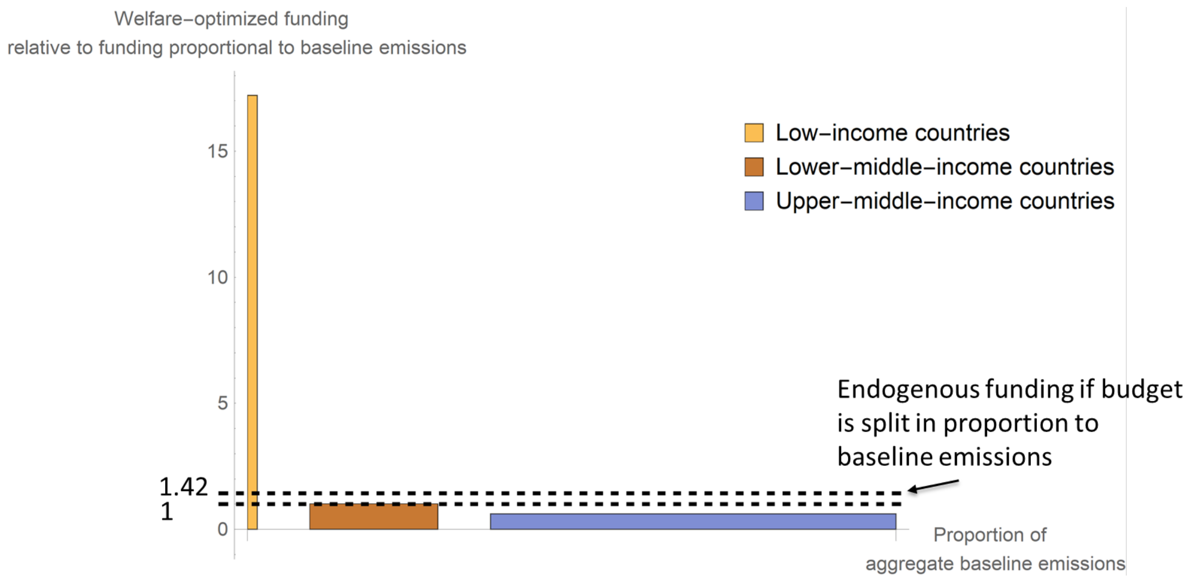

Figure 6: Welfare-oriented adjustment of the oil demand reward fund to channel higher rents to low-income countries.

Note: The budget gets split according to fixed proportions between the three separate reward funds, dedicated to the different country groups. Splitting the budget instead proportionally to baseline emissions would maximize emission reductions (given that the distribution of tax rates turn out to be very similar, as documented in the Technical Appendix). This would lead to 42 percent higher contributions by the coalition (EU + China). However, the welfare gains achieved with the skewed budget split via channeling more of the rents to low-income countries more than outweighs this loss due to lower funding. Under the optimally skewed budget split shown in the figure, low-income countries receive 17 times the funding they would get under a budget split proportional to their baseline emissions, assuming the same overall funding. The corresponding factor for lower-middle-income countries is 1.01 and for higher-middle-income countries 0.61.

A welfare-adjusted reward fund would incorporate considerations present in other payment schemes, e.g., as used by the Global Environment Facility (GEF 2005) and IDA's Performance Based Allocation (PBA) Formula (Guillaumont & Wagner 2015). Analogously to these existing formulae, our proposed welfare-adjusted reward fund would allow for balancing the tradeoff between equity and efficiency optimally, given the respective general normative criteria used. Its novelty consists in taking into account that funding will be endogenous. The approach is more complicated than alternatives such as the one used by the Global Alliance for Vaccines and Immunization (GAVI), which uses an eligibility threshold based on per capita income (Silverman & Glassmann 2019). However, the continuous "weighting" of available funds substantially improves effectiveness and, as a result, donors' motivation to give. Moreover, it avoids the mechanism being viewed as unfair by countries just above the eligibility threshold.

6. Institutional aspects

6.1 Interaction effects on existing policies

In the analysis above, including the numerical simulations underpinning the results, we have assumed that both the reward funds and the import taxes introduced by the fuel importers' tax coalition operate in addition to existing policies and international mechanisms. We now argue that this assumption is well justified.

