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With a little help from my friends: Debt Renegotiation and Climate Change

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Abstract

The economic crisis from the Covid-19 pandemic has generated a fall in tax revenues and an increase in the need for public spending in most economies throughout the world. This situation has led to a substantial increase in the sovereign debt levels and has dramatically reduced the fiscal space of governments. For upper- middle-income countries (UMICs), current access to financing is limited and this can potentially limit the space for climate action in the short and medium run. However, delaying climate action can generate a negative signal on fiscal sustainability due to the physical and transition risks of climate change. Unsustainable production practices will result in a deterioration of the productive capacity of natural assets reducing potential tax income. Simultaneously there will be a stronger need for public spending to face the future damages associated to greenhouse gases emissions. Therefore, in order to address the current crisis, we need an integral approach that considers the climate crisis as a challenge with a high degree of urgency. For this approach to be feasible, sufficient international climate finance needs to be available, and it should help to steer relief and recovery efforts into a direction in which these are also compatible with climate targets.

In this document, we propose a sovereign debt negotiation scheme in which the conditions of the debt depend on the climate policies undertaken by the debtor countries. Likewise, we point out that the feasibility of beneficial agreements for debtors and the implementation of good climate policies depend positively on the size of the debt and each country's potential to affect the current trend of climate change. For these reasons, the formation of coalitions of debtor countries can be a key factor for debt relief and the implementation of climate policies.

Keywords: Covid 19, Climate Change, Sovereign Debt, Coalitions, Climate Policy

JEL codes: D62, D71, F34, G23, H63, Q50, Q54, Q58

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Con una ayudita de mis amigos: Renegociación de deuda y cambio climático.

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Resumen

La crisis económica de la pandémica del Covid-19 ha generado una caída en los ingresos fiscales y un aumento en la necesidad de gasto público en la mayoría de las economías del mundo. Esta situación ha provocado un aumento sustancial en los niveles de deuda soberana y ha reducido drásticamente el espacio fiscal de los gobiernos. Para los países de ingresos medianos altos, el acceso actual al financiamiento es limitado y esto puede potencialmente limitar el espacio para la acción climática en el corto y mediano plazo. Sin embargo, retrasar la acción climática puede generar una señal negativa sobre la sostenibilidad fiscal debido a los riesgos físicos y de transición del cambio climático. Las prácticas de producción insostenibles resultarán en un deterioro de la capacidad productiva de los activos naturales reduciendo los ingresos fiscales potenciales. Simultáneamente, habrá una mayor necesidad de gasto público para afrontar los daños futuros asociados a las emisiones de gases de efecto invernadero. Por tanto, para hacer frente a la crisis actual, necesitamos un enfoque integral que considere la crisis climática como un desafío con un alto grado de urgencia. Para que este enfoque sea factible, es necesario disponer de suficiente financiación internacional para el clima y debería ayudar a orientar los esfuerzos de socorro y recuperación en una dirección en la que también sean compatibles con los objetivos climáticos.
En este documento, proponemos un esquema de negociación de deuda soberana en el que las condiciones de la deuda dependen de las políticas climáticas emprendidas por los países deudores. Asimismo, señalamos que la viabilidad de acuerdos beneficiosos para los deudores y la implementación de buenas políticas climáticas dependen positivamente del tamaño de la deuda y del potencial de cada país para afectar la tendencia actual del cambio climático. Por estas razones, la formación de coaliciones de países deudores puede ser un factor clave para el alivio de la deuda y la implementación de políticas climáticas.

Palabras Claves: Covid 19, Cambio Climático, Deuda Soberana, Coaliciones, Políticas Climáticas

Códigos JEL: D62, D71, F34, G23, H63, Q50, Q54, Q58

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1. Introduction

The current crisis is limiting the fiscal space for countries around the world, and it is potentially steering fiscal policies towards interventions that solely prioritize a prompt economic recovery. - From the climate action perspective, this warrants some concerns for the upper-middle- income countries (UMICs). On the one hand, the willingness to engage in climate action in the coming years is likely to wane in favor of short-run needs. On the other hand, a potentially more limited international capital market will hamper these countries' ability to engage in climate action effectively.

The risk of climate inaction needs to be accounted for in the design of recovery and stimulus packages as well as on the mechanisms that will mobilize international funds to face the current economic crisis. In other words, the ensuing risk of climate inaction is not only relevant for countries in need of financing but also for their public and private lenders. Approaching the current crisis and the challenge of climate change as separate problems that operate on different time frames and possibly have incompatible goals may prove to be a risky strategy. Instead, the climate crisis calls for immediate rather than delayed action. The evidence suggests that damages associated with climate change are already occurring, which implies that it is indeed a current problem. Furthermore, rather than being detrimental for government finances and the ability to counter the current crisis sustainably, in fiscal terms, early climate action may prove to be ultimately beneficial for fiscal sustainability. While delaying climate action may seem appealing as it will postpone the fiscal burden required to implement climate policies, this course of action is likely to send negative signals on the fiscal sustainability over a longer time horizon.

The postponement of climate action can deteriorate the government's finances in the medium and long run due to the physical and transition risks of climate change. Physical risks can be associated with unsustainable production practices and the excessively fast depletion of the country's natural capital. These unsustainable practices and rapid degradation will remain unabated in the absence of adequate mitigation policies and enforcement.

These facts imply that in order to address the current crisis we need an integral approach. That is, one that considers the climate crisis as a challenge with an extremely high degree of urgency, not only because of the very immediate threat of damages from climate change but also because of the risks to fiscal sustainability that climate inaction imposes. For this approach to be

feasible, sufficient international climate finance needs to be available, and it should help to steer relief and recovery efforts into a direction in which these are also compatible with climate targets.

With this in mind, we propose a sovereign debt negotiation scheme in which debt is conditional on climate policies undertaken by the debtor countries. Likewise, we point out that the feasibility of beneficial agreements for debtors and the implementation of good climate policies depends positively on the size of the debt and each country's potential to affect global emissions. For these reasons, the formation of coalitions of debtor countries can be a key factor for debt relief and the implementation of impactful climate policies**.**

The rest of the document is organized as follows. In the second section, we briefly describe the world trend in global warming, and highlight the need for a substantial increase in public spending for mitigation and adaptation among the UMICs. In the third section, turn our attention to the effects of the Covid-19 crisis and point out the difficulties faced by the UMICs to meet three objectives: Increase spending on mitigation and adaptation to climate change, meet external debt payments, and implement economic recovery policies. In this section we also describe how sovereign debt renegotiation mechanisms can be instrumental to meet these three objectives and why an international coalition of debtors can increase the effectiveness of such mechanisms. In the fourth section, we describe some financial instruments and debt reorganization mechanisms needed to operationalize the proposal. In the fifth section, we point out the sources of heterogeneity between debtor countries and, consistently, we propose different types of contracts according to the characteristics of the countries. In the sixth section, we discuss the incentives to form coalitions in a context where different countries may have different incentives. In the seventh section, we explain why climate change policy must be compatible with recovery policy and propose a set of policy measures that help achieve this goal. Finally, we conclude in section eight.

2. The need for climate change and the lack of fiscal space

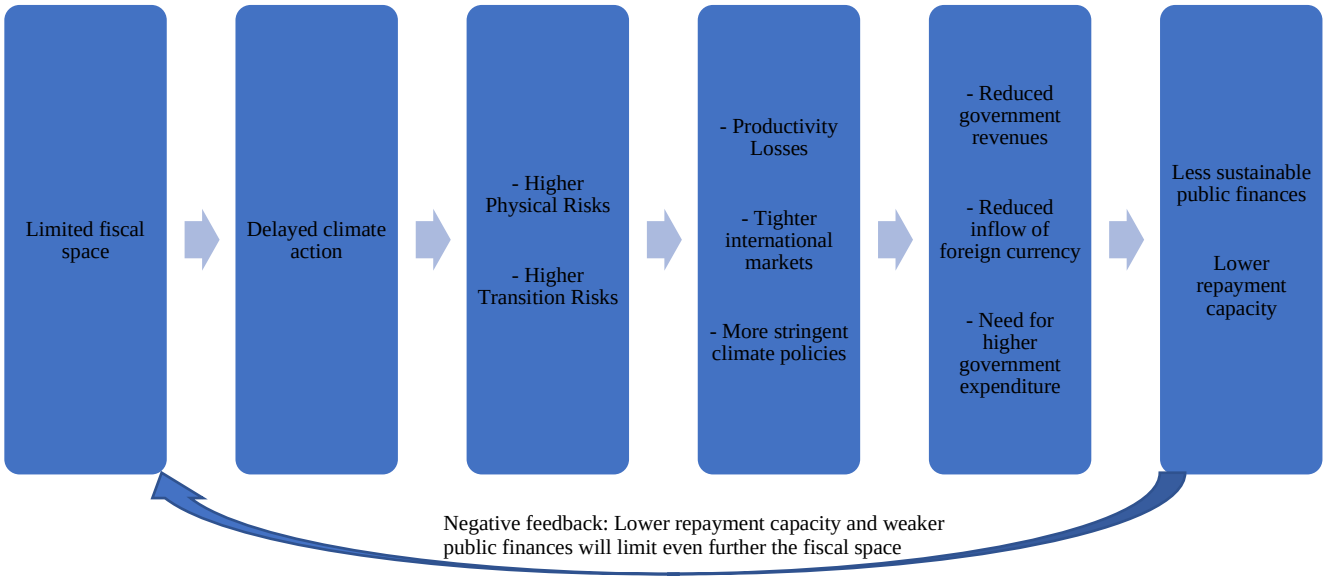
2.1 Need for Climate Action

The inevitability of climate change implies that climate action cannot be permanently postponed. The looming risk of a ‘climate ruin’ if nothing is done is sufficient to justify climate action (Bettis, Dietz, & Silver, 2017). In the absence of mitigation efforts, a quarter of the global

GDP can be lost to the effects of climate change, and these losses will be even more pronounced among countries in the Global South (Burke, Hsiang, & Miguel, 2015).

Averting these damages requires swift climate action. In turn, a timely implementation depends on the evaluation of the inter-temporal trade-off between immediate costs and benefits down the road. These immediate costs tend to be particularly pronounced when firms have installed capital that is complementary to unsustainable practices and households follow habits that may be deemed as climate 'unfriendly', and the economy is largely dependent on emission intensive sectors. However, the risk is that the tightening of the global credit markets, causes the concerns about immediate costs to result in an indefinite postponement of climate action: with tight credit markets fiscal space is limited, and the inter-temporal trade-off is further tilted towards the short-run. Nonetheless, a carbon lock-in caused by fiscal concerns appears as a self-defeating rationale, as illustrated in Figure 1.

