Democracy and Sustainability:

How does the Democratic Process Affect Sustainability?

ABSTRACT:

The idea of democracy defined the 20th century as democratic movements spread across the globe. Similarly, one of the defining ideas of the 21st century is the idea of sustainability as the effects of societal development continue to impose ecological changes at the unprecedented rate. In this paper we explore the relationship between democracy and sustainability at the national level. We ask: how does democracy affect sustainability? To answer this question, we develop indices for both democracy and sustainability using national data of 192 countries deposited at the Europa World Yearbook and the World Bank between 1972 and 2005. Then we perform a series of regression analysis to investigate the relationship between democracy and sustainability. The results of the study were illuminating, as it revealed that sustainability was largely falling during the period of study on a per capita basis, yet it was rising on per unit of GDP basis. Of particular noteworthy results were the relatively strong performances of democracies, which tended to perform the best across all groups in terms of per unit GDP figures and also tended to have the highest average sustainability (except for medium income countries) in per capita terms. Our analysis was also revealed that autocracies tended to perform the worst in these measurements, both in per capita and per unit GDP terms. The results of this study show that government type has a discernible impact on the sustainability of a country. On average, democracies tend to outperform autocracies and semi-democracies across the study period.

Keywords: autocracies, democracy, development, sustainability, and sustainability index

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INTRODUCTION

The idea of democracy defined the 20th century as democratic movements spread around the globe and many former colonies gained their independence, becoming democracies themselves. Furthermore, several of the domestic and international conflicts and wars of the 20th century can be couched in terms of the struggle between democracy and authoritarianism. The increasingly apparent effects of global warming on the political and economic agendas of nations have given sustainability a prominent role among the domestic and foreign policy goals of nations. This change in policy outlook has caused many nations to stress their efforts to promote sustainability and reaffirm their commitment to the sustainable use of natural resources. In light of this increased environmental awareness, nations have focused on sustainable development to "provide for the fundamental needs of humankind in an equitable way without doing violence to the natural systems of life on earth" (Kemp and Martens p. 5). The importance of these factors merits a closer study of the relationship between democracy and sustainability, particularly given the political and social implications that such a finding would have in the realm of national and international environmental policy.

The existing body of literature primarily addresses how green political thought is compatible with democracy (Barry p. 118) However, existing research does not adequately address, is the effect of democracy at the macro level on sustainability. The influence of democracy on environmental initiatives is of particular significance given the very nature of democracy and increasing public support for environmental initiatives, particularly in North

America and Europe. Our goal is to gain a better understanding of the relationship between democracy and sustainability. From our knowledge of democracy and the ability of the populace to influence the actions of government, we expect democracies to show a stronger tendency towards higher sustainability than autocracies. We are thus guided by our research question: *Does democracy promote sustainability?*

To answer this question, we examine the relationship between democracy and sustainability by using variables that operationalize their meaning. Variables were selected based on the literature covering both democracy and sustainability. The variables under examination are arranged under two categories, those measuring democracy and those measuring sustainability. The democratic variables will form our independent variable and will be used to categorize nations into three broad categories, democracies, semi-democracies, and autocracies. A special subcategory for democracies that arose during the 1990s wave of democratization was also created. After this step, countries were further separated by affluence GDP per capita. Sustainability will be our dependant variable and will be tracked over time, starting in 1972, the year of the Stockholm meeting on sustainability.

The relationship between democracy and sustainability is one that deserves to be studied, especially given rising concerns about global warming. The existing body of literature addresses how green political thought is compatible with democracy (Barry p. 118), how to best affect change towards sustainability in a democracy (Jänicke p. 75-76) and how democracy interacts with environmentalism (Mason p. 11). However, what existing research does not adequately address is the effect of democracy at the macro level on sustainability. The influence of democracy on environmental initiatives is of

particular significance, given the very nature of democracy and the increasing public support for environmental initiatives, especially in North America and Europe. This research will also help discern if environmentalism is a grass-roots movement or if it is more influenced by government actors. We hope that this paper will provide a better understanding of the relationship between democracy and sustainability. From our knowledge of democracy and the ability of the populace to influence the actions of government, we expect democracies to show a stronger movement towards sustainability than autocracies. It is important to note that due to the construction of this study, it is only applicable at the nation state level.

ANALYTICAL FRAMEWORK

The concepts of democracy and sustainability are complex and the interactions between them even more so. Due to this complexity and different connotations of these terms for different people, we must clearly define the meaning of these two terms and specify how they can best be measured. Furthermore, we must attempt to understand the complex relationship that exists between these two concepts and how they interact.

Democracy

The concept of democracy is one that is difficult to truly define as the concept itself means different things to different people. One definition of democracy stems from the Greek δημοκρατία - (dēmokratía) "the power to the people," which arises from the

combination of two words δῆμος (dêmos), people, and κράτος (krátos), power. Hadenius's definition of political democracy states "public policy [that] is … governed by the freely expressed will of the people, whereby all individuals are to be treated as equals" best defines what we will be considering as democracy (Hadenius p. 9). A more narrow, and less positive, outlook on democracy can be found in Joseph Schumpeter's argument that "democracy means only that people have the opportunity of accepting or refusing the men who are to rule them" (Hadenius p. 15). As such, democracy conjures ideals that have never been approached by any political system and invites criticism for its imperfect implementation. To maintain the distinction between democracy in its ideal form, the "institutional arrangements that have come to be regarded as a kind of imperfect approximation of an ideal," or polyarchy will instead be examined in this paper (Dahl 1971, 9). The use of polyarchy is beneficial for our purposes because, like democracy, "polyarchy is a quality of a political system, but unlike democracy, polyarchy is also a dimension" of the political system (Coppedge and Reinicke p. 52). The qualities of polyarchy are defined as the freedom of organization and expression, the right to vote, eligibility for public office, political competition, alternative sources of information, free and fair elections, and the impact of voting on government policies (Dahl 1971: 3).

Measuring democracy is similarly a difficult task, with several different methods proposed over the years. In order to form a better understanding of the different methods of measuring democracy, we will examine methods constructed by Coopedge and Reinicke, Mike Alvarez, José Cheibub, Fernando Limongi, and Adam Przeworski, and Vanhannen, and Hadenius to better frame our method of measuring democracy/polyarchy

at the national level. Our analysis of these methods will be further supplemented by the analysis provided by Munck and Verkuilen in "Conceptualizing and Measuring Democracy: Evaluating Alternative Indices." The methods examined ranged from rather simple, in the case of Vahannen's work, to complex in Hadenius's model. Yet, each provides its own insight into the nature of democracy and how to best measure it.

