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Conditionality Contaminates Conservation: Structural Adjustment and Land Protection in Less-Developed Nations

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Abstract

The destruction that human beings cause the natural environment is so catastrophic that the current era has now been labeled the "Sixth Extinction." Conservation and the preservation of species and ecosystems is a leading strategy in preventing biodiversity loss and preserving natural ecosystems. As threats to biodiversity mount, it is imperative that social scientists explore the macro-level processes that influence conservation areas, especially in poorer nations where the majority of biodiverse zones are located. This study explores the impact of structural adjustment policies on the ability of less-developed nations to designate land for conservation. We use ordinary least squares (OLS) regression to examine the influence of IMF conditionality on levels of terrestrial protected areas for 86 less-developed nations. The results confirm our hypothesis that nations undergoing IMF structural adjustment have a smaller percentage of land devoted to terrestrial protected areas than nations not undergoing structural adjustment. Neoliberal approaches that encourage privatization and deregulation ultimately impair less-developed nations' abilities to make conservation a priority.

Keywords: development, conservation, environment, political-economy

1. Introduction

Humans have always negatively impacted their natural environment, but the emergence of the capitalist world-economic system, beginning in Europe in the late 15th century, has increased the scale of these negative impacts and spread them to all corners of the earth (Foster 1999; Myers 2009). In fact, those at the forefront of this emerging field of science argue that we are presently experiencing "The Sixth Extinction" (Kolbert 2014). Mass extinctions are periods where there is a great loss in biodiversity and today the loss of biodiversity is on a level not seen since the dinosaur age 65 million years ago. The U.N. estimates that the earth loses between 150 and 200 species of birds, insects, mammals, and birds per day (The Guardian 2010). The source of all prior mass extinctions were from environmental or planetary catastrophes, such as asteroids or comets, or in the form of extraordinarily massive volcanism (e.g. Kolbert 2014; Wake & Vredenburg 2008). However, the current "Sixth Extinction" is caused by human alterations to the natural environment fueled by the capitalist world-economic system (Kolbert 2014; Meyers 2009; Foster 1999). By the year 2100, human activities such as pollution, land clearing, and overfishing will have eliminated more than half of the world's marine and land species. The current extinction rate is estimated to be more than 100 times higher than normal (e.g. Kolbert 2014; Wake & Vredenburg 2008).

Loss of biodiversity is thus one of the most critical current environmental problems, threatening valuable natural resources, as well as human well-being. The public and academia alike have begun to recognize the severity of environmental issues as it becomes more and more clear that a plethora of different environmental crises threaten the world that we live in and the survival of the human species (Myers 2009). Even within the field of sociology, biodiversity loss and the ways in which humans contribute to species loss is gaining in popularity (McKinney, Fulkerson, & Kick 2009; Shandra, Leckband, McKinney, & London 2009; Shandra, McKinney Leckband, & London 2010).

The strategy of environmental conservation is the one most frequently used to protect against the loss of biodiversity (Convention on Biological Diversity 2015). The establishment of protected areas started in India in the 4th century B.C. and by the 16th century national parks were being established across Europe (Dobson 1996). The United States, too, has a history of environmental conservation. The first national park, Yellowstone, was established in 1872 (Wildlife

Conservation Society 2015). Other actions in the United States, such as the Endangered Species Act of 1973 are designed to protect endangered species and their natural habitats (United States Congress 1973).

Despite the potential importance of conservation strategies for preserving biodiversity and natural ecosystems, many developing nations in particular may face limitations to protecting land. Protecting biodiversity in less-developed or poorer nations is especially relevant as many poor nations contain key biodiversity hotspots (Conservation International 2015a; Critical Ecosystem Partnership Fund 2014; Myers 2009). Biodiversity hotspots are defined as regions that encompass outstanding concentrations of native species, but many of these areas are also losing an exceptional amount of their habitats (Myers, R. Mittermeier, C. Mittermeier, da Fonseca, & Kent 2000). Using these criteria, Myers et al. (2000) conducted an analysis of 25 biodiversity hotspots and found that the majority of the hotspots are in the tropics, which largely means that they are in developing countries where the threats to biodiversity loss are the greatest due to international pressures to consumer environmental resources (Myers et al. 2000:855). Prior political-economic examinations demonstrate that factors related to economic dependency, especially structural adjustment or debt, often limit the capacity of developing states to enact environmental protections (Shandra et al. 2010; McKinney et al. 2009). These political-economic factors are thus especially relevant to consider in the context of land protection.

This research will contribute to sociological investigations of the impacts of austerity measures on environmental outcomes. By examining trends in conservation, we investigate how neoliberal development strategies impact initiatives to protect the environment in developing nations. As conservation represents the key strategy to protecting biodiversity and natural environments, rigorous cross-national investigation is needed to understand what factors explain why some nations have more land under formal protection than others.

2. The Importance of Biodiversity

Monitoring and preserving biodiversity is inherently important as biodiversity loss has a number of negative effects on all aspects of human life and on natural ecosystems (Meyer 2009; Shandra et al. 2010; Chivian and Bernstein 2010). Diverse ecosystems provide a wide variety of nutrients and food that humans need to survive and without these essential nutrients, human health is directly and negatively impacted (WHO 2014). Moreover, preserving biodiversity may ensure proper food and nutrient access for future human generations. Having a diverse array of species is specifically important, as the loss of species and reduction of biodiversity in habitats reduces the nutrients that are available to us and negatively impacts global nutrition (WHO 2014). In addition to providing nutrients for humans to survive, ecosystems provide many other services for both human beings and the rest of the planet (WHO 2014). These services include providing fuels and energy, regulating services like creating oxygen and purifying water, cultural services that provide aesthetic and spiritual qualities, and supporting services, which aid other ecosystem services (Chivian & Bernstein 2010).