Figure 1: Negative fiscal feedback of delayed climate action



A delayed implementation of climate policies will eventually result in more stringent and distortive policies. In terms of mitigation policies, delaying the introduction of carbon prices would require higher tax paths to meet a given cumulative emissions target (van den Bijgaart & Rodriguez, 2020). Furthermore, the delay in introducing carbon prices is also likely to imply a

more sudden introduction. Taken together, sharper and more sudden introduction of carbon prices will result in a less predictable policy path which will bring about negative macroeconomic consequences (Batten, Sowerbutts, & Tanaka, 2020). Next to this, a slow implementation of climate policies will expose countries to the loss of international markets. This may be the result of more demanding (green) trade standards, like low(zero)-deforestation requirements on agricultural products (Pinzon, Robins, McLuckie, & Thoumi, 2020).

Similarly, adaptation efforts will need to be more quickly phased-in if they are not preemptively introduced. This will crowd-out a more significant portion of other forms of productive public spending, potentially hampering overall economic activity. Economies among the UMICs are expected to face the direct negative effects of more frequent and more extreme weather events. The aftermath of such events tends to be detrimental to public finances. In particular, the debt-to-GDP ratio is prone to increase due to higher spending levels, to counter the effects of the disaster, and lower tax revenues because of the disruption of economic activity (Acevedo, 2014). Admittedly, early adaptation efforts will cause the debt-to-GDP ratio to be initially higher. However, these efforts will help to prevent negative impacts on economic activity (CAT, 2020), leading to a faster GDP growth and a lower medium and long-run debt-to-GDP ratio as compared to a situation without preemptive adaptation (Forni, Catalano, & Pezzolla, 2020). Overall, delayed action will result in a combination of reduced public revenues, due to productivity and foreign market losses, and the higher need for public spending, to compensate for the damages of the transition and physical risks, will put future public finances and repayment capacity under severe strain in the medium and long run.

This argument highlights the importance of supporting access to climate finance, particularly for countries with limited fiscal space, as this would encourage the implementation of early mitigation and adaptation efforts, which in turn would be beneficial not only to debtor countries but also to their creditors, as their portfolios would be less exposed to physical and transition risks. Yet, a main challenge is that the extent to which creditors will respond to this lower exposure greatly depends on whether their perceived risk does incorporate the climate dimension.

2.2 The salience of the problem in the current economic context

The pandemic and the subsequent containment measures have generated one of the strongest recessions in history, and middle-income countries have not been immune to this negative shock. The decline in economic activity has generated, on one hand, a significant reduction in tax revenues and, on the other hand, an increase in unemployment rate and poverty, which has forced governments to increase public spending.

Governments have largely focused their attention on emergency relief packages that target the health sector, attend the poorest, maintain financial stability, and provide emergency support to households and businesses (IEA, 2020). But the recovery of the fallout caused by the pandemic needs urgent investments to reduce unemployment and boost economic growth. Without an adequate evaluation of the merits of different policies, the recovery packages could have a non-desirable impact on future sustainability and resilience to the effects of climate change.

From the previous analysis, it is clear that the only way out of the current crossroads is greater access to financial markets and better conditions for sovereign debt. However, some UMICs are in a position in which finding additional funds to finance climate action may prove difficult. In these cases, the first step towards creating fiscal space for climate action is to turn to debt reorganization processes.

However, a natural concern is that once the additional fiscal space is granted, funds are no devoted to climate action. With this in mind, we propose a sovereign debt negotiation scheme in which debt is conditional on climate policies undertaken by the debtor countries, where both creditors and debtors can benefit in the long run.

3. Debt renegotiation. Size matters.

3.1 The financial issue

When an economy is hit by a sizable shock, as the one caused by the pandemic, it may eventually be pushed to declare a default on its sovereign debt. In that case, creditors have two options: (i) renegotiate the conditions of the debt, accepting a reduction in repayment (relief), or (ii) not renegotiate and accept a loss of 100% of debt value. However, when the creditor renegotiates the debt of one country it sends a signal to other debtors: the creditor is willing to renegotiate. This translates into a reputational cost for the creditor that can generate future losses.

Figure 2: Debt renegotiation without climate considerations

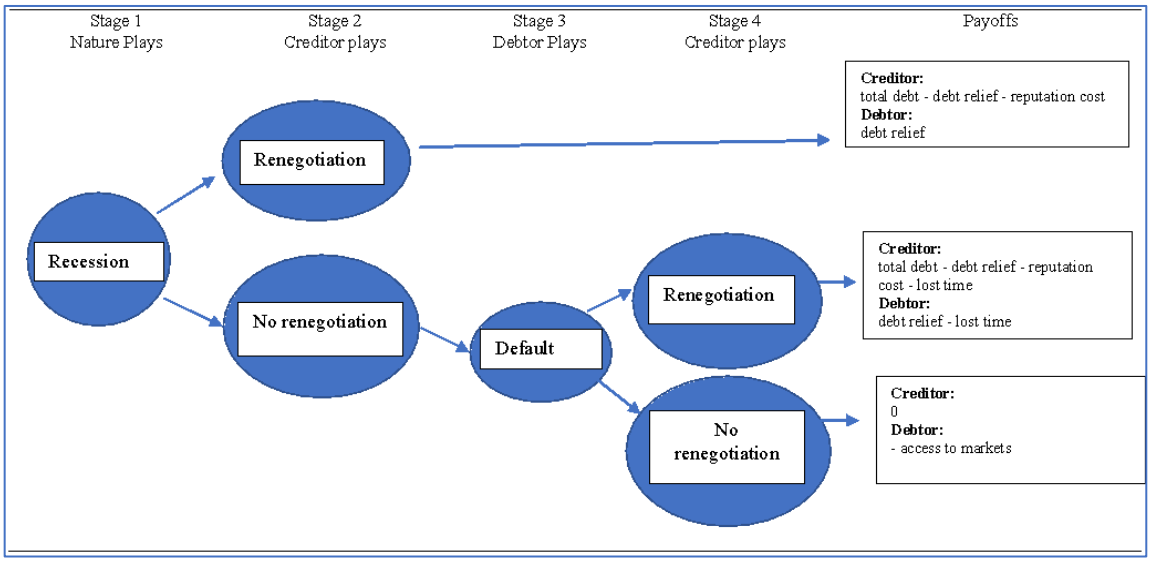


Figure 2 illustrates the possible choices of the debtor and the creditor, as well as the possible payoffs. First, a recession hits the debtor, and then the creditor can anticipate the default and offer a renegotiation. In this case, the creditor obtains the value of the debt reduced by the relief and incurs the reputational cost. The payoff for the debtor is the value of the relief. If the creditor does not renegotiate before the default, the debtor country will not be able to meet the payments and will declare default. In this case, the absence of fiscal space limits policy responses and exacerbates the recession. This manifests as a 'lost time' cost, shared by creditor and debtor. After the default, the creditor can renegotiate; else, it takes a loss in the form of the entire debt (zero repayments). With a post-default renegotiation, the payoff for the creditor is the debt payment net of relief, minus the delay cost and the reputation cost; the payoff for the debtor is the debt relief net of the lost time cost. Finally, if in post-default period the creditor decides not to renegotiate, the debtor does not pay the debt, but it faces a cost in the form of limited access to the credit markets; the creditor will lose 100% of repayment.

Notice that the gain of engaging in renegotiations positively depends on the size of the total debt. Therefore, creditors have more incentives to renegotiate with bigger and highly indebted countries. Similarly, large and highly indebted countries have more bargaining power than small countries. From this, it directly follows that a coalition of debtors has more bargaining power than any individual country (in the potential coalition). In sum, creditors have more incentives to

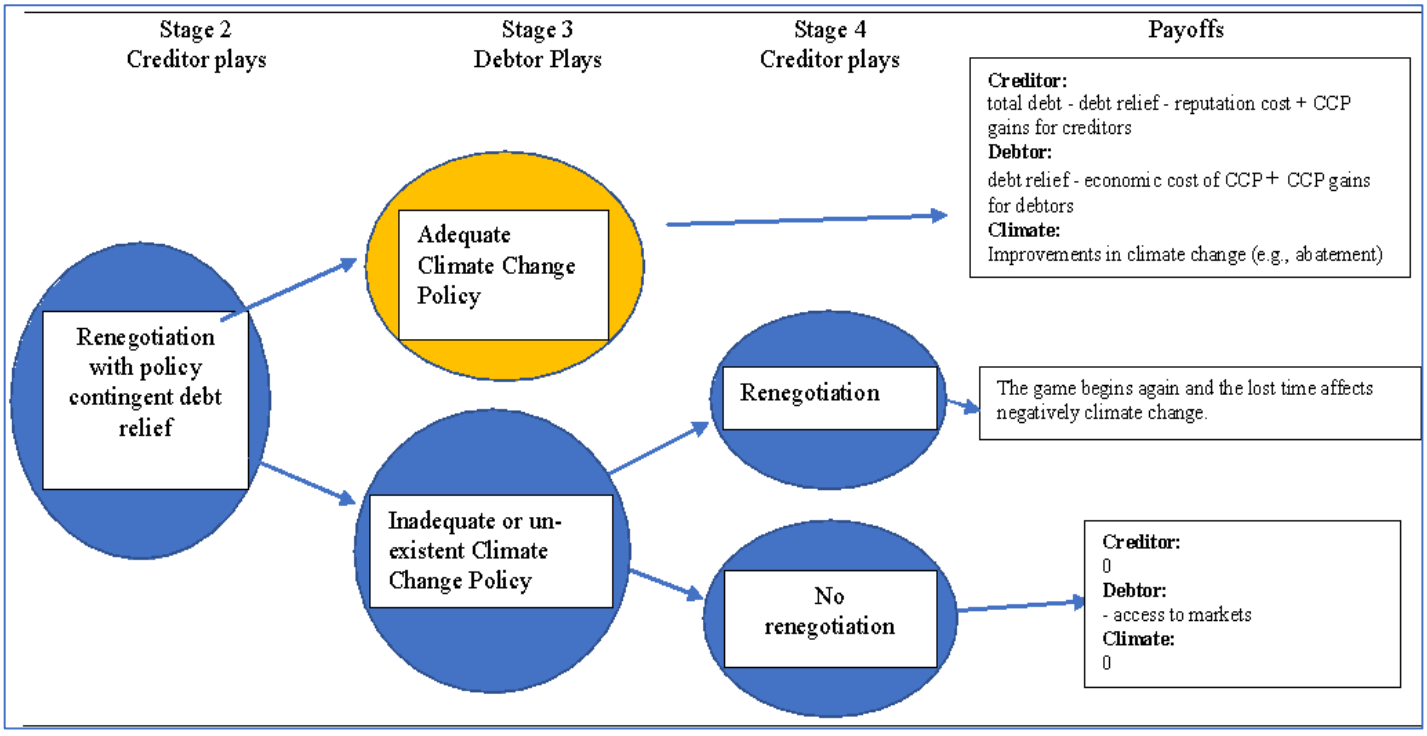
renegotiate through a coalition, and a coalition may get better debt conditions than an individual country.

