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# Brief

## **Clubs, R&D, and Climate Finance: Incentives for Ambitious GHG Emission Reductions**

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### **Abstract**

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Climate clubs, namely subgroups of countries implementing more ambitious and effective climate policies than others, may be the only practical approach to address the lack of incentives to reduce GHG emissions on the part of most, if not all, countries. In climate clubs, incentives to undertake ambitious GHG emission reduction efforts may come from adopting R&D and financial policies that provide benefits exclusively to club members. R&D and financial policies are beneficial because they provide innovation to reduce the costs of a unit of abated carbon and financial or insurance schemes to reduce the costs of investing in mitigation. These cost reductions can be designed to favor club members only. Unlike trade-related policies intended to favor club members, R&D and climate-finance policies do not have negative “side effects” for member countries. Indeed, they have positive co-benefits in addition to the primary environmental benefits—a “double dividend” for club members, and a single dividend (GHG emission reduction) for the world.

# 01

## The Lack of Incentives for Ambitious Emission Reductions

Climate change mitigation is a global public good. Indeed, the mitigation actions of any jurisdiction or entity benefit all countries in the world. In this context, the theory of global public good provision provides a clear message: an effective and global agreement on climate change mitigation is very unlikely (Carraro and Siniscalco 1993; Barrett 1994). In other words, the formation of a global coalition where all world countries cooperate to reduce GHG emissions is difficult to achieve and unlikely to emerge. Large coalitions may form, but the resulting emissions reduction level remains close to business as usual (Barrett 1994).

This is why the possibility of a subgroup of countries—a climate club—unilaterally deciding to reduce emissions to effectively tackle climate change has been explored for more than 20 years by climate and environmental economists (Carraro and Siniscalco 1993; Barrett 1997; Carraro 1999; Nordhaus 2015; are just some examples).

However, even the formation of climate clubs is very unlikely unless: (1) countries joining the club receive benefits that do not accrue to non-members (namely countries that do not reduce their GHG emissions or whose reductions are insufficient) and/or (2) non-members are sanctioned by club members. The primary example of the latter condition is trade sanctions, often advocated to support the emergence of climate clubs (Barrett 1997, 1999; Nordhaus 2015). However, effective and non-self-punishing (credible) trade sanctions are unlikely to be implemented (Barrett 1997, 1999). By inviting retaliation and reducing trade volume, they damage club members as well as non-members. Therefore, they do not provide the economic incentive necessary to support the formation of a global coalition and/or of a club of climate-concerned countries that effectively reduce GHG emissions.

# 02

## Beyond the Paris Agreement

Given the generalized lack of incentives to reduce emissions and the difficulties of forming clubs of ambitious countries, the

Paris Agreement is probably one of the best outcomes one can envisage. If the commitments adopted at COP 21 are actually

implemented, emissions will stop growing for the first time in the last 40 years. The level of emissions in 2030 will be approximately the same as the level in 2015, which would certainly be a great achievement, though insufficient by almost any measure.

We need even more effective and ambitious actions, if the objective is to keep the temperature increase below or around 2°C. In particular, massive investments

in the development of new technologies, including (1) technologies to remove large amounts of CO<sub>2</sub> from the atmosphere and (2) technologies to store large amounts of energy at low cost. The first set of technologies is crucial to reduce the stock of past GHG emissions. The second set is crucial to increase penetration of renewables well above 40%–50% of total energy demand, thus bringing the flow of GHG emissions close to zero.

## 03

### R&D, Finance and Climate Clubs

Resources to support R&D and investments in new low-carbon or carbon-removing technologies are therefore necessary. A global collaboration program to develop and fund these technologies is sometimes advocated (see King et al. 2015). Why not couple the benefits of R&D on (and diffusion of ) emission reducing technologies with incentives to form a club of emission reducing countries? In this way, the incentive to free-ride on the benefit of a cleaner environment (which is a public good fully appropriable by all countries) could be offset by the incentive to appropriate the benefit stemming from the positive R&D externality (which is a club good fully or partly appropriable only by club members). In addition, R&D cooperation would not only provide incentives to form

a club, it would also increase profitability, because club members could reap both the benefits from R&D cooperation (the technologies that are crucial to achieve large reductions of both the stock and flow of GHG emissions) and the environmental benefit from reducing GHG emissions (lower damages from climate change).

Two possible objections can be raised. First, non-members cannot be fully excluded from benefits stemming from R&D cooperation. R&D and knowledge spillovers, and lack of protections for patents and copyrights, may reduce the benefits that accrue to club members only. Nevertheless, Carraro and Marchiori (2004) show that there exists a non-zero level of R&D spillovers below which the climate club forms and it is profitable and stable. It is therefore an empirical and

regulatory matter to design patent schemes and disclosure rules enabling club members to exclude non-members, at least partly, from R&D cooperation benefits.

