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The political-economic causes of change in the ecological footprints of nations, 1991–2001: A quantitative investigation

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Abstract

This study tests a series of hypotheses concerning the political-economic causes of change in per capita consumption-based environmental impacts. To test the hypotheses, panel regression analyses are conducted to assess the effects of level of economic development, export intensity, domestic economy structure, and other factors on growth in per capita ecological footprints of nations, 1991–2001. Analyses confirm multiple hypotheses: more-developed nations and those with a greater intensity in the services sector experience higher increases in per capita footprints, while manufacturing intensity and export intensity are inversely related to growth in consumption-based impacts. The findings support key tenets of treadmill of production theory, uneven ecological exchange theory, export dependence theory, and world-systems theory.

Keywords: Ecological footprints; Political-economy; Sustainable development; Globalization; Environmental degradation; Panel regression

1. Introduction

A growing body of research in political-economic sociology and environmental sociology investigates the environmental impacts of resource consumption. Often, these analyses focus on the per capita ecological footprints of nations, which trace the average amount of

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resources a person in a given country consumes and a portion of the waste they generate.[1] The ecological footprint approach provides a comprehensive unit of measurement that allows for comparisons of various types of consumption-based impacts (Wackernagel et al., 2000). The footprint is also an effective tool for communicating human dependence on life-support ecosystems. It can be applied to a variety of issues to help identify the complementarities between natural capital, economic development, and other social structural factors (Deutsch et al., 2000).

Findings from sociological studies suggest that per capita footprints are largely a function of a country's level of economic development, export dependence, urbanization, and other social factors (e.g., Jorgenson, 2003, 2005; Jorgenson and Rice, 2005; Jorgenson et al., 2005; see also York et al., 2003). Due to the unavailability of adequate data, this body of prior research on per capita footprints is all cross-sectional by design. However, it is quite possible that the more salient factors contributing to change in per capita footprints might vary from the causes found to be most relevant in cross-sectional analyses (e.g., Davis et al., 2005). Fortunately, adequate panel data are now available that allow for investigations of these types of human/environment relationships.

Through a series of panel regression analyses of 138 countries, this study begins to address such questions. Building on prior research, we test hypotheses concerning the effects of economic development, export intensity, domestic economy structure, the environmental commitment of nation-states, urbanization, and other factors on change in consumption-based environmental impacts 1991–2001, measured as per capita footprints of nations. Prior to the analyses, we provide an overview of findings from recent cross-sectional studies of per capita footprints, and summarize the theoretical justifications for including certain predictors in the tested models.

2. Background

2.1. The ecological footprint

The footprint approach was primarily developed by Mathis Wackernagel and William Rees (e.g., 1996). The ecological footprint quantifies the amount of biologically productive land required to support the consumption of renewable natural resources and assimilation of carbon dioxide waste products of a given population[2] (e.g., Wackernagel et al., 2002). National footprints are measures of societal demand upon domestic as well as global natural resources. They allow for comparisons of a nation's environmental demand relative to available domestic and global natural capital.[3] In particular, the ecological footprint

[1] The majority of sociological research on per capita footprints has focused on international political-economic factors. However, sociological research on the total footprints of nations underscores the importance of structural human-ecological factors when examining the overall scale of environmental outcomes (Rosa et al., 2004; York et al., 2003).

[2] See Jorgenson (2003) and York et al. (2003) for more thorough discussions of the methodology involved in the calculation of national footprints and recent debates concerning the overall utility of the footprint method for social scientific research.

[3] The concept of natural capital is an extension of the economic notion of capital. It is usually defined as the stock of natural assets, such as water and forest resources, producing a flow of services and resources for human societies. The term is often criticized as being anthrocentric by political-ecologists and other environmental social scientists [see Wackernagel and Rees (1996) for a more ecologically sensitive definition and its relationship to ecological footprints].