3.2Climate considerations in debt renegotiations

We now incorporate climate considerations in our renegotiation framework (as illustrated in Figure 3). Given the preferences of the creditor, debt conditions can be improved as long as the debtor implements adequate climate change policies (CCP). What the creditor is willing to accept as adequate can be defined either in terms of policy implementation or its results.[13] In this case, the renegotiation contract is signed before the implementation (or verification) of the CCP. To induce the desired behavior (i.e., CCP implementation), debt relief is contingent.

If the debtor fails to meet its climate commitment, then debt conditions are not improved, and neither the debtor countries nor the creditors benefit from CCP. In this case, debt conditions are the ones of the pre-renegotiation contract. As in the previous case, this results in a debtor that is unable to repay. If the creditor decides not to renegotiate, the debtor faces limited access to credit markets in the future. If the creditor decides to renegotiate, the game begins again, but at the cost that a delay imposes on climate outcomes.

Figure 3: Debt renegotiation with climate considerations



[13] See Sections 5 and 6.

- Improvements in climate change maps CCP into results that the debtor country can produce: e.g., abated emissions, enhanced forest protection, adaptation actions.
- Gains for creditors maps climate action by the debtor into gains perceived by the creditor: e.g., reduced risks from climate change, reputational gains.
- Gains for debtors map climate action into local gains perceived by the debtor: lower physical risk, lower transition risks.

Payoffs portray the fundamental difference between the renegotiation schemes with and without climate considerations (Figures 2 and 3). Adequate CCP increases payoffs for creditors and debtors. For the creditor, the payoff is increased by the gains it perceives, which are larger than 0 if the creditor values climate policy; for the debtor, the payoff is increased by the gains it perceives from CCP. Hence, conditional on creditors valuing climate policy, incorporating climate considerations in renegotiation schemes increases the likelihood of a renegotiation. Moreover, if creditors care about climate change, countries with a high level of emissions or a high level of environmental services are more likely to obtain better debt conditions. Furthermore, creditors might value that debtors engage in climate policies because it will reduce their exposure to transition and physical risks in the mid and long run.

Finally, the case for a debtor coalition is reinforced in case of climate considerations in the renegotiation process. It is still true that a successful renegotiation is more likely for a coalition of countries than for a single country because (i) the size of the coalition's debt is larger and hence the coalition enjoys more bargaining power. On top of this, (ii) the climate impact of the coalition will be more sizable and hence it is more likely that creditors internalize CCP by the debtors as beneficial.

3.3The devil is in the detail

A debt renegotiation can be a good way to induce climate action, and the success of such renegotiations can be positively associated to the formation of a coalition of debtors. Then, the question is how to design these renegotiation deals and how to form these coalitions.

To begin with, financial instruments must be carefully designed in order to make them attractive for debtor countries and a good instrument to induce adequate climate change policies. Second, there are different types of creditors with different views on the risks of climate change and the required action. For this reason, the inclusion of policy contingent debt reliefs may not be possible unless potential creditors who care about climate change find a way to buy the sovereign debt of UMICs. Third, debtor countries are heterogeneous in terms of fiscal vulnerability, climate vulnerability, contributions to global emissions, stock of natural capital, and participation in the

balances of global debts. Therefore, coordination and incentive compatibility issues may prevent the formation of stable coalitions. Finally, the implementation and sustainability of climate change policies requires a domestic consensus. This might be a big challenge when plans to recover the economy after a crisis are expected by voters. For this reason, the policy design should make compatible both, the climate change action and the recovery of the economy. In the following sections, we address these issues.

4. Coalitions and debt negotiation

Achieving global reductions of emissions to control climate change depends on solving a classical collective action problem. Each country faces benefits and costs affected by its own policies and also by the policies implemented by other countries. We develop a simple game to explain this problem.

Suppose countries A and B can decide over continuing with high emissions or implement CCP. Each country evaluates its benefits and costs from each possible scenario, but those costs and benefits also depend on what the other country does. In particular, one country can affect the other country's costs by contributing to the reduction of emissions and thus reducing the climate vulnerability or damages of the other, besides its own. Both would be better off by implementing CCP, but each country would have to commit to cooperate with the other for these benefits to materialize. If one of them cooperates and the other does not, the former will incur abatement costs but will not see the entire benefits from global reductions of emissions. The strain on public finances caused by the current crisis may have exacerbated this mitigation compliance problem.

However, debt renegotiations can change the incentives for each country to engage in CCP. If better debt conditions are granted on the basis of CCP, then the country could eventually decide to unilaterally implement CCP, which will contribute to the public good by reducing its impact on climate change. The positive incentives generated by the conditional renegotiation can be fostered with a coalition formation.

4.1 Collective Action Problem with 2 countries.

The climate collective action problem can be summarized using a two-country example. Imagine countries A and B can decide over continuing with its current emissions path, or higher emissions, or reduce them to their declared Nationally Determined Contributions (NDC), or a

lower path. [14][15] Each country evaluates benefits and costs from each possible scenario, but some of those costs and benefits will depend on what the other country does. In particular, one country's actions affect the other country's net benefits: for instance, GHG emissions of either country result in damages for both countries.[16]

Depending on the exact values of each country's net benefits, it is quite plausible that both would be better off by reducing their emissions, but each country would have to commit to cooperate with the other to achieve such net benefits. If one country cooperates (i.e., follows a low emissions path) and the other does not, the former will incur great costs but will not see the entire benefits from global reductions of emissions Cooperation results in abatement costs associated with improving the carbon and energy efficiency of the economy. The following table shows a simplified payoff matrix where counties 1 and 2 can choose to cooperate and follow a low emissions path (LE). That is, comply with NDC, and not to cooperate and follow the business as usual high emissions path (HE). B^{i}_{m} represents country's *i* gross benefits under each strategy *m*, *D* is the country's abatement cost (incurred only in case of choosing LE), and *C* are the damages associated to climate change, which depend on global emissions:

Table 1. Climate action dilemma payoffs example

		Country 2	
		NDC or lower emissions	BAU or Higher emissions
Country 1	NDC	$B^1_{LE} - D^1 - C^1_{LE}$	$B^1_{LE} - D^1 - C^1_{HE}$
	or Lower emissions	$B^2_{LE} - D^2 - C^2_{LE}$	$B^2_{HE} - C^2_{HE}$
	BAU	$B^1_{HE} - C^1_{HE}$	$B^1_{HE} - C^1_{HE}$
	or Higher emissions	$B^2_{LE} - D^2 - C^2_{HE}$	$B^2_{HE} - C^2_{HE}$

This game involves a collective action problem:

[14] Nationally determined contributions (NDCs) embody efforts by each country to reduce national emissions and adapt to the impacts of climate change.

[15] According to CAT (2020), the INDCs of Russia, China, Peru, Argentina, Kazakhstan and Mexico are incompatible with a goal of 2ºC.

[16] However, the distribution of damages may be heterogeneous (Hsiang & Kopp, 2018).

(i) If, each country's benefits net of abatement costs from the HE strategy are greater than under the LE strategy when the counterpart does not cooperate: $B^1_{HE} > B^1_{LE} - D^1$ or $B^2_{HE} > B^2_{LE} - D^2$.

(ii) Even if the other country opts for LE, each country gets a larger net benefit net of abatement and damages by choosing a HE: $B^1_{HE} - C^1_{HE} > B^1_{LE} - D^1 - C^1_{LE}$ or $B^2_{HE} - C^2_{HE} > B^2_{LE} - D^2 - C^2_{HE}$

As the distribution of damages is associated to climate change is heterogeneous (Hsiang and Kopp, 2018) as well as the country's carbon intensity, the net benefits of the LE strategy would be country-specific. Irrespective of this, both countries will be better off by cooperating and mitigating the potential damages associated to climate change, and non-compliance from one of them will make the other worse-off.

The fundamental question is then how to get both countries to opt for LE. In light of the discussion in the preceding section one could analyze the role of debt renegotiations as part of the solution to this collective action problem. Debt alleviation can be a mechanism to change the incentives/payoffs associated to the LE strategy for each country by altering the net private benefits. If the benefit from obtaining such debt alleviation is sufficiently high for a country, then the country could eventually decide to reduce its emissions unilaterally and, at the same time, contribute to the public good by reducing aggregate emissions.

This debt alleviation as a coordination device can be strengthened if it occurs in the context of a cooperative agreement in which both commit to reach, at least, their NDCs. Because big reductions in emissions by any jurisdiction produce global benefits, each country would be better off by reducing its emissions, even when taking on high abatement costs. Cooperation has the potential to address the diversity of perceptions, costs, and benefits of collective action problems in climate agreements because (i) emissions are unevenly distributed; (ii) climate impacts are heterogeneous and distant in space and time, and (iii) mitigation costs vary (IPCC, 2007).

As effective mitigation will not be achieved if individual countries pursue their own interests independently, combining debt alleviation and cooperative agreements might play an important role in international cooperation, particularly if there is no binding universal collective action. To be effective, the agreement needs to be attractive enough to broad participation and engagement (Barret, 2003; Barret, 2007).

Suppose that both countries in our example are debtors with common creditors: If both countries commit to a binding agreement of CCP (e.g., mitigation targets) and form a coalition to negotiate with their creditor(s), an agreement could be reached in which the debt alleviation is conditional on the joint implementation of CCP. Both debtors have to devise a mutually enforceable mechanism for monitoring and sanctioning in such a way that the intended climate target can be reached. If debt renegotiations incorporate climate considerations, debt renegotiation coalitions will effectively become climate action coalitions, where the members have enhanced incentives to implement CCP due to the conditionality of reduced debt payments.

4.2 From 2 to N countries.

This rationale for combined debt renegotiations and climate action coalitions can be extended to a context with more than two countries with some caveats. The individual benefits from reducing emissions (at least to their NDCs) might be small relative to the individual costs. Countries with high transition risks will perceive the high costs of achieving their NDCs. However, the benefits from such sacrifice will depend highly on what the rest of the countries do and, in this case, on what the larger emitters do. In other words, the larger the sum of emissions from countries not achieving their NDCs, the smaller the benefits for any country, and those complying with their NDCs, the larger the private costs of compliance, particularly from the foregone revenues from implementing mitigation policies.

Countries will vary in terms of four relevant dimensions that must be accounted for when designing potential coalitions: (i) current dependence on carbon-intensive sectors; (ii) costs of transitioning towards a low-carbon economy; (iii) vulnerability to transition and physical risks; and (iv), political power when negotiating climate and debt commitments. These sources of heterogeneity imply that the incentives that a particular country has to switch from high to low emissions significantly depend on the possibility to form a coalition with other countries to either reach a cooperative agreement to reduce emissions, or a coalition to renegotiate debt conditions with their common creditors.

4.3 Potential willingness to cooperate

Stanvis et al., (2014) point out four principles for international climate cooperation that can be translated into the following criteria for assessing cooperation in the debt renegotiation with

climate scheme: environmental effectiveness, aggregate economic performance, distributional and social impacts, institutional feasibility and, conflict and complementarities. These criterias should be taken into account for debt and climate agreement architectures.