Medicine represents another field that will be severely and negatively impacted by biodiversity loss. Remedies and cures for human diseases are most often provided from plants or animals (Chivian & Bernstein 2010). Indeed, a wide variety of plants and organisms have provided breakthroughs in human medicine, such as morphine from the Opium Poppy, aspirin from the White Willow Tree, cancer-inhibiting chemicals found in the Pacific Yew, and stress-fighting chemicals found in Ashwagandha, just to name a few (Chivian & Bernstein 2010; Foster 1999). Important medicines are also found in animals, such as medications used to treat HIV/AIDS as well as ACE inhibitors, which are used to treat high blood pressure (Chivian & Bernstein 2010). Extracts from plants are used to treat human diseases, and it is estimated by the World Health Organization that 3.5-4 billion people, mainly in developing nations, rely on plants as the source of primary health care needs (WHO 2007). New applications are discovered all the time; for example, a team of researchers discovered a new antibiotic called teixobactin derived from soil fungi (Johnson 2015). The continual discovery of new antibiotics and medicines would not be possible without abundant availability of biodiversity.

Although "putting a price on the environment" may be controversial, some economic scales can help to demonstrate the importance of environmental resources. Recently, a researcher at the University of Calcutta calculated the economic value of countless services that the environment provides and that ware often taken for granted. He has estimated that, "…a tree living for 50 years generates $31 250 worth of oxygen, $62 000 of air pollution control, $31 250 of soil erosion mitigations and soil fertilizer, $37 500 of water, and $31,250 of shelter for animals"; the total monetary valuation of these services amounts to $193 250 (Bennett 1996:468; Sponsel 2012).

In addition to conserving biodiversity because of the many benefits it provides for human life, there are also reasons to protect biodiversity because of the benefits we may not yet be aware of. Around 1.5 and 1.8 million species today have been identified, but it is impossible to estimate how many species there are in total when so many areas like deep ocean floors and other habitats remain unexplored (Meyers et al. 2000, United Nations 2011). In fact, while many medicinal properties of plant, animal, and microbe species have been identified, recent studies reveal that as much as 86% of all terrestrial species and 91% of all marine species have not yet been discovered or catalogued (United Nations 2011).

Preserving biodiversity and preventing biodiversity loss through conservation could have enormously positive impacts for the health of natural ecosystems as well as human systems.

3. Conservation: Responding to Biodiversity Loss

Scholars, environmentalists, conservation biologists, and supra-national organizations have asserted the importance of biodiversity and its essential functions for human life and planetary health (e.g. Chivian & Bernstein 2010; Meyers et al. 2000; UN Environment Programme 2011). The immediate and obvious response to biodiversity loss is conservation. Many organizations and people working in public policy see conservation as the best strategy to minimize biodiversity losses and mitigate or protect against the impact of human activities on the natural environment (e.g. WWF 2015; Conservation International 2015b; Greenpeace 2015; The Nature Conservancy 2015).

According to the World Wildlife Fund (WWF 2015), "habitat loss is probably the greatest threat to the variety of life on this planet today". In fact, habitat destruction affects 86% of all threatened birds, 88% of threatened amphibians, and 86% of threatened mammals (IUCN 2010). Protecting or conserving areas provide a response or preventative effort to habitat loss and human-induced destruction. Protected areas can be seen as the "cornerstone of biodiversity conservation; they maintain key habitats, provide refuge, allow for species migration and movement, and ensure the maintenance of natural processes across the landscape" (Convention on Biological Diversity 2015). It is estimated that protected areas provide livelihoods for 1.1 billion people on the planet and represent the main mechanism for billions of people to access clean water (Convention on Biological Diversity 2015). Additionally, protected areas are one of the best tools for conservation and serve as essential sites for research, education, and the sustainable use of natural resources (IUCN 2010). Protected areas are also home to some of the Earth's most incredible natural landscapes and provide an aesthetic value that is incalculable (Convention on Biological Diversity 2015; IUCN 2010). Conservation biology has emerged as a field of scientific inquiry that specifically "addresses the biology of species, communities, and ecosystems that are perturbed, either directly or indirectly, by human activities or other agents" (Soulé 1985:727). The goals of this discipline are to provide tools to preserve biodiversity and to bring multiple aspects of biology together with one common goal: conservation (Soul éand Wilcox 1980).

4. Development and Conservation

We now turn to a discussion of potential developmental factors that might explain patterns in conservation across countries. Patterns in conservation may vary across nations due to a number of factors, such as financial resources available to support conservation initiatives, the level of public awareness on environmental issues, or the level of democracy in a nation (e.g. McKinney et al. 2009; Shandra et al. 2009). There are two primary theoretical frameworks in global sociology that explain macro-level patterns and trends in development and the environment: modernization theory and world systems/dependency theory. While each of these bodies of theory might predict that poorer nations have the least amount of conservation, the mechanisms emphasized by each differ.

4.1 Modernization Theory and Expanding Environmental Protections

Modernization theory as exemplified by the writings of Rostow (1960) equates human development with economic development and posits that all countries are on a path from a traditional society toward a modern society. Thus, the model of development that should be followed is Western capitalist development and any country that should be able to embark on this transformation regardless of a country's culture, history, or relations with other countries (Rostow 1960). Applying this lens to the environment, we might expect that as countries reach more advanced stages of development, they would begin to shift their resources from agricultural-based economies to more industrial economies. Thus, previously used lands in agricultural production may be made available for conservation efforts. At the final stage of development, quality of life issues become prioritized (Rostow 1960) and we would expect to see the public become engaged in environmental issues such as the protection of biodiversity.

