Money Growing on Trees:

A Study of Debt-to-Nature Swap Participants

by

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Abstract
This thesis studies the characteristics that make a country more likely to participate as the debtor party in debt-to-nature swaps. A debt-to-nature swap is a financial instrument that involves the forgiveness of a debtor country's debt in exchange for local investments in environmental conservation and sustainability. Explanatory variables used in this study include quantitative country characteristics such as GDP per capita and foreign direct investment; and qualitative attributes such as a country's environmental policy and developmental stage. To estimate the relationship between the response variable of DNS participation from1987 to June 2008 (1=yes, 0=no) and a set of independent variables, the binary logistic regression model was used. Correlation tables and the more traditional ordinary least squares regression model were used to estimate the relationship between the number of DNSs in which a country has participated during the same time period and the independent variables. These methods were performed on two datasets: one including high-income countries as defined by the World Bank and another excluding these countries. The results of this study suggest that debtor countries tend to fall within a middle range of development. Several variables, such as developmental stage and CO2 emissions per capita, support this observation. In addition, the environmental motives of DNSs seem to outweigh those involving debt burdens. The number of threatened species in a country as well as the amount of nationally protected areas increases the likelihood that a country is a participant. The quality of a country's environmental policies, its magnitude of debt burden, and the amount of foreign direct investment inflows seem to have a positive effect on the number of DNSs in which a country participates. These results can help identify potential swap participants in the future as well as encourage the use of DNSs as a significant tool against the degradation of the environment today.

I would like to express my sincere appreciation to my thesis advisor, Professor Lawrence White, for his guidance, insight, patience, and encouragement. His consistent editing and valuable input has helped shape this paper into what it is today. I would also like to thank Professor Marti Subrahmanyam, Jessie Rosenzweig, the seminar speakers, and my fellow classmates for making this program successful.

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Introduction

The health of the environment has become an important issue in modern society. Environmental degradation, depletion of resources, and the disappearance of numerous species are just a few of the problems that humanity is facing today.

In the mid 1980s, a financial instrument known as the debt-to-nature swap (DNS) was conceived. These swaps, which involve the forgiveness of a debtor country's debt in exchange for local investments in environmental conservation, might offer a solution for debtor countries that are inundated with debt, as well as an answer to some of today's environmental issues. Throughout the past few decades, numerous DNSs have occurred. Debtor countries that have been involved have ranged from Central American countries such as Costa Rica to European countries such as Poland.

This paper attempts to explain what characteristics make these debtor countries more likely debt-to-nature swap participants and why they enter into such agreements. Variables that are explored include quantitative measures such as debt balances and gross domestic product. Qualitative characteristics are also used as explanatory variables by utilizing numerical ratings created by specific outside indexes and reports such as the Global Competitiveness Report. The binary logistic regression model, the ordinary least squares regression model, and correlation tables are utilized to analyze the data.

By identifying common characteristics found among debtor countries that are involved in DNSs, other developing countries can be targeted as candidates for future swaps. Perhaps there are

cultural and demographic features that contribute to a debtor county's willingness to participate. If these characteristics are lacking in nonparticipating developing countries that exhibit environmental degradation, then this research can determine what characteristics within these countries need to be changed first. Through these "qualifications," one can infer why certain countries have not been involved in these swaps and what countries may be good potential candidates. Other relevant contributions of this paper flow from the fact that natural resources are a major component of this type of swap. With the issues of global warming and environmental degradation becoming more prevalent in today's popular culture, debt-to-nature swaps can help combat the environmental challenges that the world will face in the future.

Background

The debt-to-nature swap (also known as the debt-for-nature swap or the debt-for-environment swap) was created in 1984 by Thomas Lovejoy, Vice President of Science for the World Wildlife Fund for Nature (WWF). Modeled after the debt-to-equity swap and other similar financial transactions, the debt-to-nature swap involves the cancelling of a debtor country's foreign debt in exchange for a specified amount of local currency (usually from the debtor country's government). In accordance with the contractual agreements created by these swaps, the local currency is then invested in an environmental conservation program or project in the debtor country. Such projects include, but are not limited to, resource management programs, environmental education programs, the proliferation and maintenance of protected areas, and the training of natural park personnel.

Initially, debt-to-nature swaps were conceived as an outlet for developing countries in the 1980s. Many of these countries were simultaneously inundated with large amounts of debt and environmental degradation. The debt crisis of the early 1980s was an indirect result of the economic growth efforts of developing countries in the 1970s. During this time, developing countries borrowed extensively from western banks to invest in infrastructure and industry projects. However, in the early 1980s the demand for products from developing countries declined, leaving developing countries with less income to pay off their foreign debt. Furthermore, Thapa's study shows that there is a positive correlation between the debt crisis and the environmental degradation experienced during this period. [1] Austerity programs mandated by the IMF and the World Bank during this time actually forced developing countries to use their natural resources. For example, tropical forests were cut down for wood exports and fertile land was cultivated to grow cash crops.

The first debt-to-nature swap was completed in 1987 between Conservation International (CI) and Bolivia. In this swap, CI paid $100,000 to buy $650,000 (nominal) worth of Bolivian foreign debt on the secondary market. Citibank Investment Bank brokered the debt to CI. The $650,000 debt was then forgiven by CI. In return, the Bolivian government agreed to establish an endowment account of about $250,000 in local currency. This money was used to protect the Beni Biosphere Reserve. Other provisions of this unprecedented swap included policy reform changes aimed at reinforcing and strengthening legal regulations for park protection.[2] Throughout the past two decades, over 120 debt-to-nature swaps involving about thirty-six

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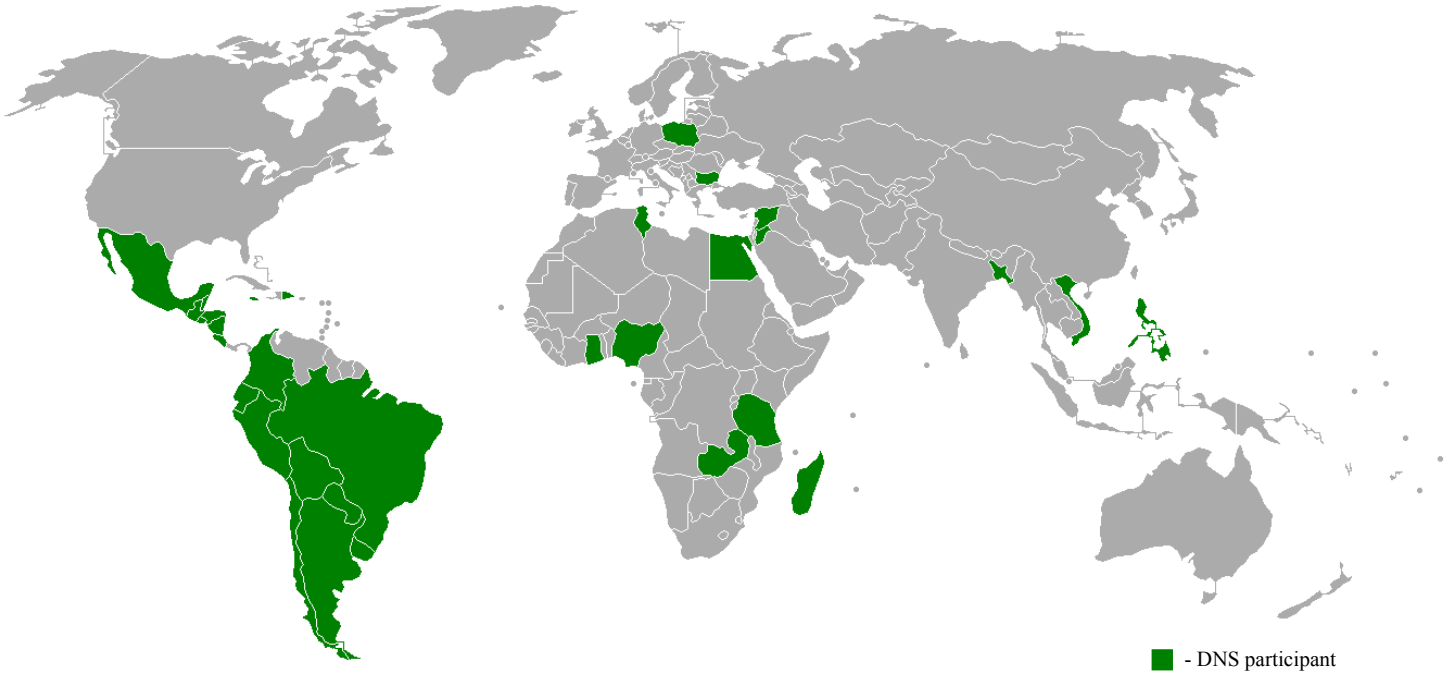
[1] Thapa, Brijesh. "The Relationship Between Debt-for-Nature Swaps and Protected Area Tourism: A Plausible Strategy for Developing Countries." *USDA Forest Service Proceedings*. RMRS-P-0. 2000. 2 November 2008 < *www.fs.fed.us/rm/pubs /rmrs_p015_2/rmrs_p015_2_268_ 272 .pdf*>.

[2] Rosen, Sydney, Simon, Jonathon L., Thea, Donald and Zeitz, Paul. "Exchanging Debt for Health in Africa: Lessons from Ten Years of Debt-for-Development Swaps." Working Paper No. 732. *Harvard Institute for International Development*. 1999.

different debtor countries have occurred. The map below indicates those debtor countries that have participated in DNSs.



Structure of the Debt-to-Nature Swap

The typical debt-to-nature swap can be found in two different forms/structures: bilateral/multilateral swaps or third-party/commercial swaps. Bilateral/multilateral swaps involve direct exchanges between the creditor country(ies) and a debtor county, while third-party swaps usually involve non-governmental organizations (NGOs) such as CI or the WWF. Although individual debt-to-nature swaps differ from one another, there are several steps that usually occur:

1. The indebted country creates guidelines for a DNS program and asks for participation from conservation organizations.

2. An international conservation program and local organizations (public and private) reach an agreement for a program.
3. Participating organizations verify that sufficient funding will exist for the purchasing of the debt or that debt donations or forgiveness (partial) may be possible.
4. Partners request approval for the swap from the local government (central bank or ministry of finance) and sometimes from the government ministry that has jurisdiction over the sector where the proceeds will be used.
5. Specific terms are negotiated (exchange rate, redemption rate, local investment instrument). The purchase price is determined by the secondary market price. The redemption rate determines the amount of conservation funds generated by the swap (it is the percentage of the face value debt that is redeemed in the local currency). The redemption rate must exceed the purchase price (rate) by a large enough margin to make the swap worthwhile. Other specifics such as the sequence and timing of debt retirement, the organization that will receive and administer the domestic currency, and the structure of the counterpart fund are designated.
6. The debt is acquired and presented to the central bank of the indebted country, which cancels the debt and provides funds in the local currency (cash or bonds).
7. Conservation programs and projects are implemented over an agreed-upon time period.[3]

There is also a distinction between *private* debt swaps and *public* debt swaps. Private debt swaps involve at least two or more non-governmental parties. Typically, a private swap would be negotiated between a creditor country NGO and a debtor country NGO in conjunction with the

[3] Resor, James P. "Debt-for-nature swaps: a decade of experience and new directions for the future." *Unasylva - No. 188 - Funding Sustainable Forestry.* Food and Agriculture Organization of the United Nations Corporate Document Repository. 2 November 2008. <http://www.fao.org/docrep/w3247e/w3247e06.htm>.

government of the debtor country. A public swap transaction, on the other hand, involves a debtor country government and a creditor country government or group of governments, such as the Paris Club and/or intergovernmental organizations like the World Bank. NGOs are usually not involved in public debt swaps, although the local currency funds generated can be given to NGOs to implement the conservation programs agreed to in such swaps. Most swaps are composed of two components: the "debt component" where debt relief occurs; and the "swap" component where the local currency fund is distributed to different projects.[4]

Benefits of Debt-to-Nature Swaps

The conservation of nature and its resources becomes more important as the world becomes more interconnected and resource stocks start to disappear; the debt-to-nature swap aims to capture the benefits of a healthy natural environment. Although the implications of environmental degradation are not fully known, human society depends on nature in many respects. For example, tropical rainforests cover about seven percent of the earth's landmass. However, they contain about half of all known species of plants, many of which contain medicinal properties. In fact, about 120 different prescription drugs are derived from tropical plants found in rainforests. Scientists believe that there are thousands more herbs and plants with medicinal properties that have not yet been discovered.[5]

The environment is also responsible for regulating the weather, distributing nutrients, and absorbing harmful substances such as pollutants. However, disturbances such as deforestation in

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[4] Rosen et al., 1999.

[5] West, Larry "Tropical Rainforests: Natures Medicine Cabinet: Preserving Rainforests May Be a Matter of Life and Death for Future Generations" *About.com: Environmental Issues*. 2 November 2008. < http://environment.about.com/od/healthenvironment/a/rainforest_drug.htm>.

developing countries have led to unfavorable phenomena such as global warming, local climate changes, decreased precipitation, erosion, and tainted water sources. In addition, since about 50% of all species are found in forests, envionmental degradation in developing countries has therefore led to an increase in the number of extinct and endangered species.[6] Conservation programs resulting from debt-to-nature swaps are meant to curtail and (hopefully) reverse many of these problems.

On the surface, debtor countries mostly benefit from DNSs because the transactions help reduce debt balances. However, many debtor countries experience benefits beyond just a reduced debt burden. It has been shown that debt-to-nature swaps can cause favorable cascading effects and can be welfare improving if implemented correctly.[7] In fact, protected areas established through debt-to-nature swaps have helped several developing countries boost their economic outlook. Several countries, such as Costa Rica, have experienced increases in tourism—more specifically, culturally/environmental-based tourism and eco-tourism, within the past decade; debt-to-nature swaps have contributed to this growth in participating debtor countries. In fact, environment-based tourism has experienced 10%-30% increases per year, which is 2-5 times larger than the overall tourism growth rate. National environmental parks and increased eco-tourism have created tangible benefits such as increased employment and income opportunities through heightened demand for lodging, food, and other goods and services related to tourists. DNSs have frequently been cited as sustainable development tools that can potentially, if implemented rapidly, reduce the universal debt burden by roughly US$200 million per year while increasing funds for environmental organizations at a similar rate. It has also been argued that these swaps

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6 Thapa, 2000.

7 Garvie, Devon A. "When are Debt for Nature Swaps Welfare-Improving?" *International Review of Economics and Business*, 2002, 49(2), 165-173. 2 November 2008. < http://www.econ.queensu.ca/faculty/garvie/mini/garviedfns.pdf>.

can help facilitate investment in tourism at the international level via conservation of forests and wildlife. [8]

How does a creditor country benefit from a debt-to-nature swap, especially when the debt in question is either bought at a discount or cancelled altogether? Creditor countries measurably benefit when debt is bought at a discount because, in many cases, it is assumed that the debtor country would otherwise default on the full amount. The time value of money explains why creditor countries prefer to have money at the time of the swap rather than wait for future payments (which may not even occur). Therefore, partial collection is more favorable than the alternative. When the debt is cancelled without the buying of debt, the creditor country is most likely aiming to foster closer relations with the debtor country in other respects (political, economic, etc.). In addition, many of these creditor countries are interested in implementing policy initiatives that involve the environment and natural resources.

Arguments Against and Limitations of Debt-to-Nature Swaps

Although the debt-to-nature swap seems to be a win-win situation on the surface, there are several drawbacks and limitations to such transactions. One of the most controversial arguments against DNSs is the notion that they mostly serve the interest of the creditor country. Some argue that DNSs impinge on national sovereignty and are simply a euphemism for "eco-colonialism," where debtor countries sometimes cede land to their richer counterparts. Others say that DNSs

[8] Thapa, 2000.

are wrong because they help impose the environmental goals of rich countries on poor countries, thereby serving the richer creditor countries and their resource needs. [9]

In addition, property rights are also an important issue/limitation. Property rights can work for NGOs that are interested in arranging DNSs, where NGOs purchase rights to use habitats and then retire them. However, when property rights to land or resources are misunderstood, DNSs may become ineffective. Many argue that DNSs are not sustainable because of property rights *a priori* and poor enforcement and monitoring *ex post*. For example, in Bolivia, much of the land that was to be "protected" under the 1987 DNS was owned by the indigenous Chimane people. Because the Chimane possessed extraction rights to the land, Conservation International and the Bolivian government were unable to enforce the protection of these forested areas—this became a huge embarrassment to the swap parties, and ironically, the first-ever DNS was considered a failure. When local customs and practices involving property rights are ignored, it is hard for local communities who "own" the land to understand the benefits of such agreements and preservation.[10]

As Hobbs quotes from Simpson (2004), "First and foremost, the local people whose actions determine the survival of biodiversity must be compensated for the opportunity cost of preservation." Hobbs also states that "(when) indigenous populations have been included in the initial negotiations and subsequent monitoring of DNSs, the results seem to be markedly better." Therefore, in order for DNSs to be successful and sustainable, it is important that swap parties

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[9] Hobbs, Bradley K. "Debt-for-Nature Swaps: The Case for Property Rights." Laissez-Faire. No. 22-23. *Universidad Francisco Marroquín* . 2005. 2 November 2008. < http://fce.ufm.edu/publicaciones/laissezfaire/22-23/LF-22.8_(Hobbs).pdf>.

[10] Hobbs, 2005.

understand the fundamentals of property rights and the impact that DNSs will have on the local population. As shown through experience, the monitoring and enforcement of DNS provisions can only be enforced and implemented by those impacted the most: the locals. Consequently, it is best to involve local stakeholders from the beginning.[11]

Other limitations found in debt-to-nature swaps (mostly for private debt swaps and to a lesser extent public debt swaps) are listed below:[12]

- One limitation is the lack of performance indicators and/or required outcomes delineated or specified in the swap agreements. This is mostly due to the fact that environmental results and outcomes are hard to measure; hence, having such provisions will ultimately lead to arguments over fulfillment. In the case of private swaps, NGOs would not be authorized to enforce such performance indicators. Instead, swap agreements can only specify inputs (personnel trained, area protected, number of parks, etc.).
- Another limitation, mostly pertaining to private debt swaps, as mentioned above, is the lack of enforcement provisions in swap agreements. Public debt swaps usually do not have this limitation because creditor countries are able to enforce performance and implement a "pay as you go" schedule. In other words, the creditor country can deem the swap void if the debtor country is not meeting its environmental program obligations.
- Because of the lack of enforcement authority, most private debt swaps must have short-term and discrete goals. Policy reform is especially hard to enact for private swaps as governments have many stakeholders to answer to, not just the environmental NGOs that set up these swaps. The first debt-to-nature swap attempted to push policy reform;

[11] Hobbs, 2005.
[12] Rosen et al., 1999.

however, it was considered a failure. On a related note, conservation funds established during DNS agreements are inherently at risk of being expropriated by the debtor country government. Although this has not yet happened, it is a real political risk that can threaten a DNS's integrity.

- A lesser concern is the claim that DNSs can become inflationary if debtor countries decide to print money in order to establish local currency funds. However, given the relatively small magnitudes of such swaps, this limitation has not historically been an issue.

Hypotheses

This paper attempts to explain what characteristics make debtor countries more likely to be participants of debt-to-nature swaps. Numerous hypotheses will be tested; they include the following:

Debtor country participants are more likely to be in the earlier stages of development.