Firstly, climate negotiators could object to reward funds because of their potential to crowd out their voluntary contributions, called Nationally Determined Contributions (NDCs), which they have already submitted in the UNFCCC. Climate policies could end up being tailored to achieve their NDCs, and, therefore, the reward funds would simply reduce countries' net costs of achieving their NDCs without raising their ambition levels. However, NDCs are re-negotiated. Presumably, countries reap diplomatic or "soft power" benefits from setting (and then achieving) an NDC that other countries recognize as being more ambitious than a target optimized for narrow national self-interest. A reward fund would transparently shift that ambition level corresponding to the narrow national self-interest. In order to get recognition for its efforts, the country would then have to set a correspondingly more ambitious NDC. In this way, the reward fund would have an impact similar to what it has in our simplified analysis that abstracts from the existence of the NDCs.

Secondly, participation in the importers' tax coalition could also affect climate policy in those countries. Nominally, countries and actors like the EU set a variety of instruments, including price-based instruments such as taxes on specific fuels and quantity-based instruments such as the EU's emission trading scheme (ETS). In general, the cap of the ETS is endogenously determined and an outcome of (broader) cost-benefit considerations. Hence, the cap of an ETS is adjusted over time in light of the overall prices that emerge: Lower ETS prices (e.g., caused by fuel import taxes) will increase support for tighter ETS caps. Ultimately, the EU effectively chooses an overall ambition level that corresponds to effective tax rates (inclusive of ETS prices) on oil, coal and gas. The EU's self-interested optimal overall tax rate, including the coalition tax rate charged and earmarked as part of participation in the fuel importers' coalition, will be increased exactly by the amount of that coalition's tax rate. The reason is that, by design of the coalition's rules, the EU's own oil imports do not affect the total amount of funding allocated to the reward fund, as this is determined by the collective self-interest of the coalition members.[17] Lowering its oil imports will thus reduce the EU's share of the burden incurred for funding the reward fund via the coalition. This incentivizes the EU to increase its overall tax rate on oil imports and prevents it from offsetting the coalition tax through adjustments in its other tax and quantity instruments.

The preceding analysis implies that when the EU's current emission caps in the ETS are set optimally according to its unilateral self-interest, the implementation of the fossil fuel importers' tax coalition

[17] See again details and proofs in the Technical Appendix.

will add a carbon price to the prevailing ETS, lowering the ETS price and inducing a reduction of the cap (according to re-optimization of the EU's ambition level) such that the ETS price is restored to the level before initiating the importer's coalition. Hence, any increase in the coalition's tax rate will lead to additional increases in the effective carbon price of coalition members.

Finally, the interaction of the tax coalition with the European Carbon Border Adjustment Mechanism (CBAM) could be a cause for concern. Some countries might find it optimal to respond to the EU's CBAM by also implementing a carbon price and a CBAM to collect carbon pricing revenue that would otherwise accrue to other countries that have a CBAM in place (Beaufils et al. 2024). For these countries, a reward fund[18] might not change their optimal domestic carbon price. However, for some other countries, the reward fund might tip the balance towards implementing a carbon price and a CBAM. This could have knock-on effects, as it would increase other countries' incentives to do the same. Thus, it is not clear whether our simplified analysis that ignores the CBAM will overestimate or underestimate the impact of reward funds in terms of induced emission reductions.

6.2 Overcoming domestic distributional conflicts

An important objection to the analysis presented in this paper is that it abstracts away from the political costs of implementing increases in fuel taxes. The modelling underlying the results presented here only considers the *aggregate* economic benefits and costs to the different players and thereby abstracts from domestic distributional questions. Under this aggregate view, the modelling shows that both the EU and China have an incentive to initiate the coalition and that the coalition "EU + China" is stable in the sense that neither of them has an incentive to quit it. However, if some parts of the populations in the EU and China were to lose economically from the fuel importers' coalitions, political opposition to participating in them could be strong. Moreover, our estimates for the responsiveness of LMICs to the conditional transfers from the jurisdictional reward funds might be too optimistic if loss aversion relative to a status quo drives opposition to raises in fuel taxes.[19]

One approach to overcoming political opposition is to combine fuel tax increases with compensation schemes that ensure that no one loses (Kalkuhl et al. 2025), without undermining the incentive effects of the fuel taxes. However, overcoming the informational constraints seems difficult or even impossible without substantial administrative effort. Such administrative efforts are unlikely to be justified just for the moderate fuel tax increases that the oil importers' coalition and the gas importers' coalition would involve.

