

In the following essay we focus on the article by Ward (2006) and provide a critical review of the theoretical arguments and methodological tools used in the context of the study. We proceed along the following lines. First, we summarize the article's theoretical and empirical content. Second, we put together an assessment of the study's strongest points as well as major shortcomings. Lastly, we conclude with a short summary on possible directions for future research for the subject of environmental regime networks.

Theoretical and Empirical Summary

By investigating the effectiveness of international environmental regimes in the context of social networks the study is directed towards a twofold, theoretical and empirical, contribution. On the one hand, the author takes into consideration the complexity and depth of environmental regimes before answering substantive questions about the relationship between a country's position in the system and its sustainability performance. On the other hand, he applies the methodology of social networks to the international system, with the purpose of investigating the issue at hand through a novel (especially at the time of publication) and sophisticated approach. As we discuss in greater detail below, the main argument is that countries with central positions in the environmental regime network (and furthermore the international system itself) should be more prone to environmentally sustainable behaviour.

Theoretically, the article draws mainly from the international relation theories of neoliberal institutionalism, as well as social capital theory. More specifically, it is argued that much like any other institutional configuration or regime in the international system, environmental regimes can be seen as a result of the increasing interconnectedness of nations and, at the same time, a factor that enhances the same phenomenon, creating a global community in the process¹. Taking this into consideration, the Kantian Peace arguments of the liberal IR literature can be naturally transferred into the realm of global environmental politics. Going even further, it is also argued that these interconnected systems can be thought of as social networks on the international level, where actor's behaviour is – amongst other factors – influenced by shared norms and practices that make up a form of social capital. This “habitus” can be, according to Ward, useful for a comprehensive explanation of variation in environmental sustainability performance.

But how would one go forward in examining the effectiveness of such complex and interlinked regimes in the apparatus of global environmental politics? By combining the aforementioned theoretical schools with the literature on social networks, the author proposes that such regimes should not be examined in isolation. Simply put, a comprehensive evaluation of the regime's output must take into consideration the entire network, simply because each individual regime or system (cluster) of regimes can produce direct and indirect links, while causing positive and negative external effects. This idea is

¹ As the liberal argument goes, this international system becomes much more than a simple aggregation of its national components.

reinforced by the fact that many environmental regimes deal with certain ecological issues that are, by definition, global in nature and extremely complex (e.g. global warming, ozone layer depletion etc.), making it easier to argue that direct and indirect links matter.

As we briefly mention above, the main theoretical claim is that – *caeteris paribus* – higher levels of centrality in the overall regime network are strongly related to environmentally sustainable practices on behalf of countries. Commonsensically, an “Environmental Kantian Peace”² argument would suggest that a central position in the system would make actors more eager to effectively enforce sustainable environmental policies, more likely to comply with environmental regulations as an outcome of international negotiations and would provide greater information capacity with regard to negative side effects or positive synergies of certain regimes. Therefore, even though the theoretical puzzle remains within the context of sovereign states, it is seen through the lenses of an international network.

In the remainder of this chapter we review the *methodological tools* chosen to approach the aforementioned hypothesis. We begin by discussing the main independent variables, dependent variables and controls, and continue by examining the model-building approach and general empirical strategy. As we already underlined, the perception of the international regime network as a system that can be studied through network analysis is quintessential to the analysis. Using two different datasets, the author constructs two measurements of “centrality” for each country as the main *independent variables*: participation at international environmental treaties and membership to an intergovernmental organization with environmental functions. As an illustration of the method it can be said that the more direct and indirect links each country has to other countries (the number of links incident upon the country’s node), the more central it is considered to the networks, resulting in a higher centrality score. Using the social network analysis software UCINET 6, the two centrality variables are calculated for each country. For the IGO and environmental IGO centrality measurements (“regimecentrality1” and “regimecentrality2”) the author reports a high correlation between the two and also with a measurement of general systemic centrality calculated using common membership in IGOs during the year 2000 with the same method.

In terms of *dependent variables*, the author uses four measures of sustainability to capture the effect of the independent variables. The first, “factor1”, is drawn from iterated principal factor analysis of development and environmental indicators taken from the GLTETF (2002). The second response variable, “footprint”, is the common indicator used to capture environmental footprint of countries. It is calculated as the area in hectares (standardized) needed to maintain the consumption of the average

² Social network analysis has been used again by the author in the context of the Kantian Peace and liberal IR theory. For example, in Dorussen and Ward (2010) the authors estimate the effect of trade network centrality in dyadic peace, finding that more direct and indirect links in the trade network are likely to promote peace between nations.

citizen for each country. Third, the author uses another factor derived from GLTETF, where higher scores indicate failure to provide energy efficiency as well as low performance in providing the public good of a clean environment. Fourth and final dependent variable is the average rate of saving of each country for the years 1995 to 2001 (“gensav”) as a percentage of its GNI, taken from the World Bank. The author uses these four measurements in an attempt to make up for some of the reported problems in the data. Each response variable acts as a “robustness test” for the others, trying to reach an acceptable level of certainty in the cross-sectional data.

