# A Study on Cournot Non-Cooperative Pollution Games

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## Abstract

Climate change agreements often rely on game-theoretic models to understand how and why coalitions of countries form and remain stable. Most studies are based on a non-cooperative, myopic game framework and employ the Stackelberg approach, where the coalition acts as a leader anticipating the responses of non-signatories, who behave as followers. These models typically focus on pollution from ??2 emissions, assuming that countries can choose among mitigation, adaptation, or even geoengineering strategies to reduce climate risks. Despite their analytical richness, such models usually predict small stable coalitions—rarely exceeding four countries—raising questions about their real-world applicability.

This paper explores an alternative perspective in which both signatories and non-signatories act independently, focusing solely on their own actions and payoffs. In this setting, countries play à la Cournot in a myopic game, each maximizing its individual welfare without considering others' strategic reactions. By solving the model analytically, the paper demonstrates that the number of stable coalition members depends solely on the strategic structure of the game—whether it follows a Stackelberg or a Cournot configuration—and not on the specific form of the welfare functions.

The findings highlight how the nature of strategic interaction, rather than economic parameters, determines the stability and size of international environmental coalitions. This insight could help policymakers design more realistic frameworks for cooperative climate action.

**Keywords:** IEAs, coalition stability, Cournot games.