Democracy, development and the marine environment — A global time-series investigation

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ABSTRACT

Is democracy favorable or adverse for the management of marine resources? While some studies find democracy to increase the likelihood of achieving sustainable development, others propose that democracy rather has negative effects on the environment. This paper contributes explicitly to this debate, but also adds insights from research arguing that the effects of democracy are conditioned by surrounding institutions. Building on this literature, we argue that the way democracy works — whether it is an instrument for collective action beneficial to the environment or an instrument for patronage and clientelism — depends on levels of economic development. The overall objective of the article is to test this proposition empirically. Employing time-series cross-section analysis and using Marine Trophic Index as a proxy for the health of marine ecosystems, we investigate the impact of democracy on the marine environment in a global sample from 1972 to 2006. The analysis provides interesting insights regarding the conditional role of economic development. We report negative effects of democracy in low income settings, but find that this pattern is reversed when economic development has reached a certain threshold. Finally, we discuss how democracy affects the prospects for sustainable development and based on our conclusions offer suggestions for future research.

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1. Introduction

This paper is concerned with the debated issue of whether democracy is favorable or adverse for the environment. We explicitly contribute to this scholarly discussion, but also add insights from research arguing that the effects of democracy are conditioned by surrounding institutions. This debate has evolved from the research emphasizing the role of the state in environmental management in general (Eckersley, 2004) and ocean and coastal management in particular (Cicin-Sain, 1993; Bowen and Riley, 2003). The key responsibility for the states lies in the protection of their Exclusive Economic Zones — marine waters under national jurisdiction. This responsibility, inter alia, involves establishing institutions for the management of marine resources, conservation and restoration of habitats in national waters, dealing with marine and coastal land pollution, controlling the levels of local overfishing, making efforts to fight illegal, unreported and unregulated fishing, establishing fleet size, and allowing selective types of fishing gear to avoid by-catch. In addition, countries are expected to engage into global management efforts and international cooperation directed towards conservation and sustainable use of resources on the high seas (Cicin-Sain, 1993).

Acknowledging the importance of the state as an actor in environmental protection, scholars further on have placed their focus on political factors within the state, namely the importance of democratic and non-democratic governance for the environmental performance. However, the findings of this strand of research are inconclusive. While some studies find democracy to increase the likelihood of sustainable development, others claim that democracy has negative effects, alternatively only appears to have positive effects on the management of some specific resources (Scruggs, 2009; Li and Reuveny, 2006; Midlarsky, 1998; Arvin and Lew, 2011).

This article, however, argues that the debate over democracy's virtuous or vicious effects may be partly misinformed. More specifically, we assert that there are substantial reasons to believe that the effect of democracy on the environment — and hence also on
the marine environment, which is in focus in this article — is fundamentally conditioned by level of economic development. This proposition originates from the literature on modernization and democratic consolidation, where it is typically argued that in societies lacking economic development, governance logic is quite different from that in more affluent countries (Leftwich, 1993; Collier, 2009; Kapstein and Converse, 2008; Spilker, 2012; Keefer, 2007; Zakaria, 2003; Lipset, 1959). Accordingly, if not preceded or accompanied by institutions that tend to be present in contexts of higher economic development (such as, for example, rule of law or predictable “rules of the game”), instrumental mechanisms of democracy cannot be expected to automatically strengthen collective action, civil society, political culture, accountability, or other factors held to be indispensable to foster sustainable development. Without such complementary institutions there are serious concerns that democracy in many cases may be no more than an empty shell, in fact potentially opening up yet other arenas for exploitation, patronage, and clientelism (Collier, 2007; Keefer, 2007; Walker, 1999). This argument also highlights the importance of sequencing. While democracy in the well-developed parts of the world was commonly preceded by rule of law and constitutional liberalism, many of today’s developing states are forced to complete the construction of the modern state project while at the same time competing in general elections (Zakaria, 2003; Diamond, 2008; Persson and Sjöstedt, 2014). Moreover, in low-income settings, democracy is often imposed from outside, implying that there might be severe legitimacy problems and little correspondence between formal and informal institutions, which in turn might imply that democracy does not have as positive effects in low-income settings as in more affluent societies (see Bratton, 2007; Helmke and Levitsky, 2006; Ross, 2006; Pritchett and Woolcock, 2004; Spilker, 2012).

Taken together, there are substantial reasons to believe that the way democracy works — that is whether it is an instrument for collective action beneficial to the environment or an instrument for patronage, clientelism, and redistribution to the ruler’s closest allies — depends on level of economic development. As will be discussed in later sections, we focus specifically on the marine environment in this article. The aim is thus to investigate whether level of democracy affects the marine environment and, if so, whether this impact differs depending on national levels of economic development.

In order to test the relationship between democracy and the marine environment empirically, we use the Marine Trophic Index as a proxy for the health of marine ecosystems and available data measuring democracy as the main independent variable. The empirical analysis is in many ways more ambitious than previous tests in the literature, with a sample of 142 countries and the health of their marine environment over the years 1972—2006. Hence, we have a larger sample size across both countries and years than normally used in this literature. Our findings provide interesting insights regarding conditional role of economic development, thus developing the claim recently made by Scruggs (2009), who argued that previous studies have not adequately taken this factor into account. We report negative effects of democracy in settings of low gross national income and positive effects when economic development has reached a certain threshold. Moreover, we contribute by adding knowledge of when democracy can be expected to generate positive environmental outcomes.

