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Analysis

Do Political Institutions Moderate the GDP-CO_2 Relationship?

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ABSTRACT

Empirical studies of the relationship between GDP per capita and country-level CO_2 emissions tend to focus on the direct effect of per capita GDP growth, rarely taking political institutions into consideration. This paper introduces theoretical insights from environmental political science research, which suggests that CO_2 emission models would gain explanatory leverage if moderators gauging political institutions were considered. We test these theories by estimating the potentially moderating effects of democracy, corruption, number of veto points and players, and civil society activity. We find that the per capita CO_2 elasticity of GDP becomes non-monotonic and diminishing as GDP per capita increases in countries with democratic non-corrupt governments and high civil society participation. The moderating impact of this political-institutional configuration is relatively small, suggesting only limited support for theories in environmental political science. However, the results are robust and add an important specification to the studies in environmental economics that find positive and monotonic GDP-CO_2 relationship: the adverse effect of GDP per capita on CO_2 emissions is not profound in rich well-governed countries with active civil societies.

1. Introduction

To address the increasingly tangible threats of climate change, researchers seek to identify factors that can curb greenhouse gas emissions and particularly carbon dioxide (CO_2) emissions, which are the largest anthropogenic contributor to climate change. Economists often propagate the idea that the level of economic development is the strongest driver of CO_2 emissions. The 'environmental Kuznets curve' (EKC) is a fundamental, yet controversial, hypothesis in this literature that predicts increased emissions as a consequence of industrialization and intensified production, and decreased emissions as a result of sectoral changes towards service and knowledge production as well as greener technologies (Stern, 2002; Tsurumi and Managi, 2010; Panayotou, 1997). Research in political science, however, emphasizes the role of the state in curbing carbon dioxide emissions and claims that the change in countries' emitting behavior can hardly be attributed to economic factors alone. Lowering emissions requires environmental policies and is therefore also dependent on political institutions that shape policy adoption and implementation (Scruggs 2001, 1998, 1999,; Payne, 1995; Immergut and Orlowski, 2013; Holmberg and Rothstein, 2012). The aim of this paper is to test existing theories and examine if political and institutional factors moderate the relationship between economic development and CO_2 emissions, such that rich well-governed countries emit less.

Despite carbon dioxide emissions is a global externality that requires international efforts to solve the problem, national political institutions play a key role. Nation states decide whether to sign and/or ratify international agreements related to CO_2 emission reductions and adopt international prescriptions in their national legislation. By means of laws and regulations they have the power to shape the behavior of firms operating on their territories and guide choices of their citizens. Theories in environmental political science therefore emphasize a number of factors that affect emissions of greenhouse gases through the adoption and implementation of environmental policies. Democracy, which entails freedom of speech, opportunities for wide participation and representation, electoral accountability, and active participation of civil society, is argued to pave the way for environmental policies on the political agenda (Li and Reuveny, 2006). The complexity of decision-making structures within government, defined by the number of political actors that have veto power over decision-making, determines how easy it is to adopt environmental laws once the issues are present on the political agenda (Immergut, 2010). High corruption and low quality of the public administration, which is responsible for implementation of policies, are believed to hamper execution of

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environmental laws and regulations and disrupt the positive effect that democracy might have on the environment (Damania, 2002). Environmental political science theories therefore expect that political-institutional factors moderate the relationship between economic development, often measured with the level of per capita gross domestic product (GDP), and CO_2 emissions by affecting environmental legislation and implementation. However, despite the fact that numerous studies theorize such moderation (e.g., Arvin & Lew 2009; Spilker, 2013), they do not model the interaction empirically and do not apply appropriate econometric models to test the relationship.

In this study, we address this research gap and challenge existing environmental political science theories by analyzing the per capita relationship between CO_2 emissions and GDP (as a proxy for economic development) in interaction with a broad spectrum of political-institutional factors using methodologies established in economics. The contribution of our study is two-fold. First, we provide a theoretical framework bridging economics and environmental political science literatures, which can be useful for further research. Second, our empirical analysis has several methodological advantages compared to previous studies on this subject. We analyze the per capita relationship between GDP and CO_2 emissions using Chudik and Hashem Pesaran's (2015) Dynamic Common Correlated Mean Group Estimator (DCCE), which provides a direct estimate of cointegration and controls for cross-sectional dependence and parameter heterogeneity. The DCCE estimator furthermore produces country-specific coefficients, which we use in a cross-sectional analysis to examine linearity and estimate the effect of political and institutional factors on the per capita GDP-CO_2 relationship.[1]

The remainder of the article proceeds as follows. We begin with a presentation of previous research on the relationship between economic development, political institutions, and CO_2 emissions. Thereafter, we describe our methodological and empirical approach, and proceed with the presentation of results. Lastly, we summarize our main findings in the concluding section, where we also discuss recommendations for policymakers and further research.