However, our modelling suggests that for the case of oil and gas, the fuel importers' coalition constitutes a policy package that could overcome the distributional conflicts by, firstly, obviating the

[18] The discussion here is most relevant for reward funds (not modelled in our background paper) incentivizing low process emissions, given that the CBAM is focused mostly on these emissions.
19 If, instead, opposition to fuel taxes is based on their level rather than arising due to changes relative to some status quo, then our modelling is not necessarily too optimistic, as shown in Kalkuhl & Stern (2024).

need for compensation in the EU and China and, secondly, making compensation much easier in the LMICs that receive and respond to the reward funds' conditional transfers.

Consider first the distributional effects within the oil importers' coalition. For this, consider the net effect of the fuel importers' coalition on the consumer price of oil in the EU. On one hand, mechanically, the import tax increases the consumer price; on the other, the oil demand reductions in LMICs induced by the corresponding reward fund and the import taxes in the EU and China both reduce the world market price. It turns out in our modelling that as far as the impact of staying in the coalition with China is concerned, the two effects approximately cancel out. Similarly, if the EU has initiated the coalition, then by joining the coalition China has a neutral effect on the net price for oil paid by its consumers. Thus, for the case of oil, the importers' coalition can lower global oil demand while avoiding domestic distributional conflicts without compensation schemes. The results for gas are similar. As far as the *overall* effect of the coalition's existence is concerned, it even turns out that its net effect on the consumer price of oil in the coalition is negative (see Lemma 12 in the Technical Appendix). Under our preferred calibration, per USD 1 of the coalition tax, the net consumer price in the coalition declines by USD 0.38.[20]

Now let us turn to the second distributional question, which arises in LMICs that respond to the conditional transfers from the reward fund by raising the corresponding fuel taxes. Administratively simple compensation schemes like uniform lump sum transfers tend to leave substantial fractions of the population worse off (Missbach & Steckel 2024). However, the conditional transfers from the reward funds could enable much closer to full compensation via uniform lump sum transfers, given that governments could pay out not just the carbon pricing revenue, but also the money that they receive from the reward fund. This money would on average exceed the net costs that arise for the country as a result of the induced efforts for emission reductions by a factor of two in our model, thus facilitating compensation as a by-product of the informational constraints that make these rents inevitable.

Thus, overall, the oil importers' coalition (and similarly the gas importers' coalition) enables a combination of oil tax increases that could avoid distributional conflicts. These results only depend on the terms-of-trade effect being the main motivation for donors to give to the reward funds, which we find to be plausible for the cases of oil and gas, given the available empirical estimates from the literature on the responsiveness of oil demand and supply to the oil price. This motivates our proposal for the coalition membership rules that require financing of the reward fund for oil demand reductions via the oil import tax.

In the case of coal, these arguments do not apply because the terms-of-trade effects play only a minor role in the donors' benefits from the corresponding coal demand reduction reward funds which mostly consist of the avoided climate damages. As coal imports to the coalition are very small, coalition countries would typically opt for other tax bases (than import taxes) to fulfil their financial contributions to the reward fund. When they directly pay from government budgets, no immediate distributional problem arises. When coalition members rely on increases in domestic carbon prices

[20] For our incidence analysis to be adequate, it is important that the importers' coalition will stay in place as long as the world has not decarbonized and will maintain a similar ad valorem coalition tax rate. Our modelling predicts that this assumption is justified. As long as the EU and China do not wean off oil much more quickly in relative terms than the rest of the world, their incentive to stay in the coalition will remain. Moreover, the ad valorem value of the coalitions oil import tax rate will not decline, according to the formula that defines it.

(e.g., on coal), governments can make use of already established compensation systems under existing emissions trading schemes. We therefore propose a different version for the coal importers' coalition, which would involve the same rules for determining how much each coalition member would have to contribute to the reward fund, but leave it up to the country to decide how to mobilize this funding.