2. On democracy, economic development and marine resources

The effect of democracy on the environment is heavily debated. While some scholars argue that democracy increases the likelihood of successful collective action and sustainable development, others hold that democratic systems tend to fall prey to the public’s unwillingness to adopt environmentally sound policies. According to the latter perspective, democracy either needs to be exchanged for less democratic political systems with unbounded capacity to reorient society away from environmentally unsustainable paths (Ophuls, 1977; Heilbrunner, 1974; also see Paehlke (1995)) or be guided by more deliberative and participatory ideals (Dryzek, 1992; Folke et al., 2003; Bluhdorn, 2013; Dryzek, 2014). Those instead holding that democracy is beneficial for the environment argue that democracy is an efficient coordination mechanism and that democratic values and procedures, such as freedom of speech and freedom of information, increase the likelihood of sustainable development (Achterberg, 1993; Lafferty and Meadowcroft, 1995; Barrett and Graddy, 2000; Jagers, 2007).

The arguments proposed in this debate are as contrasting as compelling. From a broad review of the literature, Li and Reuveny (2006) derive five causal mechanisms as to why democracy might improve environmental performance comparing to autocratic states: 1) political rights and freedom often lead to public awareness and environmental action (Payne, 1995), 2) systems with electoral accountability are more responsive to people’s environmental concerns and the influence of environmentalists on policy (Kotov and Nikitina, 1995; Bernauer and Koubi, 2009), 3) due to the dominating principles of rule of law, aversion to war and respect for life, democracies tend to produce less environmental destruction than autocracies (Weiss and Jacobsen, 1999; Gleditsch and Sverdrup, 2003), 4) the elite in an autocratic society is less pro-environmental than the public mass, and 5) relatively short time horizons of autocratic leaders will tend to promote overexploitation (Congleton, 1992).

At the same time, autocracies are said to adopt less stringent environmental policies, since governmental leaders prefer to avoid payments of the costs of tight rules themselves (Congleton, 1992; Fredriksson et al., 2005). They also tend to prioritize economic development over environmental protection and are argued to allow supporters of the governments to overexploit ecosystems in order to pay off the support (Ward, 2008).

According to Li and Reuveny (2006) there are, however, also a number of democratic factors that may worsen environmental degradation: 1) (unlimited) freedom in a democracy will lead to unchecked behavior by overharvesting individuals (see Hardin (1968)), 2) autocracies can impose stricter regulations on population growth (Heilbrunner, 1974), 3) in democracies leaders will enact election-winning policies and thus tend to promote policies supporting the employment of voters rather than the environment (Midlarsky, 1998), and 4) democracies are often market economies where corporate interests have more influence than environmentalists (Dryzek, 1987). In the same regard, Bernauer and Koubi (2009) suggest that mature democracies are influenced by special interest groups, which have little or no incentive to compromise their interests for the environment, which thus might diminish the positive effect of democracy on the provision of public goods.

This debate has spurred numerous empirical investigations studying the relationship between the level of democracy and quality of the environment. While some studies indicate a positive correlation between democracy and environmental quality (Neumayer, 2002; Li and Reuveny, 2006; Ward, 2008; Wurster, 2013; Sjöstedt and Jagers, 2014), others find negative correlations or no relationship at all (Midlarsky, 1998; Grafton and Knowles, 2004). For example, in their review, Li and Reuveny’s (2006) report that higher levels of democracy reduce CO2 and NOx emissions and lead to less water pollution, less land degradation, and lower deforestation rates. Ward (2008), on the other hand, finds that while stable democracies perform better on sustainability
indicators than do stable democracies, liberal democracies only promote weak sustainability.  
Scruggs (2009) identify 58 published studies that directly deal with the impact of democracy on measures of environmental performance. When performing an empirical test of these propositions, he finds that: “economic wealth and the speed of economic growth (or decline) have the most consistent impact on environmental performance” (Scruggs, 2009: 2). This said, when reviewing the literature on the relationship between economic development and the environment, empirical findings turn out to be equally confusing and conflicting. For example, the well-known Environmental Kuznets Curve (EKC) has been the subject of substantial debate and scrutiny. The mechanism underlying the EKC process is commonly argued to be the transfer from agriculture to a less environmentally friendly industry-based economy, which is then followed by the improvement of environmental standards or higher demand for environmental protection (Ward, 2008; Choumert et al., 2013; López-Menéndez et al., 2014; Stern, 2014). However, the role of political factors in this process is ambiguous. Although it has been assumed that economic development leads to democratic development, Przeworski and Limongi (1997) claim that transition to democracy is not dependent on income levels. Instead, they suggest that GDP per capita creates the conditions for newly establishing democracies to consolidate and become more resilient and sustainable.