Michael Coppedge and Wolfgang Reinicke's method, proposed in their article "Measuring Polyarchy," examines the fundamental definition of democracy, or more narrowly, polyarchy. Coppedge and Reincke use four variables to measure the different aspects of polyarchy: (1) free and fair elections; (2) freedom of organization; (3) freedom of expression, and (4) the availability of alternative sources of information (Coppedge and Reinicke 1990, p. 53-54). Their criteria are criticized by Munck and Verkuilen due to the omission of the way in which political offices are filled, the citizens' participation in elections, and its relatively narrow definition of democracy (2002, p. 11-12, 28). One of the most important aspects of Coppedge and Reinicke's study is how easy it is to replicate given the criteria they establish. This method is used in Coppedge and Reinicke's analysis of 137 countries (Coppedge and Reinicke 1990, p. 56). Munck and Verkuilen praise this method for the use of multiple coders and testing of inter-coder reliability, the clear presentation of their coding rules and process, and use of the Guttman scale to avoid loss of information during aggregation, while still displaying the aggregate data (2002, p. 19-21, 23). Overall, the polyarchy score constructed by Coppedge and Reinicke is easy to interpret and replicate while remaining valid and objective.

The method used by Mike Alvarez, José Cheibub, Fernando Limongi, and Adam Przeworski presents another approach to frame democracy, using an amalgamation of the methods developed by Bollen, and Coppedge and Reinicke (Alvarez et al. 1996, p. 20). Alvarez et al. focus upon contestation as the primary characteristic of democracy, arguing that for a regime to be considered democratic there are "two kinds of offices [to be] filled, directly or indirectly by election – the chief executive office and … the legislative body – and that the office holder's are responsible only to the electors" (Alvarez et al. 1996, p. 5). Alvarez et al. further define contestation as having three central features, ex ante uncertainty (the possibility an incumbent might lose), ex post irreversibility (the outcome of the election must be irreversible), and repeatability (Alvarez et al. 1996, p. 5). Alvarez et al. code their data by breaking it into a few key variables, the elective nature of the chief executive, the elective nature of the legislature, and the number of parties; with an additional sub-rule concerning the number of parties that disqualifies a regime from being democratic if the incumbent's party unconstitutionally closed the legislature and rewrote the rules in their favor (Alvarez et al. 1996, p. 7-10). This selection of indicators is praiseworthy for its ability to cover the criteria established by the authors of the study. Alvarez et al. provide a thoughtful new perspective on what it means to be a democracy, not accounting for political liberties. Instead, they direct their attention towards the central idea of the democracy, the free and fair elections of those who govern. However, the omission of participation as a variable draws criticism from Munck and Verkuilen (2002, p. 11-12, 19, 21).

In “A New Dataset for Measuring Democracy, 1810-1998,” Tatu Vanhanen presents a new facet through which democracy can be measured. They propose probably the most simple measurement, competition and electoral participation. Vanhanen calculates competition by subtracting the number of votes won by the largest party, referring to the party with the largest share of the total vote for parliamentary elections and the winner of the presidency in presidential elections, from 100. If such data was unavailable, it was calculated based on the distribution of seats in parliament (Vanhanen 2000, p. 253). The value of participation was calculated from the total population and the number of voters (Vanhanen 2000, p. 253). Once these two variables were calculated, Vanhanen combined them by first multiplying the two variables and then dividing the product by 100, creating a 1 to 100 scale for the measurement of democracy (Vanhanen 2000, p. 256). Vahanen’s technique for measuring democracy has some great features, namely the use of relatively few variables. Thus, it is easily replicated, with its basis on quantitative data. However, there are multiple problems with this approach (Vanhanen 2000, p. 256). Some of those associated with this measurement technique, beyond a minimalist definition of democracy, arise from measurement of participation data due to differing age structures of developing and developed world that can create a biases as large as 10% to 15% (Vanhanen 2000, p. 255). Further problems arise from the omission of participation, the creation of systemic basis through the poor use of indicators, and the lack of a theoretical bias for combing variables (Munck and Verkuilen 2002, p. 11, 16). Vanhanen’s work provides an introspective, easily constructed, and readily workable dataset, though there are weaknesses that arise due to differing population structures and other potential effects on the voting structure or voting distribution systems.

From the policy dimension of democracy, Axel Hadenius presents a complex and well conceived method that seeks to empirically define political democracy in his *Democracy and Development*. Hadenius defines democracy as when "public policy is [governed] by the freely expressed will of the people, whereby all individuals are to be treated equally" (Hadenius 1992, p. 9). Furthermore, political democracy cannot impose restrictions upon what actions a citizen can partake; it can merely encourage citizens to work towards its ends (Hadenius 1992, p. 37). Hadenius uses nine core variables to define his concept of political democracy. Hadenius includes universal suffrage, arguing that it is one of the primary characteristics of political democracy, and abridgements of this principle, such as the exclusion of citizens from franchise for reasons of race, sex, literacy, financial, or social status, must be taken into account (Hadenius 1992, p. 39). Meaningful and fair elections proved to be another important issue for Hadenius's measurement of democracy, as the circumstances in which elections are held and the influence they exercise over national policy are important in exercising political democracy and must be open and free from fraud such that the outcome is not fixed in advance (Hadenius 1992, p. 42). Additionally, those elected to hold office must have some actual say in the design of public policy (Hadenius 1992, p. 49). The importance of organizational freedoms cannot be overlooked, particularly the right to form political parties, and the right to maintain political associations and trade unions (Hadenius 1992, p. 53). Freedom of expression and press is another central tenet of democracy, as it allows the free exchange of ideas and beliefs (Hadenius 1992, p. 56). The last of Hadenius's variables is freedom from political violence and repression, whether from government or private factions that would otherwise stymie democratic expression

(Hadenius 1992, p. 58). Unfortunately, the broad range of variables selected by Hadenius suffers from conflation. However, the coding methodology is clear, and each indicator is justified through his conceptualization of democracy (Munck and Verkuilen 2002, p. 11, 14, 19, 21, 27). Hadenius aggregates the points obtained from each ranking (from 0 to 8), but, there is a notable restriction concerning the points obtained from political violence and oppression (Hadenius 1992, p. 60). These can only be obtained if a country scores at least 2 (of the possible 16) points from organizational freedoms and freedom of opinion (Hadenius 1992, p. 60). Once the points were aggregated, with possible scores ranging from 0 to 48, they were converted to an index from 0 to 10 (Hadenius 1992, p. 60). Hadenius presents a thorough and complete overview of democracy that is both replicable and workable. Perhaps, most importantly, its quantitative analysis is not unduly influenced through subjective measurements.

