
# Undergraduate Research Fellowship Working Paper Series

**Title:**

*The Impact of Democracy vs. Autocracy on Environmental Degradation*

**Author(s):**

Terrilynn Melton and Marcus Marktanner

**2021-2022**

# The Impact of Democracy vs. Autocracy on Environmental Degradation

Terrilynn Melton and Marcus Marktanner
*Kennesaw State University*

Abstract

We examine the impact of democracy and autocracy on environmental degradation, hypothesizing that an authoritarian regime needs to be less responsive to citizens' needs to internalize the social costs associated with the extraction of natural resources than democracies. If the government maximizes profits from natural resources extraction, meaning that it acts like a monopolist, then the following emerges. Authoritarian regimes will extract more resources and impose higher social costs on their citizens than democracies. Implicit to this result is that the level of natural resource extraction might be closer to the social optimum in an autocracy than in a democracy. We test our hypothesis using simple OLS regression. Our dependent variables are CO2 emissions, natural resource depletion, natural resource rents, air pollution, as well as the number of deaths related to air pollution. Our focus independent variable is a political regime indicator. We control for GDP per capita and population density, as well as regional fixed effects. Our findings lend strong support to our hypothesis that, all else equal, autocracies extract more resources and impose higher social costs on society than democracies who internalize more of the social cost resulting in the extraction of less resources.

JEL Classification: D72, H23, O13, Q28

# 1. Introduction

To examine the impact of democracy and autocracy on environmental degradation we argue that both authoritarian and democratic regimes act as a monopolist when extracting a natural resource, but that autocracies must be less responsive to citizens' experienced social costs than democracies. Authoritarian regimes then extract resources to a larger extent than democracies and realize an amount of natural resource extraction that may be closer to the social optimum than in a democracy.

We test our hypothesis using simple OLS regressions. We utilize five dependent variables: CO2 emissions, natural resource depletion, natural resource rents, air pollution, and the number of deaths related to air pollution. Our focus independent variable is an indicator for democracy and autocracy, namely the so-called Polity2 score. Our control variables are GDP per capita and population density. We also control for regional fixed effects. Our study suggests strong support to our hypothesis. That is, all else equal, autocracies extract more resources and impose more social costs on society than democracies. Yet, these social costs are not an indicator of allocation inefficiency per se.

The remainder of this paper is organized as follows: In section two we briefly review the relevant literature. Section three discusses our theoretical framework that we use to derive our main hypothesis. In section four we introduce our data and methodology. We present our empirical results in section five and conclude with a summary of our main findings and outlook in section six.

# 2. Literature Review

In a democracy, individuals have greater, and better-protected political rights, resulting in the free flow of information through the utilization of free media. Therefore, environmental

problems are more likely to be reported in the news and heard by the people. Democracy promotes the cause of environmental interest groups who have the incentive to raise public awareness as environmental legislation can be highly encouraged and more successful through better informed actors. This, in turn, makes people more likely to act on environmental problems, and raises environmental quality overall (Quan Li, 2006).

Through electoral accountability, democracies are much more responsive to the environmental needs of the public. Democracies hold regular and free elections, which can bring to power new parties, including those friendly to the environment. Responsiveness can influence public policymaking and lend to the achievement of political representation where environmentalists stand a greater chance of affecting policymaking (Kotov and Nikitina, 1995).

Democracies well-representing of their citizens respect human life more than oppressive autocracies. Therefore, democracies are also more responsive to environmental degradation (Schultz & Crockett 1990). This value of human life also leads to democracies engaging in fewer wars, which increases environmental quality as wars often destroy the environment and environmental degradation can be used as a means of warfare (Gleditsch and Sverdrup, 2003). In addition, democracies are more likely to comply with environmental agreements because they respect the rule of law which raises environmental quality (Weiss and Jacobsen 1999).

The elite in an autocracy are less likely to support environmental quality as the ruling elite in an autocracy hold a much larger share of national income than most people in a democracy (Olsen, 1991). Environmental regulation that curtails pollution and waste also lowers production and consumption in the process. This imposes a higher cost on the elite of an autocracy than on the masses in a democracy. Since in an autocracy the elite are tightly linked to the leader, the elite have much more at stake over regime change. If the leader loses power the elite are vulnerable to

heavy losses or even to losing their lives. Therefore, the elite in an autocracy allocate more resources towards oppression as they greatly wish to prevent regime change, even by force (Congleton, 1992).