6.3 Towards a broader architecture for financing global public goods

Fossil fuel importers' coalitions are a particularly attractive starting point for setting up a broader architecture for increasing the funding for global public goods. The underlying mechanism is rather simple: The EU can initiate the coalition by itself, set up the reward fund, and invite China to join by making tax rates conditional on joining by other countries. Thus, China knows that by joining the coalition it will cause the EU to increase its tax rate on oil/gas imports and thereby also its contribution to the corresponding reward fund. The associated benefits outweigh the cost for China to be a member. Nevertheless, funding potential is rather limited as the stable coalition size likely consists only of two players—the EU and China—and spending would only be allocated to climate mitigation projects.

We have outlined principles and proposals to expand these ideas to (i) mobilize additional funds and (ii) reward countries for other global public goods which create substantial synergies (Edenhofer et al. 2024). As became clear in the previous sections, the existence of effectively operating reward funds is essential to scale up funding: The less efficiently reward funds convert inflowing money to fuel demand reductions, the weaker the incentives are for the EU and China to contribute to such funds. Hence, additional reward funds should be established that create benefits for broader sets of countries so that contributing countries can choose what suits their interests best:

- Reward funds rewarding the reduction of the *supply* (rather than the demand) of fossil fuel could attract funding from fossil-fuel exporting countries.
- Funds rewarding countries for conserving tropical forests could attract funding from countries concerned with climate change and biodiversity loss.
- Funds rewarding countries for reducing the carbon intensity of their industrial and electricity production are particularly attractive for countries with carbon-intensive industries exposed to international competition.
- Funds rewarding countries for carbon dioxide removal could attract funding from fossil-fuel exporting countries and countries that supply carbon removals.
- Funds rewarding countries for improving their Global Health Security Index scores (CSIS 2019), for increasing pathogen detection and reporting capabilities, or for increasing RNA-based vaccine production capacity could attract funding from countries that are particularly vulnerable to global pandemics (high-income countries).
- Funds rewarding innovation in specific mitigation or adaptation measures, e.g., in the form of advanced market commitments, could attract funding from philanthropy, donors as well as countries that value such innovations most.

These examples show that broadening the menu of available reward funds increases the likelihood that an alliance of countries finds it beneficial to support one of the funds. In addition, such funds would also be open for non-state donors, responsible investors or voluntary carbon markets as they provide a clear outcome-based metric (i.e., carbon emissions additionally avoided). The different reward funds can also be pooled together into “packages” that reflect the broader incentives of certain groups of countries. As shown in Kalkuhl & Stern (2025), such mechanisms could increase incentives to join tax coalitions and contribute to global public good provisions further.

On the revenue-raising side, promising mechanisms involve forms of extraterritorial taxation that create “tipping game” dynamics where additional countries are drawn into the coalition the larger the coalition gets. Such an example is the proposed tax coalition on international aviation (Kalkuhl & Stern 2025) where coalition members tax all outgoing international flights at a common minimum rate and, in addition, all incoming international flights from non-members. When coalition members can earmark a share of their tax revenues for those global public good funds they prefer—e.g., the EU on fossil fuel demand, OPEC countries on global health or carbon dioxide removal—participation incentives become large for many countries. The more countries participate, the more costly it becomes for non-participants as they pay taxes on international flights in both directions on all flights from and to tax members, without receiving any tax revenues. Preliminary calculations suggest that the aviation tax coalition with a carbon price on aviation of USD 65/tCO_2 could raise USD 80 billion/year for global public good provision and induce universal participation.

Similar mechanisms can be incorporated in tax coalitions on maritime shipping, luxury goods consumption or private jet travel. Combining effectively operating reward funds with tax coalitions that achieve broad participation allows for substantial upscaling of funding for global public goods. Preliminary calculations suggest that this architecture might be able to mobilize USD 400 billion/year or even more—which substantially exceeds the amount of the fossil fuel importers’ coalition and increases global emission reductions and provisions of other public goods (see Fig. 7).