The Global Competitiveness Report (GCR) separates 135 different countries and economies into three different developmental stages: the factor-driven stage, the investment-driven stage, and the innovation-driven stage. The first stage is known as the factor-driven stage, where the dominant basis of competitive advantage arises mostly from physical types of resources such as natural resources and labor. In this stage, economies are very sensitive to world economic cycles, technology is minimal, and products are simple in nature.

The second stage of development is known as the investment-driven stage. Countries in this stage produce more advanced products and are able to provide efficient services. As the name implies, investment-driven economies and countries invest substantially in infrastructure, institutions, and human capital—much of this investment comes from abroad. Technology is more advanced, but it is mostly accessed through licenses and joint ventures. These economies, however, are still slightly susceptible to world financial crises and demand shifts.

The final developmental stage is the innovation-driven stage. Countries that reach this stage are extremely advanced and are usually knowledge-based. Consequently, technological advancements usually originate from countries in this stage of development. Intellectual property and services contribute to the competitive advantage of these countries. Economies in this stage of development are fairly large and are often globally driven.[13]

As mentioned, the initial motivation of the debt-to-nature swap was to provide a two-fold solution for developing countries that were inundated with debt and environmental degradation. According to the stages that the GCR uses to separate countries, countries with competitive advantages in natural resources (factor-driven) and countries with large amounts of foreign debt (investment-driven) fall within the first two developmental stages. On the assumption that the motivation for modern debt-to-nature swaps is similar, this hypothesis should hold true. Other variables, such as current account balance, will be used in conjunction with the GCR stages to test this hypothesis.

[13] Michael E. Porter, Klaus Schwab, Jennifer Blanke, et al. (2008). "The Competitiveness Report 2008-2009". *World Economic Forum, Geneva, Switzerland*. 4 November 2008. < http://www.weforum.org/documents/GCR0809/index.html>.

Debtor countries possess a certain number of threatened species that make them likely candidates.

The environmental aspect of the debt-to-nature swap usually entails the preservation of natural resources and/or forested land. Although the environment provides many different benefits to society, most creditor countries have historically been interested in preserving the "biodiversity" of the globe. This is even truer for NGOs such as CI and WWF, as these organizations have made the preservation and protection of biodiversity one of their main goals. With this in mind, it is hypothesized that debtor countries must possess at least a certain amount of threatened species to be considered for a debt-to-nature swap.

Debtor countries possess certain environmental factors and land characteristics that make them more likely to be DNS participants.

Variables such as agricultural land, arable land, and forest cover will be used to test this hypothesis. Since environmental preservation is an essential goal of DNSs, debtor countries are assumed to hold certain environmental factors that make them good candidates. Other variables, such as carbon dioxide emissions and urban population/population growth, will be used to complement the primary variables that explain this hypothesis. Common scientific knowledge states that countries with more forests exhibit less net carbon dioxide emissions. This can be attributed to the carbon dioxide absorption characteristics of plants and/or the developmental stage of the country. On the other hand, urban population growth may also be a contributing factor. Higher levels of urban population growth may threaten forested areas; hence debtor countries with high urban population growth may be good candidates for DNSs.

Debtor countries possess a specific amount of external debt that allows them to be considered for DNSs.

It is assumed that debtor countries must have a certain threshold amount of debt in order to be considered for a DNS. Countries with low levels of debt probably would not be interested in swapping out debt at all. However, countries with moderate or large amounts of debt may be targeted by creditor countries as potential DNS participants. DNSs would help creditor countries collect partially on debt that might be defaulted on all together, while debtor countries enjoy a lower debt balance.

There are specific country and institutional policy aspects that make a debtor country a likely participant.

It is hypothesized that country and institutional policies, such as those regarding corruption, would have an effect on a country's tendency to participate in debt-to-nature swaps. For example, it is more likely that a country with lower corruption levels will be trusted by a creditor country to comply with the provisions of a debt-to-nature swap. The Country Policy and Institutional Assessment (CPIA), which is published by the World Bank, rates countries against a set of 16 criteria, several of which this paper will use as explanatory variables. Variables chosen for this paper and their respective hypothesized rating ranges are shown in the chart below.

CPIA Variable	**Hypothesized Rating for Likely Participants**
Debt Policy rating	Debt policy assesses whether the debt management strategy is conducive to minimizing budgetary risks and ensuring long-term debt sustainability. A low/moderate debt rating is likely for a participating debtor country. High debt policy ratings would infer no need to swap debt at all.

CPIA Variable	Hypothesized Rating for Likely Participants
Policy and Institutions for Environmental Sustainability rating	A high rating for this variable is expected. Debtor countries are expected to create/maintain sustainable environmental programs in return for cancelled debt. Therefore, participating countries should have a high rating.
Property Rights and Rule-based Governance rating	As mentioned in the introduction, the lack of enforcement of swap provisions and the misunderstanding of property rights are two major limitations of DNSs. Therefore, a likely debtor country should rate high on this variable.
Transparency, Accountability, and Corruption rating	Debtor countries would be expected to have moderate/high ratings for this variable. If debtor countries possessed low ratings for this variable, they would be less likely to comply with DNS provisions.

This hypothesis will also be tested by using other policy indicators such as nationally protected areas (as a percentage of total country area) and public spending on education (as a percentage of GDP). These variables can help complement the CPIA variables used. The extent of nationally protected areas would be an indication of which countries have the motive to protect the environment. Public spending on education would not be as directly related to one of the CPIA variables. However, education and literacy levels can be an indication of how educated the local community is about the environment and its benefits—high levels of awareness would most likely translate into better cooperation from the community and, therefore, better management and enforcement of environmental programs.

Debtor countries with well-established financial relationships with creditor countries are more likely to be involved in DNSs.

This hypothesis focuses on the importance of inter-country relationships. It is more likely that a creditor country will forgive the debt of a debtor country that the former regularly interacts with

or wishes to interact with. Although this can be a difficult aspect to measure, balances of Foreign Direct Investment (FDI) inflows can help infer what debtor countries other countries are willing to work with/invest in. Even if there is not a specific level of FDI that makes a debtor country more likely to be involved in DNSs, a net inflow is definitely expected. This may also help to reinforce the hypothesis that debtor countries are most likely to be in the factor-driven or *investment-driven* stages.

Debtor countries often possess large tourism industries.

As mentioned in the introduction, eco-tourism has been growing at unprecedented rates in the past few years. Although figures on eco-tourism alone are not available, general tourism variables can be used to try to test this hypothesis.

Data

Over the past two decades there have been about 120 debt-to-nature swaps documented. Data collected on these debt–to-nature swaps include: debtor country, creditor country (for bilateral swaps), NGO involved (for commercial swaps), year of transaction, face value of debt, purchase price (for commercial debt), and amount of conservation funds created. For the years from 1987 to 2003, data was extracted from WWF databases for commercial DNSs and bilateral DNSs. For years occurring after 2003, information was collected from various publications and sources. The time period covered in this study starts when the first DNS was transacted in 1987 and ends in June of 2008.

This paper also requires the collection of country data. Most of the country data collected comes from the World Development Indicators (WDI) Online database, which is maintained by the World Bank Group. The WDI database provides data for about 209 countries and economies, offering about 800 different economic indicators. World Development Indicators chosen for this paper, along with their respective definitions and year of data, are displayed in the following table. For some variables, data are only available for certain years and/or substantial amounts of data are missing for more current years. Therefore, this study takes the number of data points into account when choosing the year of data to use.

Indicator	Definition	Year of data
Current account balance (BoP, current US$)	Current account balance is the sum of net exports of goods, services, net income, and net current transfers. Data are in current U.S. dollars. International Monetary Fund, Balance of Payments Statistics Yearbook and data files.	2004
GDP growth (annual %)	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. World Bank national accounts data, and OECD National Accounts data files.	2006
GDP per capita (constant 2000 US$)	GDP per capita is gross domestic product divided by midyear population. Data are in constant U.S. dollars. World Bank national accounts data, and OECD National Accounts data files.	2006
External debt, total (DOD, current US$) and External debt, total (% of GNI)	Total external debt is debt owed to nonresidents repayable in foreign currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt. Data expressed as a percentage of Gross National Income. World Bank, Global Development Finance.	2006

Indicator	Definition	Year of data
CPIA debt policy rating (1=low to 6=high)	Debt policy assesses whether the debt management strategy is conducive to minimizing budgetary risks and ensuring long-term debt sustainability. World Bank Group, CPIA database	2007
CPIA policy and institutions for environmental sustainability rating (1=low to 6=high)	Policy and institutions for environmental sustainability assess the extent to which environmental policies foster the protection and sustainable use of natural resources and the management of pollution. World Bank Group, CPIA database	2007
CPIA property rights and rule-based governance rating (1=low to 6=high)	Property rights and rule-based governance assess the extent to which private economic activity is facilitated by an effective legal system and rule-based governance structure in which property and contract rights are reliably respected and enforced. World Bank Group, CPIA database	2007
CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high)	Transparency, accountability, and corruption in the public sector assess the extent to which the executive can be held accountable for its use of funds and for the results of its actions by the electorate and by the legislature and judiciary, and the extent to which public employees within the executive are required to account for administrative decisions, use of resources, and results obtained. The three main dimensions assessed here are the accountability of the executive to oversight institutions and of public employees for their performance, access of civil society to information on public affairs, and state capture by narrow vested interests. World Bank Group, CPIA database	2007
Nationally protected areas (% of total land area) and Nationally protected areas (sq. km)	Nationally protected areas are totally or partially protected areas of at least 1,000 hectares that are designated as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, and protected landscapes. Marine areas, unclassified areas, and litoral (intertidal) areas are not included. The data also do not include sites protected under local or provincial law. United Nations Environmental Program and the World Conservation Monitoring Centre.	2004
Foreign direct investment, net inflows (BoP, current US$) and Foreign direct investment, net inflows (% of GDP)	Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-	2004

Indicator	Definition	Year of data
	term capital, and short-term capital as shown in the balance of payments. This series shows net inflows in the reporting economy. Data are in current U.S. dollars. International Monetary Fund, International Financial Statistics and Balance of Payments databases, and World Bank, Global Development Finance.	
International tourism, number of arrivals	International inbound tourists (overnight visitors) are the number of tourists who travel to a country other than that in which they have their usual residence, but outside their usual environment, for a period not exceeding 12 months and whose main purpose in visiting is other than an activity remunerated from within the country visited. When data on number of tourists are not available, the number of visitors, which includes tourists, same-day visitors, cruise passengers, and crew members, is shown instead. World Tourism Organization, Yearbook of Tourism Statistics, Compendium of Tourism Statistics and data files.	2004
International tourism, receipts (% of total exports) and International tourism, receipts (current US $)	International tourism receipts are expenditures by international inbound visitors, including payments to national carriers for international transport. These receipts include any other prepayment made for goods or services received in the destination country. They also may include receipts from same-day visitors, except when these are important enough to justify separate classification. For some countries they do not include receipts for passenger transport items. Their share in exports is calculated as a ratio to exports of goods and services, which comprise all transactions between residents of a country and the rest of the world involving a change of ownership from residents to nonresidents of general merchandise, goods sent for processing and repairs, nonmonetary gold, and services. World Tourism Organization, Yearbook of Tourism Statistics, Compendium of Tourism Statistics and data files, and IMF and World Bank exports estimates.	2004
Agricultural land (% of land area) and Agricultural land (sq. km)	Agricultural land refers to the share of land area that is arable, under permanent crops, and under permanent pastures. Arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. Land under permanent crops is land cultivated with crops	2005

Indicator	Definition	Year of data
	that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee, and rubber. This category includes land under flowering shrubs, fruit trees, nut trees, and vines, but excludes land under trees grown for wood or timber. Permanent pasture is land used for five or more years for forage, including natural and cultivated crops. Food and Agriculture Organization, Production Yearbook and data files.	
Arable land (% of land area) and Arable land (hectares)	Arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. Food and Agriculture Organization, Production Yearbook and data files.	2005
Forest area (% of land area) and Forest area (sq. km)	Forest area is land under natural or planted stands of trees, whether productive or not. Food and Agriculture Organization, Global Forest Resources Assessment.	2005
CO2 emissions (kg per PPP $ of GDP), CO2 emissions (kt) and CO2 emissions (metric tons per capita)	Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring. Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, in the U.S. state of Tennessee.	2004
Public spending on education, total (% of GDP)	Public expenditure on education consists of current and capital public expenditure on education includes government spending on educational institutions (both public and private), education administration as well as subsidies for private entities (students/households and other privates entities). United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics.	2004 and 2005
Urban population (% of total) and Urban population (% annual growth)	Urban population is the midyear population of areas defined as urban in each country and reported to the United Nations. World Bank staff estimates using United Nations, World Urbanization Prospects.	2007

This paper also utilizes data from the International Union for Conservation of Nature and Natural Resources (IUCN). Every year the IUCN publishes the IUCN Red List of Threatened Species.

The list identifies and documents those species that are most likely to become extinct if no action is taken to protect them. This paper uses Table 5 of the IUCN Red List database, which lists the number of threatened species in each available country.

Many of the qualitative variables that are used in this study come from the Global Competitiveness Report (GCR). The GCR ranks and scores 135 different countries and separates them into different stages. As mentioned in the hypotheses section, the first stage of development is the factor-driven stage. A numerical value of 1 is assigned to countries that fall into this developmental stage. The numerical values of 2 and 3 are assigned to the later developmental stages, investment-driven and innovation-driven respectively. If a country is transitioning between two developmental stages a .5 increment is used. A 1.5 value implies a country that is transitioning from a factor-driven stage to an investment-driven stage, while a 2.5 value denotes a transition from an investment-driven stage to an innovation-driven stage.

The GCR also scores countries based on 12 pillars. These twelve pillars are grouped into three subindexes: basic requirements, efficiency enhancers, and innovation factors. Each subindex is critical to a specific developmental stage. Basic requirements are most important for the factor-driven stage, while the efficiency enhancers and innovation factors are most important to the investment and innovation-driven stages, respectively. The GCR aggregates and weighs these subindexes to create an Overall Score for each country, which ranges from the lowest score of 1 to the highest score of 7. This paper uses the Overall Score as a dependent variable.

Country data utilized in this paper are from the years between 2004 and 2008. The most ideal method of testing the relationship between the independent variables and a country's participation in DNSs is to analyze data from each individual year (country data for 1990 to DNSs data for 1990). However, not all independent variables are recorded every year; data sets for some variables are published only every two to five years, etc. In addition, a paper utilizing the aforementioned method would require a much larger scale and scope. Therefore, this paper tries to estimate and test the relationship between country characteristics and DNS participation by using more current and abundant data. When comparing data from the late 1980s and early 1990s to more recent data for each variable (where the data are readily available), it should be noted that countries are relatively stable in their rankings. Of course, there are some countries and variables that have changed dramatically over the last two decades, such as China and India. However, the average country does not shift any more than twenty places when ranking the countries based on each variable. Therefore, the use of more recent data should not distort the results or their interpretation in the context of this paper.

Methodology

All statistical models used in this study were analyzed by using the Minitab 14 Statistical Software program. In order to reveal any significant relationships between the independent variables (country characteristics) and binary response variables of yes and no (1 = country has participated in at least one DNS, 0 = country has not participated in a DNS), the binary logistic regression model (logit model) was used. The logistic regression model is a generalized linear model and is used to estimate the probability of occurrence for a specific event by fitting the data to a logistic curve. The independent variables used in this model can be categorical, continuous,

discrete, or dichotomous. The response variables are dichotomous in nature, success/failure or DNS participant/not a DNS participant. In other words, the dependent variable can take the value 1 (probability of success = θ) or the value 0. The function used for the logit model is:[14]

$$\theta = \frac{e^{(\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_k x_k)}}{1+e^{(\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_k x_k)}},$$

Where α = the constant of the equation and, β = the coefficient of the predictor variables.

An alternative form of the logistic regression equation is:

$$\text{logit}[\theta(x)] = \log\left[\frac{\theta(x)}{1-\theta(x)}\right] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_i x_i.$$

The results of the logistic model offer coefficients for the constant and dependent variables. The sign of a dependent variable coefficient depicts whether the variable increases the likelihood that a country participated in a DNS or decreases this likelihood. The results also display a log-likelihood and an odds-ratio. The log-likelihood shows how well the model explains the variables (much like an R-squared figure). The odds-ratio is interpreted in the following way:

Assume

- the probability of success is .75, thus θ = .75
- the probability of failure is .25, 1-θ = .25

[14] "Logistic Regression." *San Francisco State University*. 26 September 2002. 10 April 2009. <http://userwww.sfsu.edu/~efc/classes/biol710/logistic/logisticreg.htm>.

The odds-ratio of success is then 3 to 1, which is calculated using the following equation odds(success) = $\theta/(1-\theta)$ = .75/.25 = 3. The odds-ratio of failure is the reciprocal of the odds of success. According to the Minitab 14 Software Program, the odds ratio displayed can also be used to explain the effect that each one unit increase in the independent variable has on the odds of success (in the case, participation in a DNS). For example, an odds ratio of 2.08 indicates that the odds of success increases by 108% for every one unit increase in the independent variable.

After creating models using each of the individual independent models, the correlation table for the independent variables was used to formulate a multivariable logit regression model. When variables were highly correlated, the variable that better explained the relationship of the data was used. Pearson correlation values between -1 to -.75 and .75 to 1 were used to signify that two variables were correlated. Right-hand side variables were eliminated until a strong multivariable logit regression model was found.

Some DNS participants are repeat participants; therefore, another regression model was used to try to explain such occurrences because the logistic model would not explain any of these relationships because the response variable is dichotomous. The ordinary least squares (OLS) regression model was used to estimate any relationships that might exist between the independent variables and the dependent variable of "number of DNSs." Correlation tables and correlation coefficients were also utilized to explain such relationships.[15]

[15] Econometrically, the Tobit regression model is probably a better way to perform this estimation. However, the statistical program used did not have the Tobit model readily available. Therefore, the OLS model was used as an alternative.

These methods were then repeated using a segment of the data that did not include "high income" countries as described by the World Bank. Although including "high income" country data can help explain the relationship between participation and variables such as developmental stage, excluding these data can offer a more explanatory model given the fact that this study focuses on the debtor country participants (traditionally, debtor country participants have not been high income countries).

Results

Basic statistics for each variable used are displayed in Tables 1 and 2. These tables show the number of data points, minimum, maximum, median, and mean values for each dependent and independent variable.

