

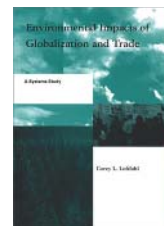
REVIEW ESSAY

Lateral Pressure and Deforestation

Andrew K. Jorgenson

Lofdahl, Corey L. 2002. *Environmental Impacts of Globalization and Trade: A Systems Study*. Cambridge, MA: The MIT Press. 253 Pages, ISBN 0-262-12245-6 (Cloth). <http://mitpress.mit.edu>

What are the effects of increased structural integration of international trade on the environment of relatively poorer countries, particularly in the southern hemisphere? This is the key question addressed by Corey Lofdahl in his book *Environmental Impacts of Globalization and Trade: A Systems Study*. Given the theme for this special issue of the *Journal of World-Systems Research*, a discussion and evaluation of this book seems rather timely and relevant. An immediate fact of interest is that Lofdahl is not an environmental sociologist, let alone acquainted with relevant empirical works grounded in a world-systems perspective. Rather, he is trained as a political scientist, and works in the simulation and information technology sector.



This book uses lateral pressure theory analytically and a variety of methodological steps (GIS, time-series, multivariate analysis, simulation modeling) to test how and to what extent the aforementioned theory in an expanded form explains the effects of international trade on environmental outcomes, more specifically deforestation in relatively poorer countries. The text consists of six chapters and a series of appendices that contain more in-depth discussions of the methods and data included in the analyses. Below I offer critical summaries of each chapter in succession, followed by a brief evaluation of the text.

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Chapter one begins with a discussion of the recent protest events in Seattle during the WTO meetings, currently a relatively common topic among social scientists. Lofdahl, like many others, explains that the protesters in Seattle were not against globalization, but rather protesting the harmful effects inflicted by it on the global environment and poorer disadvantaged populations around the world. Economists argue that free trade helps “developed” and “less-developed” nations grow economically while environmental and social justice groups maintain that increased unregulated trade caused by globalization decreases regional labor standards and environmental conditions in “less-developed” countries at the expense of the more “developed” countries’ interests. Simply, protestors maintain that trade and globalization hurts human well-being and the environment, a direct contradiction to economists, which generally believe that trade helps communities develop and the environmental outcomes are justified. This debate is nothing new to the social sciences, especially macrosociologists.

Another common topic in related areas of literature is definitional discussions regarding what we really mean by the term globalization. Lofdahl immediately takes part in this dialogue by offering a definition, which he operationalizes in this study. His definition is of the structural integration sort, rather similar to that offered by Chase-Dunn et al. (2000, 2002), with a focus on trade while clarifying that it also refers to other variations of international interaction. Following this definitional clarification, two additional areas of literature are reviewed from a political science perspective: (1) politics and markets, and (2) geopolitics and power. During the latter, Lofdahl briefly mentions Wallerstein’s early (1979) notions of the core and periphery, but misinterprets their hierarchical and relational characteristics by equating them to horizontal concepts that connote spatial differentiation among geographic units of similar scale (pg 21). This leads to the greatest weakness of the book, whether intentional or unintentional: an almost total neglect—with the exception of this misinterpretation—of references and connections to areas of relevant political-economic, political-ecological, and environmental sociological literatures. However, this shouldn’t entirely discount its methodological contributions as discussed below, but it does cloud them up a bit.

Chapter two provides a description of lateral pressure theory (LPT), the theoretical framework applied to a series of analyses in later chapters. This framework argues that as states develop economically and their populations increase, they make demands on international resources, called lateral pressure, and these demands lead to an increase of military force and the likelihood of warlike conflict. Lofdahl attempts to extend LPT with the intention of capturing the international-level, systemic interconnections that contribute to global environmental degradation (pg 45). More specifically, in this text LPT is used

to account for the expansive behavior of multinational corporations acquiring worldwide market share after World War II, which leads to the focus on international trade, and moving away from state centric analyses (pg 49). In doing so, Lofdahl distinguishes between four interconnected levels of analysis: the individual, the state, the international system, and the global system. Going from top to bottom, global processes effect the international system, which in turn effects the state, and so on. And, going from bottom to the top, the same logic applies.