There are some common threads linking the proposed methodologies. The most important of these common linkages is the use of a common definition for democracy, polyarchy as proposed by Dahl. Further linkages arising from this common framework are the same eight core points Dahl addressed in different ways. Of the approaches that we examined, the most applicable for our purpose, is the method described in Coppedge and Reinicke. The other methods offer their own insights into this problem. We will further examine our approach in depth in the methods section.

Sustainability

Sustainability, as a concept, is less ambiguous than democracy, but suffers from divergent views in how it is measured and implemented. Mason argues that sustainable development implies positive socio-economic change geared towards meeting the needs of present generations, particularly those least well off. At the same time, sustainable practices ensure that we pass on the ecological and economic means that enable future generations to be able to meet their own needs (Mason p. 36). Raven invokes Gandhi's response to the question of whether India would follow the British development process, to which Ganhdi coyly responded "It took Britian half the resources of the planet to attain this prosperity. How many planets will a country like India require?" when addressing the need for sustainable development in the developing world in light of untenable resource requirements (Raven p. 4). The goal of sustainability can thus be taken as the need to maintain resources for the use of future generations. The challenge, however, is that sustainability indicators (SIs) cannot be so easily defined. Bell and Morse note that "SIs attempt to encapsulate complex and diverse processes in relatively few simple measures," thereby decreasing their effectiveness through oversimplification. Therefore, we will examine the various methodologies for the measurement of sustainability and assess their applicability to our research.

René Kemp and Pim Martens (2007) provide an in-depth look at the concept of sustainability and its application. Kemp and Martens use the common definition of sustainable development or "development that meets the needs of current generations without compromising the ability of future generations to meet their own needs" (Kemp and Martens p. 5). Sustainability science, according to Kemp and Martens, is the multi-

disciplinary study of the relationships between the economy, environment, and society (Kemp and Martens p. 6, 8). Thus, they argue that sustainability is a "problem framing [approach] that emphasizes the interconnectedness of different issues and scales" (Kemp and Martens p. 13). Furthermore the long-term and indirect effects of actors must be considered in decision making (Kemp and Martens p. 13). When sustainability is approached from an anthropocentric view point, sustainable development is concerned primarily with the betterment of the human condition. Such a perspective requires social consensus on the definition of unsustainablility (Kemp and Martens p. 12). It is from this understanding that sustainability science can guide decision making through "provisional knowledge about social problems, the desirability of new systems… and the long-term effects of interventions" (Kemp and Martens p. 13). The views introduced by Kemp and Martens provide a basis for the understanding the concept of sustainability and the roles that it can play in society.

Klaus Rennings and Hubert Wiggering examined sustainability in "Steps towards indicators of sustainable development: linking economic and ecological concepts." They pursued both strong sustainability, in which there can be no substitution, and weak sustainability, where other factors can supplement the loss of another (Rennings and Wiggering p. 25). They argure that a combination of both is the most apt approach until "the costs and benefits of avoiding critical impacts have to be taken into account" (Rennings and Wiggering p. 25). Rennings and Wiggering use the Brundtland Report's (1987) definition of sustainable development, where "the needs of the present [are met] without compromising the ability of future generations to meet their own needs"

(Rennings and Wiggering p.25). Rennings and Wiggering, in pursuit of accurately describing weak sustainability, “try to quantify the external effects of environmental pollution” and claim sustainable income can only be achieved when resources are used in a sustainable manner, i.e. they should remain intact (Rennings and Wiggering p. 27). Rennings and Wiggering found that target indicators like critical loads and levels should form the core indicators for sustainable development and that the ecological and environmental sustainability indicators should be used in tandem, such that a better understanding of the impact of humanity can be reached (Rennings and Wiggering p. 35).

Simon Bell and Stephen Morse examine several different approaches to measuring sustainability because of the increasing relevance of sustainability indicators, as governments and agencies are increasingly devoting substantial amounts of resources to the development and testing of such indicators (Bell and Morse p. 3). Bell and Morse add that sustainable development is a “goal to reach by intervention of some sort, one [must] be aware of whether the system is still unsustainable or whether the goal of sustainability has been reached” in each specific context on relevant scales, measured with appropriate methods and designed for long term measurement (Bell and Morse p. 21). Bell and Morse divide sustainability indicators (SIs) into two broad categories; State SIs that measure the present state of a variable, and Pressure SIs that measure the process through which a variable changes (Bell and Morse p. 28). Bell and Morse, acknowledge that SIs, in attempting to condense complex and diverse processes into relatively basic measures, can suffer from oversimplification and thus lose their effectiveness (Bell and Morse p. 41-42). Bell and Morse conclude that by identifying the importance of

developing “plans that are capable of meeting the needs of tomorrow as well as today,” and the varied levels of importance of SIs in policy formation, from outright ignoring them in favor of other priorities to using them for political ‘spin’ to complete adoption (Bell and Morse p. 129, 203). Our paper will be primarily concerned with state SIs, which will allow us to better observe how things are changing over time, as pressure SIs measure change at a particular moment. Examining such variables would create extremely variable results.

Sustainability is an important issue for both present and future generations. The need for sustainability exists due to the current environmental problems facing the world and the need to address them. These works clarify necessary features of sustainability indicators and how they should be used. Overall, indicators need to be chosen not only for their applicability but also their relevance.

Linkages between Democracy and Sustainability

The recent rise in the importance of sustainability in public policy has lead to an increasing body of work that examines the relationship between democracy and sustainability. These papers take different approaches, from how green political thought is compatible with democracy, (Barry p. 118), to how democracy interacts with environmentalism (Mason p. 11). In exploring these different approaches to understand how framing affects sustainability, we hope to better frame this relationship and study its effect at the macro level.

Michael Mason defines and explores the concept of environmental democracy in his work *Environmental Democracy,* which he defines as a participatory and ecologically rational form of collective decision making (Mason p. 1). It prioritizes judgments based on long-term generalizable interests, facilitated by communicative political procedures and a radicalization of existing liberal rights (Mason p. 1). Mason argues "the democratic legitimacy of ecological activism lies partly in demonstrating how regard for social and environmental interests of others, [including future generations, broadens] our understanding as self-governing subjects with responsibilities beyond conventional political boundaries" (Mason p. 13). Although elections only indirectly address environmental problems, in most cases, changes in public policy only occur when *the chance of reelection is improved*, thus highlighting the importance of active political participation (Mason p. 66). This claim raises the importance of one of the central tenets of democracy, elections, on sustainability. Mason claims that although human rights and environmental groups have much to do in their quest for the global recognition of human environmental rights, litigation of transnational public law presents a forum to address these problems, highlighting the importance of the freedoms of the press and organization (Mason p. 232). Mason's insight into the workings of democracy in an environmental context is invaluable and provides a better understanding of the interplay between democracy and environmental activism.