Table 1: Sample Statistics for Data Including High-Income Countries

Variable	Number of Data Points	Minimum Value	Maximum Value	Median Value	Mean Value
DNS participation (binary, 1 = yes, 0 = no)	209	0.00	1.00	0.00	0.17
DNS participation (number of DNSs transacted)	209	0.00	14.00	0.00	0.57
Developmental Stage	135	1.00	3.00	2.00	1.92
Overall Score	134	2.85	5.74	4.11	4.20
Current account balance (BoP, current US$ millions)	161	- 640,149.24	172,058.72	- 60.55	- 182.32
GDP growth (annual %)	175	- 5.76	34.50	5.21	5.73
GDP per capita (constant 2000 US$)	174	90.77	53,489.99	2,048.93	6,810.76
Number of Threatened Species	200	1.00	2,208.00	72.00	156.28
External debt, total (DOD, current US$ millions)	134	84.99	322,845.29	3,476.40	22,266.11
External debt, total (% of GNI)	132	4.91	619.18	51.41	64.63
CPIA debt policy rating	75	1.00	6.00	3.50	3.49
CPIA policy and institutions for environmental sustainability rating	75	2.00	4.50	3.00	3.09
CPIA property rights and rule-based governance rating	75	1.00	4.00	3.00	2.90
CPIA transparency, accountability, and corruption in the public sector rating	75	1.00	4.50	3.00	2.88
Nationally protected areas (% of total land area)	188	0.01	74.38	7.86	11.86
Nationally protected areas (sq. km)	191	1.00	1,532,557.00	9,694.00	78,764.22

Table 1: Sample Statistics for Data Including High-Income Countries					
Variable	**Number of Data Points**	**Minimum Value**	**Maximum Value**	**Median Value**	**Mean Value**
Foreign direct investment, net inflows (BoP, current US$ millions)	175	- 10,994.23	145,812.00	324.60	4,426.11
Foreign direct investment, net inflows (% of GDP)	168	- 6.00	240.28	2.72	5.74
International tourism, number of arrivals (thousands)	182	4.00	75,121.00	693.00	4,121.98
International tourism, receipts (% of total exports)	158	0.13	86.27	9.66	16.42
International tourism, receipts (current US$ millions)	181	1.80	113,387.00	582.00	4,148.50
Agricultural land (% of land area)	203	0.57	90.58	39.58	39.43
Agricultural land (sq. km)	203	8.00	5,563,280.00	30,500.00	235,563.87
Arable land (% of land area)	203	0.04	61.08	11.01	14.44
Arable land (thousand hectares)	203	0.60	174,448.00	1,158.00	6,983.07
Forest area (% of land area)	196	0.01	94.72	28.51	30.64
Forest area (sq. km)	196	10.00	8,087,900.00	22,805.00	201,017.86
CO2 emissions (kg per PPP $ of GDP)	174	0.01	2.90	0.33	0.43
CO2 emissions (kt)	190	29.30	6,044,023.26	8,260.07	142,947.94
CO2 emissions (metric tons per capita)	188	0.01	69.16	2.54	5.43
Urban population (% of total)	208	10.10	100.00	58.24	56.82
Urban population growth (annual %)	206	- 1.73	6.89	1.81	2.04
Public spending on education, total (% of GDP)	126	1.31	13.84	4.78	4.91

Table 2: Sample Statistics for Data Excluding High-Income Countries					
Variable	**Number of data points**	**Minimum Value**	**Maximum Value**	**Median Value**	**Mean Value**
DNS participation (binary, 1 = yes, 0 = no)	145	0.00	1.00	0.00	0.25
DNS participation (number of DNSs transacted)	145	0.00	14.00	0.00	0.83
Developmental Stage	91	1.00	2.50	1.50	1.50
Overall Score	90	2.85	5.22	3.87	3.85
Current account balance (BoP, current US$ millions)	114	- 15,601.00	68,659.16	- 81.15	1,249.55
GDP growth (annual %)	134	- 5.76	34.50	5.70	6.07
GDP per capita (constant 2000 US$)	133	90.77	8,692.57	1,286.53	1,996.69
Number of Threatened Species	138	11.00	2,208.00	84.50	181.41
External debt, total (DOD, current US$ millions)	130	84.99	322,845.29	3,417.58	21,875.39
External debt, total (% of GNI)	128	4.91	619.18	51.41	65.57
CPIA debt policy rating	75	1.00	6.00	3.50	3.49
CPIA policy and institutions for environmental sustainability rating	75	2.00	4.50	3.00	3.09

Table 2: Sample Statistics for Data Excluding High-Income Countries					
Variable	**Number of data points**	**Minimum Value**	**Maximum Value**	**Median Value**	**Mean Value**
CPIA property rights and rule-based governance rating	75	1.00	4.00	3.00	2.90
CPIA transparency, accountability, and corruption in the public sector rating	75	1.00	4.50	3.00	2.88
Nationally protected areas (% of total land area)	131	0.06	74.38	7.65	11.36
Nationally protected areas (sq. km)	134	5.00	1,532,557.00	14,420.50	80,193.01
Foreign direct investment, net inflows (BoP, current US$ millions)	127	- 15.37	54,936.48	218.80	1,701.59
Foreign direct investment, net inflows (% of GDP)	125	- 1.46	44.97	2.82	4.29
International tourism, number of arrivals (thousands)	126	4.00	41,761.00	443.00	2,249.80
International tourism, receipts (% of total exports)	113	0.13	86.27	11.04	16.76
International tourism, receipts (current US$ millions)	129	1.80	27,755.00	239.00	1,500.61
Agricultural land (% of land area)	142	0.58	90.58	42.32	43.71
Agricultural land (sq. km)	142	50.00	5,563,280.00	53,410.00	258,410.11
Arable land (% of land area)	142	0.04	61.08	10.91	14.54
Arable land (thousand hectares)	142	1.00	159,650.00	1,632.50	7,408.06
Forest area (% of land area)	141	0.07	94.72	27.87	30.54
Forest area (sq. km)	141	10.00	8,087,900.00	31,950.00	210,948.44
CO2 emissions (kg per PPP $ of GDP)	129	0.01	2.90	0.30	0.42
CO2 emissions (kt)	135	29.30	5,005,687.30	5,472.52	102,884.58
CO2 emissions (metric tons per capita)	133	0.01	13.33	1.17	2.20
Urban population (% of total)	143	10.10	92.98	48.12	48.69
Urban population growth (annual %)	141	- 1.73	6.89	2.22	2.41
Public spending on education, total (% of GDP)	83	1.63	13.84	4.72	4.86

Actual regression results and correlation tables from the Minitab 14 software output are included in the Appendix.

Tables 3-5 provide summaries of the coefficients, p-values, R-squared (where applicable) and odd-ratios (where applicable) of the various independent variables, separated and grouped by the regression model utilized. The first set of tables displays the results for the regressions that included the high-income countries. Regressions displayed in Tables 3 and 4 use DNS

participation (1=yes, 0=no) as the response variable, while the OLS regressions use Number of DNSs as the response variable.

Table 3: Binary Logistic Regression Model with High-Income Countries in Dataset

Variable	Coefficient	P-value	Odds Ratio
Developmental Stage	- 0.9404330	0.001	0.39
Overall Score	- 0.9325570	0.007	0.39
Current account balance (BoP, current US$ millions)	0.0000002	0.947	1.00
GDP growth (annual %)	- 0.0011993	0.979	1.00
GDP per capita (constant 2000 US$)	- 0.0001032	0.018	1.00
Number of Threatened Species	0.0024615	0.001	1.00
External debt, total (DOD, current US$ millions)	0.0000030	0.400	1.00
External debt, total (% of GNI)	- 0.0038508	0.373	1.00
CPIA debt policy rating	0.4805420	0.182	1.62
CPIA policy and institutions for environmental sustainability rating	0.8223870	0.181	2.28
CPIA property rights and rule-based governance rating	0.4062200	0.418	1.50
CPIA transparency, accountability, and corruption in the public sector rating	0.6464430	0.177	1.91
Nationally protected areas (% of total land area)	0.0312686	0.018	1.03
Nationally protected areas (sq. km)	0.0000009	0.170	1.00
Foreign direct investment, net inflows (BoP, current US$ millions)	- 0.0000164	0.409	1.00
Foreign direct investment, net inflows (% of GDP)	- 0.0343342	0.368	0.97
International tourism, number of arrivals (thousands)	- 0.0000288	0.340	1.00
International tourism, receipts (% of total exports)	- 0.0145188	0.238	0.99
International tourism, receipts (current US$ millions)	- 0.0000728	0.147	1.00
Agricultural land (% of land area)	0.0144741	0.082	1.01
Agricultural land (sq. km)	0.0000001	0.686	1.00
Arable land (% of land area)	- 0.0036731	0.799	1.00
Arable land (thousand hectares)	- 0.0000006	0.948	1.00
Forest area (% of land area)	0.0057305	0.467	1.01
Forest area (sq. km)	0.0000001	0.496	1.00
CO2 emissions (kg per PPP $ of GDP)	- 0.9084700	0.199	0.40
CO2 emissions (kt)	- 0.0000010	0.390	1.00
CO2 emissions (metric tons per capita)	- 0.2209290	0.002	0.80
Urban population (% of total)	0.0038695	0.613	1.00

Table 3: Binary Logistic Regression Model with High-Income Countries in Dataset			
Variable	**Coefficient**	**P-value**	**Odds Ratio**
Urban population growth (annual %)	0.1282210	0.270	1.14
Public spending on education, total (% of GDP)	- 0.1905870	0.130	0.83

Table 4: Multivariable Binary Logistic Regression Model with High-Income Countries in Dataset			
Variable	**Coefficient**	**P-value**	**Odds Ratio**
Number of Threatened Species, **CO2 Emissions (metric tons per capita),** **Urban Population (% of total)**	0.0027187 - 0.4923250 0.0519157	0.004 0.000 0.000	1.00 0.61 1.05
Number of Threatened Species, **GDP per capita (constant 2000 US$),** **Urban Population (% of total)**	0.0024270 - 0.0002499 0.0479383	0.010 0.004 0.000	1.00 1.00 1.05
Number of Threatened Species, **CO2 Emissions (metric tons per capita),** **Urban Population (% of total),** **Nationally protected areas (% of total land area)**	0.0025274 - 0.5109290 0.0534630 0.0344202	0.010 0.000 0.000 0.065	1.00 0.47 1.03 1.00

Table 5: Ordinary Least Squares Regressions for Number of Swaps with High-Income Countries in Dataset			
Variable	**Coefficient**	**P-value**	**R-squared**
Number of Threatened Species **CPIA policy and institutions for environmental sustainability rating** **International tourism, receipts (current US$ millions)**	0.0063480 0.7477000 - 0.0006915	0.000 0.023 0.010	 31.6

The next set of tables (Tables 6-8) shows the results of regressions that excluded data from high-income countries.

Table 6: Binary Logistic Regression Model without High-Income Countries in Dataset			
Variable	**Coefficient**	**P-value**	**Odds Ratio**
Developmental Stage	0.1669340	0.682	1.18
Overall Score	0.5558510	0.260	1.74
Current account balance (BoP, current US$ millions)	- 0.0000203	0.495	1.00
GDP growth (annual %)	- 0.0291072	0.562	0.97
GDP per capita (constant 2000 US$)	0.0001759	0.060	1.00
Number of Threatened Species	0.0024120	0.005	1.00
External debt, total (DOD, current US$ millions)	0.0000033	0.371	1.00

Table 6: Binary Logistic Regression Model without High-Income Countries in Dataset			
External debt, total (% of GNI)	- 0.0044415	0.325	1.00
CPIA debt policy rating	0.4805420	0.182	1.62
CPIA policy and institutions for environmental sustainability rating	0.8223870	0.181	2.28
CPIA property rights and rule-based governance rating	0.4062200	0.418	1.50
CPIA transparency, accountability, and corruption in the public sector rating	0.6464430	0.177	1.91
Nationally protected areas (% of total land area)	0.0463915	0.008	1.05
Nationally protected areas (sq. km)	0.0000012	0.153	1.00
Foreign direct investment, net inflows (BoP, current US$ millions)	0.0000271	0.397	1.00
Foreign direct investment, net inflows (% of GDP)	- 0.0383916	0.367	0.96
International tourism, number of arrivals (thousands)	0.0000213	0.543	1.00
International tourism, receipts (% of total exports)	- 0.0145188	0.238	0.99
International tourism, receipts (current US$ millions)	0.0000208	0.694	1.00
Agricultural land (% of land area)	0.0047448	0.595	1.00
Agricultural land (sq. km)	0.0000001	0.840	1.00
Arable land (% of land area)	- 0.0047966	0.750	1.00
Arable land (thousand hectares)	- 0.0000020	0.836	1.00
Forest area (% of land area)	0.0060452	0.447	1.01
Forest area (sq. km)	0.0000001	0.559	1.00
CO2 emissions (kg per PPP $ of GDP)	- 0.7093410	0.280	0.49
CO2 emissions (kt)	- 0.0000005	0.556	1.00
CO2 emissions (metric tons per capita)	- 0.0597764	0.454	0.94
Urban population (% of total)	0.0330277	0.001	1.03
Urban population growth (annual %)	- 0.0548051	0.642	0.95
Public spending on education, total (% of GDP)	- 0.1607740	0.184	0.85

Table 7: Multivariable Binary Logistic Regression Model without High-Income Countries in Dataset			
Variable	**Coefficient**	**P-value**	**Odds Ratio**
Number of Threatened Species, **CO2 Emissions (metric tons per capita),** **Urban Population (% of total)**	0.0022264 - 0.3075270 0.0526475	0.019 0.015 0.000	1.00 0.74 1.05
Number of Threatened Species, **CO2 Emissions (metric tons per capita),** **Urban Population (% of total),** **Nationally protected areas (% of total land area)**	0.0019600 - 0.2971400 0.0541716 0.0371407	0.046 0.030 0.000 0.074	1.00 0.74 1.06 1.04

Table 8: Ordinary Least Squares Regressions for Number of Swaps without High-Income Countries in Dataset			
Variable	**Coefficient**	**P-value**	**R-squared**
Number of Threatened Species,	0.004399	0.000	
CPIA policy and institutions for environmental sustainability rating	0.544600	0.069	23.8

Analysis of Results and Discussion of Hypotheses

The analyses of the binary logistic regressions are mainly based on the sign of the coefficient. For logit regressions, the magnitude of the coefficient values do not explain the extent of the relationship between the independent and the dependent variables in the same manner as an ordinary least squares coefficient would. P-values are included in the results to signify the statistical significance of the coefficients. The odds ratio, as mentioned prior, offers a marginal analysis where the odds ratio denotes a multiple of the probability of success for every one unit increase in the independent variable. Correlation tables and ordinary least square regressions are analyzed in the traditional fashion. It should be understood that most of the debtor country participants fall in the low-to-middle-income categories. Therefore, results and analysis including the high-income countries is only done for completeness.

Debtor country participants are more likely to be in the earlier stages of development.

The results of the binary logistic regressions of DNS participation against Developmental Stage and DNS participation against Overall Score both show negative coefficients (-0.9404330 and -0.9325570, respectively) for the dataset including high income countries. A negative coefficient in these regressions (where θ is the probability of being a DNS participant) signifies that as the independent variable increases the likelihood of DNS participation decreases. Both coefficients have p-values less than 0.05 (0.001 and 0.007, respectively); therefore, these coefficients are significant at the 5% level. The odds ratio reveals that for every one unit increase in either the

Developmental Stage or the Overall Score, the odds of success (DNS participation) decrease by 61% or are 39% of the previous odds. These results support the hypothesis that most DNS participants are in the earlier stages of development.

However, the results of the same regressions using the datasets that do not include the high-income countries suggest otherwise. Although the coefficients of these regressions do not have statistical significance and are, therefore, not conclusive, they may help explain the relationship between DNS participation and developmental stage. The coefficients for these two independent variables are positive, and the odds ratios are greater than one. This suggests that when the high-income countries are excluded, the remaining countries are more likely to participate as their Developmental Stage and Overall Score increase. Perhaps this suggests that DNS participation is more likely for countries that fall within a certain middle range of development.

The correlation table that includes the high-income data shows that there are slight negative correlations between DNS Participation (number of DNSs transacted) (to be denoted as Number of DNSs henceforth) and each of the independent variables of Developmental Stage and Overall Score. The second correlation table without the high-income data shows slight positive correlations for these same variables. However, none of these are statistically significant.

The independent variables of Current account balance, GDP growth, and GDP per capita are used to supplement the explanation of this hypothesis. The logit regressions that include the data from high-income countries do not result in any significant relationship between the binary response variable and the variables of Current account balance and GDP growth. However, GDP

per capita shows a negative coefficient (-0.0001032) that is statistically significant at the 5% level. The odds-ratio is 1.00, which suggests the relationship is very weak. When the high-income countries were excluded, Current account balance and GDP growth still do not result in any statistically significant relationships. GDP per capita shows a positive coefficient (0.0001759) that is significant if a more lenient 10% level is used. However, once again the odds ratio remains at 1.00, suggesting the relationship may be very weak.

Both correlation tables show that the relationships between Number of DNSs and the independent variables of Current account balance and GDP growth are not significant. However, GDP per capita seems to have a slight negative correlation (-0.127, p-value: 0.094, significant at 10% level) with Number of DNSs in the dataset with high-income counties included. It also has a slight positive correlation (0.189, p-value 0.029, significant at 5% level) with the dependent variable when the high-income countries are excluded. These results reinforce the prior suggestion that DNS participants are more likely to fall within a middle range of developmental stages.

The suggestion that DNS participants tend to fall within a middle range of development can be further supported by examining the logit regression that uses GDP per capita and (GDP per capita)^2 as independent variables. The variable GDP per capita (constant 2000 US$) was divided by 1,000 (prior to squaring the term) so that the resulting coefficients would display more significant digits. The results from Minitab are shown below:

```
 Response Information


Variable  Value  Count
DNS?      1         36  (Event)
          0        138
          Total    174

Logistic Regression Table

                                                          Odds     95% CI
Predictor               Coef    SE Coef       Z      P  Ratio  Lower  Upper
Constant            -1.66846   0.378619  -4.41  0.000
GDP per cap/1000    0.560332   0.265729   2.11  0.035   1.75   1.04   2.95
GDP p.c.^2/1000   -0.0676876  0.0341747  -1.98  0.048   0.93   0.87   1.00


Log-Likelihood = -78.121
Test that all slopes are zero: G = 21.173, DF = 2, P-Value = 0.000
```

The GDP per capita variable shows a positive coefficient, while (GDP per capita)^2 is estimated to have a negative coefficient. Intuitively, from a GDP per capita value of 0 up until a maximum point, the positive effect of the GDP per capita term would outweigh the effect of the (GDP per capita)^2 term. Therefore, up until this maximum point, as GDP per capita increases so does the probability of DNS participation. After this maximum point, the (GDP per capita)^2 term would have a greater effect on θ. Since the (GDP per capita)^2 term shows a negative coefficient, an increase in GDP per capita after the maximum point would cause a decrease in the probability of DNS participation.

Using the following equation that is found on page 23:

$$\log (\theta/1- \theta) = a + bX + cX^2,$$

and the derivative of this equation, the value of X that maximizes the value of the left-hand side, the odds-ratio, and θ can be calculated. Using the results from the regression, ($b = 0.560332$ and $c = -0.0676876$), the maximum value of X can be calculated to be roughly 4.1. Multiplying this

by 1,000 to eliminate the scaling effect, the odds-ratio and θ are maximized when GDP per capita is around $4,100. This corresponds with an upper middle-income level. This is consistent with the conclusion that DNS participation is more likely to occur with countries that fall within a middle range of development.

GDP per capita might show results similar to that of Developmental Stage and Overall Score because these variables are rather highly correlated. On the other hand, the variables of Current account balance and GDP growth can be volatile and are not always correlated with developmental stage. Therefore, their relationships with the dependent variables are not as strong.

Debtor countries possess a certain number of threatened species that make them likely candidates.