2. Theory

2.1. Environmental Economics

The environmental economic literature typically describes three mechanisms through which economic development and namely changes in GDP per capita are thought to affect environmental outcomes (e.g., CO_2 emissions per capita): changes in the 'scales', 'compositions' and 'technologies' of production. Changed scales refer to the fact that production is a component in GDP, which implies that increased GDP leads to more pollution unless the economy only progresses in 'green' sectors (Blanco et al., 2014; Panayotou, 1994). Compositional change implies that agriculture as well as service and knowledge production are more energy efficient than industrial production and manufacturing (Blanco et al., 2014, Panayotou, 1994). Additionally, many studies argue that long-term increases in GDP per capita cause economies to develop from the primary sector towards secondary and tertiary forms of production, which contributes to an inverse U-shaped relationship between GDP and environmental degradation (Syrquin and Chenery, 1989; Panayotou, 1994). Lastly, technological change occurs if economic profits are used to build infrastructure that abates pollution or decreases the amount of pollution proportional to production (Andreoni and Levinson, 2001; Brock and Scott Taylor, 2005).

The relative effects of changes in the scale, composition, and technology of production determine how GDP per capita relates to environmental outcomes. Increased GDP per capita leads to more pollution if scale change outweighs compositional and technological changes. Meanwhile, increased GDP per capita leads to decreased pollution if technological changes outweigh changes in the scale and composition of production, and pollution curbs along an inverse U-shaped slope (i.e., an EKC) if the compositional change outweighs changes in the scale and technology of production (or if the latter changes balance each other out). In this context, the EKC predicts environmental improvement as a happy coincidence or by-product of economic progress, and it should therefore explain many global environmental problems like CO_2 emissions equally as well as SO_2 emissions, toxic waste, and other local environmental problems.

Although the stylized environmental economic theory does not address the role of government, it is common to argue that economic progress and environmental quality are linked through environmental policy decisions (Arrow et al., 1995; Panayotou, 1997; Kijima et al., 2010; Pasten and Figueroa, 2012). In this perspective, economic progress leads to an increased demand for environmental protection and provides resources that are necessary to feed this demand. The literature offers two main reasons why economic progress is expected to increase the demand for environmental protection. First, economic progress leads to increased environmental degradation unless the economy is regulated, while the extent of degradation in its turn causes more concern about the environment (Brock and Scott Taylor, 2005; Kijima et al., 2010). Second, high income generates a sense of material satisfaction, which leads to broadened and more altruistic political preferences (this development is sometimes labeled as 'post-materialistic', see for example Inglehart and Welzel, 2005). Politicians are consequently more inclined to pursue environmental policies after a period of economic progress, and it is policies that stimulate compositional and technological change. If the effect of GDP per capita on emissions is indeed mediated by policy initiatives, political institutions that shape policy adoption and implementation are likely to moderate this effect.[2]

Empirical findings in environmental economic research are somewhat inconsistent and inconclusive. Several recent studies suggest that the per capita CO_2 elasticity of GDP is positive and monotonic (Stern, 2010; Berenguer-Rico, 2011; Wagner, 2008, 2015; Liddle, 2015), but a number of studies also find a negative elasticity, or that per capita emissions curb along a U-shaped, N-shaped, or inverse U-shaped slope as GDP per capita increases (Apergis, 2016; Al-Mulali et al., 2015; Kaika and Zervas, 2013a; Zapata and Pandel, 2009; Liao and Cao, 2013). Among the studies that find a positive and monotonic elasticity, there are also considerable variations in the reported effect sizes. Lack of empirical consistency is thus a part of this article's impetus, and we seek to provide more accurate estimates of CO_2 emissions per capita by taking political-institutional conditions into account.

2.2. Environmental Politics

Despite the fact that effects of CO_2 emissions are global and diffused, and only have indirect and distant consequences for the individual states, national political institutions play a crucial role in tackling this international problem. CO_2 reduction by each individual country reduces the global stock of CO_2 emissions and this influence might be sufficiently important for voters and politicians to make them support climate policies targeting the CO_2 emissions of their individual country. The environmental politics literature discusses a large number of factors that may affect environmental policy adoption and implementation favorable to CO_2 emissions reductions

[1] We use the term 'monotonic' instead of 'linear' in most places in the text since it is a more accurate description of the relationship between logarithmic variables, which we use in our analysis. For the same reason, we will also discuss the relationship between CO_2 and GDP per capita in terms of 'elasticities'.

[2] Data limitations prevent us from examining the potentially mediating effect of environmental policies, but we examine if political-institutional features, which are likely to affect policy decisions and implementation, have an impact on the per capita GDP-CO_2 relationship. This moderation can only be explained if a sizable portion of the relationship is mediated by policy initiatives, and absence of moderation is only plausible if the effect of GDP per capita on CO_2 emissions is mainly direct.