Arias-Maldonado (2007) assesses the connection between sustainability and deliberative procedure that might offer the best grounds for a defense of the green case

for deliberative democracy. Arias-Maldonado argues that the openness of deliberative procedure and freedom to politically organize suppresses distortions of the liberal political process and allows for the emergence of green values. Once admitted as an interest, environmental protections must be discussed alongside other interests (Arias-Maldonado p. 235). They argue the greening of the institutions of liberal democracy would cause the greening of society, insofar as that the reinforcement of citizenship causes the realization that "sustainability and the reshaping of social-environmental relationships are political rather than moral questions (Arias-Maldonado p. 240). Arias-Maldonado found "the dichotomy of scientific knowledge and participative democracy … is not so much an obstacle to [environmental] decision making grounded on knowledge, as a means to achieve it" indicating that sustainability is possible through a democratic framework (Arias-Maldonado p. 244).

METHODOLOGY

Using the understanding that we have gained from our study of democracy and sustainability, and the nature of the variables that we have selected for our project, we will construct two indices containing our constituent variables. Our democracy data will be collected from the Europa World Yearbook and sustainability data from the World Bank's World Development Indicators as a guard against introducing differing measurement practices and maintaining temporal constancy.

Democracy

Our standards of measurement for our democracy variables will draw heavily from the rules set forth by Coopedge and Reinicke. Their method of categorizing polyarchy will form the basis of the criteria for scoring due to the replicability of their results. Furthermore, the use of the Guttman scale will avoid the loss of information during aggregation process while still displaying the aggregate data. This will also prove useful in our assessment and allow for a clearer understanding of potential anomalies (Coppedge and Reinicke 1990, p. 56; Munck and Verkuilen 2002, p. 19-21, 23). Data will be collected from the Europa World Yearbook, which catalogues the political climate of countries around the globe. We will then code the data according to the rules set forth below to create our constituent variables of democracy.

Our first variable is free and fair elections, which was chosen due to the central role that elections play in the democratic system. The importance of free and fair elections becomes particularly apparent when one considers that one of the principal benefits of representative democracy is the very low activity threshold, enabling even those only moderately interested to make their presence felt. The minority, with a strong political interest, are thereby denied the comparative procedural advantage they [would otherwise] enjoy (Hadenius p. 26).

Furthermore, representative democracy can act as a "filter for irrational and unreasonable desires, while also facilitating discussion and debate" (Dobson p. 124). The importance of free and fair elections thus lies in how its absence limits the effectiveness of democracy, as it is through elections that the voice of the people is heard. The

requirement of free and fair elections is perhaps best illustrated in Alvarez et al., where the concept of democracy exists only when competition exists, ie. that incumbents can lose elections, to heart, and use it to form the primary basis for their analysis of democracy (1996 p. 5). The importance of contestation to the democratic ideal is of particularl note in the post-World War II world, as noted by Munck and Verkuilen. The importance of suffrage is greatly diminished due to the near ubiquitous application of universal suffrage during this period (2002 p. 11). All of the other works follow the principles first set down by Dahl in his seminal work *Polyarchy,* with free and fair elections constituting one of his eight minimum requirements for political democracy (1971: 3). Indeed, two of the other seven requirements are closely related to the idea of free and fair election: eligibility for office and the right of political leaders to compete for support (1971: 3). Free and fair elections will thus be coded into three separate tiers (Coppedge and Reinicke 1990 p. 53):

1. Elections without significant fraud or coercion.
2. Elections with some fraud or coercion.
3. No meaningful elections.

The next variable is freedom of organization, another one of Dahl's minimum requirements of political democracy (1971: 3). The ability for people to form groups, with those of similar ideological and political interests is one of the fundamental freedoms of the democratic system. Allowing "several parties to operate signifies that elections, when they are held, will be more open, and that the possibilities of political

influence between elections will be far greater" (Hadenius p. 53-54). Barry argues "that the polices flowing from any conception of sustainability are likely to have widespread social impact, leaving few citizen's lives untouched, it is uncontroversial to hold that [they] should have some say in the articulation and formulation of this social principle," with political parties forming a medium through which discussions about policy can be held and consensus reached (p. 119). Alvarez et al.'s use of parties for the construction of the contestation variable also speaks of the importance of political organizations in allowing like-minded individuals an avenue for political discourse and thereby allowing their opinions to be heard at the highest levels of political power (p. 8). Bollen, despite his misgivings about the ability of political organization to measure the democratic nature of a regime, noted "the number of political parties [does give] hints about the degree of political democracy" (p. 13). The importance of political organization thus lies in its empowerment of the populace to affect change through collective action. Freedom of organization will be coded into four tiers (Coppedge and Reinicke 1990 p. 54):

1. Some trade unions or interest groups may be harassed or banned, but there are no restrictions on purely political organization.
2. Some political parties are banned and trade unions or interest groups are harassed or banned, but membership in some alternatives to official organizations is permitted.
3. The only relatively independent organizations are allowed to exist are nonpolitical.

4. No independent organizations are allowed. All organizations are banned or controlled by the government or the party.

The final constituent variable of our democracy index is a combination of two closely related requirements for democracy, as specified by Dahl, freedom of expression and access to alternative sources of information, or freedom of opinion (1971: 3). Bollen argues that the lack of political liberties such as freedom of expression and alternative sources of information indicates a lack of political democracy (p. 10). This defect suggests that elites have greater political power over non-elites than when these rights are upheld (Bollen p. 10). The premise of Barry's model for the inclusion of green ideology into the democratic system requires a discursive or deliberative model of democracy, which can only occur when information is allowed to flow freely and differing opinions are able to be voiced (p. 118). Munck and Verkuilen also acknowledge the importance of the freedom of the press and by extension freedom of expression through their inclusion of these principles in their logical structure of concepts while not labeling them as possibly conflating or redundant (p. 13). Furthermore, combining freedom of expression and the press into a single variable is not without precedent. In Hadenius's *Democracy and Development*, the two variables are combined into a single variable called freedom of opinion (p.56). Freedom of expression and the press will be condensed into three separate tiers (Coppedge and Reinicke 1990 p. 54):

1. Citizens can express their views and alternative sources of information exist and are protected by law, AND if the government owns a significant part of the media, then they are controlled by independent or multiparty bodies.
2. Dissent is discouraged by informal pressure or systematic censorship, but such control is incomplete, AND government sources of information are given preferential treatment, but alternative sources of information are available, OR the government or ruling party dominates the diffusion of information such that alternative sources exist only for nonpolitical issues.
3. All dissent is forbidden and effective suppressed, AND no public alternative to official information.