The independent variable of Number of Threatened Species shows a statistically significant positive relationship with DNS participation for both binary logistic regression models. It has a statistically significant positive correlation with Number of DNSs in both cases (with high-income counties and without) as well. The results for this variable are summarized in the following table for convenience:

Results for Independent Variable: Number of Threatened Species			
Binary Logistic Regression			
Dataset	**Coefficient**	**P-value**	**Odds Ratio**
With High-Income	0.0024615	0.001	1.00
Without High-Income	0.0024120	0.005	1.00
Correlation with Number of DNSs			
Dataset	**Coefficient**	**P-value**	
With High-Income	0.388	0.000	
Without High-Income	0.404	0.000	

These results suggest that the greater the Number of Threatened Species found in a specific country, the more likely the country is to participate in a DNS. Although the positive relationship does not seem to be the strongest of relationships, this independent variable has a statistically significant impact on DNS participation in general.

However, the odds ratios given do not explain much about the marginal effect that one more threatened species has on the probability of DNS participation. This is probably due to the scale of the independent variable; one more species would probably not make a difference. However, when the number of threatened species is divided by 100, the odds ratios become 1.28 and 1.27 (with high-income and without high-income, respectively). Therefore, for every 100 threatened species, a country becomes 28% or 27% more likely to be involved in a DNS.

The fact that Number of Threatened Species has a positive relationship with DNS participation in general should not be a surprise given the fact that many DNSs involve third parties such as the WWF and The Nature Conservancy. These organizations strive, and it is their main purpose, to preserve biodiversity and protect threatened and endangered animals.

Debtor countries possess certain environmental factors and land characteristics that make them more likely to be DNS participants.

The variables used to test this hypothesis include: Agricultural land (% of land area), Agricultural land (sq. km), Arable land (% of land area), Arable land (thousand hectares), Forest area (% of land area), Forest area (sq. km), CO2 emissions (kg per PPP$ of GDP), CO2

emissions (kt), CO2 emissions (metric tons per capita), Urban population (% of total), and Urban population growth (annual %).

In the binary logistic regressions, very few of these variables show statistically significant results; and most odds ratios remain at or close to 1.00. Therefore, for these variables the null hypotheses of the coefficients being 0 (no relationship between the independent and dependent variable) cannot be rejected.

There are a few exceptions, however. In the binary logistic regression including the high-income countries, Agricultural land (% of land area) shows a positive coefficient (0.0144741) that is significant at the more lenient 10% level. The magnitude of this relationship, however, is limited as the odds ratio is only 1.01.

Another variable that shows a statistically significant relationship is CO2 emissions (metric tons per capita). This variable shows a negative coefficient (-.0.2209290), with statistical significance at the 5% level. The odds ratio also indicates that the negative relationship is quite substantial; for every one-unit increase in the independent variable there is a 20% decrease in the probability of success.

These results are probably linked to the fact that less developed countries have more agricultural economies, while developed countries are more industrialized and emit more CO2 emissions. It is interesting to note that the relative amount of agricultural land explains the data better than does the absolute amount of agricultural land. CO2 emissions (metric tons per capita) probably

explains the data better because it standardizes the amount of CO2 emissions based on a physical attribute (population), while the other CO2 emissions variables do not.

The binary logistic regression that excludes the data from high-income countries shows contrasting results. In this set of regressions, the Urban population (% of total) variable is the only variable that shows a statistically significant relationship with DNS participation. It has a positive coefficient (0.0330277) that is significant at the 0.1% level. The odds ratio (1.03) shows that it is a very slight positive relationship, however. Similar to the results for the Developmental Stage and Overall Score variables, these results suggest that DNS participation is more likely for a low-to-middle-income country that has a higher percentage of urban population. Developing countries with larger urban populations are probably facing more urgent environmental issues than those with smaller urban populations, making them more likely candidates for DNSs. Once again, this seems to support the notion that DNS participants fall in a middle range of development.

The correlation tables show that these independent variables have parallel, yet weaker, relationships with the Number of DNSs response variable. When the high-income countries are included, the CO2 emissions (metric tons per capita) variable has a slight negative correlation coefficient (-.0131, p-value: 0.074) that is significant at the 10% level. This is expected as most industrialized countries are high-income countries that do not participate as the debtor in DNSs. When high-income countries are excluded, the Urban population (% of total) variable once again shows a positive relationship (correlation: 0.216, p-value: 0.010) with the response variable, further supporting the aforementioned theory.

Debtor countries possess a specific amount of external debt that allows them to be considered for DNSs.

Both binary logistic regression sets (with and without high-income countries) show that the null hypothesis of the coefficient being 0 cannot be rejected for External debt, total (DOD, current US$) or External debt, total (% of GNI). This suggests that the amount of debt that a country holds has little or no significant impact on the probability of DNS participation. This might suggest that the motivation for DNSs is more focused on the environmental preservation aspect as opposed to the debt forgiveness aspect.

Both correlation tables, however, show that the amount of External debt, total (DOD, current US$) has a slight positive correlation with the Number of DNSs response variable, significant at the 10% level (0.153, p-value: 0.077; 0.159, p-value 0.071 for with and without high-income countries, respectively). Therefore, it seems that a country will participate in more DNSs as the country's debt burden increases.

There are specific country and institutional policy aspects that make a debtor country a likely participant.

As mentioned above in the hypotheses section, independent variables used to explain this hypothesis include CPIA ratings for debt policy; policy and institutions for environmental sustainability; property rights and rule-based governance; and transparency, accountability, and corruption in the public sector. Nationally protected areas (both as a % of total land area and sq. km) and Public spending on education (% of GDP) are also used as independent variables.

Although all of the CPIA ratings show positive coefficients and substantial odds ratios for each of the logistic regression sets, these coefficients and odds ratios are not statistically significant. Therefore, we cannot reject the null hypothesis for these variables. Public spending on education also does not seem to have a conclusive impact on the likelihood of DNS participation.

The variable Nationally protected areas (% of total land area) has a statistically significant positive coefficient in both logistic regression sets (0.0312686, p-value: 0.018; 0.0463915, p-value: 0.008 when high-income countries are included and excluded, respectively). However, the odds ratios (1.03 and 1.05) show that the positive relationships are slight in nature. This result suggests that the relative amount of protected areas in a country has a slight positive impact on the likelihood that the country is a DNS participant. The absolute area of protected areas, however, does not seem to have the same relationship.

The correlation tables show that the CPIA policy and institutions for environmental stability rating has a positive correlation coefficient with the Number of DNSs. In both cases, the correlation coefficient is 0.236 with a p-value of 0.041. These results suggest that countries with better environmental stability programs and policies would probably participate in more DNSs. To ensure the success of DNSs and to facilitate the purposes of DNSs, a debtor country should have good policies in place to ensure the maintenance of conservation programs created by the DNSs. Perhaps creditor countries intentionally choose debtor countries based on their environmental policies, choosing countries that would uphold their contractual agreements of a DNS.

Debtor countries with well-established financial relationships with creditor countries are more likely to be involved in DNSs.

When analyzing the logit regression results for the independent variables of Foreign direct investment, net inflows (BoP, current US$) and Foreign direct investment, net inflows (% of GDP), neither has a statistically significant impact on the probability of DNS participation across the board. This may be a result of the global nature of today's economy. If the majority of countries are interacting with each other financially (i.e. in the form of foreign direct investing), then a relationship between the independent and dependent variables might not exist.

An interesting observation can be made, however, when looking at the correlation between Foreign direct investment, net inflows (BoP, current US$ millions), and the Number of DNSs. In the dataset that includes high-income countries, the correlation is not statistically significant. However, when the high-income countries are excluded, the independent variable shows a positive correlation coefficient of 0.190 with a p-value of 0.032. Therefore, among the low-to-middle-income countries, the higher the absolute amount of FDI inflows into a country, the more DNSs the country participates in. This result supports the hypothesis that was posed.

Debtor countries often possess large tourism industries.

In general, the independent variables utilized to test this hypothesis (International tourism based on number of arrivals and receipts (% of exports and total)) do not explain the response variable of DNS participation. There is one case, however, where one of these variables shows a statistically significant correlation with Number of DNSs. When high-income countries are

excluded from the dataset, International tourism, number of arrivals shows a correlation coefficient of 0.179 with a p-value of 0.045. This seems to suggest that among the developing countries, countries have more international arrivals as DNS participation occurs more often. Perhaps this is a result of the increase in ecotourism in the last decade or so.

The multivariable regressions formulated in this paper are summarized in the following table for convenience.

Multivariable Regressions			
High-Income Countries Included			
Binary Logistic Regression (Response Variable: DNS Participation (1=yes, 0=no))			
Variable	**Coefficient**	**P-value**	**Odds Ratio**
Number of Threatened Species,	0.0027187	0.004	1.00
CO2 Emissions (metric tons per capita),	- 0.4923250	0.000	0.61
Urban Population (% of total)	0.0519157	0.000	1.05
Number of Threatened Species,	0.0024270	0.010	1.00
GDP per capita (constant 2000 US$),	- 0.0002499	0.004	1.00
Urban Population (% of total)	0.0479383	0.000	1.05
Number of Threatened Species,	0.0025274	0.010	1.00
CO2 Emissions (metric tons per capita),	- 0.5109290	0.000	0.47
Urban Population (% of total),	0.0534630	0.000	1.03
Nationally protected areas (% of total land area)	0.0344202	0.065	1.00
Ordinary Least Squares Regression (Response Variable: Number of DNSs)			
Variable	**Coefficient**	**P-value**	**R-squared**
Number of Threatened Species	0.0063480	0.000	
CPIA policy and institutions for environmental sustainability rating	0.7477000	0.023	
International tourism, receipts (current US$ millions)	- 0.0006915	0.010	31.6
High-Income Countries Excluded			
Binary Logistic Regression (Response Variable: DNS Participation (1=yes, 0=no))			
Variable	**Coefficient**	**P-value**	**Odds Ratio**
Number of Threatened Species,	0.0022264	0.019	1.00
CO2 Emissions (metric tons per capita),	- 0.3075270	0.015	0.74
Urban Population (% of total)	0.0526475	0.000	1.05
Number of Threatened Species,	0.0019600	0.046	1.00
CO2 Emissions (metric tons per capita),	- 0.2971400	0.030	0.74
Urban Population (% of total),	0.0541716	0.000	1.06
Nationally protected areas (% of total land area)	0.0371407	0.074	1.04
Ordinary Least Squares Regression (Response Variable: Number of DNSs)			
Variable	**Coefficient**	**P-value**	**R-squared**
Number of Threatened Species,	0.004399	0.000	
CPIA policy and institutions for environmental sustainability rating	0.544600	0.069	23.8

One thing to be noted when analyzing these regressions is that the Number of Threatened Species is included in every one of these statistically significant multivariable regressions. This suggests that the Number of Threatened Species plays an important role (it has a positive impact) in determining the probability that a country is a DNS participant and in estimating the number of DNSs in which a country participates.

In the binary logit regressions, the Number of Threatened Species, GDP per capita, and CO2 emissions per capita have statistically significant coefficients at the 5% level. The relationships that these independent variables have to the response variable are very similar to the results discussed above when these variables are regressed individually. It should be noted, however, that GDP per capita and CO2 emissions per capita are highly correlated, which suggests that the first two multivariable regressions displayed are explaining similar phenomenon.

More interesting is the inclusion of the variable Urban population (% of total). This variable did not have any statistical significance when examined alone. However, it does seem to have a statistically significant positive coefficient in the multivariable regression results. This suggests that, when coupled with Number of Threatened Species and CO2 emissions per capita or GDP per capita, relative urban population has a positive effect on the probability of DNS participation. When the more lenient significance level of 10% is used, Nationally protected areas (% of total) also shows a positive impact in the multivariable regression.

When using the ordinary least squares model (and a more lenient significance level of 10%), the variables of Number of Threatened Species and CPIA policy and institutions for environmental

sustainability rating have positive coefficients both when high-income countries are included and when they are excluded. When high-income countries are included, the multivariable regression also displays a negative coefficient for International Tourism, receipts (current US$ millions). This fact seems to be counterintuitive to the hypothesis that DNS participants possess large tourism industries. In addition, this variable does not show significance when the dataset excluding high-income countries is used. One explanation for this may be that the high-income countries are skewing the results. High-income countries, in general, do not participate in DNSs as the debtor country. Therefore, high-income countries with large tourism industries would be classified with the response variable of 0; this may cause the variable to have a negative coefficient.

Conclusion

In analyzing the variables that affect the probability of DNS participation and the number of DNSs in which a country participates, the motivation of environmental preservation seems to outshine that of eliminating debt burdens. Across the board, the independent variable of Number of Threatened Species in a country seems to have a positive impact on DNS participation; the more threatened species that a country possesses the more likely and the more repeated is the country's DNS participation. Countries with more nationally protected areas are also more likely to participate in DNSs. In addition, there seems to be a positive relationship between the superiority of a country's environmental policies and the number of DNSs in which the country has participated. In other words, creditor countries and NGOs involved in DNSs are inclined to make these transactions solely with debtor countries that exhibit the environmental need and have the policies to maintain the DNS agreements.

The debt burden of a country does not seem to have an effect on the likelihood of a country's participation in a DNS. However, for those countries that do participate, it seems that repeat participants are those with larger debt burdens. The results also suggest that repeat participation occurs more when countries have had prior relationships with creditor countries.

It can also be concluded that debtor countries fall within a middle-range of development. When high-income countries are included, results show that developmental stage and economic prosperity indicators have a negative impact on DNS participation. However, when the high-income countries are excluded, the same independent variables show positive correlations and coefficients. Therefore, it can be deduced that DNS participants tend to fall within a middle range of development. Variables used to test whether or not land characteristics and environmental factors have an impact on DNS participation also seem to be connected to this result.

At a time when the negative effects of environmental degradation are becoming more apparent, DNSs should be used more frequently to combat and maybe even reverse the problematic status of the environment. Although these conclusions are based upon past data and past DNS participation, they can be utilized to identify potential DNS participants for the future. Repeat participants and successful swaps should be utilized as case studies and guides to ensure the survival and maintenance of biodiversity, pristine lands, and the overall health of Earth.

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APPENDIX A: Table of Commercial Swaps

Country	Date	Purchaser	Face Value of Debt	Purchase Price	Conservation Funds
Bolivia	Jul-87	CI	650,000	100,000	250,000
Bolivia	May-93	TNC, WWF	11,465,795	0	2,816,400
Bolivia Total			12,115,795	100000	3,066,400
Brazil	Jun-92	TNC	2,192,000	746,000	2,192,000
Brazil Total			2,192,000	746,000	2,192,000
Columbia	Apr-04	TNC,CI,WWF	10,000,000	8,400,000	10,000,000
Columbia Total			10,000,000	8,400,000	10,000,000
Costa Rica	Feb-88	National Parks Foundation	5,400,000	918,000	4,050,000
Costa Rica	Jul-88	Netherlands	33,000,000	5,000,000	9,900,000
Costa Rica	Jan-89	TNC	5,600,000	784,000	1,680,000
Costa Rica	Apr-89	Sweden	24,500,000	3,500,000	17,150,000
Costa Rica	Mar-90	Sweden, TNC, WWF	10,800,000	1,900,000	9,600,000
Costa Rica	Oct-07	USA, Nature Conservancy, Conservation International	26,000,000	15,120,000	26,000,000
Costa Rica	Feb-91	TNC/Rainforest Alliance	600,000	360,000	540,000
Costa Rica Total			105,900,000	27,582,000	68,920,000
Dominican Republic	Mar-90	TNC, PRCT	582,000	116,000	582,000
Dom. Rep. Total			582,000	116,000	582,000
Ecuador	Dec-87	WWF	1,000,000	354,000	1,000,000
Ecuador	Mar-89	TNC, Missouri Botanical Garden	3,600,000	424,080	3,600,000
Ecuador	Apr-89	WWF	5,389,473	640,000	5,389,473
Ecuador Total			9,989,473	1,418,080	9,989,473
Ghana	Jul-92	CI, SI, MUCIA, ICMS	1,000,000	250,000	1,000,000
Ghana	Jun-00	CI	120,000	104,000	120,000
Ghana Total			1,120,000	354,000	1,120,000
Guatemala	Oct-91	TNC	100,000	75,000	90,000
Guatemala	May-92	CI	1,300,000	1,200,000	1,300,000
Guatemala	Oct-06	TNC, CI	24,400,000	17,000,000	24,400,000
Guatemala Total			25,800,000	18,275,000	25,790,000
Jamaica	Oct-91	TNC, PRCT	437,956	300,000	437,956
Jamaica	Oct-04	TNC, USA	16,000,000	7,800,000	16,000,000
Jamaica Total			437,956	300,000	437,956
Madagascar	Jul-89	WWF	2,111,112	950,000	2,111,112
Madagascar	Aug-90	WWF	919,364	445,891	919,364
Madagascar	Jan-91	CI	119,000	59,000	119,000
Madagascar	Mar-93	Missouri Botanical Garden	725,000	362,500	725,000
Madagascar	Oct-93	CI	3,200,000	1,500,000	3,200,000
Madagascar	Oct-93	WWF	1,867,500	909,412	1,867,500
Madagascar	Apr-94	WWF	1,340,469	0	1,072,376
Madagascar	May-94	CI	200,000	50,000	160,000

Country	Date	Purchaser	Face Value of Debt	Purchase Price	Conservation Funds
Madagascar	Feb-96	WWF	2,000,000	N/A	1,500,000
Madagascar Total			12,482,445	4276803	11,674,352
Mexico	Apr-91	CI	250,000	183,000	250,000
Mexico	Aug-91	CI	250,000	0	250,000
Mexico	Jan-92	CI	441,000	355,000	441,000
Mexico	Jun-93	CI	252,000	208,000	252,000
Mexico	Jun-94	CI	280,000	236,000	280,000
Mexico	Jun-94	CI	480,000	399,390	480,000
Mexico	Nov-94	CI	290,000	248,395	290,000
Mexico	Dec-95	CI	488,000	246,000	336,500
Mexico	Jan-96	CI	391,000	191,607	254,000
Mexico	Jul-96	CI	495,674	327,393	442,622
Mexico	Nov-96	CI	670,889	440,360	560,752
Mexico	May-97	CI	265,714	186,000	243,494
Mexico	Jul-97	CI	310,000	237,661	299,499
Mexico	Jun-98	CI	311,000	249,000	311,000
Mexico Total			5,175,277	3,507,806	4,690,867
Nigeria	Jul-91	Nigerian Conservation Foundation	149,000	65,000	93,000
Nigeria Total			149,000	65,000	93,000
Panama	Sep-04	TNC, USA	11,000,000	7,800,000	11,000,000
Panama	Jul-04	TNC, USA	10,000,000	6,800,000	10,000,000
Panama Total			21,000,000	14,600,000	21,000,000
Paraguay	1991	TNC	9,000,000	2,000,000	5,000,000
Paraguay Total			9,000,000	2,000,000	5,000,000
Philippines	Jun-88	WWF	390,000	195,975	390,000
Philippines	Mar-90	WWF	900,000	438,750	900,000
Philippines	Feb-92	WWF	9,646,606	5,000,000	8,815,946
Philippines	Aug-93	WWF	19,000,000	12,973,854	17,100,000
Philippines Total			29,936,606	18,608,579	27,205,946
Poland	Jan-90	WWF	50,000	11,500	50,000
Poland Total			50,000	11,500	50,000
Zambia	Aug-89	WWF	2,271,112	454,222	2,044,001
Zambia	Jul-94	IUCN	985,986	108,458	162,687
Zambia Total			3,257,098	562,680	2,206,688
Grand Total			265,187,650	108,723,448	210,018,682

Conservation Funds is the amount of money generated to support conservation programs as a result of the swap, usually paid in the form of local currency or local currency bonds. In a few cases, non-monetary commitments (e.g., increased protection for natural areas) were made by debtor governments.