This application of modernization theory to the environment is also reflected in the "environmental Kuznets curve" (EKC) (e.g. Ehrhardt-Martinez, Crenshaw, & Jenkins 2002). It is thought that countries at very low levels of development might have only minimal impacts on the environment, as production and consumption levels are very low. As nations begin develop and modernize, environmental degradation increases due to the demands for nations to produce goods for domestic consumption as well as export revenues. However, development in the latter stages leads to the adaption of greener technologies and policies that reduce overall levels of environmental degradation (Ehrhardt-Martinez et al. 2002).

Thus, according to modernization theory and application of the EKC, curbing biodiversity and ecosystem loss and promoting conservation is an inherent outcome of increased economic development (Dasgupta, Laplante, Wang, & Wheeler 2002; Ehrhardt-Martinez et al. 2002). Applying the EKC to a perspective on conservation indicates that although countries may deforest their lands or over-utilize and pollute resources to create economic growth, eventually

they will have the means and funds to support conservation and the preservation of forests or other land area. From this perspective, factors like GDP per capita, participation in education, and democracy are indicators of development and modernization that would promote increased conservation in developing nations.

The poorest states are likely those that are least able to engage in activities that will preserve land area for conservation. Poor and developing countries face great poverty and health concerns from their populations, forcing them to make hard decisions about where to allocate funds. With food, health, and basic survival as main concerns, we expect the poorest developing countries to be less able to allocate funds toward conservation. Thus, we hypothesize that those developing nations with a higher GDP per capita will have increased percentages of terrestrial protected areas because they have more resources to fund conservation compared to nations with lower GDP per capita.

Additionally, education is a potentially important factor that leads to enhanced conservation. More educated and informed people tend to have increased concern and understanding of the threats that exist to wildlife and environments, in addition to increased self-efficacy. Thus, education is often related to increased environmental values and environmentally conscious behaviors (Fryxell & Lo 2003).

Beyond education and economic development, another aspect of modernization, the advent of liberal democracy, has also been thought to have positive impacts on the environment. There is a burgeoning body of research which investigates this link (Li & Reuveny 2006; Payne 1995; Midlarsky 1998). Aspects of democracy such as representation and electoral accountability might and political participation should explain why countries with higher levels of democracy would be expected to have higher levels of environmental protections. In democratic societies government officials are representatives of the people. Thus, when running for political office these aspiring officials seek to develop broad-based political platforms in which citizens have interests. Environmental protections along with heath concerns are public goods that are likely to be included in such platforms as these issues are often intertwined (Burroway 2016).

According to modernization theory, as nations develop economically, socially, and politically, they will be more likely to institute policies that lend greater protections to the environment, including land conservation. Given this rationale, modernization theory posits that all nations are on the path to greater conservation. However, a contrasting point of view is provided by world-systems or dependency thinking. This branch of theory argues that not all nations are on a path towards greater development, and in fact, some nations will be structurally prevented from protecting their environments. We turn to a discussion of world-systems/dependency theory to highlight these arguments and give a contrasting approach to explaining cross-national trends in conservation according to a more critical theoretical framework.

4.2 Dependency/ World-Systems Theory and Limits to Conservation

World-systems/dependency theory arose in the 1960s and 1970s as a reaction to the failed promises of modernization theory. World-systems theory is a historically-oriented perspective that examines the fundamentally unequal relationships that exist between developed and less-developed nations. It argues that the roots and persistence of global inequality today lies in the foundations of capitalism and imperialism that date back hundreds of years (Frank 1967; Chase-Dunn & Grimes 1995; Wallerstein 2004). The modern world-system is a power hierarchy where core, or wealthy and powerful nations, dominate periphery, or weak and poor nations (Chase-Dunn & Grimes 1995; Frank 1967; Wallerstein 2004). The core/periphery hierarchy is reinforced through various mechanisms such as unequal exchange, neoliberal economic strategies, and levels and management of debt.

Overall, critical development scholars argue that not all nations are on a path to greater development, but are stuck in conditions of underdevelopment. This perspective argues that not all nations are going to be able to achieve greater conservation – the consumption of resources must come from somewhere, and degradation will remain concentrated in the poorest nations through unequal trade relationships or the global division of labor, where rich nations are able to externalize their environmental costs of consumption to poorer nations. Thus, while poor nations are still argued to have lower levels of conservation from this perspective, the mechanisms and overall expected trajectory of this is very different across these development approaches.

World-systems theory also highlights the role of debt and structural adjustment in shaping developmental outcomes. Many developing nations accrued high levels of debt throughout the late 20th century, as it was argued that international lending could jump-start development in so far as the loans were used to establish industries or expand primary sector exports. However, by 1986, Third World debts accumulated a total $1 trillion, and these nations had not gained significantly in export revenues due to declining terms of trade and other factors (McMichael 2012). As a response to the debt crisis, structural adjustment or conditionality requirements were adopted or forced upon many developing nations.

Structural adjustment policies represent austerity measures that are rooted in neoliberal approaches to development (McMichael 2012). These interventions provided for loan rescheduling and other provisions from agencies like the IMF,

however, receiving nations had to agree to certain terms that liberalized their economies in the effort to promote economic growth that would increase their ability to make loan repayments. Thus, governments were advised to liberalize trade, reduce tariffs on imported goods, give international businesses unfettered access to internal markets, devalue their currencies, privatize state industries, and further tie their prospects for economic development to the export market of primary goods (McMichael 2012). Essentially, these policies lead to a "shrinking of the state" (McMichael 2012:121).