Our three constituent variables of democracy will then be aggregated into our democracy index. This will be accomplished by using a Gutmann scale for data aggregation, where the values of each of the sub-sections will remain observable, while also providing a clear picture of the overall nature of the democratic process in a nation. Constituent variables will be organized in the following order: free and fair elections, freedom of organization, and freedom of expression and the press. For example, if a nation scored a 1 in free and fair elections, a 2 in freedom of organization, and a 3 in freedom of expression and the media, the Gutmann score would read: (1 2 3). The scores on the Gutmann scale will then be used to place each nation into one of three categories: democracy, semi-democracy, and autocracy. In order for a nation to be considered a democracy, it must have a score on the Gutmann scale of a least two 1s and one 2. An Autocracy requires at least one 3 and two 2s. All scores lying between these

two extremes will be considered semi-democracies for the purposes of our analysis. The Gutmann scales will appear in the appendix, but for our analysis we will merely present countries according to the four categories of Democracy, Semi-Democracy, Autocracy, and 1990's Democracy.

Our democracy dataset will primarily be an update of the one created by Coppedge and Reinicke in "Measuring Polyarchy." We will use 1986 as our base year and use Polyarchy's Regime Change Database to identify nations that experienced regime changes during the period, removing those that experienced more than one coup d'etat or other regime change, and then identify the year the regime change took place. Once we have identified nations that have experienced a regime change, they will be scored based on the historical data presented in the Europa World Factbook. As our goal is to update "Measuring Polyarchy," our grading system will be based on their system as noted above.

Sustainability

The data used for the creation of our sustainability index will be drawn from the World Bank's World Development Indicators, as the World Bank provides an unbiased source of information about the nature of a country's sustainability. Most of our variables can be collected directly from data provided by the World Bank. However, per capita water consumption and rail density are not included among its indicators. Fortunately,

these variables can be constructed from the data provided by the World Bank. As the World Bank tracks both water consumption at the national level and national populations, water consumption per capita can be calculated by dividing water consumption by population. Similarly, rail density can be calculated by using the data the bank provides both total rail length at the national level and the nations' landmass. Rail length is then divided by landmass to create our statistic.

The first of our constituent variables will concern electricity consumption per capita, measured in terms of the natural logarithm of kilowatt-hours per capita. Energy consumption is a fundamental concern for sustainability advocates, who stress reduced waste and the more efficient use of energy. Halsæs and Verhagen note the importance of energy to society through increased educational and economic opportunities and access to healthcare (p. 672). Less consumption per capita can also produce health dividends for both the environment and people (Halsæs and Verhagen p. 672). In Nansai et al. electricity consumption is used as a measurement of eco-velocity, which measures both the immediate and future impacts of present consumption (p. 1465). "Sustainability: necessity for a prosperous society" examines the need for increased energy efficiency as well as its role in creating a sustainable society (Fokkema et al. p.221-226). Ronchi et al. use energy consumption per capita as one of their sustainability indicators for Italy, because of its importance in modern society and how wasteful use harms the environment and contributes to global warming (p. 203 – 204). Winkler et al. take a more economically oriented approach and study how increased efficiency of electricity usage in South Africa would create 40,000 new jobs (p. 12).

Water consumption per capita, another important variable in our study, will be measured in the natural logarithm of liters per capita. Water is and always will be essential for human survival. The need, in both the present and the future, for unpolluted water to both quench people's thirst and provide food for their plates is undeniable. Ronchi et al. use water as one of their resource-based indicators due to the historic problem of the lack of water in southern Italy and the pollution of water sources in the north (p. 203-204). The consequences of current consumption place a critical strain on this most important of resources (Ronchi et al. p. 203-204). Spangenberg uses water as one of his categories of material flow due to its great importance across economic and social spheres (p. 301). Spangenberg and Lorek use water consumption as one of their household sustainability variables due to the influence of individual choice in the amount of water used during both the construction and residence periods of household structures (p.137). Veleva and Ellenbecker, noting the impact of water shortages on lives, businesses, the environment, and societal function, use water consumption as one of their measures of sustainability (p. 527).

The third of our constituent variables is CO_2 emissions per capita, measured in the natural logarithm of carbon in tons. CO_2 emissions per capita is an important indicator for overall sustainability due its nature as a greenhouse gas and ability to serve as a proxy for atmospheric pollution in general. Bossel uses CO_2 as one of his sustainability variables, citing the negative affects of CO_2 on human and environmental health (p. 23-27, 103). Beg et al. also use CO_2 as an important indictor for climate change when

presenting the steps necessary to reduce the likelihood of catastrophic climate change (p. 132, 140). Winkler et al. take a more economically oriented approach and study how mitigation of CO_2 in South Africa would create 40,000 new jobs through increased efficiencies (p. 120).

The last of our constituent variables is railroad density, measured in total track length divided by the nation's landmass. Railroad density is an important indicator as it serves as an indicator of a country's infrastructure and the availability of mass transportation. Richardson examines the effects of carbon taxes on reducing the use of personal automobiles and reducing reliance on trucks for transporting goods (p. 34). Kwok and Yeh's examine the role of well planned mass transportation on reducing the use of private vehicles in their assessment of sustainable transportation in several East Asian cities (p. 922). Conversely, they find poorly planned and/or carried out mass transportation infrastructure increased reliance on private vehicles (Kwok and Yeh p. 922). Lorek and Spangenburg examined Germany, where efficient rail travel is available, specifically the high level of private car ownership, bringing the cost factor to closer scrutiny (p. 16). Federici et al. compared the transport efficiencies of rail and road transportation in Siena, Italy and found that although roads transported 3.26 times the amount of material that the railroads did, 25.28 times the amount of fuel was consumed, further demonstrating the far greater efficiency of rail (p. 163).

The previous four sub-variables are then be combined into our aggregate sustainability index. First, each of the sub-variables will be converted to a 1 to 100

index, with 100 representing the lowest value (or most sustainable value) for that variable observed over the entire period for power and water consumption as well as CO_2 emissions. For rail density the greatest value will be assigned a value 100 on the 1 to 100 scale, though this value will be excluded for island nations due to the nature of their topography. The values created using these scales will then be added and divided by four, or three in the case of islands, yielding our sustainability index. This index will thus give equal weight to each of the sub-categories, such that each is worth 25% in the index. For island countries, the rail density category will be dropped and each category will be weighed at 33% and will be designated within the data as an island nation.