First of all, environmental effectiveness refers to the possibility that the agreement achieves its environmental target. This would also require action with a sufficiently long time-frame to develop and implement adequate policies. The second criterion, aggregate economic performance, considers economic efficiency and cost-effectiveness of the climate policy. Environmental effectiveness, aggregate performance and distributional equity considerations, call for differentiated policies between countries. Ideally, every country should reduce its emissions uniformly, but each country perceives a different cost of doing that. So, "the biggest reductions should be made where they can be made most cheaply" (Kolstad, et al., 2014).

Willingness to cooperate, namely, to join a coalition and commit to certain actions, is affected by the potential economic gains of cooperation and the domestic political viability of the actions, particularly the game between the executive and legislative branches. The economic incentives were explained before (see Table 1), but the domestic political viability depends on the social preferences and the perceived short run cost of the actions. Given that domestic political conditions affect participation and compliance with international climate policies, this is a two-level game (Kroll & Shogren, 2009; Hafner-Burton, Victor, & Lupu, 2012) where legitimacy is a key component of institutional feasibility that depends, particularly, on the expected cooperation of others members (Ostrom E. , 2011; Ostrom E. , 1990). Parties in a cooperative agreement 'must have reasons to accept and implement decisions made under the agreement'. For this reason, the way in which the climate policy and debt renegotiation plans are presented is crucial, and the policy must be joined with a policy to compensate those negatively affected (as we will discuss in Section 7).

The willingness to join a climate coalition must be met the financial feasibility to engage in climate action. That is, making funds available to finance climate action. Conversely, the availability of funds for climate action must be met the willingness to engage in it, otherwise the funds will not have the intended effect. The design of climate action financing instruments plays a significant role in meeting this joint need for the willingness to engage in climate action and the availability of climate finance. The next two sections shed light on this. In Section 5, we present a set of climate

finance instruments that incorporate incentives to engage in climate action. In Section 6 we discuss how these instruments can be introduced in debt reorganization mechanisms.

5. Climate action financing instruments and debt reorganization mechanisms

5.1 Instruments to finance climate action.

Climate finance can be done through a wide array of financial instruments. These can be characterized as investment loans, policy-based financing, results-based financing, guarantees, grants, equity, line of credit, and others such as purchase agreements for carbon finance projects. According to the Joint Report on Multilateral Development Banks' Climate Finance (2018), 71 percent of total multilateral development bank (MDB) climate finance was committed through investment loans, which accounts for US$ 30,516 million, while policy-based lending constituted only 8 percent, which accounts for US$ 3,307 million. Results-based financing was accounted for 6 percent, which is around US$ 2,487 million. Moreover, the World Bank Group (2020) states that climate finance is allocated through a limited number of financial instruments, such as loans and grants. Furthermore, as the IMF (2019) states, some strategies to fight climate change should encompass risk diversification across a range of financial instruments.

Other financial instruments, such as policy-based and results-based finance, could help enhance the climate finance system by complementing project-based financing, which could drive a systemic change (World Bank, 2020). Results-based financing, as well as policy-based financing, can be established to provide borrowing countries with liquidity to help meet their financing needs (Schijman, et al., 2016).

Policy-based financing (PBF) accounts for loans, grants, or credits that provide flexible support for institutional and policy reforms through fast-disbursing funds to help the borrower address current or anticipated financing requirements (World Bank, 2004). Usually, the MDBs make the funds available to the borrower upon maintaining an adequate macroeconomic policy framework, satisfactory implementation of the overall reform program; and completion of a set of critical mutually agreed prior policy and institutional actions between the MDB and the borrower. For PBF to be considered for climate finance, the actions agreed to need to be climate-related in order to allow the policy-based financing.

PBFs provide fast-disbursing budget support and have lower transaction costs than investment projects. Additionally, they usually bring policy advice and capacity building and may help governments create consensus for the reform agenda (Schijman, et al., 2016). From the lender perspective, when comparing with investment projects, PBFs are faster, cheaper to prepare and to implement, and generate more income per dollar approved according to the OVE Annual Report on Policy-based loans from the IDB (2016).

Results-based financing (RBF) is a financing instrument under which a donor or investor disburses funds to a recipient upon the achievement and independent verification of a pre-agreed set of results (World Bank; Frankfur School of Finance and Management, 2019). According to the World Bank (2017), RBF must consider only the payments made for climate mitigation or adaptation results. Moreover, payments should be made ex-post, once predefined results have been achieved.

According to the World Bank (2017), RBF has a series of advantages: increasing the monitoring, reporting and verification systems, supporting domestic policy processes, generating a crowding-in of private actors by creating income streams that incentivize private sector investments, and contributing to market creation. RBF is relatively easy to replicate or scale up in a short period.

However, RBF suffers from some drawbacks. According to the World Bank Group (2017), as RBF implies an ex-post disbursement of funds, it may only be relevant in contexts where recipients have enough access to financing, plus it might push countries with low capacity to take on additional risks in order to achieve previously agreed results. Second, creditors may not be able to hold back transfers according to pre-agreed terms because of their internal budget commitments, e.g., spending specific amounts in each calendar year (World Bank; Frankfur School of Finance and Management, 2019). Third, RBF tends to be biased toward short-term and non-capital-intensive activities and sectors. Fourth, there is a substantial risk of perverse incentives if financing focusses on just one measurable and quantitative result, as has been the case for PBF in certain policy operations involving infrastructure investment in Peru, Indonesia, Egypt, and Mozambique, where incentives were no set right for a low-carbon transition (Mainhardt, 2017). Also, there is a bias of RBF approaches in favor of countries with good performance (Klingebiel, 2012).

In broader financing packages, RBF can be combined with other instruments, such as upfront grants, loans, or guarantees. Therefore, RBF does not need to compete with existing

financial instruments but can be used to complement them (World Bank; Frankfur School of Finance and Management, 2019). However, in some cases, RBF works better as an independent approach, like those operating within the existing carbon market infrastructure.

Investment loans, for project-based financing, have been the most common form of multilateral lending because they provide flexibility for a wide variety of projects on a wide set of terms. Traditional investment financing can also help strengthen national green finance capacity and incentivize individual investments. Used in pilot projects perceived as too risky by private investors, it can promote investment in new green markets and green assets by changing risk perceptions (World Bank, 2020).

Nonetheless, this can be complemented by PBF and RBF initiatives. PBF can support governance and reporting improvements, which can accelerate the transition to a mandatory reporting regime by providing a combination of financial incentives and technical assistance to governments with limited experience (World Bank, 2020). RBF can provide an additional incentive to support investments that would be underprovided by private investment, and it can "support structural changes in markets leading to long-term climate results beyond the initial investment". In fact, in cases of infrastructure investments, the payment flows can help improve the maintenance of these investments. This is a desirable feature for mitigation programs, which require sustained investments to be impactful.

In the context of fiscal policies, PBF can play a substantial role in making COVID-19 recovery policies consistent with climate actions. PBF can support the policy development process by covering the cost of designing and implementing those policies. This type of financing can be used to increase government capacity, relax their information constraints, and help to meet the costs of providing subsidies or incentives as part of green fiscal reforms (World Bank, 2020). RBF can also be useful because it might help prepare the way for carbon pricing regimes, including carbon taxes, and reduce the risks of policy reversal related to upfront payments to support policy action.

Additionally, PBF can promote fiscal sustainability by reducing the exposure to transition risks. By means of PBF, incentives to promote the introduction of trade liberalization policies that reduce the tariff and non-tariff barriers to trade low-carbon and climate-resilient goods and services can be introduced. This type of finance can support governments by reducing operational licensing stringency, removing minimum investment requirements, and similar barriers that increase the cost

of importing these goods and services (World Bank, 2020). Moreover, some pre-agreed terms for the disbursement of funds can be adopting climate friendly production practices among the value chains of products and services covered by international trade agreements.

Finally, in terms of climate innovation, investment financing has been an important approach because it relaxes the barriers to access capital that tends to delay innovation. Nonetheless, RBF can also support innovation by increasing the returns of climate-related innovation, which may be hindered by the difficulty in accruing the benefits of innovation and lock-in effects. PBF has the potential to provide governments with incentives to offer a stable climate policy that encourages innovation.

The feasibility of PBF and RBF depends on the characteristics of each country in terms of its fiscal and climate vulnerability, the importance of the country in the global economy, and the type of creditors it has to negotiate with.

5.2 Debt-for-Nature Swaps

In our model, debt swaps may provide debtor countries with fiscal space. The mechanism of exchanging debt forgiveness for nature conservation measures has been on the table for some decades now. During the 1980s, a major debt crisis exploded in Latin America for countries that borrowed heavily at high-interest rates and found themselves unable to cover their dues. Mexico, Brazil, and Argentina were the main victims of this debt crisis, but dozens of countries were suffering the debt crisis by the mid-1980s in the developing world, adding up to US$850 billion at the time.

Out of the oil and environmental crisis during the 1970s and 1980s, the idea of swapping debt for nature conservation came first from a major ecologist, Thomas Lovejoy from WWF, who proposed it in 1984 in an article published in the New York Times titled “Aid Debtor Nations’ Ecology”. The idea arose as a possible solution to the great difficulty of implementing conservation policies faced by highly indebted countries.

Interestingly, it was not WWF but another major NGO, Conservation International (CI), who signed the first DFN swap, with the Bolivian government, on July 13, 1987. In this DFN contract, CI committed to purchase from Citicorp USD$650,000 in Bolivian debt and forgive it. The government would, in exchange, establish three conservation areas in nearly 15 million

hectares in the Amazon basin, in a site with "13 endangered animal species and more species of birds than all of North America" (Washington Post, 1987). However, the country had a total debt of $4 billion USD at the time, so the relative importance of the debt relief was small.

The equivalent of $100,000 USD in Bolivian resources would be committed to creating the Beni Biosphere Reserve in the Amazon. The signed agreement was not free of tensions, domestic discontent and opened questions that subsequent DFN swaps considered. For over a year, the Bolivian government failed to comply with the allocation of these funds, and the legislator failed in granting the protection status to the reserve (Sher, 1993).

A second attempt for a DFN swap emerged between WWF and the government of Ecuador in which the former purchased $1 million USD in the nation's debt, assigning such amount to a local NGO, Fundación Natura. In this new swap, the country issued treasury bonds and transferred the interests to Fundación Natura to fund its conservation activities. This new model improved the design by getting local NGOs involved, avoiding the dependence on national government political dynamics, and reducing inflationary effects of the transaction by issuing these bonds. Most of the subsequent swaps have followed the Ecuador model, learning from the failures from Bolivia's first experiment.