A primary goal of this study is to explicitly identify a geographical component nested within LPT. The selection of forest change as a dependent variable overlaps considerably with this goal. Forest change, or deforestation, implies a spatially observable and measurable outcome grounded in actual locations, and Lofdahl’s proposition states that the “expansion of the social environment through globalization and trade impacts the natural environment as measured by forest change” (pg 53). In the following three chapters, findings from a series of analyses attempting to test this proposition are reported. Building on one another, they involve different yet complimentary methods.

Chapter three consists of series of geographical and time-series analyses. The geoanalyses, offered in map form, are presented to introduce the primary dependent variable addressed in this text—forest change (i.e. deforestation), and a few related variables of interest, which offer visual descriptions of their spatial distribution. The time-series analyses address how deforestation, GNP, CO₂ emissions, imports, exports, population, and forest change have varied over time.

The geographical analyses illustrate that countries with relatively larger shares of global GNP than population are generally clustered in northern (core) regions while those with more population than GNP tend to be in southern (peripheral) regions. Moreover, most CO₂ emissions are generated in the north, while relatively higher levels of deforestation occur in the south. As accurately stated, we see that global-scale data can be displayed in geographical units other than states (pg 77), particularly of relevance for natural endowments, which do not correspond with geopolitical borders. These visual descriptions are rather effective, especially for world-systems oriented scholars generally bound to cross-national data. With this mapping approach, one can create visual images that identify the world-systemic—as well as international—contours of certain kinds of conditions, especially environmental and ecological. Lofdahl undoubtedly illustrates how this methodology improves the descriptive power (at least) of these kinds of empirical studies. Other recent cross-national analyses of deforestation (studies that Lofdahl does not address) would greatly benefit from the incorporation of this methodology (e.g. Burns, Kick, Murray and Murray 1994; Kick, Burns, Davis, Murray and Murray 1996; Ehrhardt-Martinez 1998; Jorgenson 2002).

Time-series analyses are performed to establish initial connections and correlations among the set of variables listed above over a period of time. Results are what one familiar with relevant studies would expect, and offer additional support for the geographical analyses. Lofdahl identifies GNP as a proxy indicator for technology, stating that “technology here represents the sum of applied knowledge and skills, both mechanical and organizational...in other words, technology consists of the means whereby humans transform and use nature for their own benefit, a process that includes but is not limited to nature, people, competition, and economics” (pages 79–80). I consider this application somewhat problematic for the following reasons. First, and most importantly, GNP per capita is a more accurate indicator of affluence (Dietz and Rosa 1994), development (e.g. Burns, Kentor, and Jorgenson 2003; Jorgenson and Burns 2003), a proxy for consumption (Wackernagel et al. 2000; York, Dietz, and Rosa 2003; Jorgenson 2003), but not technology. More appropriate indicators of technology include GNP per worker, or proportion of total GNP in service (Dietz and Rosa 1994; York et al. 2003). Granted, all three are relatively highly correlated, but not identical. Second, Lofdahl fails to discuss how GNP partly measures relative power between countries in the world-economy (Chase-Dunn 1998; Kentor 2000). Moreover, he lumps all countries into two categories, “developed” and “less developed,” which hides the heterogeneity in the non-core between more peripheral and semiperipheral countries, and within the semiperiphery itself (Chase-Dunn and Hall 1997; Chase-Dunn 1998).

Chapter four contains a series of bivariate and multivariate statistical analyses that address causal relationships between variables explored in the previous chapter. Rather than performing and reporting a simple test of correlations, Lofdahl provides results of bivariate regression analyses which test the effects of (1) GNP per capita on CO₂ per capita, (2) population growth on CO₂ per capita, (3) population growth on forest change, and (4) GNP per capita on forest change. Findings indicate that all regression coefficients are statistically significant, but coefficients of determination (R^2) are not reported in the body of the chapter. A simple analysis of correlations between these variables would be just as effective and easier to follow.