Affluence

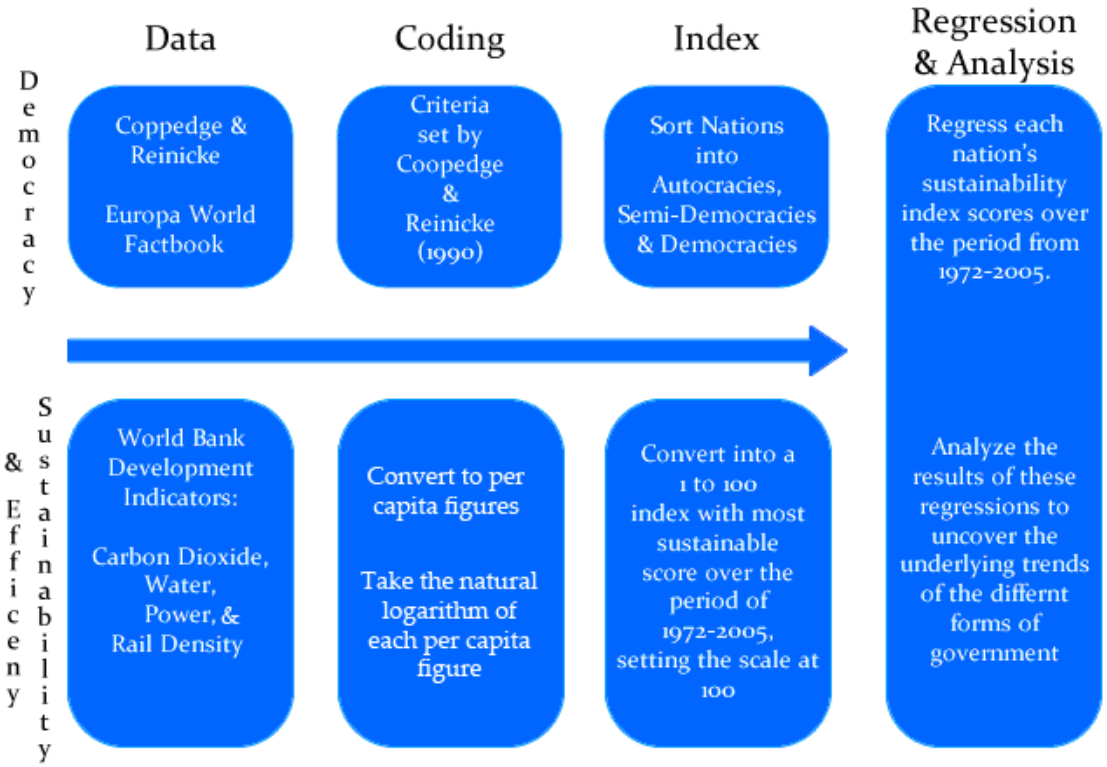
Unfortunately, simply analyzing our democracy and sustainability indices will not provide accurate information about the linkage between democracy and sustainability due to the large and important effect that affluence has on the measures that we employ to measure sustainability. The impact of affluence on sustainability thus calls for a control variable, GDP per capita. Fischer-Kowalski and Amann found that increases in GDP are related to increases in both domestic output and consumption even in the wealthiest of nations, although such increases did not occur on a one to one basis (p. 21). Dietz and Rosa support the finding that increased affluence (measured in GDP per capita) would in turn cause increased CO_2 emissions (p. 177) However, they found that this trend was somewhat reversed with decreasing CO_2 in high income countries (Dietz and Rosa p. 177). York et al. provide further support for the importance of affluence (GDP per

capita) and its close interrelationship with CO_2 emissions, representing an increasing ecological footprint (2003 p. 294). Rosa et al. similarly use GDP per capita as a method of tracking affluence (2004 p. 510). The findings of these studies indicate that the role of affluence in affecting nation's sustainability cannot be ignored; therefore the inclusion of affluence as a control variable is a must.

Using GDP per capita, we will divide countries into three separate groups: low GDP per capita, less than $5000 per capita, medium GDP per capita, between $5000 and $14,000, and high GDP per capita, over $14,000. For simplicity, we used the average GDP per capita (in constant 2000 US dollar terms) over the period of 1972 to 2008 for assigning countries into affluence groups. We will then compare democracy and sustainability within these groups to remove the influence of affluence.

Construction of Study

Once our indices of democracy and sustainability have been created, analysis of the influence of democracy on sustainability can begin. Our analysis will begin with the body of nations that are recognized by the World Bank, removing those that have had more than one regime transition or prolonged civil war such that the effects of democracy on sustainability may be more clearly studied. Dummy variables will be created for regime type and relative affluence levels. Additional, dummies will be constructed for island nations and for countries, with France serving as the baseline country. Using this data we propose to understand how democracy affects a nation's sustainability.



DATA

We began our analysis by examining the available data for the nations of the world. One of the main criteria in selecting the nations included in our research is that a country can have had at most one transition of government. This is to ensure that different government types are observable, reducing the variability arising from unstable governments. This structure is the reason for the creation of the 1990's democracies category, allowing observation of those regimes that changed from autocracy to democracy during the early 1990's. Indeed, these nations make up the majority of nations that experienced a transition in government. Only the shifts in Bahrain, Mexico, Oman, Ukraine, and Venezuela don't fall in this category. Furthermore, this category allows

deeper insight into the role of government by removing some of the confounding influences, such as culture. Of the 192 nations of the world, 133 meet this criteria, of which 96 present enough data for our analysis. However, for some variables the data was incomplete for some countries. Hence, missing data will be interpolated from existing data through the use of a robust OLS regression. Of the 96 nations, 23 are 1990's democracies, 24 are autocracies, 36 are democracies, and the remaining 12 are semi-democracies. Our GDP data reveals that 59 countries can be classified as low income countries, 13 are middle income countries, and the remaining 24 countries are high income countries. When these two are combined we are left with the following result:

Table 1: Democracy and GDP

	1990s Democracy	Autocracy	Semi-Democracy	Democracy
Low GDP per Capita	19	17, (including North Korea)	9	8
Medium GDP per Capita	4	4	2	8
High GDP		3	1	20

per Capita				

Understanding different sustainability scores on the index requires some understanding of the scaling. Seemingly inconsequential changes often have far greater impact than might otherwise be expected due to logarithmic scaling of all variables other than rail density in the index, particularly given the relatively narrow band that sustainability falls on the index (between 25 and 57 out of a possible 100). The implementation of changes in policy, particularly in larger countries, require several years to take effect. Therefore, small changes from year to year should be expected.

Table 2 about here

ANALYSIS

Our analysis of sustainability since 1972 has provided further insight into the relationship between government and sustainability, in addition to overall sustainability trends across nations and government types. Our analysis will allow affluence to have different effects on different government types. We will begin with some overall observations common across all government types, such that we can examine the current state of the world as well as overall trends for different levels of income. We will then study autocracies, examining aggregate data for different income levels. We will next discuss the movements of some nations of note. After this, we will proceed with similar examinations for 1990's democracies, democracies, and semi-democracies. Data for

individual nations and graphs using this data can be found in the appendix sorted by government type.