The second objection to the feasibility of an R&D climate club is that the decision to form the club, prompted by economic incentives stemming from R&D cooperation, is itself a strategic decision subject to free-riding. The crucial question is: do countries have an incentive to link R&D cooperation and GHG emission reduction instead of developing R&D cooperation and innovation diffusion independently of the climate club? Or to cooperate with a different (likely larger) number of countries if they cooperate only on innovation? Again, the answer to this question is provided in Carraro and Marchiori (2004), who show that: (1) if the degree of excludability of R&D cooperation benefits is sufficiently high and (2) if damages from climate change avoided by actions undertaken by club members are sufficiently large, then there is the incentive to form a climate club in which members invest in R&D and cooperate to reduce GHG emissions.

A similar argument holds for climate finance. It is clear that a large and

increasing amount of investment in mitigation and adaptation is necessary to address climate change. In the last two years, climate-related investments reached 394 billion euros—mostly for mitigation (OECD 2015). Nevertheless, the resources required to maintain temperature increase at about 2°C are much larger (IPCC 2014). Several financial and insurance schemes can be designed to reduce the costs and/or the risks of investing in mitigation or adaptation. These schemes often require regulatory interventions to provide public guarantees and/or financial benefits.

Given that these kinds of actions are profitable and useful to reduce emissions, why not use them also to provide incentives to form a climate club? It is sufficient to decide that access to these schemes—often backed by international organizations, multilateral banks, or sovereign funds—is given only to club members, namely only to countries adopting ambitious measures to reduce GHG emissions. Similar to R&D cooperation, this would provide benefits to club members that do not accrue to non-members, thus creating the conditions for the emergence of a climate club.

## Policy conclusions

**Both R&D cooperation and climate finance can play an important role in future agreements to support the formation of climate clubs. Indeed, the emergence of climate clubs crucially depends on the existence of excludable benefits for members, or sanctions to non-members. Given the**

low likelihood of trade sanctions to non-members, R&D investments and climate finance are two important sources of excludable benefits. An R&D club or a finance club can indeed provide important benefits to club members, benefits from which non-members can be excluded.

In addition to providing incentives for the formation of climate clubs, which otherwise would not emerge, R&D investments and climate finance can also provide other important and obvious benefits, such as (1) technological innovations without which the 2°C target would not be feasible and (2) new financial resources to support the transition to a low-carbon economy.

## References

**Barrett, S. 1994.** ["Self-Enforcing International Environmental Agreements."](#) Oxford Economic Papers, 46, 878-894.

**Barrett, S. 1997.** ["The Strategy of Trade Sanctions in International Environmental Agreements."](#) Resource and Energy Economics, 19:4, 345-61, 1997

**Barrett, S. 1999.** ["The Credibility of Trade Sanctions in International Environmental Agreements."](#) in P. Fredriksson (ed.), Trade, Global Policy, and the Environment, World Bank Discussion Paper No. 402, 161-172.

**Carraro, C. 1999.** "The Structure of International Agreements on Climate Change," in C. Carraro, ed., International Environmental Agreements on Climate Change. Kluwer Academic Pub.: Dordrecht, 1999, 9-26.

**Carraro, C. and C. Marchiori. 2004.** "Endogenous Strategic Issue Linkage in International

Negotiations," in C. Carraro and V. Fragnelli, eds., Game Practice and the Environment, E. Elgar, 2004.

**Carraro, C. and D. Siniscalco. 1993.** ["Strategies for the International Protection of the Environment."](#) Journal of Public Economics, 52:3, 309-328.

**Carraro, C. and D. Siniscalco. 1997.** "R&D Cooperation and the Stability of International Environmental Agreements," in C. Carraro, ed., International Environmental Agreements: Strategic Policy Issues, Edward Elgar, Cheltenham.

**King, D., J. Browne, R. Layard, G. O'Donnell, M. Rees, N. Stern, and A. Turner. 2015.** ["A Global Apollo Program to Combat Climate Change."](#) London School of Economics and Politics, London.

**IPCC. 2014.** ["Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change."](#)

Cambridge, United Kingdom and New York, USA:  
Cambridge University Press.

**Nordhaus, W. 2015. “Climate Clubs: Overcoming  
Free-Riding in International Climate Policy.”**

American Economic Review, vol. 105, no. 4, 1339-70.

**OECD. 2015. “Climate Finance in 2013-2014  
and the USD 100 billion goal.”** OECD Report,

Paris, 2015.



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