



The Green Climate Fund as an effective compensatory mechanism in global climate negotiations



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ABSTRACT

The Paris Agreement reached during the COP21 in December 2015 represents a timid step towards burden sharing in emission mitigation involving all countries. However, given the heterogeneity of countries and their relative differences in vulnerability to climate change damage and in mitigation costs, compensating schemes are required to reach an effective agreement. This paper investigates the role of the Green Climate Fund (GCF) as a potential compensating measure for both adaptation and mitigation actions under a global climate regime. A dynamic climate-economy computable general equilibrium model (GDynEP) is developed by including both a monetary valuation of climate change damage costs and two alternative methods to determine the allocation of GCF resources among receiving countries and between adaptation and mitigation contributions. Results show that, despite the high costs associated with the implementation of mitigation actions, most developing countries would face even higher costs in case of inaction. Furthermore, the preference of a country for an allocation method is strongly influenced by its characteristics and needs. Consequently, a main policy conclusion is to design country-specific sharing rules for GCF in order to maximize country participation in a global agreement.

1. Introduction

Since climate change has emerged as a globally recognized issue in the 1992 Rio Earth Summit, international cooperation aims at promoting the “stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”, as stated in the UN Framework on Climate Change (UNFCCC, 1992, Art. 2). During the subsequent Conferences of Parties (COPs), and through all the ups and downs of the negotiation process, the Kyoto Protocol was adopted in 1997, enforced

in 2005 (Montreal Action Plan) and additional instruments were introduced to support developing countries in taking action against climate change. During the last COP21, held in Paris in December 2015, 195 countries succeeded in reaching the so-called Paris Agreement, whose goal is to limit the increase of the global average temperature below 2 °C, or even 1.5 °C, above pre-industrial levels. It will be effective from 2020 if ratified by at least 55 countries accounting for at least 55% of GHGs (as in the Kyoto Protocol). The ratification by China and the U.S. in September 2016 increased coverage to more than 40% of GHGs and on 5 October 2016 the threshold for entry into force of the

Abbreviations: BAU, Business As Usual; CBDR, Common But Differentiated Responsibilities; CEPIL, Centre d'Etudes Prospectives et d'Informations Internationales; CGE, Computable General Equilibrium; COP, Conferences Of Parties; CTR, carbon tax revenue; DCs, developing countries; DICE, Dynamic Integrated Climate and Economy; EE, Energy Efficiency; EEx, energy exporters; ENVISAGE, ENVIRONMENTAL Impact and Sustainability Applied General Equilibrium; FUND, Climate Framework for Uncertainty, Negotiation and Distribution; GCF, Green Climate Fund; GDP, gross domestic product; GDyn, GTAP dynamic; GDynE, GTAP dynamic energy; GDynEP, GTAP dynamic energy power; GET, Global Emission Trading; GHG, greenhouse gas; GS, Genuine Savings; GTAP, Global Trade Analysis Project; IAM, Integrated Assessment Model; ICES, Intertemporal General Equilibrium System; IEA, International Energy Agency; IIASA, International Institute for Applied Systems Analysis; ILO, International Labour Organization; IMAGE, Integrated Model to Assess the Global Environment; INDCs, Intended Nationally Determined Contributions; IPCC, intergovernmental panel on climate change; LDCs, least developed countries; MERGE, Model for Evaluating Regional and Global Effects of greenhouse gases reduction policies; ND-GAIN, Notre Dame Global Adaptation Index; NNP, Net National Product; NPV, Net Present Value; OECD, Organization for Economic Co-operation and Development; PAGE, Policy Analysis of the Greenhouse Effect; PPM, parts per million; PSC, preference score; RCP, representative concentration pathways; RICE, regional dynamic integrated climate and economy; SCC, Social Cost of Carbon; SIDS, Small Island Developing States; SNA, System of National Accounts; UNFCCC, United Nations Framework Convention on Climate Change; WITCH, World Induced Technical Change Hybrid model

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Paris Agreement was achieved thanks to the ratification by the EU. The Agreement entered into force on 4 November 2016.

While the aim of the negotiations is to define a new climate regime able to achieve the peaking of emissions as soon as possible, the Paris Agreement is still based on a voluntary approach, according to which the Parties publicly present what actions they intend to take in the post-2020 scenario in the so-called Intended Nationally Determined Contributions (INDCs). Given the global public good nature of climate change, the absence of sanctions creates the risk of free-riding and makes the enforcement of the Agreement weak (Nordhaus, 2015). Indeed, the U.S. President Trump recently announced the intention to withdraw from the Agreement. This decision represents a threat to the achievement of the global target, given the primary role of the U.S. in global emissions, as well as a risk for further defections from other countries, especially from China, whose commitment was closely related to the U.S. one (Zhu-Gang et al., 2014). Moreover, from a game-theoretic framework, the fact that a country can still achieve better payoffs without cooperation makes the Paris Agreement an unstable deal (Chander, 2017).