Because Third World nations were so desperate to pay off debts and loans from major lenders, they were left with no other option than succumb to the terms required by these structural adjustment loans. This put the institutions such as the IMF in the "driver's seat", with the IMF assuming a "supervisory status" to implement these policies, which involved a "comprehensive restructuring of production priorities and government programs in a debtor country" (McMichael 2012:116). Neoliberalism became the leading ideology during this time, and the IMF and other related agencies "…became the new missionary institutions, through which these ideas were pushed on the reluctant poor countries that often badly needed their loans and grants" (Stiglitz 2003:13).

There is an extensive and growing body of research on the harmful effects of structural adjustment policies and other debt restructuring initiatives provided by institutions such as the IMF on outcomes such as child mortality, deforestation, maternal mortality, and urban slums (Shandra et al. 2011; Pandolfelli, Shandra, & Tyagi 2014; Shandra et al. 2010). Of particular relevance to this study, prior research demonstrates a link between structural adjustment and biodiversity loss in developing nations (Shandra et al. 2010). Some of the specific ways that structural adjustment or conditionality measures might impact strategies for conservation include the reduction of state capacity or funding and the privatization of state enterprises. There are a number of reasons why conservation depends on the power of the state and why a retrenchment of the state could have disastrous consequences for the environment. First and foremost, national parks depend largely on government funds for resources, staffing, and day-to-day operations (NWF 2015). Funding from national budgets provide the necessary resources for parks to operate and manage natural resources (NWF 2015). Since national parks are funded and looked after by the governments in their respective countries, they can be seriously affected by structural adjustment policies and the mandates to appropriate land for other purposes. Specifically, structural adjustment policies can increase pressure on nations to use land for economic growth by decreasing the capacity of developmental planning of the state and privileging the corporate sector (McMichael 2012:122). This shift in the control and use of land may divert land away from conservation and protecting biodiversity loss. When structural adjustment policies leave states with less or diminished power, their ability to protect and set aside land for national parks can be seriously impaired.

The provisions of structural adjustment loans could adversely affect conservation rates in additional ways. If states are required to dedicate more effort to producing and exporting raw materials to drive profits, they will be more in favor of destroying valuable forests and habitats instead of protecting them. A shrinking of the power of the state could also mean that there is less enforcement of areas designated for conservation. Privatization also decreases the capacity to plan and implement policies (McMichael 2012:122). The decline of the power and resources of the government gives them less power over what happens within their nation, including making and enforcing protections in terrestrial areas.

Instead of liberalizing nations' economies and promoting structural adjustment policies, a world-systems scholar might favor other strategies to encourage development and conservation. A strengthening of the state and government spending may be one solution to expand conservation areas. One way state spending or influence has been measured is through measures of domestic investment, such as gross capital formation (Jorgenson, Dick, & Mahutga 2007). Domestic investments are more likely to be invested back into a nation in ways that improve social and environmental services (Jorgenson et al. 2007; Kentor & Boswell 2003). We therefore expect a positive correlation between gross capital formation and protected land areas.

Overall, extreme levels of biodiversity loss and environmental decline demand that conservation rates be examined more closely. Currently, there is a lack of cross-national studies examining patterns in conservation, despite the importance of conservation to protecting biodiversity loss and other forms of environmental decline. Also, there is significant variation in levels of conservation across developing countries. Thus, more careful investigation of the economic, social, and political factors associated with conservation is greatly needed, and our key objective is to examine the influence of IMF structural adjustment on the percent of land area under conservation in poor nations.

5. Data and Methods

5.1 Sample

The sample in this analysis includes 86 less-developed countries, displayed in Table 1. We restrict our sample to less-developed nations as biodiversity hotspots are found in mainly in these countries (CEPF 2014). Most importantly, we focus on less-developed countries as these are the recipients of structural adjustment policies by the IMF

(McMichael 2012). The sample size for our study is somewhat limited due to a lack of data availability on some key control variables, such as schooling enrollments and gross capital formation. Despite this, our sample represents a fairly representative pooling of nations from across Latin America, Africa, and SE Asia, which represent key areas of biodiversity hotspots.

Table 1. Countries Included in the Analysis (N=86)

Afghanistan	Colombia	Guinea	Mozambique	Swaziland
Albania	Comoros	Guinea-Bissau	Nepal	Tajikistan
Angola	Congo (DRC)	Guyana	Nicaragua	Tanzania
Armenia	Congo, Rep.	Honduras	Niger	Togo
Bangladesh	Cote d'Ivoire	India	Nigeria	Tonga
Belize	Dominica	Indonesia	Pakistan	Tunisia
Benin	Dominican Rep.	Kenya	Paraguay	Uganda
Bhutan	Ecuador	Kyrgyz Rep.	Peru	Ukraine
Bolivia	Egypt	Lao PDR	Philippines	Uzbekistan
Bosnia and Herz.	El Salvador	Liberia	Rwanda	Vanuatu
Burkina Faso	Eritrea	Macedonia	Senegal	Vietnam
Burundi	Ethiopia	Madagascar	Serbia	Yemen, Rep.
Cabo Verde	Fiji	Malawi	Sierra Leone	Zambia
Cambodia	Gambia	Mali	Solomon Islands	Zimbabwe
Cameroon	Georgia	Mauritania	South Africa	
Central Af. Rep.	Ghana	Moldova	Sri Lanka	
Chad	Grenada	Mongolia	St. Lucia	
China	Guatemala	Morocco	St. Vincent	

5.2 Analytic Strategy

The analytic strategy used to assess variation in land conservation is OLS regression. This method is often utilized in comparative cross-national research as it is able to assess the effect of several predictors at once on the outcome variable, while controlling for the effects of the other predictors in the model (Allison 1999). In addition, assessing the cross-national predictors of land conservation is a new area of research and OLS regression provides a nice starting point upon which future analyses can build. There are five models that are estimated in this analysis below. The first model is considered our baseline model as it incorporates whether a country is under IMF structural adjustment, GDP per capita, the percent of the country that is forested, and the absolute value of a country's latitude. Additional control variables are entered in logical groupings in subsequent models. In Model 2, we add debt and gross capital formation, or domestic investment. Model 3 adds some non-economic indicators of modernization, such as schooling and democracy. Model 4 includes additional geographic control variables. The final model, Model 5, consists of all variables examined in the previous analyses. The dependent variable is measured in the year 2012 while the independent and control variables discussed below are measured in 2010 allowing for a clear temporal ordering. All variables were obtained from the World Bank World Development Indicators database (World Bank 2015) unless otherwise noted.