Heidland et al. (2025) argue that existing multilateral funds for global public goods harness two effects to motivate donors to provide funding. Firstly, via the part of the material benefits (e.g. from reduced pandemic risk, reduced antimicrobial resistance) accruing to the donor. Secondly, via the opportunity to signal altruistic motives and normative alignment, given that the rules-based functioning of the multilateral funds precludes the possibility that donors extract narrowly self-interested concessions from recipient countries. The proposed architecture of tax coalitions and jurisdictional reward funds can harness both of these motives. By participating in a tax coalition, e.g. based on taxes on international aviation emissions, a country can direct funding to their preferred reward funds instead of leaving it to the other participants to decide on the allocation. Moreover, the tax coalition could gain legitimacy by adopting democratically grounded rules (e.g. population-weighted qualified majority voting by all countries) to determine which reward funds will be considered as eligible for receiving funding via the taxes. Actors like the EU could gain soft power by initiating such a coalition and donating all the tax revenue to reward funds, thereby avoiding the international criticism and resistance that it has historically encountered when enacting extraterritorial taxation and retaining all the revenue for itself (Kalkuhl & Stern 2025).

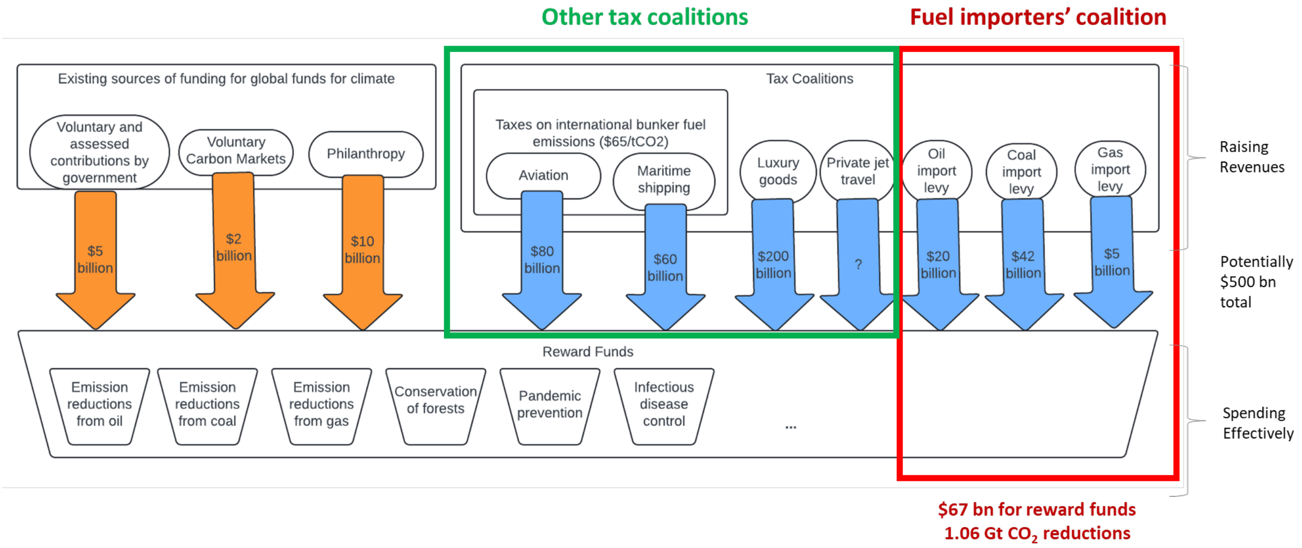

Figure 7: Overall financial flows and contributions to global public good provision. Own illustration, updated calculations based on Edenhofer et al. (2024).

6.4 Initiating tax coalitions and reward funds by the EU

The European Union can establish a fossil fuel importers' tax coalition by first creating for each fossil fuel a dedicated reward fund that channels payments to low- and middle-income countries in return for verified emissions reductions below their baseline. To finance these funds, the EU would introduce levies on imports of oil and natural gas, with rates determined by a formula designed to generate the collectively optimal funding volume for all coalition members. For example, if the EU were the sole member, the levy on oil imports would be set at 0.9 percent to meet funding targets; once China joined, that rate would rise to 3.1 percent; and were India to participate alongside China, the levy would reach 9.6 percent on all oil imports (see again Tab. 3). Instead of an ad valorem charge, the levy could alternatively be expressed in dollars per ton of CO_2 equivalent, aligning more directly with climate policy metrics.