To reduce free-riding incentives and avoid further withdrawals, the burden sharing on GHGs mitigation should be designed in order to ensure equality of marginal costs and benefits from climate actions for each country (Carraro et al., 2003). Such costs and benefits should include not only the impacts derived from mitigation actions but also the economic value of damages provoked by climate change. In fact, coalition stability might be reduced and incentives to free ride might rise if countries highly vulnerable to climatic damages are also large emitters, because of the trade-off between the positive externalities from reducing the damage and the mitigation costs needed to achieve a considerable abatement target (Martimort and Sand-Zantman, 2016). In view of this, together with the abatement cost, it is also crucial to assess the vulnerability of a country to climate change (Kelly and Adger, 2000) by analysing the physical impacts of climate change on countries (Fussel, 2010; Fussel and Klein, 2006) and their monetary evaluation (Anderson, 2006; Arndt et al., 2015; Stern, 2007). As a matter of fact, several countries are already spending considerable financial resources on adaptation measures to reduce or recover from climatic damage. In particular, rich countries are more oriented to anticipatory actions (in order to avoid climatic damage), and developing countries are still focussed on reactive interventions in the form of recovery costs after the damage occurred (Bosello et al., 2013). This explains why the computation of monetary damages from climate change could be a source of radical changes in developing countries' bargaining strategy, and the stability of a large coalition would increase with the probability of high climate damages. Indeed, if all negative externalities due to climate damages are accounted for, the more a country is vulnerable to climate change, the more will be its interest to act and ask for active measures in current climate negotiations, given that damage costs could be larger than the costs associated to the implementation of mitigation and abatement policies (Bosello et al., 2010; Dellink et al., 2013).

In this respect, developing countries can assume a crucial role in both determining the success of international climate negotiations and emissions mitigation, coherently with the existing countries' heterogeneities in terms of responsibility in polluting emissions, costs and benefits related to climate actions (or inactions) and large socio-economic and geographical inequalities (Costantini et al., 2016).

The first mechanism designed to minimize inequalities in burden sharing was the "Common But Differentiated Responsibilities (CBDR)" principle (UNFCCC, 1992, Art. 3.1), which allowed developing countries to adopt less stringent commitments, as well as a longer time horizon to reach the peaking of emissions compared to Annex I countries (broadly developed countries), and the financial and technical support provided by developed countries to developing ones partly addressed these critical points. However, the CBDR is a debated principle, especially regarding the positions of emerging countries, which are rapidly becoming responsible for a larger share of global emissions

(Brunnée and Streck, 2013). Accordingly, the cooperation of emerging economies (primarily China and India) in defining abatement targets and burden sharing among all Parties has become essential.

A second strategy for reducing free-riding incentives is to design compensatory measures to smooth the contrasting forces that undermine coalition stability, making cooperation more attractive. The achievement of a global solution would benefit from the introduction of side payments and compensatory measures to tackle the heterogeneity in country features and the interdependence among them (Hovi et al., 2015). In fact, as highlighted in game-theoretic literature, transfers can play a crucial role in favouring coalition stability in cooperative games (Lessman et al., 2015; Zhu-Gang et al., 2014). Indeed, appropriately designed transfers between countries can help the achievement of the core solution and foster the stability of the grand coalition, that is the group consisting of all players (Tulkens, 2016).¹ In this respect, according to Bayramoglu and Jacques (2015), effective side payments should not be very costly to implement and a useful instrument to obtain such result already exists that is the Green Climate Fund (GCF).

The GCF is the main compensating measure under the current climate regime. Discussed and approved during the COP16 held in Cancun in 2010² and officially launched the following year at COP17,³ the GCF is defined as an operating entity under the financial mechanism of the UNFCCC (Decision 3/CP.17). Its purpose is to "promote the paradigm shift towards low-emission and climate-resilient development pathways by providing support to developing countries to limit or reduce their greenhouse gas emissions and to adapt to the impacts of climate change, taking into account the needs of those developing countries particularly vulnerable to the adverse effects of climate change." Accordingly, the GCF collects resources from developed countries and catalyses them to support developing country Parties in the implementation of projects, programmes, policies and other activities⁴ in accordance with climate change strategies and plans through a variety of financial instruments.⁵

To sum up, two crucial factors arise from this discussion. First, the monetary value of climatic damages and its regional distribution must be better considered in the bargaining process. Second, the GCF could be a key element in facilitating the achievement of an effective burden sharing agreement about CO₂ mitigation, if properly designed to maximize its compensatory effect.

To the best of our knowledge, the literature still lacks a joint analysis of these two aspects, while we believe that the allocative mechanism design of the GCF should not be discussed independently from its interactions with climatic damage impacts.

Accordingly, the present paper analyses the role of GCF as a compensatory measure focussing on how the resource allocation mechanisms might influence the acceptability of a global climate regime when climate costs are fully internalized in the payoff matrix. The empirical analysis relies on a dynamic climate-economic computable general equilibrium (CGE) model that includes a monetary evaluation of climate change damage costs combined with mitigation policies and the operationalization of the GCF. This allows jointly assessing the incentive to free ride when abatement costs are high and the feasibility of a stable coalition if there are positive externalities from climate change reduction.

¹ The core solution is a concept in game theory that assigns to each cooperative game the set of payoffs that no coalition can improve upon. In other words, the core is the set of stable solutions in a non-zero sum game where there is no alternative coalition that can improve upon it (Aumann, 1961; Gillies, 1953, 1959).

² Decision 1/CP.16.

³ Decision 3/CP.17.

⁴ See Section 2 for a further discussion on GCF financing and allocation mechanisms.

⁵ In May 2015, the signed contributions by developed economies reached the 50% threshold (USD 5.5 billion) required to start allocation so these resources can now be used to finance activity-based projects in developing countries in the form of grants, concessional loans, equity or guarantees, according to the vulnerability degree of each country and the possible involvement of the private sector.

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