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Making or breaking climate targets: The AMPERE study on staged accession scenarios for climate policy

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ABSTRACT

This study explores a situation of staged accession to a global climate policy regime from the current situation of regionally fragmented and moderate climate action. The analysis is based on scenarios in which a front runner coalition – the EU or the EU and China – embarks on immediate ambitious climate action while the rest of the world makes a transition to a global climate regime between 2030 and 2050. We assume that the ensuing regime involves strong mitigation efforts but does not require late joiners to compensate for their initially higher emissions. Thus, climate targets are relaxed, and although staged accession can achieve significant reductions of global warming, the resulting climate outcome is unlikely to be consistent with the goal of limiting global warming to 2 degrees. The addition of China to the front runner coalition can reduce pre-2050 excess emissions by 20–30%, increasing the likelihood of staying below 2 degrees. Not accounting for potential co-benefits, the cost of front runner action is found to be lower for the EU than for China. Regions that delay their accession to the climate regime face a trade-off between reduced short term costs and higher transitional requirements due to larger carbon lock-ins and more rapidly increasing carbon prices during the accession period.

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1. Introduction

Climate change is one of the great global policy challenges of our time. It is increasingly recognized that unabated climate change can lead to large impacts on human societies [1,2]. At the same time, slow progress in international climate negotiations has given rise to skepticism about the prospect of global cooperative action on climate change. Given the scope of the coordination challenge, emphasis has shifted from global cooperative action to regional climate action and to the integration of other priorities such as energy security and development policies. Yet, the quest for a more comprehensive international climate treaty with binding targets continues. After a failure at the Copenhagen climate conference in 2009, negotiators agreed on a new attempt to adopt a global treaty to come into effect by 2020 [3]. Whether the so-called Durban platform for enhanced action will fare any better than the previous attempt is highly uncertain. Yet, targeting greenhouse gas emissions globally has clear advantages. From an economic point of view, it is most efficient to exploit the cheapest abatement option in the sector and region at the margin. It is total global emissions which matter with respect to limiting atmospheric greenhouse gas (GHG) concentrations and global mean temperature.

Even though the advantages of global cooperation are evident, the world may be locked into moderate and fragmented climate action due to the institutional, ethical and political challenges posed by the need for international coordination, transfers and incentives. Recent studies have shown that an extrapolation of the current national pledges over the 21st century is likely to lead to warming of more than 3 degrees by the end of the century and further warming thereafter [4,5]. In light of this, the present paper aims at investigating how effective a group of countries might be in leading the way with stringent mitigation action even if the rest of the world joins the effort only decades later. There is literature in support of the idea that in situations of cooperation problems involving a public good, a leader setting a good example can play a role [6,7]. Such unilateral climate action might both reduce uncertainty about the mitigation costs and, at the same time, build credibility, which is an important element in international coordination problems [8–10]. In addition, it might also address concerns related to historical responsibility, frequently raised at the negotiation tables by developing countries [11].

This paper presents a multi-model exploration of staged accession scenarios to a global climate regime conducted within the AMPERE project. It focuses on the EU as a candidate for pioneering stringent climate action. The EU has adopted a 20% emission reduction target for 2020 relative to 1990 as part of its climate and energy package [12] and has agreed to commit to the 20% target in the second commitment period of the Kyoto protocol. It has established the worlds' largest emissions trading system and has implemented a number of additional climate policies at the national level. The EU has also discussed the unilateral strengthening of its reduction target to 30% by 2020, and established a "Roadmap for moving to a competitive low carbon economy for 2050" (short: EU Roadmap) that envisions 80% emission reduction by 2050 [13].

The main research question is concerned with the stakes of adopting the EU Roadmap without an international climate agreement in place. The study considers two opposite possible outcomes: either the rest of the world makes a transition to an ambitious global climate regime in the period 2030–2050 (Success), or the EU has to return to a more moderate climate policy reference case after 2030 if it becomes clear that the rest of the world does not increase its level of ambition (Reconsideration). In particular, we investigate the following questions:

a) In the case of successful staged accession, what are the climate outcome and the mitigation costs relative to both the reference case and the ideal case of immediate global cooperation?
b) In both cases (success and reconsideration), how does the asymmetry between mitigation efforts by the front runners and other regions impact regional emissions and costs due to carbon leakage, technology spillover and carbon lock-ins?

The study also explores the case of a front runner coalition with two major players leading the way. A coalition between the EU and China was chosen for several reasons. First, China may face notable climate change impacts, e.g. in the area of freshwater resources that are already strained in some regions [14]. It thus has a strong incentive to mitigate climate change. Second, China is suffering from a major air pollution problem and thus can expect to reap significant co-benefits from the reduction of fossil fuel use, particularly coal [15,16]. Third, China is the world's largest emitter, and the stringency of its climate action will have a strong impact on global emissions and the global energy sector. This gives it high visibility in international climate negotiations. Fourth, China has been very active in enacting a number of domestic climate and energy policies and is expected to adopt more in the future [17,18]. Although the case of an EU–China coalition does not reflect the current status of international climate negotiations, a bilateral dialog on climate policy issues has progressed [19]. Finally, the investigation of an EU–China climate coalition permits us to study how the impacts of advanced mitigation efforts differ between two regions with substantially different economic profiles.

The study builds on a comparison of results from 11 energy–economy and integrated assessment models (IAMs). Such models have been extensively used to explore mitigation pathways which meet long-term climate targets (e.g. [20,21]). Previous energy–economy and IAM intercomparison exercises have investigated idealized policy settings such as global carbon tax scenarios [22] and immediate cooperative action to reach stabilization targets in the range between 450 and 650 ppm CO_2e [23,24,25]. Previous exercises have also reviewed limited policy situations with constrained technology availability [24,26] and delayed and fragmented action [4,23,27,28]. [23] investigated a staged accession scenario with two groups of countries joining the industrialized countries over the period 2030–2070. The analysis highlighted the difficulty to reach stringent stabilization targets in such a setting. [28] focused on delay until 2020 and identified benefits for early movers if the long term target is maintained.

This study considers two different long-term climate targets (450[3] and 550 ppm CO_2e) as guiding principles for long term climate action. Contrary to the previous comparison studies on staged accession [23,28], we do not assume that the climate targets and their associated greenhouse gas

[3] It has been shown that the lower target of 450 ppm CO_2e has a large probability of keeping global mean warming below 2°C since preindustrial times [29]. The 2 degree target was recognized by the international climate negotiations as consistent with the goal to avoid dangerous anthropogenic interference with the climate system [30].

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