According to Deacon & Murphy (1997), by 1992, more than twelve countries had already moved to sign DFN swaps with private partners. By 2010, 37 countries had signed various forms of DFN swaps worth 1.034 billion USD at the time (Sheikh, 2010). Factors such as containing more tropical forested areas with larger numbers of engendered species, a more democratic government, and larger debt burdens increase the likelihood of debtor countries significantly to enter into a swap mechanism (Deacon & Murphy, 1997).

Over these decades, new forms of DFN swaps have emerged, which overall can be classified into two major categories: private swaps, such as the first case between the Bolivia government and CI, and public swaps in a second-generation where governments that are creditors directly reduce the debt owed by debtor nations (Sher, 1993). The argument in favor of 'public' swaps lies in the possibility of generating larger debt relief and more resources. By 1993 private swaps had generated $90.8 million in environmental assistance, a much smaller sum than what the 'public' swaps had generated for environmental actions. Indeed, the first wave of 'public' swaps had already generated more than $1 billion in debt relief to nations.

There are three types of second-generation swaps (Sher, 1993): (i) governments purchasing debt from debtor nations, (ii) governments issuing grants to conservation groups who would sign private DFN swaps, and (iii) forgiving debt to debtor nations. In all cases, they still suffer from enforcement difficulties, but they have improved monitoring and verification, according to several analysts. The role of international lawyers seems, according to Sher, key in improving the enforceability of future swaps, although nations' sovereignty continues to be one of the main barriers to making international law work in favor of honoring these financial transactions between signing parties. However, there are examples in banking where international law has generated promising results in enforcing agreements among nations that could offer some lessons to apply in public DFN public swaps. One of the mechanisms suggested by Sher is arbitration as a way of solving default possibilities in these contracts. Arbitration, more common among commercial parties, is also a possibility for cases among states, although rarer and with mixed results.

Cassimon et al. (2011) document one more recent case of a public DFN swap between the US and Indonesian governments to reduce an outstanding amount of almost US$30 million in principal and interests owed to USAID. This swap involved the two governments, Conservation International and a local environmental NGO (Yayasan Keanekaragaman Hayati Indonesia, KEHATI).

In a further development, and closer to our goal of exploring the possibility of swaps for climate goals, Cassimon et al. (2014) report on a case to fund a wind farm project in Uruguay (Los Caracoles Wind Farm project) under the Clean Development Mechanism (CDM) and Kyoto, signed between Spain and Uruguay as a Debt-for-Efficiency swap. This is an example of a new wave of swaps, which includes other goals such as education, health, and, in this case, climate change goals. Their evaluation of this swap is mixed. On the one hand, it did get the Los Caracoles wind farm project operating with a 10MW production capacity and an equivalent of 180,000 carbon credits during the first seven years of operation. These credits would be bought by the Spanish Carbon Fund and in exchange generate a relief of $10.5 million USD out of Uruguay's $77 million USD debt with Spain. This, however, would imply commitments by the Uruguay government to secure purchases in its trade with Spanish companies, one of the concerns issued by Cassimon et al. (2014) evaluation. Their assessment also highlights that the Uruguay government would see no expansion in its fiscal maneuvering space because resources aimed originally at servicing debt are now targeted at funding the debt-for-efficiency projects. They also

raise the issue that these projects would not tackle the larger amounts of debt involved and, therefore, would only scratch the surface of the debt scale. For that, their suggestion is to explore multilateral larger swap projects with larger amounts of debt, inviting more creditor countries to participate in the contract.

The most recent assessment of the possible impacts of swaps on nature is provided by Sommer et al. (2020), who find that countries that have signed DFN swaps with the U.S. have seen reductions of forest loss when the amounts of debt reduction and funds for conservation have been larger.

Given these different studies, a few elements seem to emerge from their assessments: First, Debt-for-Climate swaps, a label which is gaining ground again, become more relevant in the face of the increasing weight of debt on countries hit by the Covid-19 pandemic[17]. Second, verification and enforcement of the agreed terms are the main challenges for accomplishing the associated environmental goals. Too much dependence on national governments created problems with the first wave of swaps. However, there are two mechanisms that may help to improve verification and enforcement: (i) involving local NGOs and (ii) the use of technologies like satellite imagery may reduce the transaction costs of verification. Third, the argument of national sovereignty can be used as a pretext for non-compliance with the agreed conditions. However, there is space for international law to include clauses within the swaps contracts that could solve some of these issues (Sher, 1993).

In the context of our proposal, debt swaps may provide debtor countries with fiscal space. However, until now, the swaps have involved rather small amounts of debt. This limitation may be overcome with the creation of coalitions of creditors willing to participate in debt swaps. Further, coalitions by host countries who could negotiate swaps with creditors could also create transnational projects of larger scale and create a deeper impact on the debt service costs to these countries. Particular examples could be a coalition of Amazonian countries negotiating a swap contract to achieve conservation goals for reducing deforestation that could significantly impact overall carbon sequestration and emissions reductions. Large transnational basins that could create integrated and sustainable watershed management projects for hydroelectric energy production and replace carbon-based energy could also be part of such coalition-based swaps. One more

[17] See Degnarain (2020)

example could emerge with Caribbean countries with high debt service costs. See Fuller et al. (2018) for an overview of this regional case.

6. Vulnerability, debt, and priorities.

Climate action (or the lack of it) has medium- and long-term consequences for the implementing country, and the rest of the world. Yet, the short-run costs of these actions can cause UMIC governments to postpone engaging in decisive climate action indefinitely. This "climate inaction trap" provides a rationale for the introduction of climate-related contingencies in debt contracts and debt renegotiations. Consider a situation in which, as part of the renegotiation process, the debtor commits to implement a set of climate actions such that the negative externalities for the creditor are reduced. If the creditor values the reduction of the externality, then this commitment can be perceived as part of the debt service. In other words, if the debtor country implements adequate climate policies or achieves desirable climate-related results, then debt conditions are improved for the debtor.

Given the wide battery of climate policies and regulations, it is advisable to define a small set of acceptable measures for contingent debt (possibly within a PBF framework). Within this set of measures, a carbon price floor can be prioritized, given its lower verification cost. Achievable goals in terms of reduction of deforested areas can also be included, given the possibility of verification with satellite data.

Debt reorganizations can also be a forum for transnational climate equity, especially when dealing with Official Bilateral Creditors. Countries that have emitted the most GHG in the past have the responsibility to compensate the rest of the world for the damages associated with higher GHG concentrations. Such damages are already materializing and will continue to materialize for years to come. For example, China not only produces 23% of GHG emissions today, but is also responsible for about 12% of total cumulative emissions. Together with China, four countries account for 60% of historical CO2 emissions: The US, China, Russia (including the former Soviet Union), Germany, and the UK (Hsiang & Kopp, 2018). These 'historical contributors' have a responsibility not only for the future but also for the current level of GHG concentrations.

This is particularly relevant if one considers that these 'historical contributors' also represent some of the most important Official Bilateral Creditors. In this sense, improving debt

conditions for UMICs, LMICs, and LICs can be seen as compensation for climate damage generated over the years, similar to mechanisms such as REDD+ in which emitting countries or companies compensate avoided emissions in developing countries.

Furthermore, debt reorganizations should account for the specific climate-related risks that debtors face. For countries with high climate vulnerability, there should be an economic assessment of the risks of natural disasters so that the economies responsible for most of the current stock of emissions assume these costs via debt alleviation.

UMICs may also face significant transition risks. Implementing climate-friendly development strategies may be costlier for these countries than for developed countries. UMICs that are abundant in fossil resources are an extreme example of this. For these countries, the tax collection and the availability of foreign currencies depend on the production of fossil fuels so that a responsible climate policy can generate high costs in the short term.

With these considerations in mind, we analyze the interaction between debtor-specific characteristics and the type of creditor they are facing (multilateral, official bilateral, private) to identify suitable reorganization mechanisms. These mechanisms are neither mutually exclusive nor the only viable alternatives. Instead, the mechanisms that we put forward exhibit particular merits to be taken into consideration in specific debt reorganization contexts. In this sense, we pay special attention to the possibility that debt reorganization processes initiate a widespread transition from investment financing to PBF and RBF. Table 2 summarizes the proposed mechanisms.

Table 2: Debtors/Creditors and potential reorganization mechanisms

Creditor Debtor	Multilateral	Bilateral official	Private
High fiscal vulnerability Priority: solvency	New concessional debt to buy-back mkt debt Swaps to PBF Swaps to RBF Transition from PBF to RBF	Relief: write-offs (e.g., under Paris-20 rules)	If small debtors: 'Brady plan' championed by climate committed + home to creditors (with components of PBF) If large debtors: leadership in renegotiation
High debt levels Significant players in capital markets and in bigger footprints		Swaps to state-contingent debt (first-movers) High transition risk: gradual phase-out of contingency / PBF	Swaps to equity in Green infrastructure projects
High Debt burden (service/revenues): Priority: liquidity	Extend debt maturity. NPV neutral (lower service payments in SR)		

6.1 Debtors (1) - High fiscal vulnerability

Countries facing solvency problems are at the highest risk of not engaging in climate action unless their public finances are substantially restructured. This would require strong forms of debt reorganization that translate into some form of relief and effectively more fiscal space.

6.2 Multilateral creditors (1)

For debtor countries with high levels of (private) non-concessional debt, their solvency problems are likely to force them to spend a significant part of their income on external debt service. Simultaneously, interest rates on new loans are often high to compensate for the low probability of repayment. The priority for this type of debtors to alleviate their fiscal conditions. For such countries, new concessional debt to buy-back market debt can go a long way in generating the necessary macroeconomic conditions to open fiscal space for climate action. Concessional debt should result in lower average interest rates and longer debt maturities.

Multilateral organizations are central in this debt relief mechanism. When negotiating with debtor countries, they should undertake a detailed evaluation of each country's debt composition,

capacity to pay, and climate change investment needs. They must prioritize the new concessional debt to buy-back market debt in countries with high market debt levels. The aim of this debt alleviation mechanism is not only to provide relief to debtors but also to modify the composition of their debt.

At the end of the intervention, debtor countries should end up with a higher proportion of their debt with multilateral agencies. These agencies should provide them with lower interest rates and extended-term maturities, and should provide adequate incentives to engage in a fiscal recovery that is compatible with climate action. As opposed to private creditors that are granular and not immediately interested in sacrificing their investment gains to induce climate change actions, multilateral lending agencies, in support of the SDGs, can foster the internalization of externalities associated with climate change.

The new concessional debt, replacing the outstanding market debt, can be part of a comprehensive package of negotiations between the debtor countries and the multilateral organizations. As with the other types of credit relief analyzed in this section, the extension of concessional financing to buy-back market debt could be part of an integral reorganization program that also contemplates policy-based or result-based loans. Leverage for introducing the PBF or RBF would come from the 'below' the market conditions upon which the concessional debt is extended.

