Recession and fossil fuel dependence undermine climate policy commitments

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Abstract

Knowledge on the determinants of more or less ambitious climate policies on the country level is still limited, especially with regards to the 2015 Paris Agreement to mitigate global climate change. This is a significant knowledge gap, especially given the review of many contributions to the Paris Agreement due in 2021. I analyse why some countries make insufficient pledges to reduce their greenhouse gas emissions under the Paris Agreement, while other countries pursue more ambitious climate change mitigation goals. Using qualitative comparative analysis (QCA), the study finds that economic recession, dependence on fossil fuels for energy generation, and levels of development are strong predictors of insufficient climate policies. These results are worrisome in the context of the economic recession triggered by the COVID-19 pandemic as well as the continued predominance of fossil fuels in the world’s energy mix.

1. Introduction

Anthropogenic climate change is among the most important global governance challenges of our time. Climatic changes driven by human greenhouse gas emissions will have negative impacts on food systems, water availability, the prevalence of natural hazards and infectious diseases, economic development, and potentially conflict and migration [1]. Exceeding tipping points in the Earth system could worsen those impacts, for instance if large ice sheets collapse or monsoon dynamics change [2]. Climate change mitigation is a significant policy task.

Consequently, there is considerable research on international climate regimes [3, 4] as well as on the drivers of high CO₂ emissions on the country level. Work on the environmental Kuznets curve, for instance, argues that countries with a medium level of economic development have the highest greenhouse gas emissions. Less developed countries (due to poverty) and highly developed countries (due to better technologies, strong tertiary sectors, and postmaterialist values), by contrast, tend to emit less CO₂ [5, 6]. Other country characteristics like high levels of democracy and membership in international organisations are also established predictors of lower CO₂ emissions [7, 8]. By contrast, research on country-specific drivers of climate policies (rather than policy outcomes like CO₂ emissions) is still sparse. There are several notable exceptions, highlighting the role of climate change vulnerability, selective incentives set by international partners, levels of democracy, and national identities as determinants of ambitious climate policies [9–11].

The question of why countries pursue ambitious or insufficient climate change mitigation goals is particularly relevant in the context of the most recent 2015 Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). This is the case for at least two reasons: First, according to the Paris Agreement, countries set and submit nationally determined contributions (NDCs), that is, individual pledges to curb greenhouse gas emissions [12]. Most countries submitted their first NDCs under the Paris Agreement in 2016, meaning their review is due in 2021. Second, the Paris Agreement marks a new era of global climate politics, characterised by bottom-up approaches, voluntarism, and flexible coordination [4]. The
validity of insights from studies on earlier time periods (e.g., on the Kyoto Protocol or the Copenhagen negotiations) under these changed conditions needs to be tested.

However, paralleling the general literature on national climate policies, limited cross-case work has been conducted on why some states make more ambitious pledges under the Paris Agreement, while other do not [13]. Most comprehensive in this regard is a recent study by Tørstad et al who find that democracy, vulnerability to climate change, low coal rents and a small GDP per capita are correlated with more ambitious reduction targets under the Paris Agreement [14].

This letter analyses why countries make insufficient commitments to climate change mitigation. Specifically, I use qualitative comparative analysis (QCA) to identify the drivers of weak NDCs under the Paris Agreement. Results indicate that economic recession, dependence on fossil fuels for energy generation and, to a lesser degree, level of economic development facilitate unambitious climate change mitigation commitments.

2. Methods and data

Qualitative comparative analysis (QCA) is the main method utilised in this article. QCA is a set-theoretic approach highly suitable to reveal complex patterns characterised by conjunctural causation (rather than linear associations) and equifinality (several different combinations of conditions resulting in the same outcome) [15]. The method is thus increasingly employed in the environmental social sciences [16, 17].

When conducting a QCA, all data first need to be calibrated to reflect whether a case is in (=1) or out (=0) of a defined set of countries (e.g., those with insufficient climate policies). Please note that these sets reflect membership of cases (here: countries) in certain categories (e.g., democracies) and are not identical with the entire sample under study. I use the fuzzy-set version of QCA, which allows partial (rather than binary) set membership scores (0, 0.33, 0.67 and 1 in this case). Afterwards, all possible combinations of conditions and the corresponding empirical observations are listed in a truth table. The Quine McCluskey algorithm is then utilised to conduct a logical minimisation process indicating causal relations in the calibrated data. The resulting solutions are characterised by a raw coverage and a consistency value (see Figure 2). Consistency indicates whether a solution is free of contradictions and sufficient to explain the outcome. Its value should be at least 0.8. Coverage indicates the explanatory value of (or the percentage of cases explained by) the solution [15].

The Climate Action Tracker (CAT) analyses the nationally determined contributions (NDCs) of selected countries (including all major emitters) under the Paris Agreement. It judges whether these pledges are insufficient (or unambitious) in the light of (1) compatibility with the 2- and 1.5-degree goals, (2) the capability of the country to reduce emissions, and (3) its historic greenhouse gas emissions (see figure 1 for an overview). The CAT data are used here due to their comprehensive and in-depth assessment of countries’ NDCs [18].

Pledges in line with the 2-degrees goal are considered fully out of the set of insufficient NDCs (0). Following CAT’s definition of a fair share range, pledges in line with under 3 degrees of warming are considered partially out of the set of insufficient NDCs (0.33), while those implying more than three degrees of warming are partially in the set (0.67). NDCs that would result in a temperature rise of more than 4 degrees are considered fully
Ukraine seems to exist for fossil fuel-dependent countries under economic stress. Fossil fuels government that is either resource poor is plausible. Ambitious NDCs require investments and might reduce economic competitiveness of a country. A level of human development or a large share of fossil fuels in their energy consumption set very weak NDCs. This contrast to other studies, which potential costly pledges during times of economic stress costs when changing the country on CO2 emissions.