Taken together, the effects of democracy on the environment, as well as the effects of economic development on the environment, or even the effects of democracy on economic development and vice versa, are subjects of considerable controversy and disagreement. In an attempt to contribute to these research fields, we set out to perform a more fine-grained empirical analysis, including levels of economic development and democracy in a joint analysis. Taking a departure in the discussion on causal mechanisms outlined above, we argue that there are reasons to believe that these mechanisms function differently depending on surrounding institutions and especially levels of economic development.

The mechanisms of positive impact of democracy might be more functioning when economic development is high. Conversely, the proposed negative effects of democracy might very well be stronger when economic development is low. In order to develop this argument, we are theoretically informed by the well-established literature on modernization and institutional arrangements prevailing at different levels of economic development. Adapting the focus on marine resources when investigating the effect of democracy during different stages of economic development is appropriate in many respects. Being fungible, marine resources accentuate many of the governance challenges associated with common pool resources (Ostrom, 1990, 2009). Fisheries are in fact often used as textbook illustrations of common pool resource problems and the importance of collective action mechanisms such as democracy or other governance arrangements. Yet, empirical studies on the effect of democracy on the marine environment are scant and demonstrate conflicting results (Sjöstedt and Jagers, 2014). Similarly, the effect of economic development on marine resources is far from settled empirically. In the first attempts to explore Environmental Kuznets Curve patterns for the marine environment Clausen and York (2008a, 2008b) report that the rise of per capita income leads to a decline of the marine trophic level without further improvement of the indicator at higher income levels. Marine resources naturally only belong to countries with a marine costal line. Thus, the choice of this set of resources has some implications for the country sample used in the analysis in that it excludes countries with only land borders (compared to e.g., air emissions). In the next section, we further specify how we proceed in testing the impact of democracy and economic development on the marine environment.

3. The investigation

The health of a marine ecosystem is of course determined by various factors in a complex and interlinked system, such as

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1 The logic behind the EKC is that as countries get richer, their environmental quality first deteriorates and then, with the further growth of income – starts to improve again (Grossman and Krueger, 1995). Research is still far from reaching consensus over the validity of the EKC, found in cross-country studies of e.g., air pollution, energy use, clean water, urban sanitation, nitrates, suspended particulate matter, waste, and deforestation (e.g., Shafik and Randolph, 1992; Cole et al., 1997; Panayotou et al., 1999; Ehrhardt-Martinez et al., 2002). Simultaneously, however, other studies have demonstrated an N-shaped pattern for the relationship between income and CO₂, NOx, SO₂, and smoke (Grossman and Krueger, 1993, 1995; Selden and Song, 1994); and scholars have discovered a linear logarithmic pattern, implying that an increase in emissions is strongly correlated with income, but that further improvements in environmental quality do not necessarily depend on further economic growth (Bruyn et al., 1998). Yet other scholars have address the issue of reverse causality, assuming that it is environmental degradation that causes income to decrease (Stern et al., 1996).
pollution, eutrophication, overfishing, introduction of alien species, climate change, etc. Regardless of the nature of its cause, however, deterioration of the marine environment is always reflected on the marine fauna. In order to operationalize this trend and measure the health of marine ecosystems, we used Marine Trophic Index (MTI). The index is calculated by assigning a number to each species according to its location in the food chain, where carnivores receive higher and herbivores receive lower numbers. The measure averages trophic levels from the overall catch, based on a dataset of commercial fish landing compiled by the Food and Agriculture Organization of the United Nations (FAO). Lower values of the index mean that catches consist of smaller fish. A negative trend in this measurement is thus a proxy measure for overfishing and that “fisheries are not being sustainably managed” (Sea Around Us, 2011). Thus, this measurement captures to what extent countries “fish down the food web” within their exclusive economic zones (Pauly et al., 1998).

Overfishing affects the marine environment in a number of ways. First, pressure on fisheries from harvesting tends to affect fish at the top of the food chain as humans often target larger predatory fishes (Pauly, 2005; Pauly and Watson, 2005; Pauly and Palomares, 2005). Second, high concentration of transport in fishing sector causes pollution of marine waters. Pollutants increase the metabolic rate, thereby slowing down fish growth; they tend to collect in larger fish, which creates more danger to species at higher trophic levels and thus contributes to lowering MTI in the area (Walsh, 1978; Moiseenko, 2010). Third, overexploitation of fish stocks leads to the loss of biodiversity and food chain imbalance, which threatens ecosystems' stability. Therefore MTI is also considered to be “a measure for overall ecosystem health and stability” and was included as such in the 2010 Environmental Performance Index (Emerson et al., 2010).

Just as catch-based fisheries data, the index has been criticized for not adequately reflecting true situation in marine ecosystems, as it is solely built on the catches of commercial species (Branch et al., 2010; Caddy et al., 1998; Pauly et al., 2013). However, since an alternative measure, based on stock assessments, is not yet available for many of the countries due to high costs of data collection method, MTI, with its clear advantage of availability across countries and over time, is the best available proxy for marine ecosystems' health and stability (Clausen and York, 2008a; Emerson et al., 2010; Pauly and Watson, 2005). As underlined by Pauly et al. (2013: 305), “when only catch data are available, fisheries researchers can and should use these data to infer fishery status, at least tentatively”.