CI = Conservation International
IUCN = World Conservation Union
MUCIA = Midwest Universities Consortium for International Activities, Inc.
PRCT = Puerto Rico Conservation Trust
SI = Smithsonian Institution
TNC = The Nature Conservancy
WWF = World Wildlife Fund/World Wide Fund for Nature

APPENDIX B: Table of Bilateral Swaps

Creditor	Country	Date	Face Value Debt Treated	Environmental Funds Paid
Canada	**Colombia**	1993	12800000	12800000
Canada	**Costa Rica**	1995	16600000	8300000
Canada	**El Salvador**	1993	7100000	7100000
Canada	**Honduras**	1993	24900000	12450000
Canada	**Nicaragua**	1993	13600000	2700000
Canada	**Peru**	1994	16210000	354919
Canada Total			91210000	43704919
Finland	**Poland**	1990	17000000	17000000
Finland	**Peru**	1996	24620000	3679020
Finland Total			41620000	20679020
France	**Poland**	1993	66000000	66000000
France	**Madagascar**	2008	20000000	20000000
France	**Cameroon**	2006	25000000	25000000
France Total			111000000	111000000
Germany	**Bolivia**	1997	3700000	1150000
Germany	**Bolivia**	2000	15800000	3200000
Germany	**Ecuador**	2002	9500000	3081400
Germany	**Ecuador**	2002	10200000	3235770
Germany	**Honduras**	1999	1068442	534221
Germany	**Jordan**	1995	13400000	6700000
Germany	**Jordan**	1995	22700000	11300000
Germany	**Jordan**	2000	43600000	21800000
Germany	**Jordan**	2001	11300000	5700000
Germany	**Madagascar**	2002	25092262	14843007
Germany	**Peru**	1995	20150000	6089810
Germany	**Peru**	1999	5140000	2060000
Germany	**Peru**	1999	5140000	2060000
Germany	**Peru**	2003	25000000	7500000
Germany	**Philippines**	1996	5800000	1800000
Germany	**Syrian Arab Republic**	2001	31700000	15900000
Germany	**Vietnam**	1996	18200000	5400000
Germany	**Vietnam**	1999	16400000	5000000
Germany	**Vietnam**	2001	7000000	
Germany Total			290890704	117354208
Italy	**Poland**	1998	32000000	32000000
Italy Total			32000000	32000000
Netherlands	**Costa Rica**	1996	14100000	14100000
Netherlands Total			14100000	14100000
Norway	**Poland**	2000	27000000	27000000
Norway Total			27000000	27000000
Spain	**Costa Rica**	1999	5222302	2180594
Spain Total			5222302	2180594
Sweden	**Poland**	1997, 1999	13000000	13000000
Sweden	**Tunisia**	1992	1342000	1342000
Sweden	**Tunisia**	1993	477300	477300

Creditor	Country	Date	Face Value Debt Treated	Environmental Funds Paid
Sweden Total			14819300	14819300
Switzerland	**Bolivia**	1993	35400000	1365000
Switzerland	**Bulgaria**	1995	16200000	16200000
Switzerland	**Ecuador**	1994	46300000	4524000
Switzerland	**Egypt, Arab Rep.**	1995	121000000	18000000
Switzerland	**Guinea-Bissau**	1995	8400000	400000
Switzerland	**Honduras**	1993, 1997	42030000	8430000
Switzerland	**Peru**	1993	131000000	32700000
Switzerland	**Poland**	1993	63000000	63000000
Switzerland	**Tanzania**	1993	25600000	190000
Switzerland Total			488930000	144809000
USA	**Argentina**	1993	38100000	3100000
USA	**Bangladesh**	2000	31301857	8500000
USA	**Belize**	2001	8584692	9289560
USA	**Bolivia**	1991	38400000	21800000
USA	**Botswana**	2006	8300000	7000000
USA	**Chile**	1991	39000000	1400000
USA	**Chile**	1992	147000000	17300000
USA	**Colombia**	1992	310000000	41600000
USA	**El Salvador**	1992	335000000	25600000
USA	**El Salvador**	1992	279000000	15600000
USA	**El Salvador**	2001	38400000	14000000
USA	**Jamaica**	1991	271000000	9200000
USA	**Jamaica**	1993	134400000	12300000
USA	**Peru**	1997	350000000	22844235
USA	**Peru**	2002	28315096	10604003
USA	**Philippines**	2002	41380000	8224143
USA	**Poland**	1991	370000000	370000000
USA	**Uruguay**	1992	1000000	93400
USA	**Uruguay**	1992	33400000	6100000
USA Total			2502581645	604555341
Grand Total			3619373951	1132202382

APPENDIX C: Binary Logistic Regression Models (with High-Income Countries)

Binary Logistic Regression: DNS? versus Developmental Stage

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         34  (Event)
          0        101
          Total    135

* NOTE * 135 cases were used
* NOTE * 75 cases contained missing values

Logistic Regression Table

                                                        Odds     95% CI
Predictor               Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant            0.581829  0.523691   1.11  0.267
Developmental Stage  -0.940433  0.293425  -3.21  0.001   0.39   0.22   0.69


Log-Likelihood = -70.275
Test that all slopes are zero: G = 11.827, DF = 1, P-Value = 0.001
```

Binary Logistic Regression: DNS? versus Overall Score for Global Competitiveness

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         34  (Event)
          0        100
          Total    134

* NOTE * 134 cases were used
* NOTE * 76 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor           Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant         2.74127   1.39254   1.97  0.049
Overall Score  -0.932557  0.344171  -2.71  0.007   0.39   0.20   0.77


Log-Likelihood = -71.704
Test that all slopes are zero: G = 8.386, DF = 1, P-Value = 0.004
```

Binary Logistic Regression: DNS? versus Current account balance (BoP, current US$ millions)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        125
          Total    161

* NOTE * 161 cases were used
* NOTE * 49 cases contained missing values

Logistic Regression Table
```

```
                                                                  Odds
Predictor                          Coef    SE Coef      Z      P  Ratio
Constant                        -1.24475   0.189151  -6.58  0.000
Current account balance (BoP, c  0.0000002  0.0000035   0.07  0.947   1.00

                                  95% CI
Predictor                       Lower  Upper
Constant
Current account balance (BoP, c   1.00   1.00


Log-Likelihood = -85.558
Test that all slopes are zero: G = 0.004, DF = 1, P-Value = 0.947
```

Binary Logistic Regression: DNS? versus GDP growth (annual %)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        139
          Total    175

* NOTE * 175 cases were used
* NOTE * 35 cases contained missing values

Logistic Regression Table

                                                        Odds     95% CI
Predictor                  Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant                -1.34409   0.319666  -4.20  0.000
GDP growth (annual %)  -0.0011993  0.0453067  -0.03  0.979   1.00   0.91   1.09


Log-Likelihood = -88.939
Test that all slopes are zero: G = 0.001, DF = 1, P-Value = 0.979
```

Binary Logistic Regression: DNS? versus GDP per capita (constant 2000 US$)

```
Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        138
          Total    174

* NOTE * 174 cases were used
* NOTE * 36 cases contained missing values

Logistic Regression Table

                                                                  Odds
Predictor                          Coef    SE Coef      Z      P  Ratio
Constant                        -0.895179   0.227425  -3.94  0.000
GDP per capita (constant 2000 U  -0.0001032  0.0000436  -2.37  0.018   1.00

                                  95% CI
Predictor                       Lower  Upper
Constant
GDP per capita (constant 2000 U   1.00   1.00


Log-Likelihood = -83.047
Test that all slopes are zero: G = 11.323, DF = 1, P-Value = 0.001
```

Binary Logistic Regression: DNS? versus Number of Threatened Species

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        164
          Total    200

* NOTE * 200 cases were used
* NOTE * 10 cases contained missing values

Logistic Regression Table

                                                                          95%
                                                                Odds      CI
Predictor                        Coef    SE Coef      Z      P  Ratio  Lower
Constant                      -1.97417   0.242014  -8.16  0.000
Number of Threatened Species  0.0024615  0.0007505   3.28  0.001   1.00   1.00



Predictor                    Upper
Constant
Number of Threatened Species   1.00


Log-Likelihood = -87.675
Test that all slopes are zero: G = 13.208, DF = 1, P-Value = 0.000
```

Binary Logistic Regression: DNS? versus Number of Threatened species (hundreds)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        164
          Total    200

* NOTE * 200 cases were used
* NOTE * 10 cases contained missing values

Logistic Regression Table

                                                  Odds     95% CI
Predictor            Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant          -1.97417   0.242017  -8.16  0.000
Threaten species  0.246148  0.0750533   3.28  0.001   1.28   1.10   1.48


Log-Likelihood = -87.675
Test that all slopes are zero: G = 13.208, DF = 1, P-Value = 0.000
```

Binary Logistic Regression: DNS? versus External debt, total (DOD, current US$ millions)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0         98
          Total    134
```

```
* NOTE * 134 cases were used
* NOTE * 76 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor            Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant          -1.07382   0.215440  -4.98  0.000
Ex. debt (tot.)  0.0000030  0.0000036   0.84  0.400   1.00   1.00   1.00


Log-Likelihood = -77.637
Test that all slopes are zero: G = 0.680, DF = 1, P-Value = 0.410
```

Binary Logistic Regression: DNS? versus External debt, total (% of GNI)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0         96
          Total    132

* NOTE * 132 cases were used
* NOTE * 78 cases contained missing values

Logistic Regression Table

                                                                 Odds
Predictor                           Coef    SE Coef      Z      P  Ratio
Constant                         -0.745973   0.317829  -2.35  0.019
External debt, total (% of GNI)  -0.0038508  0.0043242  -0.89  0.373   1.00

                                  95% CI
Predictor                       Lower  Upper
Constant
External debt, total (% of GNI)   0.99   1.00


Log-Likelihood = -76.833
Test that all slopes are zero: G = 1.025, DF = 1, P-Value = 0.311
```

Binary Logistic Regression: DNS? versus CPIA debt policy rating

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         12  (Event)
          0         63
          Total     75

* NOTE * 75 cases were used
* NOTE * 135 cases contained missing values

Logistic Regression Table

                                                                  95%
                                                          Odds    CI
Predictor                          Coef   SE Coef      Z      P  Ratio  Lower
Constant                        -3.40393   1.39284  -2.44  0.015
CPIA debt policy rating (1=low  0.480542  0.359721   1.34  0.182   1.62   0.80



Predictor                     Upper
```

```
Constant
CPIA debt policy rating (1=low   3.27


Log-Likelihood = -32.008
Test that all slopes are zero: G = 1.934, DF = 1, P-Value = 0.164
```

Binary Logistic Regression: DNS? versus CPIA policy and institutions for environmental sustainability rating

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         12  (Event)
          0         63
          Total     75

* NOTE * 75 cases were used
* NOTE * 135 cases contained missing values


Logistic Regression Table

                                                                          95%
                                                                 Odds     CI
Predictor                          Coef   SE Coef      Z      P  Ratio  Lower
Constant                       -4.26996   2.02615  -2.11  0.035
CPIA policy and institutions fo  0.822387  0.614957   1.34  0.181   2.28   0.68



Predictor                      Upper
Constant
CPIA policy and institutions fo   7.60


Log-Likelihood = -32.021
Test that all slopes are zero: G = 1.909, DF = 1, P-Value = 0.167
```

Binary Logistic Regression: DNS? versus CPIA property rights and rule-based governance rating

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         12  (Event)
          0         63
          Total     75

* NOTE * 75 cases were used
* NOTE * 135 cases contained missing values

Logistic Regression Table

                                                                          95%
                                                                 Odds     CI
Predictor                          Coef   SE Coef      Z      P  Ratio  Lower
Constant                       -2.86016   1.54653  -1.85  0.064
CPIA property rights and rule-b  0.406220  0.501895   0.81  0.418   1.50   0.56



Predictor                      Upper
Constant
CPIA property rights and rule-b   4.01
```

```
Log-Likelihood = -32.635
Test that all slopes are zero: G = 0.680, DF = 1, P-Value = 0.410
```

Binary Logistic Regression: DNS? versus CPIA transparency, accountability, and corruption in the public sector rating

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         12  (Event)
          0         63
          Total     75

* NOTE * 75 cases were used
* NOTE * 135 cases contained missing values


Logistic Regression Table

                                                                                  95%
                                                                          Odds     CI
Predictor                            Coef   SE Coef      Z      P  Ratio  Lower
Constant                          -3.58371   1.50599  -2.38  0.017
CPIA transparency, accountabili  0.646443  0.479003   1.35  0.177   1.91   0.75



Predictor                        Upper
Constant
CPIA transparency, accountabili   4.88


Log-Likelihood = -32.034
Test that all slopes are zero: G = 1.882, DF = 1, P-Value = 0.170
```

Binary Logistic Regression: DNS? versus Nationally protected areas (% of total land area)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         35  (Event)
          0        153
          Total    188

* NOTE * 188 cases were used
* NOTE * 22 cases contained missing values

Logistic Regression Table

                                                                          Odds
Predictor                            Coef    SE Coef      Z      P  Ratio
Constant                          -1.89157   0.269977  -7.01  0.000
Nationally protected areas (% o  0.0312686  0.0131735   2.37  0.018   1.03

                                   95% CI
Predictor                        Lower  Upper
Constant
Nationally protected areas (% o   1.01   1.06


Log-Likelihood = -87.598
Test that all slopes are zero: G = 5.518, DF = 1, P-Value = 0.019
```

Binary Logistic Regression: DNS? versus Nationally protected areas (sq. km)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         35  (Event)
          0        156
          Total    191

* NOTE * 191 cases were used
* NOTE * 19 cases contained missing values


Logistic Regression Table

                                                                    Odds
Predictor                           Coef    SE Coef      Z      P  Ratio
Constant                         -1.58095   0.201127  -7.86  0.000
Nationally protected areas (sq.  0.0000009  0.0000007   1.37  0.170   1.00

                                   95% CI
Predictor                        Lower  Upper
Constant
Nationally protected areas (sq.   1.00   1.00


Log-Likelihood = -90.110
Test that all slopes are zero: G = 1.720, DF = 1, P-Value = 0.190
```

Binary Logistic Regression: DNS? versus Foreign direct investment, net inflows

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        139
          Total    175

* NOTE * 175 cases were used
* NOTE * 35 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor             Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant           -1.29472   0.194616  -6.65  0.000
FDI, net inflow  -0.0000164  0.0000199  -0.83  0.409   1.00   1.00   1.00


Log-Likelihood = -88.448
Test that all slopes are zero: G = 0.982, DF = 1, P-Value = 0.322
```

Binary Logistic Regression: DNS? versus Foreign direct investment, net inflows (% of GDP)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        132
          Total    168

* NOTE * 168 cases were used
```

```
* NOTE * 42 cases contained missing values

Logistic Regression Table

                                                  Odds     95% CI
Predictor         Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant      -1.15542   0.234094  -4.94  0.000
FDI, % GDP  -0.0343342  0.0381320  -0.90  0.368   0.97   0.90   1.04


Log-Likelihood = -86.568
Test that all slopes are zero: G = 1.443, DF = 1, P-Value = 0.230
```

Binary Logistic Regression: DNS? versus International tourism, number of arrivals (thousands)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         35  (Event)
          0        147
          Total    182

* NOTE * 182 cases were used
* NOTE * 28 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor             Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant          -1.33621   0.207542  -6.44  0.000
Tourism, people  -0.0000288  0.0000302  -0.95  0.340   1.00   1.00   1.00


Log-Likelihood = -88.489
Test that all slopes are zero: G = 1.220, DF = 1, P-Value = 0.269
```

Binary Logistic Regression: DNS? versus International tourism, receipts (% of total exports)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        122
          Total    158

* NOTE * 158 cases were used
* NOTE * 52 cases contained missing values

Logistic Regression Table

                                                                    Odds
Predictor                            Coef    SE Coef      Z      P  Ratio
Constant                          -1.00019   0.256631  -3.90  0.000
International tourism, receipts  -0.0145188  0.0123128  -1.18  0.238   0.99

                                   95% CI
Predictor                        Lower  Upper
Constant
International tourism, receipts   0.96   1.01


Log-Likelihood = -84.017
Test that all slopes are zero: G = 1.551, DF = 1, P-Value = 0.213
```

Binary Logistic Regression: DNS? versus International tourism, receipts (current US$ millions)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        145
          Total    181

* NOTE * 181 cases were used
* NOTE * 29 cases contained missing values

Logistic Regression Table

                                                          Odds     95% CI
Predictor               Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant             -1.20376   0.209096  -5.76  0.000
Tourism, Receipts  -0.0000728  0.0000502  -1.45  0.147   1.00   1.00   1.00


Log-Likelihood = -88.271
Test that all slopes are zero: G = 4.048, DF = 1, P-Value = 0.044
```

Binary Logistic Regression: DNS? versus Agricultural land (% of land area)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        167
          Total    203

* NOTE * 203 cases were used
* NOTE * 7 cases contained missing values

Logistic Regression Table

                                                                    Odds
Predictor                            Coef    SE Coef      Z      P  Ratio
Constant                          -2.13872   0.410255  -5.21  0.000
Agricultural land (% of land ar  0.0144741  0.0083149   1.74  0.082   1.01

                                   95% CI
Predictor                         Lower  Upper
Constant
Agricultural land (% of land ar    1.00   1.03


Log-Likelihood = -93.329
Test that all slopes are zero: G = 3.080, DF = 1, P-Value = 0.079
```

Binary Logistic Regression: DNS? versus Agricultural land (sq. km)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        167
          Total    203

* NOTE * 203 cases were used
* NOTE * 7 cases contained missing values
```

```
Logistic Regression Table

                                                    Odds     95% CI
Predictor          Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant       -1.55966   0.195312  -7.99  0.000
Agric. sq km  0.0000001  0.0000002   0.40  0.686   1.00   1.00   1.00


Log-Likelihood = -94.793
Test that all slopes are zero: G = 0.153, DF = 1, P-Value = 0.696
```

Binary Logistic Regression: DNS? versus Arable land (% of land area)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        167
          Total    203

* NOTE * 203 cases were used
* NOTE * 7 cases contained missing values

Logistic Regression Table

                                                                      95%
                                                                Odds    CI
Predictor                          Coef    SE Coef      Z      P  Ratio  Lower
Constant                        -1.48217   0.273509  -5.42  0.000
Arable land (% of land area)  -0.0036731  0.0144271  -0.25  0.799   1.00   0.97



Predictor                    Upper
Constant
Arable land (% of land area)   1.02


Log-Likelihood = -94.836
Test that all slopes are zero: G = 0.066, DF = 1, P-Value = 0.798
```

Binary Logistic Regression: DNS? versus Arable land (thousand hectares)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        167
          Total    203

* NOTE * 203 cases were used
* NOTE * 7 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor          Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant       -1.53067   0.192722  -7.94  0.000
Arable hect.  -0.0000006  0.0000085  -0.06  0.948   1.00   1.00   1.00