All revenues collected from these import levies would be strictly earmarked for the reward fund, ensuring that every euro raised directly finances emission-reduction incentives in LMICs. To guarantee transparency and compliance, the coalition would establish a verification office responsible for auditing member states' revenue streams. This office would track fossil fuel trade data to confirm that each participant transfers all the proceeds from the levy to the corresponding reward fund. Should any member fail to allocate its revenues in full, the remaining members would automatically adjust their levy rates downward, preserving the fund's integrity and preventing free riding.

Recognizing the strategic importance of securing broader participation, before setting up the coalition mechanism the EU could already engage in bilateral negotiations with China to design the coalition's governance and levy schedule in a manner that reflects Chinese interests and climate ambitions. Such dialogue would minimize the risk that the proposed tax structure fails to deliver net benefits for China due to differing assumptions about climate benefits or terms-of-trade gains.

The establishment of the coalition will affect the EU's internal climate policy and associated compensation policies in various ways. For a given emission cap, the tax coalition will reduce the EU ETS price and, hence, the effective domestic carbon price in the EU. If the initial effective carbon price were optimal, the EU would have to adjust the cap in the ETS to re-optimize the domestic policy mix according to its unilateral optimality considerations. To a very good approximation, the optimal adjustment would be such that ETS prices would be unchanged overall, and the tax coalition implies an increase in the overall effective carbon price. As a result, both the EU and China need to re-adjust domestic compensation policies to cushion adverse distributional effects from more ambitious climate policy.[21]

By its design, the tax coalition creates a levy that is additional to existing policies. As such, its fiscal implications are more moderate (only via a reduction of the tax base for the internal carbon price due to lower imports). Given the rather small rate of the levy (e.g., 3.1 percent on oil for the EU + China coalition) and the low supply and demand elasticities, reduction in fiscal revenues from the internal carbon price are 1.3 percent for the case of oil.

The increase in the EU's and China's ambition level as well as the increased ambition level in receiving countries will also increase carbon leakage. We can distinguish here between two kinds of leakage: fuel market leakage and production location leakage. Fuel market leakage means that the oil price reductions induced by the demand reductions in the coalition members and in the recipients of the reward fund's incentive payments will lead to greater oil consumption in other countries. This effect has already been fully accounted for by calculating the unilateral optimal choices in reducing emissions and financing emission reductions in other countries. Hence, there will be no need to initiate additional measures for reducing fuel market leakage. The second kind of leakage (production location leakage), however, is not captured in the simple model underlying our analysis. It is a priori unclear whether production leakage increases or decreases incentives for the importers' coalition, so future research should investigate this issue in more detail.[22]

[21] A compensation scheme for the building sector that can avoid hardship cases and even ensure Pareto-improvements among all households has been developed in Kalkuhl et al. (2024).

[22] Production location leakage means that when countries reduce their fossil fuel use in response to the incentive payments that they receive from the reward funds, part of this reduction takes the form of production (e.g., iron, steel, aluminum, fertilizers) shifting to other countries. Concomitantly, this raises the world market price of the corresponding goods. The latter effect actually benefits the donors to the extent that they are net exporters of the relevant goods. Thus, by not taking into account production location leakage we might actually have underestimated the benefits generated by the reward fund for donors. However, a countervailing effect could arise if production leakage shifts production to countries with higher emission intensity, thereby decreasing environmental effectiveness.

7. Conclusions

Reliable institutions for funding global public goods provide benefits that go beyond the scope of the numerical analyses presented here. By establishing a rules-based funding and reward system—implemented through jurisdictional reward funds with clear and transparent criteria—governments can be encouraged to make long-term investments in global public goods. Over time, these investments pay off as subsequent reward flows become available. Capital markets can further reinforce this effect by treating these rewards as a reliable income source for governments, improving their credit ratings, reducing interest rates and risk premiums, and lowering external funding costs. In turn, this spurs additional investment in global public goods.