In order to measure the main independent variable of the study, that is the degree of democracy in a country at a given point in time, we used the combined Freedom House/Polity Index, suggested by Hadenius and Teorell (2005). The index is a calculated average of Freedom House democracy score (Freedom House, 2010) and Polity IV index (Marshall et al., 2010). For countries and years where data on Polity IV is missing, the index contains imputed values calculated by regressing Polity on the average Freedom House indicator. Hadenius and Teorell (2005) show that the average index performs better in terms of validity and reliability than each of the indices separately. The index is available for the period 1972–2009 and ranges from 0 to 10, where 10 corresponds to the most democratic regimes (Teorell et al., 2011).

When choosing our control variables, we built on previous research outlined above. Following the reasoning of, for example, Li and Reuveny (2006), we included a measure of a country’s openness to and engagement in world trade. A country’s openness to world trade is held to relate to environmental outcomes in several ways. For example, it has been argued that trade and globalization encourage establishment of higher environmental standards according to the demands from markets and also promote technologies and innovations of a higher standard (Esty and Gentry, 1997; Vogel, 1995; Braithwaite and Drahos, 2000). However, others have argued in line with the hypotheses of the “race to the bottom,” holding that countries fearing to lose competitiveness will dismantle environmental standards (e.g., Sheldon, 2006; Frankel and Rose, 2005; Antweiler et al., 2001; Managi et al., 2008). The indicator of openness to trade is taken from Penn World Trade (Heston et al., 2009) and measures total trade as a percentage of GDP in constant 2005 prices. The data covers the years 1950–2007.

In addition, following Delgado et al. (2003), who discuss the impact from growing human population on the pressure put on fisheries, we included a control variable for the size of a country’s population. On the one hand, population pressure, together with the growth of consumption, which follows, increases environmental impact. On the other hand, a larger population may produce pressures on the government for environmental policies and action (Scruggs, 2003). Despite the controversy of its effect, however, the factor has proved to be an appropriate control variable. The data on population is taken from the World Bank database for the years 1971–2010, and is measured in numbers of inhabitants.

Of all the gears used in harvesting marine fish resources, bottom trawls and dredges are generally considered to be the most destructive ones (Watson et al., 2004, 2006). They cause chronic disturbances in coastal waters and lead to changes in trophic structures (Jennings et al., 2001). We therefore included a control for trawling intensity in our analysis. We use the Coastal Shelf Fishing Pressure Index, developed by the Environment Performance Index (2012). The index measures intensity of gears operating in the coastal waters by dividing metric tons of catch from trawling and dredging gears in a country for a given time by the area of its Exclusive Economic Zone (EEZ). The data is available for 1950–2005.

Following our theoretical argument on the impact of democracy on environmental performance at different stages of economic development, we also controlled for national income levels at a given time. The measure we use is real GDP per capita in constant 2005 prices, chain series (Heston et al., 2009). The indicator is available from 1950 to 2007 and is log-transformed due to its skewed distribution.

In order to model different stages of economic development for countries, we divided nations at different points in time into groups

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2 For more information about the method, see Ricard et al. (2012).
according to their gross national income (GNI) per capita.\textsuperscript{8} Following the World Bank methodology (World Bank, 2011), since the classification threshold changes every year, we choose the highest threshold for the year 2010. Countries that have a GNI below $1005 per capita are classified as low-income countries, lower middle-income countries have a GNI between $1006 and $3975 per capita, upper middle-income countries have a GNI between $3976 and $12,275 per capita, and high-income countries have a GNI above $12,276 per capita (World Bank, 2011). This measure does not account for “welfare and success in development,” but is recognized as the “best single indicator of economic capacity and progress” (World Bank, 2011).

A more direct way of capturing the influence of economic institutions on the environment would perhaps have been through adding the measures for rule of law and property rights into our model instead of classifying countries into income-groups. However, such an approach simultaneously brings a number of limitations into our study. For example, the data for such governance indicators is only available for 10 years out of our total 34, which substantially decreases our variance size and produces biased estimates.

3.1. Specification and methodology

In order to model the impact of our independent variables on changes in MTI across countries and years, we used time-series cross-section (TSCS) analysis. Since we are interested in changes of trophic levels and not the absolute levels as such, the dependent variable was measured as the first difference of MTI instead of annual values. We also made sure we dealt with problems inherent to TSCS data\textsuperscript{9} and introduced fixed effects in order to take care of country-specific factors, such as geography\textsuperscript{10} and natural resource dependence.