5.3 Dependent Variable

The key dependent variable in this analysis is *Terrestrial Protected Land Areas as a Percent of Total Land Area*. This is defined as areas that are at least 1,000 hectares in size and are either partially or totally protected by the national government. This variable excludes any marine, littoral, areas of the country that are unclassified, and areas that are protected by sub-national governments. Practically speaking, these are areas of a country that have been set aside as scientific reverses, national parks, wildlife reserves and sanctuaries, managed land for sustainable use, or other protected landscapes (World Bank 2015). This variable was retrieved from the World Bank's World Development Indicators databank although it was originally compiled by the World Resources Institute.

5.4 Independent Variables

The key independent variable in this analysis is *IMF Structural Adjustment*. This variable is a dichotomous indicator coded as "1" if a country is under a structural adjustment program in 2010 and "0" if it is not. This data was retrieved from the IMF data repository. It follows from dependency/ world-systems theory that countries that are under IMF mandated structural adjustment policies in 2010 will be less likely to set as areas of protected lands. Thus, we hypothesize that countries that are under SAPs in 2010 will have less protected are as a percent of total land than those countries that are not under SAPs.

GDP Per Capita is another key control variable in this analysis. This variable measures the monetary contribution of all residents to the country's economy and is expressed on a per capita basis. This is done by dividing the GDP for the country by the midyear population (World Bank 2015). We hypothesize that there will be a positive relationship between a country's GDP per capita and the percent of protected lands within a country.

An important control variable included in all models in this analysis is the *Forest Area Percent* or the percent of land area covered by forests in a country. To qualify as forest area, the land must be larger than .5 hectares and have trees at least 5 meters high and producing a canopy area of more than 10% of this area or at least have trees that can reach these standards. In addition, it is does not include land that is currently utilized for agriculture or urban use. We hypothesize that countries with higher percentages of forest area will also have higher percentages of terrestrial protected areas, as forested areas are often targets as biodiversity hotspots in need of protection.

We also include the variable *Latitude (Absolute Value)* in all models in this analysis to control for location in tropical zones. Countries closer to the equator are likely to have more biodiversity hotspots and have increased efforts to or pressures for land conservation (CEPF 2014; Myers et al. 2000). Each country's latitude was obtained from the CIA World Factbook and then we created the absolute value for each estimate.

We also consider *External Debt Stocks as a Percent of GNI* to further examine how economic dependencies negatively impact the percent of land that is protected. This indicator accounts for all debt within a country that is owed to parties not residing in the country and is expressed as a percent of the country's gross national income (GNI). As with SAPs discussed above, we hypothesize that those countries which are more heavily in debt will be less likely to designate lands as protected.

Gross Capital Formation is included in this analysis as an indicator of a country's spending on fixed assets in the economy. These domestic investments include infrastructure such as hospitals, machinery, railways, roads, and also include improvements to land such as fences, drainage ditches, etc. We hypothesize that gross capital formation will be positively associated with the percent of protected lands within a country as these investments can also include spending to protect land area.

As discussed above, there is likely to be a positive relationship between schooling and the percent of land area that is protected within a country. We utilize the *Gross Enrollment Rate in Primary Education* as our indicator of education as this variable has better coverage than other indicators of education in less-developed countries. This variable refers to the total amount of people in school, regardless of age, compared to the age-appropriate population (World Bank 2015). We hypothesize that a more educated populace is more likely to be more knowledgeable about environmental issues, including the importance of biodiversity. In addition, it is likely that better attendance at school is also likely to be associated with higher percent of land protected as those in school will be less likely to be working formally or informally in export agriculture. We also test models using a measure of secondary school enrollments. Our substantive results did not change when we utilized gross enrollment in secondary school, but our sample was even further diminished as data availability is poorer with secondary education in less-developed countries. Thus, we utilize primary school enrollments in the final analyses to boost our sample size.

A country's *Level of Democracy* is also likely to be associated with protection of land area within a country. To measure democracy we use data from Freedom House's *Freedom in the World 2010* report. It is standard practice by cross-national researchers to average the estimates for indicators of civil liberties and political freedoms to measure the level of democracy. The scores are coded 1 to 7 with 1 indicating highest level of political rights and civil liberties and 7 indicating the lowest levels of each. These scores were reverse coded to indicate that higher levels represent higher levels of democracy. Previous analyses have shown that higher levels of democracy to be associated with lower levels of deforestation (Li & Reuveny 2006).

We also take into account additional geographic variables, including location in were *Sub-Saharan Africa*, *Latin America*, and *SE Asia*. Each of these are dichotomous variables that indicates whether a country belongs to either of these two regions. We include these measures to investigate if certain regions have increased land area under conservation than others.