The importers' coalition focuses on the self-interests of large emitting and fuel-importing economies, creating mutual benefits both within the coalition and for low- and middle-income countries. By reducing climate damages and improving terms of trade through outcome-based rewards, the coalition can mobilize substantial funds and slash global emissions by nearly half of the EU's current territorial CO_2 emissions from fossil fuels. While this approach does not attempt to resolve the broader global cooperation problem among major emitters, it offers a pragmatic starting point for building an architecture of financing coalitions and jurisdictional reward funds. Such an architecture could raise significant financial resources and establish a more comprehensive system for financing diverse global public goods.

If equipped with sufficiently large streams of funding, the different jurisdictional reward funds could together align countries' national self-interests with achieving emission targets consistent with the Paris agreement. Such funding levels would require expanding the set of tax coalitions beyond the set that this article has proposed. One additional candidate instrument on which a further tax coalition could be built is a tax on corporate profits. Such a tax coalition could complement the global minimum tax initiative (Pillar 2) and mitigate detrimental tax competition more effectively than the current global minimum tax.[23]

Overall, the tax coalitions and jurisdictional reward funds proposed in this paper could achieve substantial gains in global welfare. Once these mechanisms have been established, they could be further scaled up via additional tax coalitions. Adopting this approach could generate new momentum in international politics on issues that are currently stalled or at risk, including climate policy, global health, biodiversity protection, and reliable development assistance. Even among countries that remain economic or geopolitical rivals in other areas, this framework can enhance

[23] The reason for this is as follows: In mechanisms like the existing global minimum tax initiative, countries constrained to set higher corporate income tax rates than they otherwise would will have incentives to use other policy instruments, such as investment subsidies, to counteract the resulting loss in competitiveness (Agrawal et al. 2023). Tax competition might partly shift to different instruments that are more difficult to quantify and agree upon than the tax rates. Tax coalitions where participating countries would be obliged to allocate a part of their tax revenue to jurisdictional reward funds could avoid such a shift in tax competition. To the extent that a country benefits less from marginal money going to the reward funds than from retaining money itself, the obligation to allocate a part of the tax revenue to reward funds will reduce its incentive to attract companies. Moreover, whereas in discussions about national tax policy revenue accruing to other countries is typically implicitly not valued at all (consistent with national self-interest being the underlying objective), a tax coalition would create a situation where tax base shifts to other countries (e.g., as a result of the country increasing its tax rate), and would at least partly benefit the country via the jurisdictional reward funds that other participating countries would contribute to via the corporate income tax. Thus, the tax coalition would help mitigate the zero-sum components of tax competition.

mutually beneficial cooperation. By combining visionary ambition with practical mechanisms for implementation, the proposed architecture represents a forward-looking yet feasible path toward improved global cooperation. It is now incumbent on the EU to take the initiative and invite other countries to participate.

Supplementary materials

An interactive Google spreadsheet allows re-producing and adjusting all tables with alternative structural parameters:
https://docs.google.com/spreadsheets/d/1SOs89ymHKJnCb_PkfTsf9cwsGLpddult2d-qXEtsPHs/edit?gid=738692897#gid=738692897

The Technical Appendix contains derivations of model equations and formal proofs:
https://drive.google.com/file/d/1NhkkYNZmrxqahlsrAIY3GVQ4mOyQCJQO/view

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Appendix

As mentioned in the main text, there is also a stable coalition for the coal importers' coalition consisting of U.S. + China. We focused on the coalition consisting of China + EU, so we provide the following table here as complementary information:

Table 6: Implications of fossil fuel importers' tax coalitions on reducing thermal coal demand. Results are shown for two stable coalitions: China + EU and U.S. + China.

Fuel	Thermal Coal	Thermal Coal
Stable Coalition	**CHN+EU**	**US+CHN**
Revenues Raised by Coalition ($bn)	29.68	45.37
Global Emission Reductions ($GtCO_2$)	0.74	0.95

Tab. 7 shows the gas importers' coalition tax rates:

Table 7: The coalition tax rate for the gas importers' coalition as a function of the set of participants.

Coalition	Coalition Tax Rate in % Ad Valorem	Coalition Tax Rate in $\$/tCO_2$
EU	1.0	2.2
EU+CHN	2.6	5.7
EU+CHN+India	4.9	10.7