In order to make sure that independent variables are measured before the change in the dependent variable takes place, we used a one-year lag of all the independent variables in our models. We hence use one-year lags in combination with the one-year lag of all the independent variables in our models. We therefore chose to exclude these cases from the total 34, which substantially decreases our variance size and produces biased estimates.

\[ \Delta MTI_t = \alpha_1 + \beta_1 D_{1,t-1} + \beta_2 \log O_{1,t-1} + \beta_3 \log P_{1,t-1} + \beta_4 \log G_{1,t-1} + \beta_5 \log T_{1,t-1} + e_{1t}; \]

where \( i \) corresponds to each country in the sample and \( t \) refers to the year. \( \Delta MTI_t = MTI_{t} - MTI_{t-1} \) corresponds to the change in the Marine Trophic Index for a given country in a given year, \( \alpha_1 \) is an intercept term for \( i \), \( \beta_1 \) (\( j = 1,2,3,4,5 \)) denotes the coefficients to be estimated, \( D_{1} \) is a Freedom House/Pollity index for democracy for a given country in a given year, \( O_{1} \) is openness to trade (country, year), \( P_{1} \) stands for population (country, year), \( G_{1} \) refers to real GDP per capita for a certain country in a given year, is trawling intensity in the EEZ of each country per year, and is an error term for each unit of analysis. The equation was estimated using generalized least squares (GLS) with fixed effects and robust standard errors (Wooldridge, 2002).\textsuperscript{11}

Marine Trophic Index assigns values for each major marine coast or island territory of a nation. Since our independent variables are measured at the national level and are not available specifically for coastal regions or island territories of a nation, some problems arose in our analysis. Seven countries (the US, Turkey, Indonesia, Malaysia, Japan, Saudi Arabia, and Russia) have several MTI scores—one for each of their coastlines—while having only one national value of independent variables to match them with. This is also the case for sixty-seven island territories, where MTI values are available but where there are no corresponding values of the independent variables. We therefore chose to exclude these cases from the analysis. In doing so, considerable variance in our dependent variable was lost, but we still consider our strategy of excluding cases a safer option than alternative approaches.\textsuperscript{12}

The results presented in the next section follow the model described above. However, we also performed a number of alternative estimations. For example, we tested several lag structures. Using different lags of the independent variables in time indicated that the one-year lag produced most of significant results. Since previous studies found a U-shaped relationship between GDP and

<table>
<thead>
<tr>
<th>Table 1</th>
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<tr>
<td>The influence of democracy on changes in marine trophic levels.</td>
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<table>
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<tr>
<th>DV:</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
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<tr>
<td>Democracy</td>
<td>-0.00220**</td>
<td>-0.00226**</td>
<td>-0.00301***</td>
<td>-0.00298***</td>
<td>-0.00269**</td>
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<tr>
<td>(0.000792)</td>
<td>(0.000774)</td>
<td>(0.000854)</td>
<td>(0.000845)</td>
<td>(0.000907)</td>
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<tr>
<td>Openness to trade</td>
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<td>0.000177</td>
<td>0.00111</td>
<td>0.00334</td>
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<td>(0.00505)</td>
<td>(0.04840)</td>
<td>(0.00590)</td>
<td>(0.00715)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>0.1916*</td>
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<td>0.0210*</td>
<td></td>
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<tr>
<td>(0.00779)</td>
<td>(0.00789)</td>
<td>(0.00818)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>GDP per capita</td>
<td>-0.00329</td>
<td>-0.00345</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>(0.00741)</td>
<td>(0.00660)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trawling intensity</td>
<td>0.00314</td>
<td></td>
<td></td>
<td></td>
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<td>(0.00290)</td>
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<td></td>
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</tr>
<tr>
<td>Constant</td>
<td>0.0122**</td>
<td>0.00338</td>
<td>-0.284*</td>
<td>-0.263*</td>
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</tr>
<tr>
<td>(0.00447)</td>
<td>(0.0213)</td>
<td>(0.123)</td>
<td>(0.122)</td>
<td>(0.125)</td>
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<td>Observations</td>
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<td>4100</td>
<td>4100</td>
<td>4015</td>
</tr>
<tr>
<td>R-squared</td>
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<td>0.001</td>
<td>0.002</td>
<td>0.002</td>
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<tr>
<td>Number of countries</td>
<td>142</td>
<td>138</td>
<td>137</td>
<td>137</td>
<td>137</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses. **p < 0.001, *p < 0.01, p < 0.05. All the independent variables are lagged 1 year. Openness to trade, population, GDP per capita and trawling intensity are log-transformed.

\footnote{11 An alternative way to estimate the equation would have been to use ordinary least squares (OLS) regressions with panel-corrected standard errors as suggested by Beck and Katz (1995). However, taking into account the necessity to include fixed-effects estimations into our model—and to control for significant but unobservable unit-specific effects—we chose GLS regression.}

\footnote{12 An alternative strategy would have been to average the values of MTI for countries with several coastlines in order to obtain a single national score for the dependent variable to correspond with other variables. Another way of dealing with the problem would have been to impute data for independent variables to the regions or island territories with no regional measures. However, both of these approaches have obvious problems. The strategy of creating average values of MTI for coastal regions or island territories might not correspond to reality and thus produce misleading results.}
environmental outcomes (e.g., Grossman and Krueger, 1993, 1995) as well as between democratic development and the environment (e.g., Buitenzorg and Mol, 2011), we also tried including squared values of democracy and GDP per capita into the model. However, the results were similar to those presented in the tables and did not increase the explanatory power of the model. In addition, Granger causality testing seems to confirm that no reversed causality exists between our dependent and independent variables.