Insufficient (1). Accordingly, the sample of this study comprises all countries for which CAT provides full data on the country level (n = 32). This implies excluding the European Union as all 27 member states made one combined pledge.

The main analysis focuses on five conditions and whether they (alone or in combination) lead to insufficient NDCs of a country: negative or weak economic growth (recession), the nature of the political system (democracy), the level of human development, the relevance of fossil fuels for a country’s energy supply (fossil fuel dependence), and vulnerability to climate change. The literature identifies these conditions as most relevant in driving environmental and particularly climate policies, and sufficient data is available for all of them [14, 19]. The conditions of high GDP, public support for emission reductions, and contribution of fossil fuels to a country’s GDP are also frequently discussed by experts, and were hence used in robustness tests. None of them proved to have significant explanatory value (see supplementary material is available online at stacks.iop.org/ERC/2/101002/mmedia).

Data on economic growth and fossil fuel consumption (as a percentage of total energy consumption) are sourced from the World Bank [20]. The polity2 indicator from the polityIV project is taken to measure the level of democracy [21], while ND-GAIN provides information on vulnerability to climate change [22] and the UNDP on the level of human development [23]. For economic growth, I use the average values for the pledge year and the year before. For all other indicators, the study uses data for the pledge year (or, if unavailable, the year before).

For the main sufficiency analysis, I use the parsimonious QCA solution, which is considered most reliable [24]. I run several robustness tests, using different cut-off points and calibration thresholds, sub-samples of cases, additional conditions, and alternative data for NDC ambitiousness, democracy and development. The main solution is highly robust (see supplementary material).

3. Results and discussion

Figure 1 visualises the results of the QCA for the 32 countries under analysis, while figure 2 displays the results in a tabular format. No individual condition alone can explain the lack of ambitious climate policies. However, the first and second solution indicate that countries which experience an economic recession and either have a low level of human development or a large share of fossil fuels in their energy consumption set very weak NDCs. This is plausible. Ambitious NDCs require investments and might reduce economic competitiveness of a country. A government that is either resource poor (indicated by low levels of human development) or would face huge costs when changing the country’s energy supply (indicated by fossil fuel dependence) is unlikely to commit to potential costly pledges during times of economic stress [14, 19].

Taken together, the first and third solution indicate that countries characterised by fossil fuel dependence in conjunction with either a recession or high levels of human development avoided ambitious pledges under the Paris Agreement. This is plausible as well. Governments of countries that have built substantial wealth by using fossil fuels (e.g., Saudi Arabia, Singapore, USA) are less inclined to set ambitious NDCs. Similar risk aversion seems to exist for fossil-fuel-dependent countries under economic stress (e.g., Argentina, South Africa, Ukraine) [25, 26].

Democracy and vulnerability to climate change, by contrast, play no role in the three solutions. This stand in contrast to other studies, which find that democratic and vulnerable countries are more likely to pursue more ambitious climate policies [27], including under the Paris Agreement [14]. One reason for this might be a difference in the outcome of interest, with me studying NDC ambitiousness, while some earlier work focusing on CO2 emissions [7] or bargaining positions in climate negotiations [9].

Another potential explanation relates to the different methods used. QCA is well suited to detect conjunctural causation, and a combination of two (or more) conditions might have such a strong explanatory power that other (individual) conditions are rendered insignificant. Vulnerability to climate change, for instance, is certainly an incentive for countries to strive for ambitious climate change mitigation efforts. But when these countries are fossil fuel-dependent and economically stressed (due to a recession and/or low levels of development), the short-term benefits of less ambitious NDCs could outweigh the medium- to long-term (and uncertain) gains of reducing vulnerability [28].

The findings of this study are robust to 12 alternative tests (see supplementary material) and can explain at least 84% of the cases studied (and up to 97%, see supplementary material). All three sub-solutions as well as the overall solution pass the consistency threshold of 0.8 (see Figure 2). One should note, however, that solution 2 has a rather low coverage (as it only explains 2 cases) when compared to solutions 1 and 3 (which explain 7 and 10 cases, respectively), and it also slightly less robust (see supplementary material). Solutions 1 and 3 have therefore more explanatory power.
4. Conclusion

Taken together, the findings of this study paint a less optimistic picture for climate policies in the years to come. Dependence on fossil fuels for energy generation and economic recession are identified as key conditions for NDCs that are highly insufficient with regards to the 1.5- and 2-degree targets, with the level of development playing a minor and more complex role. The contribution of fossil fuels to the world’s energy consumption has hardly declined over the past 30 years [29]. Likewise, the COVID-19 pandemic, while having some positive environmental impacts [30], will drive the world into the deepest recession since World War 2. The global GDP is predicted to decline by 4.9% in 2020, which is worse than even the most severe economic crisis in the sample I studied (Ukraine, 2016, −3.665% GDP growth) [31].

At the same time, scientific uncertainty as well as room for optimism remain. The analysis conducted here detected robust patterns in statistical data. Process tracing and interviews with decision makers are an important next step to unravel the causal chains behind these findings. These insights would also allow to identify entry points for facilitating more ambitious climate change mitigation goals. Based on the findings presented here, green stimulus packages in response to the pandemic-induced recession are a sensible policy measure. They are able to address two key drivers of non-ambitious climate policies—recession and fossil fuel dependence—at the same time [32].

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