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Network Analysis of Global Politics

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PAPER ABSTRACT: An ecological approach looks at the entire system of interactions, both among actors and between actors and environment. In international relations (IR) theory in political science, this approach to global politics is best known as "global governance," and fits the definition of a complex system: multiple types of actors and processes, the structure of which is the result of past structure, actor choices, and stochastic processes. The modeling of such complex systems in international relations has its roots in sociology and English School international relations theory. It is greatly facilitated by the use of quantitative social network analysis methods, used to map broad trends and patterns, which can then be used as a basis for comparison, for finding "communities" of similar actors, and for investigations into dynamics. To demonstrate this, examples from a range of global security governance issues will be explored.

However, using social network analysis to study global governance requires careful examination of both ontology and epistemology, as the definitions and conceptions of what is to be studied are affected by the choice of a formal mathematical approach. In contrast to both realism and liberal institutionalism, which look at the pattern of interaction among the members of only one or two types of organization, the ecological approach assumes that all the organizations that demonstrate agency, or choice, count as actors. These actors interact with each other and with their environment,

which refers not just to the strictly material or ideal, but also to background trends such as globalization that do not exhibit agency. In this sense, it draws upon the heritage of English School theory. This approach also means that the intellectual puzzles of researchers will change, as the questions become more oriented toward patterns of cooperation and cohesion, and less about the actions and motivations of individual actors, or of specific types of actors.

This project examines network intersections or "slices" of the cloud of actors involved in global security issues (for the purposes of demonstration, this paper looks at networks from different issue areas, but the concept applies to geographical and temporal slices as well). The actors belong to different sets (because they are different types of organizations -- states, NGOs, companies, etc.), but there are also connections among and between sets. On the basis of this theoretical framework, this paper will examine both clustering, or how closely connected actors are, and structural equivalence, or finding "communities" of actors with similar patterns of relations to the rest of the network. Several different types of clustering measures will thus be computed and compared: hierarchical clustering and Newman's Modularity (Newman 2006), betweenness centrality (Freeman 1979), and homophily (McPherson et al 2001). Finally, several methods of structural equivalence or community-finding measures will be computed and compared: eigen decomposition (Seary et al 2006), and a proposed method of hypergraph piercing (Bárány 2005).