### 3.2. Results and analysis

In this section we empirically explore the relationship between levels of democracy and annual changes in the Marine Trophic Index during different stages of economic development. Introducing our independent variables stepwise, we first apply our equation to the whole sample and investigate the relationship between our variables of interest on the global scale and across time. In order to find out whether democracy exerts an influence on the changes in marine trophic levels during different stages of economic development, we then explore this relationship in different income groups.13

Table 1 presents the results from our multivariate model on the global sample over all available years. The unit of analysis is country-year and the sample includes 142 marine coastal states over the years 1972–2006. The analysis shows that democracy is significantly and negatively correlated with changes in marine trophic levels. According to this pattern, less democratic countries tend to have less healthy marine ecosystems.

However, when we proceed to divide countries based on their income, we can note some more detailed trends, not visible in the analysis of the full sample reflected in Table 1. Table 2 reports our findings related to the impact of democracy on the changes in marine trophic levels throughout the countries’ economic development. We aim at finding different thresholds of economic development where countries display different effects of democracy on the changes in MTI. We use the same set of control variables. In order to control for the effect of income within each of the stages of economic development, we also include GDP per capita. We hence keep the classification from the World Bank of low-, lower middle-, upper middle-, and high-income countries, but also aim to show differences within these categories (World Bank, 2011). Full list of countries and the years when they are included in each of the groups is available in Appendix A.

The results in Column 1 show that the impact of democracy on our dependent variable is not significant in countries where gross national income is below 1005 USD per capita. Here we also observe a positive impact of population size on MTI. In the lower middle-income group, the picture is a bit more complex. Looking at Column 2, the effect of democracy is negative and significant in the group of countries with a GNI between 1006 and 2000 USD per capita. Yet, another cluster of countries within the lower middle-income group, where GNI is between 2000 and 3975 USD per capita, display insignificant results, as shown in Column 3. As presented in Column 4, democracy shows no significant effect on changes in the health of the marine environment in the upper middle-income countries. The results indicate that at these development stages a country’s level of democracy does not seem to be a strong predictor of the subsequent change in the health of its marine environment. However, the results are contrastingly different when we proceed to analyze countries with higher levels of economic development. Columns 5 and 6 report the results of our analysis for high-income countries with a GNI exceeding 12,275 USD per capita. It is evident from these results that democracy does not exert a significant effect on the marine environment in groups where GNI per capita is between 12,276 and 20,000 USD. However, an interesting finding is that a positive and significant effect is visible among the countries with a GNI exceeding 20,000 USD per capita.

In sum, the empirical analysis shows negative effects of democracy in the poorer section of the lower middle-income countries, no significant effects in the upper middle-income countries and positive effects in the richest of the high-income countries.

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13 An alternative method for answering our second research question on whether the effect of democracy on the environment is different in different economic contexts could be through introducing interaction terms between democracy and gross national income. However, since we expect that the direction of the relationship between democracy and the environment may differ between the income groups, interaction terms might not capture the behavior of the curve. Therefore, we have chosen to study each stage of economic development in detail. Following our expectations, interaction terms, when introduced, do not produce any significant results.

### Table 2

The influence of democracy on changes in marine trophic levels throughout the countries’ economic development processes.

<table>
<thead>
<tr>
<th>DV: Differented MTI</th>
<th>Low-income countries</th>
<th>Lower middle-income countries</th>
<th>Upper middle-income countries</th>
<th>High income-countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNI/c &lt; $1005</td>
<td>$1005 &lt; GNI/c &lt; $2000</td>
<td>$2000 &lt; GNI/c &lt; $3975</td>
<td>$3975 &lt; GNI/c &lt; $12,275</td>
<td>$12,275 &lt; GNI/c &lt; $20,000</td>
</tr>
<tr>
<td>Democracy</td>
<td>-0.00170</td>
<td>-0.0123***</td>
<td>-0.00293</td>
<td>0.00679</td>
</tr>
<tr>
<td></td>
<td>(0.00102)</td>
<td>(0.00360)</td>
<td>(0.00348)</td>
<td>(0.00540)</td>
</tr>
<tr>
<td>Openness to trade</td>
<td>-0.00541</td>
<td>0.0201</td>
<td>-0.0128</td>
<td>-0.00789</td>
</tr>
<tr>
<td></td>
<td>(0.0137)</td>
<td>(0.0356)</td>
<td>(0.0286)</td>
<td>(0.0168)</td>
</tr>
<tr>
<td>Population</td>
<td>0.0164*</td>
<td>0.0376</td>
<td>-0.000622</td>
<td>-0.0333</td>
</tr>
<tr>
<td></td>
<td>(0.00781)</td>
<td>(0.0423)</td>
<td>(0.0512)</td>
<td>(0.0526)</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>-0.00717</td>
<td>-0.00995</td>
<td>0.01107</td>
<td>-0.0371</td>
</tr>
<tr>
<td></td>
<td>(0.00897)</td>
<td>(0.0656)</td>
<td>(0.0424)</td>
<td>(0.0352)</td>
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<tr>
<td>Trawling intensity</td>
<td>-0.00396</td>
<td>0.00121</td>
<td>0.0234</td>
<td>0.0112</td>
</tr>
<tr>
<td></td>
<td>(0.00491)</td>
<td>(0.00894)</td>
<td>(0.0210)</td>
<td>(0.0146)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.190</td>
<td>-0.502</td>
<td>0.0912</td>
<td>0.869</td>
</tr>
<tr>
<td></td>
<td>(0.167)</td>
<td>(0.795)</td>
<td>(0.989)</td>
<td>(0.709)</td>
</tr>
<tr>
<td>Observations</td>
<td>1299</td>
<td>543</td>
<td>563</td>
<td>600</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.002</td>
<td>0.011</td>
<td>0.015</td>
<td>0.009</td>
</tr>
<tr>
<td>Number of countries</td>
<td>82</td>
<td>70</td>
<td>68</td>
<td>59</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses, **p < 0.001, *p < 0.01, bp < 0.05. Groups are divided based on GNI per capita in 2010 constant US dollars. All the independent variables are lagged 1 year. Openness to trade, population, GDP per capita and tawling intensity are log-transformed.
all, this lends some support to the theoretical argument made in this article holding that the effect of democracy on the marine environment is conditioned by economic development and, more specifically, that required key institutions are often missing in low-income settings while they are relatively well established at higher development stages.\textsuperscript{14}