For countries with solvency problems and relatively higher levels of public (concessional and non-concessional) debt with multilateral agencies (see Table 2), a reorganization mechanism could contemplate swap to policy-based loans. In this case, the outstanding debt bonds are exchanged for new loans, which are contingent on policy actions implemented by debtor governments. If clear and verifiable actions are implemented, then the conditions will be better than the initial ones, but if these actions are not implemented, the financing conditions do not change. Essentially, the swap is policy-based.

Multilateral organizations committed to the SDGs can induce debtor countries to implement climate policies through action-contingent debt swaps. Countries with high debt vulnerability, for their part, can achieve better financing conditions with the swap. The fact that swapping conditions depend on the governments' actions guarantees that the mechanism is incentive compatible. That is, to the extent that the debtor's benefits only materialize if the climate

action policy is effectively implemented, there are no incentives to request the financing swap if the cost of implementing the policies surpasses the benefit of executing the swap.

This type of mechanism can be far-reaching, and many countries could benefit from it. However, the costs of negotiating individually with each of those countries are high and can reduce the efficiency of the swapping scheme. Next to this, the effect of an individual country's actions on global climate change can be negligible, so the bargaining power of individual countries can be very small. In these circumstances, the formation of a debtor coalition can be useful to reduce negotiation costs and increase the aggregate effect of climate policies. A unilateral design of policy-based swapping instruments by multilateral organizations can play the role of a coordination device. If the instruments are well designed, countries with fiscal vulnerability will have incentives to request the financing swap.

Debtor countries with a significant climate impact (categories 2 and 4, Tables 1 and 2) may have incentives to negotiate special conditions and obtain additional benefits to those granted through the swap. The main challenge here is that the actual effect of climate policies is not observable in the short run (is not even materialized in the short run) that makes it harder to start rolling out the mechanism, where traditional debt is being swapped for RBF, or where the execution of the swap in itself is contingent on results. A more ambitious scheme can be designed as having two stages. Initially, the conditions for more favorable financing terms are policy based. Then, for the countries where policies are effectively implemented, there is a new swap to RBF.

6.3 Bilateral creditors (1)

With official bilateral creditors, strong forms of debt reorganizations simply translate into write-offs. These write-offs should preferably happen within some common rules for the group of creditors, for instance the Paris Club, to ensure that the residual claimant of the write-off is the debtor country, not other creditors. As this type of debt relief is likely to have the most immediate impacts, it should be mainly focused on countries particularly vulnerable to the consequence of climate change and in more urgent need of adaptation actions (e.g., V20), or with a relatively large impact on global emissions and hence where swift mitigation action is required.

One aspect to be considered when resorting to this instrument is that it can reduce the scope for other forms of restructuring. Hence, a transparent definition of the conditions a debtor country must fulfill to qualify for a write-off is necessary. Write-offs should be a last resort and prioritize

(if not being limited to) cases at the intersection of critical solvency and high vulnerability or high impact on climate change. Otherwise, when the prospect of debt forgiveness is on the table, alternative instruments that can be more easily leveraged to induce climate action, like debt-swaps, would be plainly disregarded by debtors (Occhiolini, 1990).

6.4Private creditors (1)

In case of debt renegotiations involving private creditors, the initial focus should be on large debtors, i.e., relatively large economies, that can play a strategic role in the debt renegotiation processes (categories 3 and 4 in Tables A1 and A2). One of the great difficulties in debt renegotiations involving private creditors is the costs of coordination among debtors and multiple granular creditors. Therefore, identifying actors that can lead the negotiation processes in each creditor and debtor group becomes very useful. Following the theory of economic development, we refer to these as 'key actors and brokers' (Gould & Fernandez, 1989; Zenou, 2016; Chaudhuri, Roy, McDonald, & Emendack , 2020)

The role of key actors and brokers has been analyzed in the design of development policies that involve the cooperation of a large number of actors in an economic process (Brown & Ashman, 1996; Lasker & Weiss, 2003; Ansell & Gash, 2008). For example, when there is cooperation or negotiations between buyers and sellers of raw materials in production chains, or creditors and debtors' coalitions to apply for credits to finance shared investments. Brokers and key actors greatly facilitate the flow of information, and the generation of consensus and verification mechanisms (Isaac, Anglaaere, Akoto, & Dawoe, 2014; Rockenbauch & Sakdapolrak, 2017). We can adapt this type of analysis to the design of the process of debt renegotiation and climate change cooperation.

Jointly with multilateral agencies, large debtors could play the role of brokers bridging debtor and creditors countries. First, because of the size of their debt, they may have higher bargaining power in negotiations involving private creditors. Second, they are pivotal agents from the climate perspective as they can generate crucial impacts on the climate by reducing their emissions. Third, they can significantly influence countries with geographical proximity and/or economic complementarities because of the size of their economies.

In the case of smaller debtors, they may be interested in negotiating with their creditors collectively rather than individually. Individually they may be too 'economically irrelevant' to

encourage creditors to renegotiate favorable debt conditions. However, if all creditor countries act in a coordinated manner, they can reap more significant benefits. The problem is that it is not easy to coordinate actions and cooperate when there are so many dispersed granular actors. It is then imperative to identify the key actors that can help serve as brokers of collective deals. As mentioned above, these brokers could be the large debtors with close ties with the smaller economies. The role of multilateral agencies is fundamental. First, to balance the negotiation between small and large debtors and creditors. Second, to fill the gap if no large debtors can be identified as suitable brokers.

Private creditors may have incentives to accept a renegotiation if the expected return is positive. However, for smaller debtors, the effect of better debt conditions on the debtor's capacity to repay is marginal. In these conditions, a coalition of debtors could be a good strategy. However, coordination between small private creditors is extremely challenging, so that a coordination device could generate gains for creditors and debtors.

Multilateral organizations and governments of developed nations can play a central role in ensuring that small private creditors agree to offer better debt conditions. The Brady plan is a clear precedent in which the United States government and multilateral organizations worked together to improve the conditions of the debt that was in the hands of many different private creditors. This plan was a strategy adopted to restructure the debt of Latin American countries with commercial banks and sought the conversion of the old debt contracted exclusively with private or commercial banks for new debt, backed by United States Treasury bonds. The program also aimed to convert debt into equity and purchase discounted securities with the IMF and the World Bank's support.

The Brady plan did not achieve significant short-term cash flow relief for borrowers, but it did provide a stable long-term financial framework that, along with structural reforms, helped restore access to the international financial market (Clark, 1993). This approach is, therefore, more suitable for cases of insolvency problems over cases of liquidity problems.

6.5 Debtors (2): High debt levels

Debt reorganizations involving large debtors, i.e., relatively big economies, open the opportunity to explore the more widespread use of some less frequently used, yet promising, instruments. These economies are likely to enjoy more bargaining power among creditors, which

grants some scope for proposing novel renegotiation instruments. Renegotiating over larger stocks of debt implies that these novel instruments may provide some of the market deepness that they have so far lacked.

6.6Bilateral creditors (2)

In case of debt renegotiation with official bilateral lenders, swapping outstanding debt for state-contingent debt is an attractive strategy. Swapping non-contingent debt for debt contingent on risks associated with climate change would help debtor countries build fiscal resilience. This would translate into less fiscal vulnerability, reducing the need for international financing when risks associated with climate change manifest.

Depending on the countries' specific characteristics, the 'states' upon which the debt is contingent can be tailored to be compatible with their more pressing risks. For debtor countries facing high physical risks due to the damages associated with climate change or their exposure to natural disasters, which may be exacerbated by global warming, debt contingency should prioritize the materialization of such damages or the occurrence of a natural disaster. For debtor countries facing high transition risks, fiscal resilience to the sudden decline in public revenues associated with these exports could partially be built into their debt.

As these types of instruments imply that part of the risk of delayed action would effectively be transferred to the creditor, one evident concern is that such contingency considerations are incentive incompatible with early climate action. This potentially negative effect on incentives for early action is less likely to be an issue in case of physical risks, where the costs of inaction are privately borne: the effective direct cost faced by the debtor should suffice to engage in early climate action provided that the fiscal budget constraint is relaxed.

Such an argument weakens in case of contingency to the materialization of transition risk. Lower exposure to this type of risk is primarily achieved by means of mitigation actions, which entail a public benefit but a private cost of implementation. There is scope for taking measures to reinforce the incentives to engage in early action in this case. Incentives for debtors to promptly engage in climate action can be incorporated through instruments with some additional degree of complexity. Specifically, financing instruments could include some gradual phasing-out of the degree of 'state' contingency on the materialization of transition risks. A high initial degree of 'state' contingency would reduce the debtors' exposure of debtors to transition risks, promoting

fiscal resilience, potentially facilitating their access to additional financing. The gradual phase-out of the contingency imposes an additional cost on delaying mitigation actions: the increasing exposure of debt to transition risks adds to the costs of early inaction. This should, partially, serve for the debtor to internalize some of the public benefits that emerge from its early mitigation efforts. Alternatively, instead of a phasing-out of the state contingency, the transition risk can be faced by incorporating PBF into the financing package. In this case, policies upon which further debt transformation, where the contingency concerning transition risks is only active if the debtor country has taken clear and measurable policy actions, towards mitigating these risks.

Resorting to this type of debt reorganizations with large debtors can have a positive spillover towards smaller debtors. The saliency of these renegotiations, and the implementation of this type of instruments as an outcome, can raise the awareness of the advantages associated to them. This would allow these instruments to gain traction in the international capital markets as they become more widely available and accepted as vehicles to mobilize funds to countries with high fiscal exposure to physical and transition risks. Furthermore, recurring to this type of reorganizations with countries that produce big climate externalities implies more bargaining power on the side of the debtor, which will then facilitate bringing the instruments to the negotiation table in the first place. In this sense, coalitions of debtors can be useful not only to increase the size of the debt but also to increase the size of the external climate effect.[18]

Insofar these instruments facilitate early mitigation actions among large debtors, which are also the countries with a relatively bigger GHG footprint, smaller countries with high vulnerability to climate change will benefit. An additional feature to consider is that the contingency upon the materialization of physical risks partially shifts the burden of climate change damages; this serves to incorporate a principle of transnational equity. In other words, implementing this type of instrument would allow for a more even distribution of the costs of damages associated with climate change.

6.7Private creditors (2)

[18] More on cooperation and coalition formations in subsection 4.4.

As mentioned above, debt reorganizations with private creditors can be involved and costly due to the high granularity of the creditors. A potential approach to mitigate this is to recur to the secondary debt market, where the market itself acts as the aggregator of the creditors.

A debt reorganization based on debt-for-green-equity swaps relies on identifying private investors with interest in climate infrastructure projects and profitable climate (adaptation/mitigation) projects in the debtor country. This reorganization process involves at least three types of agents: the debtor government, private creditors, and the investor. The investor buys debt in the hands of private creditors in the secondary market. This grants the investor with equity in an infrastructure project, where the value of the investor's participation is equivalent to the amount of the debt bought in the secondary market.