The overall data present an interesting, if sobering, picture of sustainability in the world since 1972. Across overall, we see a yearly decline in the index score of 0.002 per year with an adjusted R^2 of 0.99, and a p-value of 0.012. It is important to note the decrease in sustainability over the period is masked by the inclusion of a one year time lag for the sustainability index, which has a coefficient of 0.885 and p-value of <0.001, indicating a relative decrease year-on-year. Compared to high income regimes we see some intriguing results in low and medium wealth regimes. We find that on average low income nations possess slightly lower levels of sustainability, -1.560 from the reference value with a p-value of <0.001. For medium income nations, we find slightly higher average levels of sustainability, 0.849 points above the reference, with a p-value of <0.001. This data is intriguing as we find sustainability has been declining in the world as a whole since the 1970s. Better performance of middle income regimes compared to other those regimes suggests an inverted environmental Kuznets's curve. Additionally, we also find despite dropping rail density from our calculations, being an island or archipelagic nation

Autocracies presented the lowest overall level of sustainability since 1972. We find that autocratic governments perform 2.425 points higher in sustainability than our baseline estimate with a high level of confidence (p-value <0.001). This is however, masks that autocracies in general have lower initial levels of sustainability. This effect

dominates influence of our individual dummy variables, with the exception of some extremely undeveloped nations, such as Togo.

1990's democracies present slightly lower levels of sustainability. We find that 1990's democracies perform on average 0.573 points higher in sustainability than our baseline with a high level of confidence (p-value <0.001). The lower levels of sustainability are likely influence by the previous form of government in these regimes, autocracies before circa 1990. However, this result is likely influenced somewhat by the relative majority of autocracies that are low income, though this is largely mitigated by the use of dummy variables controlling for income.

Democracies represent our baseline observation and are thus in many ways the most intriguing of regime types. Overall, democracies have the highest average level of sustainability. It is perhaps intriguing is that we see some of the greatest variance in sustainability, in particular we see that economies that predominantly focused on resource extraction tend to perform worse in sustainability. In our data, we find that low-income regimes were less sustainable by 7.206 points (p-value <0.001) on average than high income regimes. However, medium income regimes have on average even lower levels of sustainability (7.732 points lower than the base for democracies with a p-value of <0.001), which contradicts what one would expect under post-materialist thoughts Similarly, we see a trend in which economies focused on services tend to perform better in terms of sustainability. This suggests that an inclusion of some form a measurement of the distribution of economies, which might improve the quality of our measurement.

Semi-democracies present another noteworthy subject for further study as they performed the worst out any government type, with an average sustainability 1.517 points

below the baseline value, with a p-score of <0.001. This result is intriguing as one would expect that higher levels of democracy in these nations would translate into higher levels of sustainability.

DISSCUSION

Our data provided several revealing results about the relationship between democracy and sustainability. Furthermore, these results also raise some poignant questions about the nature of this relationship.

First, democracies tend to perform better than autocracies and 1990s democracies. Autocracies exhibited the lowest level of sustainability of any form of government. This indicates that there exists a link between democratic action and sustainability, as an empowered populace is better able to act on their desires for cleaner surroundings. It also suggests that a free media might also play an important role by reporting disasters or hazardous conditions, thereby forcing the government to act in situations where failings in policy might have otherwise been ignored. Additionally, autocracies tend to suffer from more radical wealth distributions, placing the vast majority of the wealth in the hands of relatively few, which in turn lends towards lower investments in infrastructure.

Second and perhaps most surprising, we found that the anticipated effects of post-materialism do not hold. Post-materialism posits that the basic priorities of individuals reflect their socioeconomic environment, placing the greatest worth on those in short supply (Kidd & Lee 2). Furthermore, as the socioeconomic environment changes, these priorities transition from sustenance and safety to quality of life (Kidd & Lee 2).

Intriguingly, we find that an inverted Kuznets curve describes the relationship between wealth and sustainability, with the lowest levels of sustainability being present in medium income countries, for democracies. This finding contradicts what one would anticipate given the post-materialism hypothesis, where one would expect to find high income democracies to be more sustainable than other forms.

Third, we concluded that the overall trend of all nations, no matter their government type, or income level, was decreasing sustainability over the period studied. This result is important due to the increasing significance of sustainability over the time period, and the attention received around the world, as highlighted by the Copenhagen talks of 2010. However, the world has changed significantly since the beginning of the measurement period through the increased use of personal electronics (cell phones, home video, video games, etc.), increased reliance on computers for business and diversion (digital modeling, digital editing, word processing, etc.), and the advent of the internet as a medium for communication (instant messaging, Youtube, news, etc.). Our ever-increasing interconnectedness has likely caused our sustainability to decrease, while somewhat paradoxically it has allowed us to become increasingly aware of our own impact on the environment.

Fourth, we find that the greatest variance of any government type is in semi-democracies. This finding is logical given greater variability of government structures in semi-democratic regimes. However, the strong significant effects discovered for other forms of government suggest that by decomposing the democracy score, a more detailed understanding of these governments may be found.

FUTURE RESEARCH

The results of our research prompt further research into how democracy and sustainability interact with further refinement of our methods. Most prominent of these is further refinement of our methods of measuring democracy and sustainability, opening them to new variables creating a more holistic and representative model. One such method would be separating countries by region to better analyze the effects of government, as countries in the same region tend to have similar societies and social mores, allowing further isolation of government's role. Other avenues include attempts to broaden our base of countries through the use of different datasets. Additionally, research into the relationship between democracy and sustainability at the micro level could provide greater insight, as the pathways in which democracy affects sustainability might be revealed as opposed to only its effect. Examining the role on government stability also promises further insight in the impact of regimes on sustainability. Finally, and perhaps most interesting, research into the individual effects of the decomposed democracy variables would provide greater insight into semi-democracies and how democracy effects sustainability.

CONCLUSION

Our research disclosed several important aspects about the relationship between democracy and sustainability. The foremost of these is the increased need for awareness

of the need for sustainability and the impact of unsustainable actions on the environment. Yet, awareness does not create change alone. Instead changes must be made on the societal and individual level. It is through such actions that we can become more sustainable and better able to affect change. Furthermore, our analysis suggested that the democratic process tends towards a more sustainable future, with the impact of democracy apparent as long as a country is at least somewhat democratic. We also find that transitioning to more democratic regimes similarly increases the sustainability of a nation. Although, the effects of government on sustainability are varied, the impact of government type on sustainability is important.