Although significant in some of the income groups, the size of the effect of democracy on changes in MTI is generally quite small. This is, however, often the case in first difference models.

If we finally look at our data in more detail, i.e., studying specific country examples, we find a number of countries where our discovered patterns clearly correspond to national trends. Among countries in the context of high economic development there are several cases where democratization has had a positive impact on MTI levels. For instance, in Spain, which started from a relatively high economic level in our dataset, democratization from the mid-1970s was followed by positive trends in MTI. In South Korea democratic development has also resulted in increasing levels of MTI. Correspondingly, we also find countries in the low economic context, where our large-scale patterns are clearly reflected. Jamaica and Kenya can serve as illustrative examples. In Jamaica, increasing level of democracy has resulted in rather dramatic decreases in MTI levels. We also find a similar development in Kenya although the decrease in MTI levels has been somewhat more moderate there. Finally, if we look at countries in the middle-income group — where we, theoretically, should expect that democratization will have more or less no effect on MTI levels — the results are, however, more mixed. We both find countries fulfilling our expectations, e.g., the Dominican Republic, but also countries where increases and decreases in MTI levels are discovered, e.g., Thailand (increase) and South Africa (decrease).

4. Conclusions

With the point of departure in theories about the importance of the state and type of political regime, i.e., democracy or authoritarianism, for performance in ocean and coastal management, this article argues that the debate over democracy’s virtuous or vicious effects on the environment may be partly misinformed. More specifically, we argue that there are substantial reasons to believe that the way democracy works — whether it is an instrument for collective action beneficial to the environment or an instrument for patronage, clientelism and redistribution to the ruler’s closest allies — fundamentally depends on level of economic development. As such, we hypothesize that if not preceded or accompanied by institutions that tend to be present in contexts of higher economic development, democracy may in fact not be more than an empty shell, potentially even opening up yet other arenas for exploitation, patronage and clientelism.

These theoretical propositions partly gain support in our empirical investigations. When we analyze the effect of democracy on the changes in MTI in the entire sample of 142 countries across 34 years, we find a negative effect, indicating that democratic regimes tend to have a negative impact on the marine environment. However, the main empirical contribution from this article is that we study the effect of democracy at different stages of economic development. The strongest and most straightforward result is that democracy has a significant negative effect on the health of marine ecosystems during early stages of economic development, but as we climb the income ladder the effect turns positive. That is, there are negative effects of democracy in settings of low gross national income and positive effects when the economic development has reached a certain threshold. Until a country becomes an upper-middle-income economy, democracy seems to have a negative effect on the health of the marine environment, but the effect then turns positive and significant in the richest countries with a GNI per capita exceeding 20,000 USD. This suggests that although rich nations are more technologically developed and may find it easier to extract resources from the sea than poor countries, our results indicate that they, on the contrary, tend to preserve their marine resources to a larger extent.

What these results show is hence that the effect of democracy is conditioned by levels of economic development. This lends support to the argument that although democracy might have an intrinsic value, it does not necessarily or automatically result in any specific positive development outcomes. For example, a growing research field within political science and economics now argues that when it comes to explaining positive development outcomes, the political input side (i.e., democratic procedures) is far less important than the political output side (e.g., absence of corruption and rule of law) (Rothstein, 2011; Boix et al., 2003). More specifically, this literature holds that these are not issues concerning access to power but rather levels of impartiality in the exercise of public authority that constitute the essence of high-quality institutions. In our case, if the output side of political systems works unsatisfactorily, democracy might be insufficient for fostering stewardship of marine resources and compliance to environmental regulations. This echoes the argument by Larry Diamond (2007: 119) saying: “There is a specter haunting democracy in the world today. It is bad governance ... that is drenched in corruption, patronage, favoritism, and abuse of power.”

In conclusion, the implication of our findings is that the general urge to implement democratic procedures in low income settings should primarily be motivated by democracy’s intrinsic value rather than by assumptions about positive causal effects from democracy. Arguments holding that democracy by default leads to public awareness and environmental action should thus be handled with care and not without acknowledging that the assumed positive effects from democracy only seem to exist in high-income settings where other complementary institutions presumably already are in place.