This type of instrument may prove particularly useful to accelerate the execution of a project. This can occur, for instance, if the redemption value invested by the debtor government is above the market value of the debt bought by the investor. One way to achieve this is if the investor and the debtor, ex-ante, agree that as part of the debt alleviation implied in the reorganization, the redemption value is indeed higher than the value of the debt bought by the investor. Another option is to get a fourth party involved, namely a multilateral lender, or to identify projects where a multilateral lender is already participating. In this case, disbursements by the multilateral lender related to this project can be contingent on the government upholding its end of the deal. Additionally, following an RBF approach, the multilateral lender can top up the government's initial investment, after the completion of some project milestones, assuring that the total investment in the project exceeds the value of the debt initially bought by the investor.

There are four main reasons why using this type of instrument may be better suited for reorganizations involving large debtors. First, a high volume of outstanding debt implies that the leverage of the mechanism is not exhausted with an increase in the secondary market price of debt. Second, it provides an alternative to debt forgiveness, which is, in any case, unlikely for larger economies. Third, in a large economy, the number and size of potential investment projects are likely larger, facilitating the match between projects and investors. Fourth, larger economies are more likely to have the oversight and enforcement capacity necessary to minimize the risk of the projects being abandoned before completion.

Besides the debt alleviation potential, this type of instrument can serve to accelerate the implementation of climate infrastructure projects. This can be particularly attractive for debtor

governments insofar these projects align with a recovery agenda, for instance, because of their potential to generate employment in the short run and their sustained profitability in the long run[19]. Regarding the latter, this type of instrument may prove useful to steer private investment away from assets that are at risk of being stranded.

One risk for the debtor country is that it may end up committing resources to projects that are too costly, crowding-out other expenditure needs. To mitigate this, it is important that the project's cost-benefit analysis incorporates the social benefits derived from the completion of the climate infrastructure project and identifies potential positive spillovers, for instance, in the form of employment opportunities. A risk for the investor is that the project experiences delays or is not completed. The mechanism should partially mitigate this risk if the invested value is higher than the market value of the debt it was swapped for, either as part of the government's commitment or as a consequence of the participation of multilateral lenders in the project. Furthermore, the portion of the project that is financed from multilateral lending can incorporate elements of RBF, which could serve as commitment devices for the government to complete milestones of the project.

Multilateral lenders can play a significant role in mitigating the non-completion risk by assisting the identification of low-risk projects, as well as providing monitoring capacity for the selected projects. In this sense, projects that involve the retrofitting of already existent infrastructure and in which there is already involvement of multilateral lenders may be particularly appealing. Reducing this type of risk may prove key for the instrument to work in the first place. By reducing the risk, the debt-for-green-equity swap will have a competitive edge over the obvious alternative: investing in the project directly.

6.8 Debtors (3) - High debt service burden

Some countries do not have significant insolvency problems but still face liquidity problems in the form of high debt service relative to public revenues (e.g., Paraguay). Liquidity constraints may be particularly relevant in the current covid-19 crisis, where economies are facing economic recessions, and governments need to finance economic recovery programs. The liquidity problems can be exacerbated by other types of temporary economic shocks in the future, like natural disasters that difficult the servicing of the external debts. This could happen, even if the

[19] For more details about this, see subsection 4.3.

economy has the necessary solvency to respond to its external debt in the long term. Although liquidity problems are less severe than solvency problems, mechanisms need to be designed to assist countries affected by the former.

There are a few reasons to push for debt reorganizations that alleviate liquidity constraints. First, market mechanisms are not always fast enough to provide the necessary liquidity to countries that require it, particularly in severe economic recessions. Second, an economic downturn could become more persistent in cases of liquidity constraints due to the difficulty of financing consumption and investment expenditures. Third, liquidity problems may eventually result in solvency problems in periods of a severe recession. Countries that cannot service their debt for some periods may be heavily punished by the credit market through higher risk premiums, which will result in higher interest rates and deepen the negative effects of a recession. A liquidity constraint can trigger a vicious circle of high-interest rates, low fiscal space, low economic growth, and difficulties in accessing new credit resulting in long-term insolvency. Next to this, countries with liquidity problems experience heavy debt-servicing burdens. This severely limits their fiscal space, among other things, to take timely climate actions.

Addressing liquidity problems requires 'softer' reorganizations than those in case of solvency problems. A potential avenue to reduce the current debt servicing burden without shifting the creditors' cost is to reorganize debt following the principle of net present value-neutrality. This type of reorganization would consist of extending debt maturity, which will result in debt-servicing payments more evenly spread over time. In the short- and medium-run, this would allow countries to implement economic recovery packages and service the debt without sacrificing climate change action.

7. Making climate policy compatible with recovery

While there is still great uncertainty about the effects and length of the covid-19 crisis, there is a consensus on the need for well-designed recovery packages. Currently, many governments are focused on emergency relief packages and recovering from the effects of the pandemic. However, it is fundamental that the recovery strategy does not lose sight of the climate crisis. Where addressing the latter requires considerable changes in patterns of land use, investment in energy, and transportation infrastructure. Without climate policies to steer investments, recovery packages

may enhance the use of fossil fuels, especially in countries that increasingly depend on low-cost coal power plants to supply their energy needs (Gupta, et al., 2014).

The global sources of climate finance include government budgets, capital markets, and carbon markets. The majority of the climate government budget comes from regular revenues. As described before, debt reorganization processes have a real potential to open fiscal space for climate finance. Such additional fiscal space appears as urgent in the midst of the current crisis. The fiscal space created by debt reorganizations can be topped up with the revenue raised from the implementation of carbon pricing schemes. According to Carraro, Favero, and Massetti (2012), setting up a carbon pricing scheme could raise carbon revenues, especially in the short and medium run. Fast-growing regions, like some of the UMICs, can expect a growing stream of carbon pricing revenues for several decades upon implementation.

With the right incentives and institutions, the private and public sectors can play an important role in financing mitigation (Gupta, et al., 2014). In the following lines, we present the key elements of a sustainable/green recovery.

7.1Tax reforms

Additional fiscal space can be used to reduce distortive labor taxation, help the recovery of the labor demand, and reduce informality rates. Permanent labor tax cuts could help to speed up the economic recovery. By encouraging investment and a shift towards a formal economy, such a reform can result in higher overall productivity, especially in countries with large informal sectors. By reducing the burden of distortive labor taxation, this type of reform can undo the regressive effects of carbon pricing schemes.

A tax reform can also consider subsidies applied across sectors and include a variety of policy designs, such as tax rebates or exemptions, grants, loans, and credit lines (Gupta, et al., 2014). For carbon-intensive sectors, governments can supply tax credit and tax reliefs with emissions reduction targets commitments and ensure an equitable transition to a low-carbon economy (IMF, 2020). An encompassing PBF approach can consider implementing carbon pricing schemes with provisions on how to relieve carbon-intensive sectors and facilitate their clean transition. Table 3 specific types of subsidies that can be applied in each sector to achieve a clean transition.

Table 3: Subsidies across sectors

Energy	Transport	Buildings	Industry	AFOLU	Human Settlements and Infrastructure
Fossil fuel subsidy removal Feed in tariffs (FITs) for renewable energy	Biofuel subsidies Vehicle purchase subsidies Feebates	Subsidies or tax exemptions for investment in efficient buildings, retrofits and products Subsidized loans	Subsidies (e.g., for energy audits) Fiscal incentives (e.g. for fuel switching)	Credit lines for low-carbon agriculture, sustainable forestry.	Special Improvement or Redevelopment Districts

Taken from Gupta et al. (2014)

7.2Assistance to households and firms

If carbon pricing schemes are implemented, the cost of certain goods and services will increase, which can have particularly negative impacts on certain population groups. Fiscal space can be directed to those most affected, on top of those of the pandemic.

Upon the implementation of a carbon pricing scheme, increasing the cost of emitting sectors affects two types of agents: workers in those sectors and households who consume goods/services from those sectors. Fiscal space can be used in redistributive policies that pay particular attention to the most affected by an eventual carbon pricing reform. For example, governments can use the development of skills or job-seek programs to retrain workers in emissions-intensive sectors. Also, revenues can provide early retirement support. An example of such supportive policies can be found in Germany's coal phasedown plan[20].

For consumers, particularly low-income households, governments can target direct cash-transfers to those heavily impacted by a carbon pricing scheme. Governments with high emissions-intensive energy sectors can use additional fiscal space to assist lower-income households through public transport subsidies.

[20] See more in Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2019).

Covid-19 assistance

Stimulus packages would need investment and government assistance to most affected households and businesses. Government programs such as a minimum income guaranteed are already implemented in several countries to mitigate pandemic impacts on the lower end of the income distribution. In addition to the fiscal space created by debt reorganization processes, carbon pricing rents can help to sustain these programs over time, especially if carbon pricing is swiftly implemented. Support to the most affected communities and the potential to foster a quick recovery can improve the perceived fairness and political feasibility of carbon pricing schemes.

7.3 Fiscal sustainability

A common theme in the expected effect of debt reorganizations is how to improve fiscal sustainability and minimize the risk of future insolvency. In this sense, any reform taken upon debt restructuring needs to consider the role of revenues from carbon pricing schemes.

The carbon rents can reduce fiscal deficits and improve the sustainability of public finances in the medium run. In a non-crisis situation, countries could use these carbon rents to reduce the economic burden generated by debt and interest payments and increase public budgets to invest in social projects. This debt alleviation can free up resources in future periods. During a crisis, carbon rents can be used to mitigate negative shocks and as part of recovery policy packages.

As the objective of carbon pricing is to reduce emissions in the long run, total carbon revenues will also decrease over time: this additional revenue has a transitional nature. These revenues waning down would be a sign of a less carbon-intensive apparatus, hence lower exposure transition risks and enhanced fiscal resiliency.

7.4 Climate actions

The additional fiscal space from debt reorganizations and carbon pricing schemes can be used to complement the mitigation effect of the pricing schemes themselves. Other market failures can prevent agents from reacting effectively to the price signal of a carbon pricing scheme. Those failures can be barriers to financial investment, lack of information, or systematic behavioral biases (Weber & Johnson, 2012). Investment in climate actions could overcome those failures and complement carbon pricing into emissions reductions.

Countries choose specific policies, projects, and strategies to be included in the INDC. Examples of these complementary actions are the restoration of degraded agricultural lands and forests, sustainable management of lands, reductions of deforestation and forest degradation, feed-in tariffs or minimum requirements for renewable energy generation, energy-efficiency standards for vehicles, appliances, or buildings, and research and development of cleaner alternatives. Many of these actions are unconditional to international cooperation. However, larger goals require additional financing, the fiscal space created by debt reorganization processes, and carbon rents can support these additional actions. Table 4 shows mitigation actions related to government provision of public goods or services.