We tested multiple other variables that we chose not to include in our final models because of a lack of statistical significance. Some of the variables that we tested in earlier models include: GDP per capita Growth, Agriculture (% of GDP), Secondary School Enrollment, Tertiary School Enrollment, Population Growth, Rural Population Percent/ Urban Population Percent, Rural Population Growth, Deforestation, CPIA Policy Rating, CPIA Transparency Rating, Debt Service, FDI Stocks, the Percent of Women in the Lower House of the Legislature, and location in Southeast Asia. Including these variables in models did not impact the statistical significance of factors reported here. While these variables did not alter our substantive findings of interest, their lack of statistical significance led to their exclusion from our study in effort to maintain parsimony.

6. Results

The correlation matrix and descriptive statistics for all variables utilized in the analyses are displayed in Table 2. For the sample of 86 less-developed countries included in this analysis, there is an average of 13.4% of land area that is

nationally protected. The countries with the largest percentage of nationally protected land area in the sample were Zambia (37.8%), Belize (36.7%), Tanzania (32.2%), Guatemala (30.9%) and Nicaragua (30.8%). The countries at the other end of the spectrum consist of Afghanistan (0.4%), Mauritania (0.6%), Yemen (0.8%), Bosnia and Herzegovinian (1.5%) and Grenada (2.2%). These figures present marked differences in the amount of land area which is nationally protected within the sample of less-developed countries. In terms of IMF structural adjustment policies, of the 86 countries in the sample 42 were under IMF structural adjustment in 2010. None of the variables in the analyses were excessively skewed so the variables included are in their original units.

The results from the OLS regression models are presented in Table 3. The estimation strategy consisted of first running a baseline regression model (Model 1) which predicts, terrestrial protected land, predicted with four key variables: whether a country is under IMF structural adjustment, GDP per capita, the percent of the country that is forested, and the absolute value of a country's latitude. Other predictors taken from the literature are entered into the analysis in a step-wise manner to avoid issues of multicollinearity. The final model, Model 5, contains all of the variables from the previous models. All of the hypothesis tests are two-tailed and the regression coefficient estimates are flagged for statistical significance. In addition, the standard errors are italicized, the standardized coefficients are reported in parentheses, and the variance inflation factors (VIFs) are presented in square brackets. The standardized coefficients are useful in that they enable comparisons of the relative importance of the predictors of the model. In reporting the VIFs, it is important to demonstrate that the results were not driven by multicollinearity, as the VIFs are in an appropriate range. The table also reports the number of countries in each of the models so that it is clear that the sample remains consistent in size and composition. In addition, the mean VIF and the amount of variance in conserved land area that is explained by the predictor in the model (R^2) are also reported at the bottom of each model.

Overall the results presented in Table 3 demonstrate that countries that are under IMF structural adjustment have less terrestrial protected land area, on average, than countries that are not under conditionality policies. These results are consistent and robust across all of the five models examined. In Model 1, for countries under IMF structural adjustment the statistically significant coefficient is -4.311, meaning that these countries have, on average, 4.3 percent *less* terrestrial protected land area than countries that are not under IMF structural adjustment, holding other factors constant. This result is consistent with our hypothesis that these countries have less resources available for environmental protections of land area due to increased fiscal austerity and that there may be pressures to use land to increase exports to increase revenues.

Taking a closer look at each model, the results presented in Model 1 demonstrate that in addition to IMF structural adjustment, the percent of forested land within a country and latitude are also associated with protected lands within a country. The percent of forest area has a positive association with protected land area, demonstrating that nations with larger forests tend to have more land under conservation or protection. The coefficient for the absolute value of latitude is negative and significant indicating that land conservation tends to decrease with distance from the equator or tropical zones, controlling for other variables in the model. In this model and in many subsequent models, GDP per capita has no significant association with protected land area when taking into account the other predictors.

Table 2. Correlation Matrix and Univariate Statistics

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	Protected Areas in 2012	1										
(2)	IMF Structural Adjustment	-.239	1									
(3)	GDP per capita	-.040	-.284	1								
(4)	Forest Area Percent	.334	-.097	.215	1							
(5)	Latitude (Absolute Value)	-.338	.044	.21	-.356	1						
(6)	External Debt Stocks (% GNI)	-.028	.176	.134	.193	.38	1					
(7)	Gross Capital Formation	.013	-.247	.101	-.062	.194	-.108	1				
(8)	Schooling Enrollments	.129	-.027	.046	.149	-.098	-.063	.16	1			
(9)	Democracy	.065	-.026	.498	.234	-.015	.168	.141	.141	1		
(10)	Sub-Saharan Africa	.114	.326	-.49	-.087	-.484	-.231	-.192	-.159	-.219	1	
(11)	Latin America	.264	-.228	.551	.349	-.207	.145	-.123	.14	.45	-.415	1
	Mean	13.42	.49	2275.8	32.35	18.44	43.14	23.89	105.65	4.03	.43	.19
	S.D.	9.10	.503	1911.8	22.10	12.64	25.88	9.64	16.33	1.57	.50	.39

In Model 2, additional financial variables, external debt stocks as a percent of GNI and gross capital formation, are examined with the above variables in the baseline model. Neither of these two additional variables are statistically significant and do not impact the associations identified in Model 1. In Model 3 we examine whether additional indicators of modernization, including schooling and a country's level of democracy, impact on the percent of a country's land that is nationally protected. We find that neither of these measures are significant in impacting the amount of land under protection in developing nations, despite our predictions concerning modernization theory. Again, the associations involving IMF structural adjustment, forest area, and latitude remain consistent in this model.