In addition, the results from this study contribute to the debate over the Environmental Kuznets Curve. More specifically, this study indicates that when it comes to the marine environment, political factors such as levels of democracy can help explain why deterioration of the environment seems to be less severe in high-income settings.

Finally, this study is somewhat limited by the fact that some countries are absent from our empirical analysis due to missing values and that Marine Trophic Index, being a catch-based variable, only approximately reflects the state of the marine environment. However, we are confident that our findings contribute to the scholarly discussion with new insights and believe that our study will inform future research. More specifically, although our findings lend support to the theoretical claims about democracy’s different effects, future studies ought to look closer into the specific mechanisms producing these outcomes. For example, is it the institutions normally accompanying economic development — such as rule of law or property rights protection — that make democracy have different effects during different stages of economic development? Or is it rather economic development per se that affects resource use and exploitation patterns in society? That is, while we have strong theoretical reasons to believe that democracy is more likely to work as an instrument for collective action in settings where other fundamental collective action problems involved in the process of state building and development have already been solved.

\textsuperscript{14} However, this is not usually the case in oil-rich countries, where high income levels are reached despite the lack of strong economic institutions.
the exact blending, pacing and sequencing of institutional reforms necessary to foster sustainable development and stewardship of natural resources remain to be explored. Another potential line of research concerns how the political output side (e.g., level of corruption and adherence to rule of law) affect environmental performance, where it is reasonable to hypothesize that if the output side of the political systems works unsatisfactorily, even mature democracies will have difficulties in managing marine resources and safeguarding sufficient compliance to environmental regulations.

Acknowledgments

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Appendix A. Cases classified on the basis of GNI per capita

<table>
<thead>
<tr>
<th>Low-income countries with GNI per capita below 1005 USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania 1986–1999</td>
</tr>
<tr>
<td>Algeria 1972–1976</td>
</tr>
<tr>
<td>Angola 1987–2004</td>
</tr>
<tr>
<td>Bangladesh 1974–2006</td>
</tr>
<tr>
<td>Barbados 1972</td>
</tr>
<tr>
<td>Bosnia and Herzegovina 1996</td>
</tr>
<tr>
<td>Brazil 1972–1975</td>
</tr>
<tr>
<td>Cambodia 1995–2006</td>
</tr>
<tr>
<td>Cameroon 1972–2006</td>
</tr>
<tr>
<td>Cape Verde 1988–1992</td>
</tr>
<tr>
<td>Sri Lanka 1972–2003</td>
</tr>
<tr>
<td>Chile 1975–1977</td>
</tr>
<tr>
<td>China 1972–2001</td>
</tr>
<tr>
<td>Colombia 1972–1979</td>
</tr>
<tr>
<td>Comoros 1983–2006</td>
</tr>
<tr>
<td>Congo 1972–2004</td>
</tr>
<tr>
<td>Congo, Democratic Republic 1972–2006</td>
</tr>
<tr>
<td>Benin 1972–2006</td>
</tr>
<tr>
<td>Dominica 1979–1980</td>
</tr>
<tr>
<td>Ecuador 1972–1992</td>
</tr>
<tr>
<td>Equatorial Guinea 1987–1999</td>
</tr>
<tr>
<td>Eritrea 1994–2004</td>
</tr>
<tr>
<td>Fiji 1972–1975</td>
</tr>
<tr>
<td>Djibouti 1992–2005</td>
</tr>
<tr>
<td>Gabon 1972–1973</td>
</tr>
<tr>
<td>Georgia 1994–2003</td>
</tr>
<tr>
<td>Gambia 1972–2006</td>
</tr>
<tr>
<td>Ghana 1972–2006</td>
</tr>
<tr>
<td>Kiribati 1978–1992</td>
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<tr>
<td>Grenada 1979</td>
</tr>
<tr>
<td>Guatemala 1972–1991</td>
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<td>Guyana 1972–2004</td>
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<tr>
<td>Honduras 1972–2000</td>
</tr>
<tr>
<td>India 1972–2006</td>
</tr>
<tr>
<td>Iran 1972–1974</td>
</tr>
<tr>
<td>Cote d’Ivoire 1972–2006</td>
</tr>
<tr>
<td>Jamaica 1972–1986</td>
</tr>
<tr>
<td>Jordan 1977</td>
</tr>
<tr>
<td>Low middle-income countries with GNI per capita between 1005 and 2000 USD per capita</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td>Antigua and Barbuda 1981</td>
</tr>
<tr>
<td>Argentina 1972–1978</td>
</tr>
<tr>
<td>Barbados 1973–1977</td>
</tr>
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<td>Bosnia and Herzegovina 1997–2002</td>
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<td>Fiji 1976–1992</td>
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<td>Djibouti 2006</td>
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<td>Greece 1972</td>
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<td>Grenada 1986–1989</td>
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<td>Honduras 2001–2006</td>
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<td>Iran 1975–2003</td>
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<tr>
<td>Ireland 1972</td>
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<td>Jamaica 1975–1994</td>
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<tr>
<td>Jordan 1978–2002</td>
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<td>Low middle-income countries with GNI per capita between 2000 and 3975 USD per capita</td>
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