In terms of control variables, the author draws a number of potential controls from the literature, including economic performance, demographic variables, political variables (such as level of democracy, corruption and state capacity), while allowing for non-linearity where there is evidence for such an effect (e.g. income). Because the literature is inconclusive as to what should be taken into account, the author adopts a “testing down” approach, estimating OLS regressions for each of the dependent variables and eliminating insignificant control variables until a balance is reached with the confounders. This approach results in different sets of controls being used in different models. The results of the OLS regressions provide support for the working hypothesis of the article that regime centrality is strongly associated to sustainable practices by nations, while the control variables follow patterns that more or less resemble the literature’s expectations. Finally, the study addresses the possible issue of endogeneity of international institutions and reverse causality. In order to provide evidence against these hypotheses, the author uses three stage least squares equations for the sustainability and centrality measurements, finding little evidence for endogeneity or reverse causality in the context of this study.

Strengths and Weaknesses

In the following chapter we outline strengths and weaknesses of the study at hand. Beginning with the strongest points, the article contributes substantially to our theoretical understanding and puts forward an innovative empirical approach. More specifically, the theoretical proposition that a country’s centrality in the network of environmental regimes could have explanatory power over sustainability performance, manages to introduce well developed arguments of IR literature and social capital theory into the socially relevant discussion of global environmental governance. Another theoretical innovation is the transferal of social capital literature into the discussion on the effects of environmental sustainability. If, as the literature suggests, membership in IGOs creates socialization effects that drive countries to comply with shared norms and practices, it would be reasonable to argue that the same logic can be applied for environmental issues. In addition, ecological problems are complex and can produce considerable negative externalities, making information capacity quintessential as well. The strong theoretical foundation contributes to the social relevance and clarity of the

study, as the estimated effect can be adequately explained through the causal mechanism outlined by the author.

Methodologically, the article manages to reach a good level of internal validity and robustness, despite the fact that it deals with incomplete data and only focuses on cross-sectional analysis. Using data censoring and imputation³, the author deals with skewness and other quality concerns in the variables. Furthermore, the study utilizes multiple measurements for the dependent and independent variables, in order to display that all the possible proxies point towards the same direction for the effect we are interested in. To justify the methods used (factor analysis, choice of proxies etc.) correlation matrices and statistical tests are reported, strengthening the internal validity of the study even further.

Be that as it may, a number of issues remain problematic. In the following paragraphs we outline weaknesses and propose ways of overcoming them when possible. We focus mostly on methodological and data-related issues that negatively affect validity, both internal and external. First, centrality measurements assume that all links in the undirected graph are equally influential in the network, effecting each nation's behaviour and information capacity the same way. Even though this might be true in the end, the possibility that some agreements or IGOs are more influential or more effective in enforcing the agreed upon rules is not addressed in the study and could be interesting to investigate. This limitation could be overcome, for example, by investigating if ineffective networks still have a positive effect on sustainability or (alternatively) by constructing centrality measurements based only on regimes that are able to actively promote compliance or even reinforce it.

Perhaps more importantly, the article focuses on a limited time frame (close to the year 2002), therefore making it possible that estimated effects are not capturing the big picture, but only short term variation. Even though this is mostly due to data constraints, a comprehensive review of the study's shortcomings cannot overlook this external validity problem. Indeed, one could reasonably claim that the cross-sectional nature of the data is simply not enough to capture the longitudinal and dynamic effects associated with such a complex matter. By the same token, inferring causality through the methods and observational data used for this article would be difficult, which is why the author is very cautious with such claims. Indeed, the simple OLS regressions are not operating within potential outcomes notation, even with the controls used. Consequently, the study does not provide enough evidence that would completely eliminate alternative explanations⁴.

In order to overcome these issues a number of steps could be taken. Adopting a statistical learning approach would help boost the article's internal validity without requiring extra data. One

³ Unfortunately the author does not report the exact imputation method used or the specific variables that were imputed.

⁴ As we mention above, there is an attempt to overcome this. However, the author himself admits that data is not available to address the full scope of the problem.

could use cross validation to display out of sample prediction error, thus proving support that (at least for the data included) the models are predictive of out of sample cases. In order to overcome the aforementioned issues of external validity, a comprehensive data collection effort would need to be undertaken. Simply put, without panel data of higher precision it is almost impossible to reach a much higher level of confidence for the theory.

Finally, it is essential to point out that the analysis does not address the qualitative, micro level implications of the theory. Even if the macro-level association holds, one would need to provide evidence that the causal mechanism proposed by the author is also present at the micro level of environmental negotiations between governments and the environmental policy planning within governments. Using the macro-level association between regime centrality and sustainability as preliminary evidence, one could apply a nested research strategy following Lieberman's systematic methodological guide (Lieberman, 2005). In this context, we would need to conduct process tracing or qualitative comparative analysis for on-the-line cases with the intention of empirically illustrating the causal mechanism in its entirety. This is without doubt a difficult task, however, one could use expert surveys, interviews, or even lab experiments to qualitatively complement the already existing analysis.

Conclusion

Taking everything into consideration, and despite the problems encountered, our assesment of the article is by and large positive. The study puts together a balanced and robust assesment of the effect of centrality in promoting sustainability using the means available at the time. The introduction of such a discussion in the literature is a contribution in its own right. Beyond this points, the fundamental theoretical propositions of the article remain to be tested by additional research in the future, focusing on the micro and macro levels. To eliminate any suspicion of bias or reverse causality, quasi experimental research designs or actual lab experiments can be conducted with the purpose of establishing potential outcomes that would empirically strengthen the otherwise clear and sophisticated theory introduced by the study.

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