Table 3. OLS Regressions Predicting Terrestrial Protected Land Areas (% Total Land) in 2012

	Model 1	Model 2	Model 3	Model 4	Model 5
IMF Structural Adjustment	-4.311*	-4.447*	-4.481*	-5.294**	-5.175*
	1.864	*1.971*	*1.902*	*1.912*	*2.066*
	(-0.238)	(-0.246)	(-0.248)	(-0.292)	(-0.286)
	[1.10]	[1.21]	[1.13]	[1.23]	[1.39]
GDP Per Capita	-0.001	-0.001	-0.001	-0.001+	-0.001+
	0.001	*0.001*	*0.001*	*0.001*	*0.001*
	(-0.12)	(-0.119)	(-0.159)	(-0.252)	(-0.25)
	[1.27]	[1.27]	[1.68]	[1.84]	[2.16]
Forest Area Percent	0.108*	0.093+	0.102*	0.110*	0.104*
	0.046	*0.05*	*0.046*	*0.045*	*0.05*
	(0.262)	(0.226)	(0.248)	(0.268)	(0.253)
	[1.27]	[1.50]	[1.30]	[1.34]	[1.58]
Latitude (Absolute Value)	-0.15+	-0.190*	-0.142+	0.023	0.022
	0.08	*0.095*	*0.081*	*0.105*	*0.123*
	(-0.209)	(-0.264)	(-0.198)	(0.032)	(0.031)
	[1.28]	[1.77]	[1.30]	[2.35]	[3.13]
External Debt Stocks (% GNI)		0.033			0.01
		0.042			*0.043*
		(0.093)			(0.027)
		[1.48]			[1.61]
Gross Capital Formation		0.037			0.07
		0.1			*0.104*
		(0.039)			(0.074)
		[1.15]			[1.30]
Schooling Enrollments			0.036		0.048
			0.056		*0.057*
			(0.064)		(0.086)
			[1.04]		[1.13]
Freedom House Democracy			0.395		-0.033
			0.684		*0.705*
			(0.068)		(-0.006)
			[1.42]		[1.58]
Sub-Saharan Africa				5.036+	5.705*
				2.686	*2.817*
				(0.276)	(0.312)
				[2.39]	[2.54]
Latin America				8.452*	8.829*
				3.265	*3.589*
				(0.364)	(0.380)
				[2.18]	[2.55]
Constant	16.099***	15.087***	11.301+	10.997**	3.786
	2.705	*3.646*	*6.521*	*3.72*	*7.632*
N	86	86	86	86	86
Mean VIF	[1.23]	[1.40]	[1.31]	[1.89]	[1.90]
R^2	0.22	0.226	0.228	0.286	0.299

Notes. Estimates Flagged for Statistical Significance + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Standard errors italicized; Standardized Coefficients in Parentheses; VIFs in brackets

We add two regional control variables in Model 4, Sub-Saharan Africa and Latin America (we also tested for the influence of SE Asia, but it was not statistically significant). We find that both location in Sub-Saharan Africa and Latin America have a positive and statistically significant effect on the percent of land that is protected within a country. Sub-Saharan Africa countries have on average 5 percent more protected land area than countries that are not in these regions and the effect of Latin America is even larger in that countries located in this region have on average 8.5 percent more protected land as a percent of total land than countries not in these regions. We note that the variable latitude is no longer significant in Model 4. We suggest that latitude is capturing the tropical areas that are found in these key regions of Latin America and Sub-Saharan Africa, thereby causing latitude to become non-significant once these regions are controlled for in the model. In addition, GDP per capita becomes statistically significant and suggests that developing nations with higher GDPs have less land area under conservation. This finding is counter to what we initially hypothesized, but may speak to the pressure that middle-developed nations face in harnessing export revenues and expanding economic growth at all costs (e.g. Wallerstein 2004).

The final model containing all variables in this analysis is presented in Model 5. The key finding IMF structural adjustment remains robust when controlling for all of the variables in prior models. In addition, we note that the VIF for

structural adjustment in Model 5 is modest, at 1.39, which lends further confidence that these findings are not driven by multicollinearity. Other findings that are consistent with earlier models include effects for forest area, location in Sub-Saharan Africa, and location in Latin America. As in Model 4, we also find in Model 5 a modest, negative influence of GDP per capita, net of other factors.

7. Discussion and Conclusion

Globally, conservation is the most popular strategy or environmental policy aimed to address issues of biodiversity loss and ecosystem decline (e.g. Chivian & Bernstein 2010; Meyers et al. 2000; UN Environment Programme 2011). Despite the popularity of conservation efforts, to the best of our knowledge, this is the first study to attempt to understand what factors explain rates of land conservation across nations. As threats to biodiversity and conservation continue to increase, especially in poor countries most vulnerable to environmental degradation (e.g. Meyers 2009), it is critical that attention is paid to macro-level policies that influence land conservation rates in developing nations which contain the largest global reserves of resources and biodiversity.

Based on the results of the regression analyses, we find substantial support for the ideas of world-systems/dependency theory concerning the harmful impacts of structural adjustment policies or economic conditionality measures. Our main variable of interest, IMF structural adjustment, has consistent and robust negative impacts on the percent of land area that is under conservation in developing nations. In other words, less-developed nations undergoing structural adjustment have less land set aside for conservation than countries who are not under austerity measures. This is likely because of the features of structural adjustment policies described earlier, including the reduction of state capacity for funding resources, staffing, and day-to-day operations in national parks or conservation areas. Additionally, structural adjustment policies can increase pressure on developing nations to use land for economic growth or corporate interests through expanding agriculture, harvesting mineral or other raw materials, or creating export infrastructure.