Log-Likelihood = -94.867
Test that all slopes are zero: G = 0.004, DF = 1, P-Value = 0.948
```

Binary Logistic Regression: DNS? versus Forest area (% of land area)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        160
          Total    196

* NOTE * 196 cases were used
* NOTE * 14 cases contained missing values

Logistic Regression Table

                                                                          95%
                                                                Odds      CI
Predictor                        Coef    SE Coef      Z      P  Ratio  Lower
Constant                      -1.67271   0.316065  -5.29  0.000
Forest area (% of land area)  0.0057305  0.0078787   0.73  0.467   1.01   0.99



Predictor                    Upper
Constant
Forest area (% of land area)   1.02


Log-Likelihood = -93.214
Test that all slopes are zero: G = 0.523, DF = 1, P-Value = 0.470
```

Binary Logistic Regression: DNS? versus Forest area (sq. km)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        160
          Total    196

* NOTE * 196 cases were used
* NOTE * 14 cases contained missing values

Logistic Regression Table

                                                 Odds     95% CI
Predictor          Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant       -1.52269   0.191382  -7.96  0.000
Forest sq km  0.0000001  0.0000002   0.68  0.496   1.00   1.00   1.00


Log-Likelihood = -93.266
Test that all slopes are zero: G = 0.421, DF = 1, P-Value = 0.516
```

Binary Logistic Regression: DNS? versus CO2 emissions (kg per PPP $ of GDP)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        138
          Total    174

* NOTE * 174 cases were used
* NOTE * 36 cases contained missing values
```

```
Logistic Regression Table

                                                                          95%
                                                                 Odds     CI
Predictor                          Coef   SE Coef      Z      P  Ratio  Lower
Constant                     -0.982583  0.323337  -3.04  0.002
CO2 emissions (kg per PPP $ of  -0.908470  0.707845  -1.28  0.199   0.40   0.10


Predictor                     Upper
Constant
CO2 emissions (kg per PPP $ of   1.61


Log-Likelihood = -87.720
Test that all slopes are zero: G = 1.976, DF = 1, P-Value = 0.160
```

Binary Logistic Regression: DNS? versus CO2 emissions (kt)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        154
          Total    190

* NOTE * 190 cases were used
* NOTE * 20 cases contained missing values

Logistic Regression Table

                                                       Odds     95% CI
Predictor                Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant              -1.36624   0.199978  -6.83  0.000
CO2 emissions (kt)  -0.0000010  0.0000012  -0.86  0.390   1.00   1.00   1.00


Log-Likelihood = -91.400
Test that all slopes are zero: G = 1.674, DF = 1, P-Value = 0.196
```

Binary Logistic Regression: DNS? versus CO2 emissions (metric tons per capita)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        152
          Total    188

* NOTE * 188 cases were used
* NOTE * 22 cases contained missing values

Logistic Regression Table

                                                                  Odds
Predictor                          Coef    SE Coef      Z      P  Ratio
Constant                     -0.717340   0.245943  -2.92  0.004
CO2 emissions (metric tons per  -0.220929  0.0699928  -3.16  0.002   0.80

                                 95% CI
Predictor                     Lower  Upper
Constant
CO2 emissions (metric tons per   0.70   0.92
```

```
Log-Likelihood = -82.794
Test that all slopes are zero: G = 18.040, DF = 1, P-Value = 0.000
```

Binary Logistic Regression: DNS? versus Urban population (% of total)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        172
          Total    208

* NOTE * 208 cases were used
* NOTE * 2 cases contained missing values

Logistic Regression Table

                                                                                  95%
                                                                        Odds      CI
Predictor                           Coef    SE Coef      Z      P  Ratio  Lower
Constant                         -1.78667   0.481966  -3.71  0.000
Urban population (% of total)  0.0038695  0.0076478   0.51  0.613   1.00   0.99



Predictor                     Upper
Constant
Urban population (% of total)   1.02


Log-Likelihood = -95.704
Test that all slopes are zero: G = 0.257, DF = 1, P-Value = 0.612
```

Binary Logistic Regression: DNS? versus Urban population growth (annual %)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        170
          Total    206

* NOTE * 206 cases were used
* NOTE * 4 cases contained missing values

Logistic Regression Table

                                                                                  95%
                                                                        Odds      CI
Predictor                           Coef   SE Coef      Z      P  Ratio  Lower
Constant                         -1.82622  0.318296  -5.74  0.000
Urban population growth (annual  0.128221  0.116132   1.10  0.270   1.14   0.91



Predictor                       Upper
Constant
Urban population growth (annual   1.43


Log-Likelihood = -94.846
Test that all slopes are zero: G = 1.208, DF = 1, P-Value = 0.272
```

Binary Logistic Regression: DNS? versus Public spending on education, total (% of GDP)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         24  (Event)
          0        102
          Total    126

* NOTE * 126 cases were used
* NOTE * 84 cases contained missing values

Logistic Regression Table

                                                                        Odds
Predictor                            Coef   SE Coef      Z      P  Ratio
Constant                         -0.558090  0.603787  -0.92  0.355
Public spending on education, t  -0.190587  0.125828  -1.51  0.130   0.83

                                    95% CI
Predictor                         Lower  Upper
Constant
Public spending on education, t    0.65   1.06


Log-Likelihood = -60.084
Test that all slopes are zero: G = 2.535, DF = 1, P-Value = 0.111
```

APPENDIX D: Correlation Table (with High-Income Countries)

	DNS?	No. of DNS	Development S	Overall Scor
No. of DNS	0.679			
	0.000			
Development S	-0.288	-0.136		
	0.001	0.116		
Overall Scor	-0.242	-0.141	0.811	
	0.005	0.104	0.000	
BoP, Current	0.005	-0.007	-0.055	-0.065
	0.948	0.926	0.552	0.481
GDP growth %	-0.002	-0.000	-0.170	-0.130
	0.979	0.998	0.058	0.150
GDP p. capit	-0.210	-0.127	0.769	0.817
	0.006	0.094	0.000	0.000
Threaten spe	0.288	0.388	-0.083	0.035
	0.000	0.000	0.343	0.694
Ex. debt (to	0.074	0.153	0.361	0.458
	0.397	0.077	0.001	0.000
Ex. Debt %GN	-0.079	-0.091	-0.229	-0.412
	0.366	0.302	0.031	0.000
CPIA Debt	0.157	0.153	0.343	0.424
	0.180	0.189	0.026	0.005
CPIA Environ	0.157	0.236	0.049	0.268
	0.179	0.041	0.756	0.086
CPIA prop.	0.094	0.117	0.124	0.509
	0.423	0.318	0.435	0.001
CPIA trans.	0.158	0.180	0.065	0.336
	0.176	0.122	0.680	0.030
Protected %	0.184	0.082	-0.023	0.046
	0.012	0.261	0.790	0.607
Protect sq.	0.104	0.022	0.042	0.135
	0.152	0.766	0.634	0.126
FDI, net inf	-0.065	-0.001	0.327	0.401
	0.391	0.985	0.000	0.000
FDI, % GDP	-0.061	-0.046	0.125	0.082
	0.430	0.551	0.163	0.366
Tourism, peo	-0.073	0.016	0.401	0.447
	0.328	0.833	0.000	0.000
Tourism, % r	-0.095	-0.076	-0.030	-0.196
	0.235	0.346	0.745	0.033
Tourism, Rec	-0.108	-0.042	0.403	0.491
	0.150	0.571	0.000	0.000
Agric. %	0.123	0.094	-0.189	-0.215
	0.080	0.181	0.031	0.014
Agric. sq km	0.029	0.029	0.016	0.145
	0.686	0.679	0.858	0.100
Arable %	-0.018	-0.048	0.062	0.042

	0.800	0.497	0.484	0.634
Arable hect.	-0.005	-0.004	0.033	0.188
	0.949	0.955	0.712	0.032
Forest %	0.052	0.050	0.148	0.056
	0.469	0.491	0.095	0.530
Forest sq km	0.050	0.027	0.116	0.136
	0.486	0.710	0.192	0.128
CO2 per GDP	-0.098	-0.080	0.020	0.078
	0.200	0.295	0.826	0.381
CO2 kt	-0.068	-0.026	0.142	0.300
	0.353	0.719	0.106	0.001
CO2 per cap.	-0.213	-0.131	0.464	0.491
	0.003	0.074	0.000	0.000
Urban %	0.035	0.045	0.685	0.677
	0.615	0.517	0.000	0.000
Urban growth	0.077	0.017	-0.543	-0.440
	0.270	0.813	0.000	0.000
Education	-0.136	-0.102	0.199	0.246
	0.130	0.257	0.051	0.016

	BoP, Current	**GDP growth %**	**GDP p. capit**	**Threaten spe**
GDP growth %	0.037			
	0.655			
GDP p. capit	-0.088	-0.134		
	0.282	0.078		
Threaten spe	-0.264	-0.035	-0.040	
	0.001	0.657	0.611	
Ex. debt (to	0.572	0.096	0.280	0.368
	0.000	0.283	0.001	0.000
Ex. Debt %GN	-0.095	-0.036	-0.137	-0.129
	0.319	0.683	0.125	0.145
CPIA Debt	0.071	0.293	0.085	0.167
	0.588	0.011	0.477	0.160
CPIA Environ	-0.076	0.239	0.350	0.099
	0.566	0.040	0.003	0.409
CPIA prop.	-0.140	0.236	0.491	0.024
	0.286	0.043	0.000	0.843
CPIA trans.	0.018	-0.007	0.469	0.112
	0.889	0.955	0.000	0.351
Protected %	0.031	0.001	0.117	0.174
	0.703	0.988	0.139	0.018
Protect sq.	-0.336	0.021	0.093	0.423
	0.000	0.786	0.236	0.000
FDI, net inf	-0.639	-0.059	0.482	0.293
	0.000	0.455	0.000	0.000
FDI, % GDP	0.006	0.099	0.321	-0.080
	0.939	0.212	0.000	0.309
Tourism, peo	-0.275	-0.106	0.378	0.211
	0.001	0.184	0.000	0.005

Tourism, % r	-0.040	0.090	-0.115	-0.158
	0.616	0.276	0.164	0.051
Tourism, Rec	-0.627	-0.141	0.492	0.286
	0.000	0.072	0.000	0.000
Agric. %	-0.083	0.039	-0.168	-0.020
	0.302	0.612	0.029	0.784
Agric. sq km	-0.346	0.085	0.071	0.436
	0.000	0.269	0.358	0.000
Arable %	-0.037	0.033	0.033	-0.079
	0.646	0.671	0.668	0.272
Arable hect.	-0.428	0.073	0.093	0.414
	0.000	0.341	0.225	0.000
Forest %	0.030	-0.103	0.034	0.140
	0.712	0.184	0.658	0.055
Forest sq km	-0.162	0.011	0.073	0.283
	0.043	0.883	0.346	0.000
CO2 per GDP	0.002	0.232	-0.073	-0.007
	0.978	0.003	0.352	0.926
CO2 kt	-0.548	0.009	0.228	0.390
	0.000	0.905	0.003	0.000
CO2 per cap.	-0.116	-0.051	0.715	-0.069
	0.144	0.511	0.000	0.358
Urban %	-0.029	0.007	0.573	0.002
	0.713	0.929	0.000	0.977
Urban growth	-0.007	0.010	-0.315	0.095
	0.934	0.893	0.000	0.184
Education	-0.017	-0.205	0.175	-0.109
	0.861	0.028	0.061	0.229

	Ex. debt (to	**Ex. Debt %GN**	**CPIA Debt**	**CPIA Environ**
Ex. Debt %GN	-0.165			
	0.059			
CPIA Debt	0.135	-0.404		
	0.255	0.000		
CPIA Environ	0.082	-0.161	0.540	
	0.493	0.174	0.000	
CPIA prop.	0.048	-0.100	0.538	0.732
	0.689	0.402	0.000	0.000
CPIA trans.	0.042	-0.043	0.563	0.556
	0.723	0.715	0.000	0.000
Protected %	0.004	0.015	-0.042	0.240
	0.968	0.864	0.727	0.046
Protect sq.	0.667	-0.129	-0.067	0.080
	0.000	0.152	0.580	0.509
FDI, net inf	0.822	-0.151	0.224	0.044
	0.000	0.088	0.060	0.717
FDI, % GDP	-0.093	0.369	0.164	0.026
	0.296	0.000	0.173	0.832

Tourism, peo	0.836	-0.223	0.180	0.168
	0.000	0.015	0.148	0.178
Tourism, % r	-0.232	0.304	-0.000	0.337
	0.014	0.001	0.999	0.008
Tourism, Rec	0.809	-0.232	0.205	0.196
	0.000	0.010	0.093	0.110
Agric. %	0.022	-0.041	-0.128	-0.042
	0.799	0.644	0.275	0.723
Agric. sq km	0.770	-0.150	-0.003	0.006
	0.000	0.089	0.978	0.962
Arable %	0.155	-0.113	0.052	0.064
	0.076	0.200	0.660	0.584
Arable hect.	0.797	-0.164	0.138	0.087
	0.000	0.063	0.238	0.456
Forest %	0.009	0.198	-0.104	-0.046
	0.914	0.024	0.373	0.693
Forest sq km	0.636	-0.083	-0.117	-0.101
	0.000	0.349	0.317	0.387
CO2 per GDP	0.227	-0.090	0.148	0.106
	0.010	0.315	0.212	0.371
CO2 kt	0.746	-0.138	0.162	0.109
	0.000	0.118	0.167	0.357
CO2 per cap.	0.336	-0.241	0.218	0.261
	0.000	0.006	0.064	0.026
Urban %	0.299	-0.046	0.008	0.037
	0.000	0.604	0.948	0.751
Urban growth	-0.220	0.237	-0.268	-0.093
	0.011	0.006	0.021	0.433
Education	-0.144	-0.122	0.108	0.318
	0.190	0.267	0.502	0.043

	CPIA prop.	**CPIA trans.**	**Protected %**	**Protect sq.**
CPIA trans.	0.698			
	0.000			
Protected %	0.109	0.106		
	0.367	0.382		
Protect sq.	-0.115	-0.051	0.283	
	0.339	0.671	0.000	
FDI, net inf	0.013	-0.008	0.044	0.474
	0.912	0.946	0.573	0.000
FDI, % GDP	0.153	0.051	0.020	-0.061
	0.201	0.673	0.806	0.442
Tourism, peo	0.035	-0.030	0.012	0.332
	0.779	0.812	0.874	0.000
Tourism, % r	0.529	0.507	-0.102	-0.169
	0.000	0.000	0.212	0.039
Tourism, Rec	0.176	0.136	0.067	0.432
	0.151	0.267	0.384	0.000
Agric. %	-0.012	-0.186	-0.069	-0.032

	0.916	0.109	0.351	0.659
Agric. sq km	-0.127	-0.065	-0.007	0.781
	0.278	0.578	0.928	0.000
Arable %	0.158	-0.042	-0.046	-0.117
	0.176	0.720	0.538	0.110
Arable hect.	0.057	0.058	-0.027	0.713
	0.625	0.619	0.713	0.000
Forest %	-0.056	0.083	0.239	0.066
	0.635	0.479	0.001	0.373
Forest sq km	-0.267	-0.153	0.040	0.815
	0.021	0.191	0.595	0.000
CO2 per GDP	0.032	-0.183	-0.140	0.101
	0.790	0.121	0.073	0.192
CO2 kt	0.100	0.078	0.024	0.651
	0.396	0.511	0.752	0.000
CO2 per cap.	0.217	0.039	-0.053	0.082
	0.066	0.745	0.487	0.278
Urban %	0.049	0.091	0.049	0.130
	0.679	0.437	0.503	0.073
Urban growth	-0.228	-0.242	0.027	-0.031
	0.051	0.038	0.713	0.676
Education	0.403	0.401	0.057	-0.049
	0.009	0.009	0.537	0.589

	FDI, net inf	**FDI, % GDP**	**Tourism, peo**	**Tourism, % r**
FDI, % GDP	0.364			
	0.000			
Tourism, peo	0.568	-0.054		
	0.000	0.503		
Tourism, % r	-0.139	-0.001	-0.153	
	0.087	0.986	0.063	
Tourism, Rec	0.770	-0.030	0.842	-0.105
	0.000	0.705	0.000	0.190
Agric. %	0.075	-0.014	0.124	-0.091
	0.328	0.856	0.100	0.258
Agric. sq km	0.553	-0.047	0.392	-0.166
	0.000	0.552	0.000	0.039
Arable %	0.078	0.002	0.218	-0.059
	0.307	0.980	0.003	0.464
Arable hect.	0.568	-0.057	0.466	-0.170
	0.000	0.465	0.000	0.034
Forest %	0.001	0.022	-0.015	-0.036
	0.990	0.784	0.848	0.657
Forest sq km	0.327	-0.041	0.288	-0.158
	0.000	0.602	0.000	0.051
CO2 per GDP	0.036	0.015	0.048	-0.150
	0.648	0.854	0.550	0.066
CO2 kt	0.711	-0.047	0.560	-0.134
	0.000	0.548	0.000	0.094

CO2 per cap.	0.331	0.259	0.162	-0.164
	0.000	0.001	0.034	0.040
Urban %	0.286	0.112	0.233	-0.145
	0.000	0.147	0.002	0.069
Urban growth	-0.127	0.007	-0.204	-0.005
	0.093	0.928	0.006	0.955
Education	0.006	-0.068	0.000	0.158
	0.945	0.471	0.999	0.100

	Tourism, Rec	**Agric. %**	**Agric. sq km**	**Arable %**
Agric. %	0.091			
	0.228			
Agric. sq km	0.473	0.174		
	0.000	0.013		
Arable %	0.151	0.521	-0.023	
	0.044	0.000	0.748	
Arable hect.	0.553	0.094	0.824	0.160
	0.000	0.183	0.000	0.022
Forest %	-0.008	-0.440	-0.083	-0.245
	0.912	0.000	0.247	0.001
Forest sq km	0.287	-0.111	0.601	-0.090
	0.000	0.121	0.000	0.211
CO2 per GDP	-0.005	0.037	0.218	-0.002
	0.954	0.630	0.004	0.979
CO2 kt	0.729	0.057	0.752	0.076
	0.000	0.435	0.000	0.299
CO2 per cap.	0.208	-0.304	0.066	-0.127
	0.006	0.000	0.373	0.086
Urban %	0.253	-0.191	0.062	-0.116
	0.001	0.006	0.378	0.101
Urban growth	-0.186	0.053	0.003	-0.174
	0.012	0.454	0.971	0.014
Education	0.004	0.121	-0.117	0.028
	0.969	0.183	0.200	0.760

	Arable hect.	**Forest %**	**Forest sq km**	**CO2 per GDP**
Forest %	-0.035			
	0.627			
Forest sq km	0.676	0.137		
	0.000	0.055		
CO2 per GDP	0.178	-0.177	0.094	
	0.020	0.022	0.223	
CO2 kt	0.838	-0.003	0.478	0.173
	0.000	0.969	0.000	0.023
CO2 per cap.	0.070	-0.070	0.118	0.390
	0.343	0.350	0.116	0.000
Urban %	0.035	0.052	0.126	0.148
	0.622	0.474	0.079	0.052
Urban growth	-0.061	-0.103	-0.095	-0.272
	0.392	0.155	0.187	0.000

Education	-0.102	-0.110	-0.094	0.017
	0.263	0.234	0.311	0.860

	CO2 kt	**CO2 per cap.**	**Urban %**	**Urban growth**
CO2 per cap.	0.147			
	0.045			
Urban %	0.099	0.468		
	0.175	0.000		
Urban growth	-0.102	-0.246	-0.463	
	0.162	0.001	0.000	
Education	-0.017	-0.026	-0.021	-0.105
	0.854	0.778	0.817	0.240

Cell Contents: Pearson correlation
P-Value

APPENDIX E: Multivariable Logit Regressions (with High-Income Countries)

Binary Logistic Regression: DNS? versus Number of Threatened Species, CO2 emissions (metric tons per capita), Urban population (% of total)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        145
          Total    181

* NOTE * 181 cases were used
* NOTE * 29 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor             Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant          -3.29951   0.656659  -5.02  0.000
Threaten species  0.0027187  0.0009546   2.85  0.004   1.00   1.00   1.00
CO2 per cap.      -0.492325   0.119437  -4.12  0.000   0.61   0.48   0.77
Urban %           0.0519157  0.0130027   3.99  0.000   1.05   1.03   1.08


Log-Likelihood = -65.997
Test that all slopes are zero: G = 48.595, DF = 3, P-Value = 0.000
```