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Table 2: Main Variables

Variable	Coefficient	Std Error	T-value	P-value
Year	-0.0022	0.0009	-2.52	0.012
Lagged Index	0.8845	0.0071	124.21	<0.001
Low Wealth	-1.5607	0.1400	-11.15	<0.001
Medium Wealth	0.8493	0.1132	7.50	<0.001
Autocracy	2.4248	0.2025	11.98	<0.001
Semi-democracy	-1.5172	0.1375	-11.04	<0.001
90's Democracy	0.5728	0.1067	5.37	<0.001
Island nation	0.8286	0.1117	7.42	<0.001

Appendix:

Table 1: Country Dummy Variables

Country	Coefficient	Std Error	T-value	P-value
Albania	0.6893	0.1318	5.23	<0.001
Armenia	0.7123	0.1344	5.30	<0.001
Australia	-1.2522	0.1321	-9.48	<0.001
Austria	0.2453	0.1074	2.28	0.022
Bahrain	-5.2464	0.3985	-13.17	<0.001
Belarus	2.7409	0.2285	12.00	<0.001
Belgium	2.6500	0.2099	12.63	<0.001
Benin	0.7784	0.1321	5.89	<0.001
Botswana	0.9291	0.1561	5.95	<0.001
Brazil	0.8706	0.1446	6.02	<0.001
Brunei	-4.2823	0.3391	-12.63	<0.001
Bulgaria	0.6259	0.1283	4.88	<0.001
Cameroon	1.8737	0.1783	10.51	<0.001
Canada	-1.8052	0.1740	-10.38	<0.001
Chile	0.2078	0.1234	1.68	0.092
China	-1.5016	0.1513	-9.92	<0.001
Columbia	0.9987	0.1477	6.76	<0.001
Costa Rica	0.8716	0.1437	6.06	<0.001
Cuba	-0.8019	0.1332	-6.02	<0.001
Cyprus	-2.5375	0.2289	-11.09	<0.001
Czech Republic	Exemplar	-	-	-
Denmark	0.1061	0.1062	1.00	0.318
Dominican Republic	0.8764	0.1431	6.12	<0.001
Egypt	2.3668	0.2292	10.33	<0.001
Estonia	-2.1804	0.1771	-12.31	<0.001
Finland	-0.7694	0.1175	-6.55	<0.001
Gabon	-1.2695	0.1471	-8.63	<0.001
Germany	1.0315	0.1292	7.98	<0.001
Greece	-1.5609	0.1618	-9.65	<0.001
Hungary	1.6625	0.1599	10.39	<0.001
Iceland	-2.0130	0.1794	-11.32	<0.001

Country	Coefficient	Std Error	T-value	P-value
India	1.4714	0.1652	8.91	<0.001
Indonesia	2.6604	0.2546	10.45	<0.001
Iran	-1.7983	0.1651	-10.89	<0.001
Iraq	-1.8038	0.1667	-10.82	<0.001
Ireland	-0.3756	0.1088	-3.45	0.001
Israel	-0.2485	0.1082	-2.30	0.022
Italy	0.0157	0.1061	0.15	0.882
Jamaica	Exemplar	-	-	-
Japan	Exemplar	-	-	-
Jordan	-1.5046	0.1524	-9.87	<0.001
Kazakhstan	-1.9752	0.1769	-11.17	<0.001
Kenya	-0.4907	0.1270	-3.86	<0.001
North Korea	-0.7828	0.1348	-5.81	<0.001
South Korea	-1.8441	0.1610	-11.45	<0.001
Kuwait	-4.4296	0.3401	-13.02	<0.001
Kyrgyz Republic	-1.7396	0.1683	-10.32	<0.001
Latvia	0.9753	0.1386	7.04	<0.001
Libya	-4.3609	0.3154	-13.82	<0.001
Lithuania	0.7508	0.1337	5.62	<0.001
Luxembourg	1.0513	0.1226	8.58	<0.001
Macedonia	0.5428	0.1269	4.28	<0.001
Malaysia	2.2770	0.2263	10.06	<0.001
Malta	-0.9343	0.1418	-6.59	<0.001
Mexico	Exemplar	-	-	-
Moldova	2.8420	0.2386	11.91	<0.001
Mongolia	0.3198	0.1241	2.58	0.010
Morocco	2.6162	0.2392	10.94	<0.001
Mozambique	Exemplar	-	-	-
Namibia	1.4356	0.1719	8.35	<0.001
Netherlands	0.5398	0.1103	4.89	<0.001
New Zealand	-1.7199	0.1678	-10.25	<0.001
Norway	-0.9359	0.1211	-7.73	<0.001
Oman	-5.2883	0.3862	-13.69	<0.001
Panama	0.3471	0.1239	2.80	0.005
Paraguay	0.7224	0.1338	5.40	<0.001
Poland	1.4010	0.1560	8.98	<0.001
Portugal	-1.2387	0.1505	-8.23	<0.001
Romania	1.0115	0.1361	7.43	<0.001
Russia	Exemplar	-	-	-
Saudi Arabia	-4.4701	0.3231	-13.84	<0.001
Senegal	3.1863	0.2642	12.06	<0.001
Singapore	Exemplar	-	-	-
Slovak Republic	1.5566	0.1550	10.04	<0.001
Slovenia	-1.3053	0.1458	-8.95	<0.001

Country	Coefficient	Std Error	T-value	P-value
South Africa	0.3568	0.1245	2.87	0.004
Spain	-0.5503	0.1123	-4.90	<0.001
Sri Lanka	3.2718	0.2712	12.06	<0.001
Sweden	-0.5645	0.1124	-5.02	<0.001
Switzerland	0.5284	0.1087	4.86	<0.001
Syria	-1.5138	0.1521	-9.95	<0.001
Tanzania	-0.1358	0.1228	-1.11	0.269
Togo	-0.0330	0.1225	-0.27	0.788
Trinidad & Tobago	-2.6568	0.2337	-11.37	<0.001
Tunisia	-1.2766	0.1432	-8.92	<0.001
Turkmenistan	-1.9779	0.1744	-11.34	<0.001
Ukraine	2.7826	0.2434	11.43	<0.001
United Arab Emirates	-4.4992	0.3506	-12.83	<0.001
United Kingdom	0.6860	0.1080	6.35	<0.001
United States	-0.9082	0.1211	-7.50	<0.001
Uruguay	-1.3563	0.1547	-8.77	<0.001
Uzbekistan	-1.7785	0.1704	-10.44	<0.001
Venezuela	-1.7355	0.1699	-10.21	<0.001
Vietnam	-1.0595	0.1336	-7.93	<0.001
Zambia	0.8308	0.1302	6.38	<0.001