In the second part of chapter four, Lofdahl develops an indicator similar to import or export partner concentration,¹ but takes it a step further. The new indicator, “trade connected times GNP” (TC x GNP), generates a value that

¹ Partner concentration refers to the percent or proportion of total exports or imports to a country's largest trading partner (Kentor 2000).

depends both on the amount a country trades with its partner and the size of that partner's GNP (pg 119). Mathematically, it is calculated by cross-multiplying trade connections (proportion of a country's total imports or exports) with the GNP of each associated trading partner, and then summing these values. Lofdahl constructs this index for both imports and exports, but focuses on imports in the reported multivariate analysis.² He considers this index to be an international variable whereas variables such as GNP per capita and population growth are domestic indicators.

While I consider this new indicator to be a **critical** empirical and methodological development for the social sciences, the use of total GNP instead of or in addition to GNP per capita is problematic. Lofdahl sates that GNP per capita is not included because “it matters little whether a trading partner's large GNP is due to high technology and low population or low technology and high population” (pg 119). This justification, coupled with his justification for treating per capita GNP solely as an indicator of technology illustrates a limitation of this study. Many of the relatively poorest (per capita wealth) countries in the world contain higher total GNPs than some of the relatively wealthiest countries (per capita wealth). Per capita wealth (GNP or GDP), which is highly correlated with a country's relative position in the core-periphery hierarchy, is also very highly positively correlated with per capita consumption, and negatively correlated with deforestation (Wackernagel et al. 2000; York et al. 2003; Jorgenson 2002, 2003; Brosimmer 2002). At minimum, both total and per capita GNP should be included, meaning the construction and analysis of two trade-connected indicators.

This leads to a multivariate analysis in which forest change is regressed on (1) TC x GNP, (2) GNP per capita, and (3) population growth. All three regression coefficients are statistically significant, with TC x GNP's effect on forest change the strongest (negative), followed by population growth (negative) and GNP per capita (positive). In sum, while increased GNP per capita leads to forestation, higher trade connectedness with partners with higher GNPs, and relatively higher levels of domestic population growth lead to relatively higher levels of deforestation. Thus, deforestation is a function of both domestic (GNP and population) and international (TC x GNP) factors. Although the development and incorporation of this new indicator is an advance for empirical work concerning environmental outcomes, Lofdahl's multivariate analysis particularly

² Lofdahl explains in an endnote (43) that the results for imports and exports are almost identical due to the high correlation between the two.

illustrates the key limitation of this book, resulting from the neglect of other relevant studies of deforestation (e.g. Burns et al. 1994; Kick et al. 1996; Ehrhardt-Martinez 1998; Jorgenson 2002). These other analyses illustrate that the current model, which specifies three independent variables, is too parsimonious. For example, deforestation may result from three types of dependency: export/trade dependency, debt dependency, and foreign capital penetration (Ehrhardt-Martinez 1998). Hence, the greater the rate of dependency on core countries, the greater the rate of deforestation. Dependency indicates that high levels of domestic inequality will result in increased levels of deforestation as the rural poor become increasingly impoverished, rely more heavily on forest resources, and search for nonagricultural activities to supplement or replace their agricultural income (Ehardt-Martinez 1998; Jorgenson 2002).

Empirical findings also suggest that deforestation is most severe in semiperipheral regions (Burns et al 1994; Kick et al 1996; Jorgenson 2002).³ Population growth has a positive effect on deforestation in all regions of the world-economy, but its effects are intensified in the semiperiphery (Kick et al. 1996). However, rural population growth is a better predictor than total population growth. Increased urbanization in semiperipheral regions causes landless workers to migrate out of urban areas into forested regions, a process labeled rural encroachment (Burns et al. 1994). Moreover, landless workers contribute to deforestation through their limited knowledge of agricultural practices (Burns et al. 1994). Semiperipheral countries tend to have lax environmental policies and because of the potential for economic development are more eager to reap the perceived economic benefits of deforestation than core countries (Smith 1994; Bergesen and Bartley 2000). On average, these countries possess greater technological capacities to deforest than peripheral regions do (Kick et al. 1996).

International trade in forest products is another factor effecting deforestation. Core countries are able to export forest products without high levels of deforestation because they often possess the means and technology necessary for reforestation practices (Kick et al. 1996). In semiperipheral countries, both the import and export of forest products impacts deforestation (Kick et al. 1996). Exportation of forested products increases deforestation due to the lack of reforestation practices. Importation of forest products is an indicator of infrastructure building and development, which increases deforestation directly through land acquisition and development (Kick et al 1996).