Binary Logistic Regression: DNS? versus Urban population (% of total), Number of Threatened Species , GDP per capita (constant 2000 US$)

```
Link Function: Logit


Response Information

Variable  Value  Count
DNS?      1         36  (Event)
          0        131
          Total    167

* NOTE * 167 cases were used
* NOTE * 43 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor             Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant          -3.41131   0.689382  -4.95  0.000
Urban %           0.0479383  0.0132424   3.62  0.000   1.05   1.02   1.08
Threaten species  0.0024270  0.0009437   2.57  0.010   1.00   1.00   1.00
GDP p. capita     -0.0002499  0.0000874  -2.86  0.004   1.00   1.00   1.00


Log-Likelihood = -67.947
Test that all slopes are zero: G = 38.201, DF = 3, P-Value = 0.000
```

Binary Logistic Regression: DNS? versus Number of Threatened Species, CO2 emissions (metric tons per capita), Urban population (% of total), Nationally protected areas (% of total land area)

Link Function: Logit

Response Information

Variable	Value	Count	
DNS?	1	35	(Event)
	0	137	
	Total	172	

* NOTE * 172 cases were used
* NOTE * 38 cases contained missing values

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	-3.76538	0.736550	-5.11	0.000			
Threaten species	0.0025274	0.0009771	2.59	0.010	1.00	1.00	1.00
CO2 per cap.	-0.510929	0.126245	-4.05	0.000	0.60	0.47	0.77
Urban %	0.0534630	0.0135104	3.96	0.000	1.05	1.03	1.08
Protected % land	0.0344202	0.0186800	1.84	0.065	1.04	1.00	1.07

Log-Likelihood = -61.563
Test that all slopes are zero: G = 50.662, DF = 4, P-Value = 0.000

APPENDIX F: Multivariable Ordinary Least Square Regression for Number of DNSs (with High-Income Countries)

Regression Analysis: No. of DNS versus Number of Threatened species, CPIA policy and institutions for environmental sustainability rating, International tourism, receipts (current US$ millions)

```
The regression equation is
No. of DNS = - 2.51 + 0.00635 Threaten species + 0.748 CPIA Environ.
             - 0.000691 Tourism, Receipts


65 cases used, 145 cases contain missing values


Predictor               Coef    SE Coef      T      P
Constant              -2.513      1.020  -2.46  0.017
Threaten species     0.006348   0.001318   4.82  0.000
CPIA Environ.          0.7477     0.3199   2.34  0.023
Tourism, Receipts  -0.0006915  0.0002605  -2.65  0.010

S = 1.39016   R-Sq = 31.6%   R-Sq(adj) = 28.2%

Analysis of Variance

Source          DF       SS      MS     F      P
Regression       3   54.360  18.120  9.38  0.000
Residual Error  61  117.886   1.933
Total           64  172.246
```

APPENDIX G: Binary Logistic Regression Models (without High-Income Countries)

Binary Logistic Regression: DNS (w/o HI) versus Developmental Stage

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         34  (Event)
              0         57
              Total     91

* NOTE * 91 cases were used
* NOTE * 54 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor              Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant          -0.768058  0.653764  -1.17  0.240
Development Stage  0.166934  0.408045   0.41  0.682   1.18   0.53   2.63


Log-Likelihood = -60.054
Test that all slopes are zero: G = 0.167, DF = 1, P-Value = 0.683
```

Binary Logistic Regression: DNS (w/o HI) versus Overall Score for Global Competitiveness

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         34  (Event)
              0         56
              Total     90

* NOTE * 90 cases were used
* NOTE * 55 cases contained missing values

Logistic Regression Table

                                                Odds     95% CI
Predictor          Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant       -2.64624   1.92554  -1.37  0.169
Overall Score  0.555851  0.493715   1.13  0.260   1.74   0.66   4.59


Log-Likelihood = -59.022
Test that all slopes are zero: G = 1.290, DF = 1, P-Value = 0.256
```

Binary Logistic Regression: DNS (w/o HI) versus Current account balance (BoP, current US$ millions)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         78
              Total    114

* NOTE * 114 cases were used
* NOTE * 31 cases contained missing values
```

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	-0.754980	0.202609	-3.73	0.000			
BoP, Current US$	-0.0000203	0.0000298	-0.68	0.495	1.00	1.00	1.00

Log-Likelihood = -70.801
Test that all slopes are zero: G = 0.592, DF = 1, P-Value = 0.442

Binary Logistic Regression: DNS (w/o HI) versus GDP growth (annual %)

Link Function: Logit

Response Information

Variable	Value	Count	
DNS (w/o HI)	1	36	(Event)
	0	98	
	Total	134	

* NOTE * 134 cases were used
* NOTE * 11 cases contained missing values

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	-0.828331	0.351494	-2.36	0.018			
GDP growth %	-0.0291072	0.0501909	-0.58	0.562	0.97	0.88	1.07

Log-Likelihood = -77.798
Test that all slopes are zero: G = 0.359, DF = 1, P-Value = 0.549

Binary Logistic Regression: DNS (w/o HI) versus GDP per capita (constant 2000 US$)

Link Function: Logit

Response Information

Variable	Value	Count	
DNS (w/o HI)	1	36	(Event)
	0	97	
	Total	133	

* NOTE * 133 cases were used
* NOTE * 12 cases contained missing values

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	-1.36775	0.289912	-4.72	0.000			
GDP p. capita	0.0001759	0.0000935	1.88	0.060	1.00	1.00	1.00

Log-Likelihood = -75.916
Test that all slopes are zero: G = 3.494, DF = 1, P-Value = 0.062

Binary Logistic Regression: DNS (w/o HI) versus Number of Threatened Species

Link Function: Logit

Response Information

Variable	Value	Count

```
DNS (w/o HI)  1         36  (Event)
              0        102
              Total    138

* NOTE * 138 cases were used
* NOTE * 7 cases contained missing values

Logistic Regression Table

                                                        Odds     95% CI
Predictor              Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant           -1.51451   0.263222  -5.75  0.000
Threaten species  0.0024120  0.0008663   2.78  0.005   1.00   1.00   1.00


Log-Likelihood = -74.114
Test that all slopes are zero: G = 10.186, DF = 1, P-Value = 0.001
```

Binary Logistic Regression: DNS (w/o HI) versus Number of Threatened species (hundreds)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0        102
              Total    138

* NOTE * 138 cases were used
* NOTE * 7 cases contained missing values

Logistic Regression Table

                                                      Odds     95% CI
Predictor              Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant           -1.51451   0.263222  -5.75  0.000
Threaten species  0.241198  0.0866321   2.78  0.005   1.27   1.07   1.51


Log-Likelihood = -74.114
Test that all slopes are zero: G = 10.186, DF = 1, P-Value = 0.001
```

Binary Logistic Regression: DNS (w/o HI) versus External debt, total (DOD, current US$ millions)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         94
              Total    130

* NOTE * 130 cases were used
* NOTE * 15 cases contained missing values

Logistic Regression Table

                                                      Odds     95% CI
Predictor              Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant           -1.03597   0.216053  -4.79  0.000
Ex. debt (tot.)  0.0000033  0.0000036   0.90  0.371   1.00   1.00   1.00


Log-Likelihood = -76.316
Test that all slopes are zero: G = 0.774, DF = 1, P-Value = 0.379
```

Binary Logistic Regression: DNS (w/o HI) versus External debt, total (% of GNI)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         92
              Total    128

* NOTE * 128 cases were used
* NOTE * 17 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor            Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant        -0.665272   0.327737  -2.03  0.042
Ex. Debt %GNI  -0.0044415  0.0045082  -0.99  0.325   1.00   0.99   1.00


Log-Likelihood = -75.404
Test that all slopes are zero: G = 1.290, DF = 1, P-Value = 0.256
```

Binary Logistic Regression: DNS (w/o HI) versus CPIA debt policy rating

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         12  (Event)
              0         63
              Total     75

* NOTE * 75 cases were used
* NOTE * 70 cases contained missing values

Logistic Regression Table

                                           Odds     95% CI
Predictor      Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant   -3.40393   1.39284  -2.44  0.015
CPIA Debt  0.480542  0.359721   1.34  0.182   1.62   0.80   3.27


Log-Likelihood = -32.008
Test that all slopes are zero: G = 1.934, DF = 1, P-Value = 0.164
```

Binary Logistic Regression: DNS (w/o HI) versus CPIA policy and institutions for environmental sustainability rating

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         12  (Event)
              0         63
              Total     75

* NOTE * 75 cases were used
* NOTE * 70 cases contained missing values

Logistic Regression Table

                                              Odds     95% CI
```

```
Predictor          Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant       -4.26996   2.02615  -2.11  0.035
CPIA Environ.  0.822387  0.614957   1.34  0.181   2.28   0.68   7.60


Log-Likelihood = -32.021
Test that all slopes are zero: G = 1.909, DF = 1, P-Value = 0.167
```

Binary Logistic Regression: DNS (w/o HI) versus CPIA property rights and rule-based governance rating

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         12  (Event)
              0         63
              Total     75

* NOTE * 75 cases were used
* NOTE * 70 cases contained missing values

Logistic Regression Table

                                           Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant    -2.86016   1.54653  -1.85  0.064
CPIA prop.  0.406220  0.501895   0.81  0.418   1.50   0.56   4.01


Log-Likelihood = -32.635
Test that all slopes are zero: G = 0.680, DF = 1, P-Value = 0.410
```

Binary Logistic Regression: DNS (w/o HI) versus CPIA transparency, accountability, and corruption in the public sector rating

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         12  (Event)
              0         63
              Total     75

* NOTE * 75 cases were used
* NOTE * 70 cases contained missing values

Logistic Regression Table

                                           Odds     95% CI
Predictor        Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant     -3.58371   1.50599  -2.38  0.017
CPIA trans.  0.646443  0.479003   1.35  0.177   1.91   0.75   4.88


Log-Likelihood = -32.034
Test that all slopes are zero: G = 1.882, DF = 1, P-Value = 0.170
```

Binary Logistic Regression: DNS (w/o HI) versus Nationally protected areas (% of total land area)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         35  (Event)
              0         96
```

```
             Total    131

* NOTE * 131 cases were used
* NOTE * 14 cases contained missing values

Logistic Regression Table

                                                        Odds     95% CI
Predictor              Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant           -1.58015   0.300345  -5.26  0.000
Protected % land  0.0463915  0.0174274   2.66  0.008   1.05   1.01   1.08


Log-Likelihood = -71.820
Test that all slopes are zero: G = 8.433, DF = 1, P-Value = 0.004
```

Binary Logistic Regression: DNS (w/o HI) versus Nationally protected areas (sq. km)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         35  (Event)
              0         99
              Total    134

* NOTE * 134 cases were used
* NOTE * 11 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor             Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant          -1.14608   0.212894  -5.38  0.000
Protect sq. km.  0.0000012  0.0000008   1.43  0.153   1.00   1.00   1.00


Log-Likelihood = -75.922
Test that all slopes are zero: G = 2.070, DF = 1, P-Value = 0.150
```

Binary Logistic Regression: DNS (w/o HI) versus Foreign direct investment, net inflows

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         91
              Total    127

* NOTE * 127 cases were used
* NOTE * 18 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor             Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant         -0.977033   0.206489  -4.73  0.000
FDI, net inflow  0.0000271  0.0000321   0.85  0.397   1.00   1.00   1.00


Log-Likelihood = -75.353
Test that all slopes are zero: G = 0.728, DF = 1, P-Value = 0.394
```

Binary Logistic Regression: DNS (w/o HI) versus Foreign direct investment, net inflows (% of GDP)

```
Link Function: Logit
```

```
Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         89
              Total    125

* NOTE * 125 cases were used
* NOTE * 20 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor         Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant     -0.752644   0.252541  -2.98  0.003
FDI, % GDP  -0.0383916  0.0426016  -0.90  0.367   0.96   0.89   1.05


Log-Likelihood = -74.544
Test that all slopes are zero: G = 1.001, DF = 1, P-Value = 0.317
```

Binary Logistic Regression: DNS (w/o HI) versus International tourism, number of arrivals (thousands)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         35  (Event)
              0         91
              Total    126

* NOTE * 126 cases were used
* NOTE * 19 cases contained missing values

Logistic Regression Table

                                                      Odds     95% CI
Predictor             Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant          -1.00591   0.217022  -4.64  0.000
Tourism, people  0.0000213  0.0000350   0.61  0.543   1.00   1.00   1.00


Log-Likelihood = -74.267
Test that all slopes are zero: G = 0.358, DF = 1, P-Value = 0.549
```

Binary Logistic Regression: DNS (w/o HI) versus International tourism, receipts (% of total exports)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         77
              Total    113

* NOTE * 113 cases were used
* NOTE * 32 cases contained missing values

Logistic Regression Table

                                                    Odds     95% CI
Predictor           Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant       -0.472044   0.279081  -1.69  0.091
Tourism, % r  -0.0184509  0.0132037  -1.40  0.162   0.98   0.96   1.01
```

```
Log-Likelihood = -69.622
Test that all slopes are zero: G = 2.187, DF = 1, P-Value = 0.139
```

Binary Logistic Regression: DNS (w/o HI) versus International tourism, receipts (current US$ millions)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         93
              Total    129

* NOTE * 129 cases were used
* NOTE * 16 cases contained missing values

Logistic Regression Table

                                                        Odds     95% CI
Predictor               Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant           -0.981459   0.213936  -4.59  0.000
Tourism, Receipts  0.0000208  0.0000529   0.39  0.694   1.00   1.00   1.00


Log-Likelihood = -76.302
Test that all slopes are zero: G = 0.150, DF = 1, P-Value = 0.699
```

Binary Logistic Regression: DNS (w/o HI) versus Agricultural land (% of land area)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0        106
              Total    142

* NOTE * 142 cases were used
* NOTE * 3 cases contained missing values

Logistic Regression Table

                                             Odds     95% CI
Predictor       Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant    -1.28989   0.444244  -2.90  0.004
Agric. %   0.0047448  0.0089313   0.53  0.595   1.00   0.99   1.02


Log-Likelihood = -80.255
Test that all slopes are zero: G = 0.283, DF = 1, P-Value = 0.595
```

Binary Logistic Regression: DNS (w/o HI) versus Agricultural land (sq. km)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0        106
              Total    142

* NOTE * 142 cases were used
* NOTE * 3 cases contained missing values
```

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	-1.09597	0.209227	-5.24	0.000			
Agric. sq km	0.0000001	0.0000003	0.20	0.840	1.00	1.00	1.00

Log-Likelihood = -80.376
Test that all slopes are zero: G = 0.040, DF = 1, P-Value = 0.842

Binary Logistic Regression: DNS (w/o HI) versus Arable land (% of land area)

Link Function: Logit

Response Information

Variable	Value	Count	
DNS (w/o HI)	1	36	(Event)
	0	106	
	Total	142	

* NOTE * 142 cases were used
* NOTE * 3 cases contained missing values

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	-1.01115	0.286896	-3.52	0.000			
Arable %	-0.0047966	0.0150249	-0.32	0.750	1.00	0.97	1.02

Log-Likelihood = -80.344
Test that all slopes are zero: G = 0.104, DF = 1, P-Value = 0.747

Binary Logistic Regression: DNS (w/o HI) versus Arable land (thousand hectares)

Link Function: Logit

Response Information

Variable	Value	Count	
DNS (w/o HI)	1	36	(Event)
	0	106	
	Total	142	

* NOTE * 142 cases were used
* NOTE * 3 cases contained missing values

Logistic Regression Table

Predictor	Coef	SE Coef	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant	-1.06560	0.204179	-5.22	0.000			
Arable hect.	-0.0000020	0.0000096	-0.21	0.836	1.00	1.00	1.00

Log-Likelihood = -80.374
Test that all slopes are zero: G = 0.045, DF = 1, P-Value = 0.832

Binary Logistic Regression: DNS (w/o HI) versus Forest area (% of land area)

Link Function: Logit

Response Information

Variable	Value	Count

```
DNS (w/o HI)  1         36  (Event)
              0        105
              Total    141

* NOTE * 141 cases were used
* NOTE * 4 cases contained missing values

Logistic Regression Table

                                                 Odds     95% CI
Predictor       Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant    -1.26011   0.320991  -3.93  0.000
Forest %   0.0060452  0.0079547   0.76  0.447   1.01   0.99   1.02


Log-Likelihood = -79.817
Test that all slopes are zero: G = 0.572, DF = 1, P-Value = 0.449
```

Binary Logistic Regression: DNS (w/o HI) versus Forest area (sq. km)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0        105
              Total    141

* NOTE * 141 cases were used
* NOTE * 4 cases contained missing values

Logistic Regression Table

                                                   Odds     95% CI
Predictor          Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant       -1.09862   0.199964  -5.49  0.000
Forest sq km  0.0000001  0.0000002   0.58  0.559   1.00   1.00   1.00


Log-Likelihood = -79.940
Test that all slopes are zero: G = 0.325, DF = 1, P-Value = 0.569
```

Binary Logistic Regression: DNS (w/o HI) versus CO2 emissions (kg per PPP $ of GDP)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         93
              Total    129

* NOTE * 129 cases were used
* NOTE * 16 cases contained missing values

Logistic Regression Table

                                                 Odds     95% CI
Predictor         Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant     -0.668072  0.315545  -2.12  0.034
CO2 per GDP  -0.709341  0.656681  -1.08  0.280   0.49   0.14   1.78


Log-Likelihood = -75.694
Test that all slopes are zero: G = 1.367, DF = 1, P-Value = 0.242
```

Binary Logistic Regression: DNS (w/o HI) versus CO2 emissions (kt)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         99
              Total    135

* NOTE * 135 cases were used
* NOTE * 10 cases contained missing values

Logistic Regression Table

                                                 Odds     95% CI
Predictor        Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant    -0.973264   0.201679  -4.83  0.000
CO2 kt     -0.0000005  0.0000008  -0.59  0.556   1.00   1.00   1.00