Table 4: Government provision of public goods or services

Energy	Transport	Buildings	Industry	AFOLU	Human Settlements and Infrastructure
Research and development Infrastructure expansion (district heating/cooling or common carrier)	Investment in transit and human powered transport Investment in alternative fuel infrastructure Low-emission vehicle procurement	Public procurement of efficient buildings and appliances	Training and education Brokerage for industrial cooperation	Protection of national, state, local forests Investment in improvement and diffusion of innovative technologies in agriculture and forestry	Provision of utility infrastructure, such as electricity distribution, district heating/cooling and wastewater connections, etc. Park improvements Trail improvements Urban rail

Taken from Gupta et al. (2014)

7.5 Carbon leakage prevention

The implementation of carbon pricing schemes threatens the competitiveness of domestic industries in international and national markets. Whereas a country/jurisdiction sets up a carbon tax or ETS and its firms' profits are reduced, other countries/jurisdictions may gain from less strident carbon regulation. This carbon leakage undermines the effectiveness of any mitigation policy because, in the aggregate, it leads to a lower reduction in global emissions. Emission-intensive and trade-exposed (EITE) firms can shift their production to uncovered jurisdictions because they cannot reduce emission-intensity in the short-run. When a company's production is shifted elsewhere, total revenues raised by the carbon price and global emissions reductions decrease.

Governments can use the additional fiscal space to mitigate this carbon leakage. For instance, they can allocate free-allowance, partial tax exemptions, or feebates upon implementing a pricing scheme. These policies aim to mitigate carbon pricing impact on competitiveness in the short run while firms are able to adjust their business models. Preventing carbon leakage can avoid inefficient economic and climate outcomes and helping affected industries to adapt to carbon pricing can encourage long-run investment in low-carbon technologies.

These programs, however, need to be carefully designed and monitored to ensure that they do not reduce the incentive to decarbonize. With transition programs like energy-savings regulations and training, monitoring can be a large share of government expenditure. Carbon rents can develop and implement transparent evaluation mechanisms to ensure the effective use of carbon revenues. Carbon leakage prevention must be transitional. These policies should help to support companies' adjustment of carbon pricing reforms and prevent carbon leakage. But these policies can be phased-out when other jurisdictions implement similar levels of carbon pricing (PMR, 2015).

7.6 Foster technological change and transition toward decarbonization

Without government support, the private sector underinvests in low-carbon technologies (Carbon Pricing Leadership Coalition, 2017). Fiscal space can be used to provide tax credits, R&D credits, or support energy efficiency investments in innovation and adoption towards a low-carbon transition. These investment credits can be part of 'innovation boosting packages' to the private sector. The use of new clean technology produces societal benefits through reduced emissions, better future environmental quality (Aghion, Hemous, & Veugelers, 2009; Acemoglu, Aghion, Bursztyn, & Hemous, 2012), and enhanced productivity.

7.7 Policies to complement carbon pricing schemes

Implementable carbon pricing schemes are theoretically insufficient to reach Paris goals (Stern, 2015; Stiglitz, 2013). Given the current markets and government failures, as well as distributional impacts, carbon pricing schemes need to be complemented with other well-designed policies (Carbon Pricing Leadership Coalition, 2017), performance standards, investment in public transportation and urban planning, land and forest management, and investments in infrastructure, investment in new methods and technologies, and financial instruments that foster private sector participation and reduce the risk-weighted investment costs of clean or low-cost technologies and

projects (Fay, et al., 2015; Bhattacharya, Meltzer, Oppenheim, Qureshi, & Stern, 2016). These policies are especially relevant for countries with political-economic considerations that make it particularly challenging to implement ambitious pricing schemes: for instance, countries with high emission intensities.

Phase-out of fossil fuel subsidies

This must be an integral element of any carbon pricing reform and should play a role in any PBF mechanism that has carbon pricing provisions. These subsidies are effectively carbon subsidies, which basically exacerbate the distortion caused by the negative emissions externality (Carbon Pricing Leadership Coalition, 2017). These subsidies discourage investment in research and development of clean alternatives and delay the adoption of already existent technologies. Finally, the elimination of such subsidies helps open fiscal space.

Although these subsidies are typically intended to be particularly helpful for lower-income households, it is not unusual that they end up benefiting wealthier groups (Pezzini, 2020). The currently low level of oil prices opens a unique window of opportunity to get rid of these subsidies. In light of the current crisis, governments should consider more effective and less distortive redistributive fiscal instruments.

8. Conclusions

As the world struggled to emerge from the financial crisis in 2008, the global investment in renewables-based generation fell by close to one-fifth (IEA, 2009). Investment dropped by 14% in countries where the financial crisis hit hardest (Frankfurt School-UNEP Centre, and BNEF, 2012). Some countries facing large public sector deficits scaled-down green spending even when the economy started to recover (Eyraud, Wane, Zhang, & Clements , 2011). In response, G20 governments implemented economic stimulus packages that supported the rapid recovery of renewable investments by compensating for reduced financing from banks (Gupta, et al., 2014). Without the stimulus provided by government fiscal packages, investment in renewable energy would have fallen by almost one-third (IEA, 2009).

The pandemic fallout represents a similarly threatening scenario for green spending and climate action. The current crisis is limiting fiscal space for countries around the world and potentially orienting fiscal policies towards interventions that prioritize a speedy economic recovery and limit the scope for climate action. The absence of prompt climate action would have

lasting negative consequences. Indeed, climate inaction can lead to the materialization of physical and transition risks with the consequent decrease in productivity and output. On top of that, the need for government spending would also increase in order to repair the damage suffered by the population and undertake adaptation costs. Under these circumstances, tax revenue would go down as spending must go up. To get out of this quagmire, it is essential to find mechanisms to increase fiscal space and promote the implementation of climate policy.

We propose a sovereign debt negotiation scheme in which the conditions of the debt depend on the climate policies undertaken by the debtor countries. Likewise, we point out that the feasibility of beneficial agreements for debtors and the implementation of good climate policies depend positively on the size of the debt and the potential of each country to affect the current trend of climate change. For these reasons, the formation of coalitions of debtor countries can be a key factor for debt relief and the implementation of climate policies.

In order to implement this scheme, financial instruments must be carefully designed to induce adequate climate change policies. Second, there are different types of creditors with different appreciations of climate change. For this reason, the inclusion of policy contingent debt reliefs may not be possible unless potential creditors who care about climate change find a way to buy the sovereign debt of UMICs. Third, debtor countries are heterogeneous in terms of fiscal vulnerability, climate vulnerability, contributions to global emissions, stock of natural capital, and participation in the balances of global debts. Therefore, a set of incentive related problems from coordination issues may prevent the building of coalitions. Finally, for climate change policy to be implemented and sustained, a domestic consensus about its need must emerge. This is a big challenge in a period where voters are expecting a plan to recover the economy. For this reason, the policy design should make compatible the climate change action and the recovery of the economy.

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10. Appendix

Country Name	External debt stocks, total (DOD, current million US$)	Debt level (above median)	CO2 emissions (kt)	CO2 emissions (above median)	Categories
Albania	10121.92	Low	5716.853	Low	1
Algeria	5710.42	Low	145400.22	High	2
Argentina	280515.65	High	204024.55	High	4
Armenia	11018.78	Low	5529.836	Low	1
Azerbaijan	16212.18	Low	37487.741	High	2
Belarus	38843.66	High	63497.772	High	4
Belize	1380.01	Low	495.045	Low	1
Bosnia and Herzegovina	15824.21	Low	22233.021	High	2
Botswana	1748.74	Low	7033.306	Low	1
Brazil	557822.65	High	529808.16	High	4
Bulgaria	39873.91	High	42416.189	High	4
China	1962304.43	High	10291927	High	4
Colombia	134939.84	High	84091.644	High	4
Costa Rica	27818.99	High	7759.372	Low	3
Cuba	-	-	34836.5	-	-
Dominica	279.16	Low	135.679	Low	1
Dominican Republic	33905.11	High	21539.958	Low	3
Ecuador	45018.58	High	43919.659	High	4
Equatorial Guinea	-	-	5346.486	-	-
Fiji	851.80	Low	1169.773	Low	1
Gabon	6766.55	Low	5192.472	Low	1
Georgia	17118.12	High	8987.817	Low	3

Grenada	644.94	Low	242.022	Low	1
Guatemala	22348.73	High	18327.666	Low	3
Guyana	1609.08	Low	2009.516	Low	1
Iran, Islamic Rep.	6323.88	Low	649480.7	High	2
Iraq	-	-	168443.64	-	-
Jamaica	16306.73	Low	7422.008	Low	1
Jordan	32044.52	High	26450.071	High	4
Kazakhstan	156920.69	High	248314.57	High	4
Kosovo	2297.16	-	-	-	-
Lebanon	79344.60	High	24070.188	High	4
Libya	-	-	56996.181	-	-
Malaysia	-	-	242821.41	-	-
Maldives	2332.42	Low	1334.788	Low	1
Marshall Islands	-	-	102.676	-	-
Mauritius	11207.48	Low	4228.051	Low	1
Mexico	452991.16	High	480270.66	High	4
Montenegro	7950.86	Low	2211.201	Low	1
Namibia	-	-	3755.008	-	-
Nauru	-	-	47.671	-	-
North Macedonia	8744.24	Low	7510.016	Low	1
Paraguay	15806.12	Low	5702.185	Low	1
Peru	66697.38	High	61744.946	High	4
Romania	112116.34	High	70003.03	High	4
Russian Federation	453938.11	High	1705345.7	High	4
Samoa	427.48	Low	198.018	Low	1
Serbia	34338.97	High	37667.424	High	4
South Africa	179306.41	High	489771.85	High	4
Sri Lanka	52626.04	High	18393.672	Low	3
St. Lucia	615.75	Low	407.037	Low	1
St. Vincent and the Grenadines	328.20	Low	209.019	Low	1
Suriname	-	-	1991.181	-	-
Thailand	169240.67	High	316212.74	High	4
Tonga	188.68	Low	121.011	Low	1
Turkey	445139.15	High	345981.45	High	4
Turkmenistan	907.33	Low	68422.553	High	2
Tuvalu	-	-	11.001	-	-
Venezuela, RB	154898.12	High	185220.17	High	4
Median	**16306.73**		**19966.815**		
Mean	**116239.10**		**289999.83**		

Note: Data for external debt stocks from the World Bank International Debt Statistics (2018). Data for CO_2 emissions from the World Bank World Development Indicators (2014). The last column shows the categories which are classified in the following way: category 1 stands for low debt level, and low CO_2 emissions; category 2 stands low

debt level, and high CO_2 emissions; category 3 stands for high debt level, and low CO_2 emissions; finally, category 4 stands for high debt level, and high CO_2 emissions.

Table A2

Debt level	Emission level	Categories	Frequency	Percent	Cumulative percent
Low	Low	1	19	39.58%	39.58%
Low	High	2	5	10.42%	50.00%
High	Low	3	5	10.42%	60.42%
High	High	4	19	39.58%	100.00%
		Total	**48**	100.00%	