³ However, Tom Burns, Edward Kick, and Byron Davis have found that levels of deforestation are increasing in the periphery relative to the semiperiphery—at least in the last decade ([see their article in this special issue](#)).

Like Lofdahl, these other empirical studies include GNP per capita and population as independent variables. However, by themselves they potentially elevate the effect of the newly constructed indicator of trade connectedness. To adequately test this indicator's effect on deforestation, an analysis should control for the additional factors discussed above. Furthermore, population needs to be specified in both urban and rural, and considering the robust evidence concerning higher levels of deforestation in the semiperiphery, Lofdahl's "less developed" category needs restructuring. Since his analyses are not grounded in a world-systems perspective, a simple solution might include the incorporation of a "middle income" (GNP per capita) dummy variable.

In chapter five a series of simulation models are presented that "provide a link between the systemic assumptions and dynamic responses necessary to explain the preceding time-series and statistical analyses" (pg 136). The final model, labeled the environmental lateral pressure model (ELP), incorporates the three key factors of interest throughout the book: population, technology (measured as GNP per capita), and resources (measured as forest change). Moreover, model feedback loops are applied to help make sense of the "transition from a system's microfeatures to its macrobehavior" (pg 141).

This study argues that trade provides a mechanism by which the costs of industrialization are pushed off by rich countries onto poor ones (pg 157). The ELP model in its presented form supports this argument. It depicts the developed northern countries exporting technology and high value goods to southern relatively poorer countries, while the latter export natural resources to the former. These relational characteristics create asymmetric outcomes: relatively higher economic development and a healthier environment for northern countries, and economic underdevelopment and increased environmental degradation for southern countries. Overall, findings are supported by the literature reviewed in earlier chapters, not to mention the neglected sociological areas of literature concerned with the "global treadmill of production" (e.g. Schnaiberg 1980; Schnaiberg and Gould 1994) and the "Netherlands fallacy" (e.g. Ehrlich and Holdren 1971; York et al. 2003; Rosa and York 2002; Jorgenson 2002, 2003). The level of sophistication involved is quite impressive and the analyses illustrate the utility of simulation modeling for studying global-level phenomena while paying attention to different levels of analysis. However, the underspecification of the multivariate analyses in chapter four also seriously impacts the simulation models developed here. Like chapter four, one must applaud Lofdahl's methodological efforts and advances but be wary of his empirical findings.

The final chapter provides a brief conclusion of the book's findings, theoretical and methodological contributions, policy implications, and future steps for this research agenda. Each of these sections is well written, offering clear and

concise narratives of the steps taken in the preceding five chapters. Policy implications discussed are rather reminiscent of recent empirical works that challenge the environmental Kuznet's curve (Grimes and Roberts 1995; Roberts and Grimes 1997) and dependency and world-systems perspectives that challenge modernization theory's approach to domestic development.

In summary, Lofdahl attempts to expand and operationalize lateral pressure theory to better explain if and how international trade impacts the environment. Using a series of complementary geo and statistical methods, empirical findings suggest that trade does impact the environment—in this case forested areas, particularly for southern countries with relatively lower levels of per capita GNP, relatively higher levels of population growth, and relatively higher levels of trade connectedness with partners (other countries) that possess relatively higher total GNPs. This book warrants notice due to its application of sophisticated statistical methods and especially the development of a trade connectedness indicator that expands and greatly improves upon trade partner concentration as a predictor of various environmental and well being outcomes, in this case deforestation. With these strengths and contributions comes a general noticeable weakness: the neglect and/or misinterpretation of relevant theoretical perspectives and empirical studies. This is particularly evident in the literature review provided in the first two chapters, and especially the underspecification of the multivariate analysis in chapter four and the simulation models in chapter five. This underspecification potentially biases the reported empirical findings. However, the indicator developed by Lofdahl is a noteworthy advance for studies of various international and world-systemic processes and with slight changes should definitely be incorporated into future relevant analyses. Furthermore, his application of simulation modeling and especially geoanalysis illustrate the utility of these methodologies for all social scientists, and like the new trade connected indicator, their addition to future analyses would be greatly effective.

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