Log-Likelihood = -77.999
Test that all slopes are zero: G = 0.579, DF = 1, P-Value = 0.447
```

Binary Logistic Regression: DNS (w/o HI) versus CO2 emissions (metric tons per capita)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         97
              Total    133

* NOTE * 133 cases were used
* NOTE * 12 cases contained missing values

Logistic Regression Table

                                                   Odds     95% CI
Predictor           Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant       -0.865396   0.252650  -3.43  0.001
CO2 per cap.  -0.0597764  0.0798020  -0.75  0.454   0.94   0.81   1.10


Log-Likelihood = -77.365
Test that all slopes are zero: G = 0.596, DF = 1, P-Value = 0.440
```

Binary Logistic Regression: DNS (w/o HI) versus Urban population (% of total)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0        107
              Total    143

* NOTE * 143 cases were used
* NOTE * 2 cases contained missing values

Logistic Regression Table

                                               Odds     95% CI
Predictor       Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant    -2.80657   0.597277  -4.70  0.000
```

```
Urban %    0.0330277  0.0102256   3.23  0.001   1.03   1.01   1.05


Log-Likelihood = -74.934
Test that all slopes are zero: G = 11.506, DF = 1, P-Value = 0.001
```

Binary Logistic Regression: DNS (w/o HI) versus Urban population growth (annual %)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0        105
              Total    141

* NOTE * 141 cases were used
* NOTE * 4 cases contained missing values

Logistic Regression Table

                                                 Odds     95% CI
Predictor           Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant       -0.940553  0.336280  -2.80  0.005
Urban growth  -0.0548051  0.117909  -0.46  0.642   0.95   0.75   1.19


Log-Likelihood = -79.994
Test that all slopes are zero: G = 0.217, DF = 1, P-Value = 0.642
```

Binary Logistic Regression: DNS (w/o HI) versusPublic spending on education, total (% of GDP)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         24  (Event)
              0         59
              Total     83

* NOTE * 83 cases were used
* NOTE * 62 cases contained missing values

Logistic Regression Table

                                            Odds     95% CI
Predictor       Coef   SE Coef      Z      P  Ratio  Lower  Upper
Constant   -0.147969  0.596084  -0.25  0.804
Education  -0.160774  0.120934  -1.33  0.184   0.85   0.67   1.08


Log-Likelihood = -48.932
Test that all slopes are zero: G = 1.967, DF = 1, P-Value = 0.161
```

APPENDIX H: Correlation Table (without High-Income Countries)

	DNS (w/o HI)	No. of DNS	Development S	Overall Scor
No. of DNS	0.661			
	0.000			
Development S	0.043	0.134		
	0.686	0.206		
Overall Scor	0.120	0.116	0.641	
	0.261	0.278	0.000	
BoP, Current	-0.067	-0.122	0.063	0.249
	0.480	0.196	0.580	0.026
GDP growth %	-0.050	-0.032	0.074	0.197
	0.564	0.716	0.489	0.066
GDP p. capit	0.166	0.189	0.753	0.572
	0.056	0.029	0.000	0.000
Threaten spe	0.281	0.404	0.081	0.249
	0.001	0.000	0.453	0.020
Ex. debt (to	0.080	0.159	0.354	0.474
	0.365	0.071	0.001	0.000
Ex. Debt %GN	-0.089	-0.097	-0.248	-0.407
	0.316	0.275	0.021	0.000
CPIA Debt	0.157	0.153	0.343	0.424
	0.180	0.189	0.026	0.005
CPIA Environ	0.157	0.236	0.049	0.268
	0.179	0.041	0.756	0.086
CPIA prop.	0.094	0.117	0.124	0.509
	0.423	0.318	0.435	0.001
CPIA trans.	0.158	0.180	0.065	0.336
	0.176	0.122	0.680	0.030
Protected %	0.264	0.121	-0.024	-0.044
	0.002	0.170	0.825	0.686
Protect sq.	0.133	0.025	0.165	0.192
	0.126	0.773	0.125	0.075
FDI, net inf	0.080	0.190	0.247	0.407
	0.371	0.032	0.023	0.000
FDI, % GDP	-0.083	-0.074	0.083	0.076
	0.358	0.414	0.451	0.495
Tourism, peo	0.055	0.179	0.361	0.540
	0.540	0.045	0.001	0.000
Tourism, % r	-0.134	-0.101	0.106	-0.013
	0.158	0.287	0.348	0.911
Tourism, Rec	0.035	0.140	0.313	0.556
	0.695	0.113	0.004	0.000
Agric. %	0.045	0.043	-0.093	-0.015
	0.598	0.610	0.391	0.887
Agric. sq km	0.017	0.024	0.082	0.276
	0.841	0.774	0.449	0.010
Arable %	-0.027	-0.061	0.020	0.128

	0.751	0.471	0.856	0.237
Arable hect.	-0.017	-0.013	0.086	0.318
	0.837	0.881	0.425	0.003
Forest %	0.064	0.059	0.146	0.020
	0.450	0.488	0.174	0.857
Forest sq km	0.051	0.025	0.226	0.196
	0.551	0.765	0.035	0.069
CO2 per GDP	-0.096	-0.079	0.191	0.336
	0.277	0.374	0.078	0.002
CO2 kt	-0.056	-0.007	0.095	0.342
	0.518	0.939	0.384	0.001
CO2 per cap.	-0.065	0.004	0.577	0.501
	0.455	0.963	0.000	0.000
Urban %	0.281	0.216	0.659	0.511
	0.001	0.010	0.000	0.000
Urban growth	-0.039	-0.068	-0.615	-0.467
	0.645	0.426	0.000	0.000
Education	-0.148	-0.108	0.036	0.080
	0.182	0.331	0.785	0.547

	BoP, Current	GDP growth %	GDP p. capit	Threaten spe
GDP growth %	0.082			
	0.392			
GDP p. capit	-0.011	0.041		
	0.911	0.640		
Threaten spe	0.199	-0.038	0.050	
	0.037	0.675	0.579	
Ex. debt (to	0.596	0.097	0.281	0.378
	0.000	0.280	0.002	0.000
Ex. Debt %GN	-0.096	-0.056	-0.123	-0.136
	0.317	0.533	0.174	0.133
CPIA Debt	0.071	0.293	0.085	0.167
	0.588	0.011	0.477	0.160
CPIA Environ	-0.076	0.239	0.350	0.099
	0.566	0.040	0.003	0.409
CPIA prop.	-0.140	0.236	0.491	0.024
	0.286	0.043	0.000	0.843
CPIA trans.	0.018	-0.007	0.469	0.112
	0.889	0.955	0.000	0.351
Protected %	0.071	0.044	0.069	0.246
	0.460	0.631	0.448	0.006
Protect sq.	0.693	0.090	0.088	0.318
	0.000	0.319	0.329	0.000
FDI, net inf	0.704	0.127	0.186	0.333
	0.000	0.162	0.040	0.000
FDI, % GDP	-0.070	0.393	0.088	-0.131
	0.466	0.000	0.333	0.151
Tourism, peo	0.619	0.109	0.211	0.312
	0.000	0.234	0.020	0.001

Tourism, % r	-0.139	-0.012	0.249	-0.210
	0.141	0.902	0.008	0.028
Tourism, Rec	0.495	0.097	0.233	0.355
	0.000	0.282	0.009	0.000
Agric. %	-0.076	0.041	-0.156	-0.123
	0.422	0.638	0.075	0.155
Agric. sq km	0.714	0.166	0.035	0.287
	0.000	0.057	0.693	0.001
Arable %	-0.075	0.057	-0.088	-0.088
	0.428	0.516	0.318	0.307
Arable hect.	0.680	0.142	0.001	0.282
	0.000	0.103	0.993	0.001
Forest %	0.058	-0.114	0.143	0.172
	0.538	0.196	0.103	0.047
Forest sq km	0.693	0.044	0.054	0.201
	0.000	0.615	0.542	0.020
CO2 per GDP	0.280	0.224	0.069	0.003
	0.003	0.011	0.445	0.972
CO2 kt	0.802	0.133	0.026	0.277
	0.000	0.135	0.768	0.001
CO2 per cap.	0.249	0.119	0.563	0.033
	0.008	0.183	0.000	0.710
Urban %	0.086	0.116	0.596	0.110
	0.365	0.180	0.000	0.203
Urban growth	-0.045	-0.038	-0.482	0.032
	0.637	0.663	0.000	0.716
Education	-0.030	-0.138	0.147	-0.131
	0.800	0.220	0.189	0.245

	Ex. debt (to	**Ex. Debt %GN**	**CPIA Debt**	**CPIA Environ**
Ex. Debt %GN	-0.173			
	0.051			
CPIA Debt	0.135	-0.404		
	0.255	0.000		
CPIA Environ	0.082	-0.161	0.540	
	0.493	0.174	0.000	
CPIA prop.	0.048	-0.100	0.538	0.732
	0.689	0.402	0.000	0.000
CPIA trans.	0.042	-0.043	0.563	0.556
	0.723	0.715	0.000	0.000
Protected %	0.004	0.013	-0.042	0.240
	0.962	0.886	0.727	0.046
Protect sq.	0.680	-0.136	-0.067	0.080
	0.000	0.138	0.580	0.509
FDI, net inf	0.826	-0.153	0.225	0.044
	0.000	0.088	0.060	0.717
FDI, % GDP	-0.087	0.435	0.164	0.026
	0.333	0.000	0.173	0.832

Tourism, peo	0.833	-0.232	0.180	0.168
	0.000	0.012	0.148	0.178
Tourism, % r	-0.230	0.301	-0.000	0.337
	0.016	0.001	0.999	0.008
Tourism, Rec	0.810	-0.237	0.205	0.196
	0.000	0.009	0.093	0.110
Agric. %	0.000	-0.064	-0.128	-0.042
	0.999	0.477	0.275	0.723
Agric. sq km	0.784	-0.157	-0.003	0.006
	0.000	0.079	0.978	0.962
Arable %	0.121	-0.128	0.052	0.064
	0.174	0.152	0.660	0.584
Arable hect.	0.808	-0.170	0.138	0.087
	0.000	0.057	0.238	0.456
Forest %	0.015	0.204	-0.104	-0.046
	0.869	0.022	0.373	0.693
Forest sq km	0.646	-0.087	-0.117	-0.101
	0.000	0.332	0.317	0.387
CO2 per GDP	0.235	-0.086	0.148	0.106
	0.009	0.344	0.212	0.371
CO2 kt	0.756	-0.142	0.162	0.109
	0.000	0.114	0.167	0.357
CO2 per cap.	0.393	-0.220	0.218	0.261
	0.000	0.014	0.064	0.026
Urban %	0.294	-0.041	0.008	0.037
	0.001	0.645	0.948	0.751
Urban growth	-0.208	0.239	-0.268	-0.093
	0.018	0.007	0.021	0.433
Education	-0.157	-0.134	0.108	0.318
	0.162	0.234	0.502	0.043

	CPIA prop.	**CPIA trans.**	**Protected %**	**Protect sq.**
CPIA trans.	0.698			
	0.000			
Protected %	0.109	0.106		
	0.367	0.382		
Protect sq.	-0.115	-0.051	0.367	
	0.339	0.671	0.000	
FDI, net inf	0.013	-0.008	0.012	0.634
	0.912	0.945	0.897	0.000
FDI, % GDP	0.153	0.051	-0.027	-0.083
	0.201	0.673	0.774	0.369
Tourism, peo	0.035	-0.030	-0.032	0.460
	0.779	0.812	0.732	0.000
Tourism, % r	0.529	0.507	-0.042	-0.207
	0.000	0.000	0.666	0.032
Tourism, Rec	0.176	0.136	-0.024	0.403
	0.151	0.267	0.794	0.000
Agric. %	-0.012	-0.186	-0.211	-0.121

	0.916	0.109	0.015	0.164
Agric. sq km	-0.127	-0.065	-0.022	0.715
	0.278	0.578	0.804	0.000
Arable %	0.158	-0.042	-0.170	-0.148
	0.176	0.720	0.053	0.088
Arable hect.	0.057	0.058	-0.054	0.621
	0.625	0.619	0.542	0.000
Forest %	-0.056	0.083	0.301	0.140
	0.635	0.479	0.000	0.109
Forest sq km	-0.267	-0.153	0.064	0.834
	0.021	0.191	0.468	0.000
CO2 per GDP	0.032	-0.183	-0.132	0.104
	0.790	0.121	0.147	0.250
CO2 kt	0.100	0.078	-0.017	0.565
	0.396	0.511	0.846	0.000
CO2 per cap.	0.217	0.039	-0.060	0.180
	0.066	0.745	0.506	0.043
Urban %	0.049	0.091	0.065	0.199
	0.679	0.437	0.463	0.021
Urban growth	-0.228	-0.242	0.107	-0.064
	0.051	0.038	0.224	0.464
Education	0.403	0.401	-0.032	-0.112
	0.009	0.009	0.778	0.319

	FDI, net inf	**FDI, % GDP**	**Tourism, peo**	**Tourism, % r**
FDI, % GDP	0.006			
	0.944			
Tourism, peo	0.850	-0.060		
	0.000	0.523		
Tourism, % r	-0.182	0.120	-0.163	
	0.059	0.215	0.098	
Tourism, Rec	0.791	-0.078	0.922	-0.068
	0.000	0.396	0.000	0.477
Agric. %	0.033	-0.077	0.065	-0.097
	0.717	0.396	0.472	0.305
Agric. sq km	0.840	-0.066	0.674	-0.233
	0.000	0.464	0.000	0.013
Arable %	0.041	-0.089	0.146	-0.044
	0.651	0.325	0.104	0.642
Arable hect.	0.700	-0.096	0.632	-0.207
	0.000	0.287	0.000	0.028
Forest %	0.011	-0.011	-0.036	-0.044
	0.900	0.906	0.695	0.645
Forest sq km	0.490	-0.050	0.419	-0.174
	0.000	0.584	0.000	0.065
CO2 per GDP	0.203	0.083	0.281	-0.142
	0.025	0.364	0.002	0.136
CO2 kt	0.892	-0.061	0.794	-0.139
	0.000	0.500	0.000	0.145

CO2 per cap.	0.275	0.045	0.360	-0.081
	0.002	0.622	0.000	0.395
Urban %	0.179	0.120	0.201	-0.107
	0.044	0.182	0.024	0.259
Urban growth	-0.138	-0.071	-0.201	0.004
	0.123	0.429	0.024	0.966
Education	-0.096	-0.013	-0.024	0.273
	0.397	0.906	0.830	0.019

	Tourism, Rec	**Agric. %**	**Agric. sq km**	**Arable %**
Agric. %	0.050			
	0.572			
Agric. sq km	0.645	0.138		
	0.000	0.101		
Arable %	0.122	0.480	-0.032	
	0.169	0.000	0.707	
Arable hect.	0.608	0.057	0.816	0.202
	0.000	0.499	0.000	0.016
Forest %	-0.077	-0.513	-0.103	-0.279
	0.392	0.000	0.226	0.001
Forest sq km	0.307	-0.156	0.568	-0.099
	0.000	0.064	0.000	0.243
CO2 per GDP	0.219	0.153	0.291	0.070
	0.016	0.083	0.001	0.428
CO2 kt	0.769	0.057	0.851	0.076
	0.000	0.509	0.000	0.380
CO2 per cap.	0.304	-0.025	0.247	0.003
	0.001	0.779	0.004	0.969
Urban %	0.173	-0.048	0.095	-0.110
	0.050	0.568	0.262	0.192
Urban growth	-0.148	-0.008	-0.032	-0.148
	0.094	0.921	0.706	0.083
Education	-0.068	0.142	-0.198	-0.026
	0.552	0.200	0.073	0.815

	Arable hect.	**Forest %**	**Forest sq km**	**CO2 per GDP**
Forest %	-0.052			
	0.541			
Forest sq km	0.633	0.159		
	0.000	0.059		
CO2 per GDP	0.230	-0.203	0.095	
	0.009	0.021	0.285	
CO2 kt	0.808	-0.044	0.439	0.269
	0.000	0.611	0.000	0.002
CO2 per cap.	0.203	-0.005	0.210	0.681
	0.019	0.957	0.015	0.000
Urban %	0.042	0.120	0.170	0.230
	0.623	0.159	0.045	0.009
Urban growth	-0.090	-0.078	-0.123	-0.362
	0.291	0.365	0.152	0.000

Education	-0.151	-0.128	-0.107	0.092
	0.173	0.253	0.339	0.418

	CO2 kt	CO2 per cap.	Urban %	Urban growth
CO2 per cap.	0.215			
	0.013			
Urban %	0.049	0.502		
	0.576	0.000		
Urban growth	-0.076	-0.490	-0.472	
	0.383	0.000	0.000	
Education	-0.100	0.090	-0.008	-0.132
	0.375	0.424	0.945	0.234

Cell Contents: Pearson correlation
P-Value

APPENDIX I: Multivariable Logit Regressions (without High-Income Countries)

Binary Logistic Regression: DNS (w/o HI) versus Number of Threatened Species, CO2 emissions (metric tons per capita), Urban population (% of total)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         36  (Event)
              0         92
              Total    128

* NOTE * 128 cases were used
* NOTE * 17 cases contained missing values

Logistic Regression Table

                                                        Odds     95% CI
Predictor              Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant           -3.43244   0.674598  -5.09  0.000
Threaten species  0.0022264  0.0009486   2.35  0.019   1.00   1.00   1.00
CO2 per cap.      -0.307527   0.126039  -2.44  0.015   0.74   0.57   0.94
Urban %           0.0526475  0.0132568   3.97  0.000   1.05   1.03   1.08


Log-Likelihood = -61.818
Test that all slopes are zero: G = 28.461, DF = 3, P-Value = 0.000
```

Binary Logistic Regression: DNS (w/o HI) versus Number of Threatened Species, CO2 emissions (metric tons per capita), Urban population (% of total), Nationally protected areas (% of total land area)

```
Link Function: Logit


Response Information

Variable      Value  Count
DNS (w/o HI)  1         35  (Event)
              0         87
              Total    122

* NOTE * 122 cases were used
* NOTE * 23 cases contained missing values

Logistic Regression Table

                                                        Odds     95% CI
Predictor              Coef    SE Coef      Z      P  Ratio  Lower  Upper
Constant           -3.95255   0.778515  -5.08  0.000
Threaten species  0.0019600  0.0009835   1.99  0.046   1.00   1.00   1.00
CO2 per cap.      -0.297140   0.136873  -2.17  0.030   0.74   0.57   0.97
Urban %           0.0541716  0.0137935   3.93  0.000   1.06   1.03   1.08
Protected % land  0.0371407  0.0207638   1.79  0.074   1.04   1.00   1.08


Log-Likelihood = -57.251
Test that all slopes are zero: G = 31.736, DF = 4, P-Value = 0.000
```

APPENDIX J: Multivariable Ordinary Least Square Regression for Number of DNSs (without High-Income Countries)

Regression Analysis: No. of DNS versus Number of Threatened Species, CPIA policy and institutions for environmental sustainability rating

The regression equation is
No. of DNS = - 1.81 + 0.00440 Threaten species + 0.545 CPIA Environ.

72 cases used, 73 cases contain missing values

Predictor	Coef	SE Coef	T	P
Constant	-1.8069	0.9245	-1.95	0.055
Threaten species	0.004399	0.001084	4.06	0.000
CPIA Environ.	0.5446	0.2947	1.85	0.069

S = 1.38564 R-Sq = 23.8% R-Sq(adj) = 21.6%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	41.396	20.698	10.78	0.000
Residual Error	69	132.479	1.920		
Total	71	173.875			