Given the existing literature on structural adjustment policies and other neoliberal strategies for economic liberation, it is clear that steps need to be taken to prevent future environmental injustices and degradation. One important policy recommendation to prevent further environmental damage is to forgive debt in poor nations. Relatedly, some conservations efforts in developing nations have been enabled through debt-for-nature swaps (e.g. Dobson 1996; The Nature Conservancy 2010). Debt-for-nature swaps occur when a conservation organization acquires the debt at a discounted rate and the debtor country redeems the debt by supplying land for reserves and funds for people to manage, monitor, and protect those reserves. In practice, debt-for-nature swaps have helped many less-developed nations alleviate debt and increase conservation, as in the case of Costa Rica (The Nature Conservancy 2010). In this instance, the Costa Rican government and the U.S. Treasury agreed upon a debt-for-nature swap to alleviate debt and instead devote funds to marine and terrestrial protected areas (The Nature Conservancy 2010). Debt-for-nature swaps are excellent initiatives for resolving issues of debt for developing nations, while at the same time promoting environmental protection and conservation.

Based on the themes echoed in world-systems and dependency analysis, we hypothesized that gross capital formation would have a positive effect on terrestrial protected land areas and that the level of debt would have a negative influence. However, we did not find empirical support for either of these propositions. Since structural adjustment policies are not necessarily determined by the level of debt, there could be some inconsistency between the results for debt and structural adjustment. Additionally, structural adjustment policies are often undertaken in nations that have a long history of being unable to make debt or interest repayments; thus the measure used here of total debt for the year 2010 may not adequately capture this. The non-significant findings for gross capital formation, or domestic investment, may imply that governments in developing nations are not using domestic resources for land conservation. As described earlier, perhaps needs that are perceived as being more immediate, such as for roads, housing, education, or medical services are taking priority over environmental concerns in poorer nations. Future research should examine these themes, including examining the role of other forms of structural adjustment, such as structural adjustment from other agencies, like the World Bank, or the influence of other neoliberal strategies for development on land conservation in developing nations.

Likewise, we find a lack of statistical significance for a number of other indicators included in the models, such as modernization factors related to education enrollments and level of democracy, as well as inconsistent and weak, negative impacts of GDP per capita. In some ways, these are surprising and disheartening findings, and overall suggest that improvements in income, education, or democratic rights do not translate into increased environmental protections in developing nations. In fact, the negative association involving GDP per capita in some of the later models may suggest that the most economically advanced developing nations fail to make conservation a priority, or may be reminiscent of the environmental Kuznets curve. Taken together, the findings involving schooling and democracy, as well as inconsistent effects of GDP per capita, provide a lack of support for modernization theory overall, or the ideas

that expansions in democratic rights or education will automatically lead to better protection for the environment in developing nations, at least in the case of land conservation.

Taken together, the findings for forest area percentage, latitude, and location in Sub-Saharan Africa or Latin America, together show that countries with large forested areas and those in Sub-Saharan Africa and Latin America or closer to the equator are more likely to have land under conservation. We speculate that these findings speak to the fact these areas often represent biodiversity hotspots (CEPF 2014), and therefore have received extra attention to conservation efforts, perhaps by international organizations. Increases in terrestrial protected areas among topical, forested nations in key geographic zones may also be driven by an emphasis on ecotourism or environmental or wildlife tourism more broadly. As an example, the two of the nations with the highest percentages of terrestrial protected areas in this study are Tanzania and Belize, which also have extensive ecotourism programs (Sood 2012; The International Ecotourism Society 2014). These nations dedicate a significant percentage of their land to conservation as ecotourism has significant economic benefits (Sood 2012). However, even nations rich in biodiversity that benefit from ecotourism, poverty, governance issues, a lack of resources, and other neoliberal development pressures can place great strains on conservation efforts (The International Ecotourism Society 2014). Indeed, after controlling for these factors, we still find robust impacts of IMF structural adjustment; therefore for nations under structural adjustment policies, it may be increasingly difficult to preserve land and biodiverse zones needed to develop ecotourism industries and attract tourism revenues.

One of the limitations to this study is the availability of data. For some measures, data was only available for some nations, limiting the sample size. Concerns with data availability also limited our study to a cross-sectional analysis. Also, based on the nature of the study, we are limited to data that is publicly available. It is therefore impossible to gather data on other measures that may have been relevant to this study, such as level of enforcement in conservation areas, or the amount of spending on conservation. In addition, we would have liked to include a measure of environmental organizations or environmental NGOs; we did test earlier models utilizing a measure of environmental NGOs, but the data was too thin and dramatically reduced the sample size (about 25 cases). We encourage future work to more explicitly consider the role of environmental groups in creating pressures in developing nations to promote and enforce conservation efforts, especially in light of our results that suggest that countries in key geographic zones or with abundant forests are more likely to have land under conservation.

At a time when species are being extinguished at unprecedented rates, we must take into consideration any and all factors that may adversely affect our ability to conserve biodiversity. Chief among these is the negative impact of structural adjustment. As the phrase the "Sixth Extinction" aptly draws our attention to the fact that we are currently experiencing a mass extinction, we emphasize and acknowledge that human activities are responsible for causing it (Kolbert 2014). Perhaps there is some hope at the global level, as a few global financial institutions are realizing the limits to economic austerity measures like structural adjustment. For example, the current president of the World Bank, Jim Yong Kim, is prioritizing ending extreme poverty and focusing on financial strategies in local contexts, stating that "…there's no one-size fits all" (Lowrey 2012). Kim has also made strides to eliminate structural adjustment programs from the World Bank; whether or not similar protocols will be undertaken with other institutions, like the IMF, remains to be seen. Certainly, we must continue to carefully invest resources in preserving the natural environment, rather than using it for short term economic gains, especially in poor nations where pressures to transform natural resources into export revenues are strongest. Failure to guard natural endowments and protect biodiversity will likely only lead to limited or very short-lived economic growth, as developing nations spoil what could be their key assets.

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