To that effect, the autocratic regime censors information flows and directs decision making in an autonomous fashion resulting in a lack of reporting of environmental degradation by the media to the people (Quan Li, 2006). Evidence even suggests nondemocratic governments frequently abuse the human rights of environmentalists. Repressive regimes are likely to harass, imprison, or otherwise abuse activists working to preserve the rights of indigenous peoples, sustain rainforests, or halt the dumping of hazardous wastes (Payne, 1995).

Democratic governments are accountable to the public and therefore, the people have the opportunity to learn about environmental problems and insist on the government searching for active solutions. Freedom of speech and the press promote environmental objectives since groups and individuals can openly debate policy choices and scientific communities can provide specialized information. Open-market societies rely on judicial institutions to resolve disputes, providing opportunities to those wronged by others to pursue civil and economic damages ensuring powerful actors cannot easily pursue narrow self-interest (Congleton, 1992).

Together, these democratic forces work to monitor activities of the most prominent sources of environmental degradation and publicize their findings. In Costa Rica, for example, the government has undergone an attempt to institutionalize a movement behind forest conservation by implementing an environmental-education program. This program is designed to help voters informatively elect a representative aligning with the country's environmental views to assist in greater representation in legislation and public policy (Congleton, 1992).

A movement from within the United States saw environmental pressure groups successfully motivate the country's negotiators, as well as influence other governments to successfully gain agreement on ozone protection (Payne, 1995). On a global scale, international criminal law can offer the opportunity to spark debate among nations and to tackle these issues in a consistent and effective way. Schwegler (2017) argues that in an autocratic regime, the focus is on minimizing loss even if that entails committing ecocide. Therefore, it should be considered an international crime because of its severity, magnitude, and the potentially lasting effect it has on many aspects of lives of different species.

## 3. Theoretical Framework

Our model rests on the assumption that a government has access to a natural resource extraction opportunity. Both an autocracy and a democracy want to maximize the profit from the extraction of the natural resource. A democracy may do so for the purpose of financing a sovereign wealth fund that pays for social security while an autocracy may do so for the purpose of enriching an elite. Many natural resource rich countries, such as the United Arab Emirates, have sovereign wealth funds, which, however, they employ differently to the benefit of society (Hanna and Marktanner, 2013).

Assume that government maximizes the profit from the extraction of a natural resource Q, which is subject to the inverse demand function

$$P(Q) = a - bQ \qquad (1)$$

The only difference between a democracy and autocracy is that a democracy will be more responsive to citizens' concerns, which we express as social costs. For simplicity, we assume that

the private marginal cost of extraction is zero. The only marginal cost that matters for government is the marginal social costs associated with natural resource extraction. The marginal social cost $m$ depends on the level of democracy, with the level of democracy being specified as δ. We limit the level of democracy to a range between zero and one, i.e.

$$0 \leq \delta \leq 1 \tag{2}$$

A value of δ = 0 implies zero democratic legitimacy, a value of one perfect democratic legitimacy, meaning that an absolute dictator (δ = 0) can ignore all social cost associated with the extraction of the natural resource while a perfect democrat (δ = 1) considers all social costs.

Government then maximizes

$$\max \pi(Q) = TR(Q) - TC(Q) \tag{3}$$

with the first order-condition

$$a - 2bQ = \delta m \tag{4}$$

and the profit maximizing quantity, Q*,

$$Q^* = \frac{a-\delta m}{2b} \tag{5}$$

The government sells the natural resource at a price of

$$P^* = \frac{a+\delta m}{2} \tag{5}$$

Thus, because $\frac{dQ^*}{d\delta} < 0$ and $\frac{dP^*}{d\delta} > 0$ a democratic government extracts fewer resources than a dictator and sells the resource at a higher price.

Total welfare (W) is equal to consumer surplus (CS), plus producer surplus (PS), minus total social cost (SC), which is

$$W = CS + PS - SC \tag{6}$$

where

$$CS(Q^*) = \frac{(a-\delta m)^2}{8b} \tag{7}$$

$$PS(Q^*) = TR(Q^*) = \frac{a^2-\delta^2 m^2}{4b} \tag{8}$$

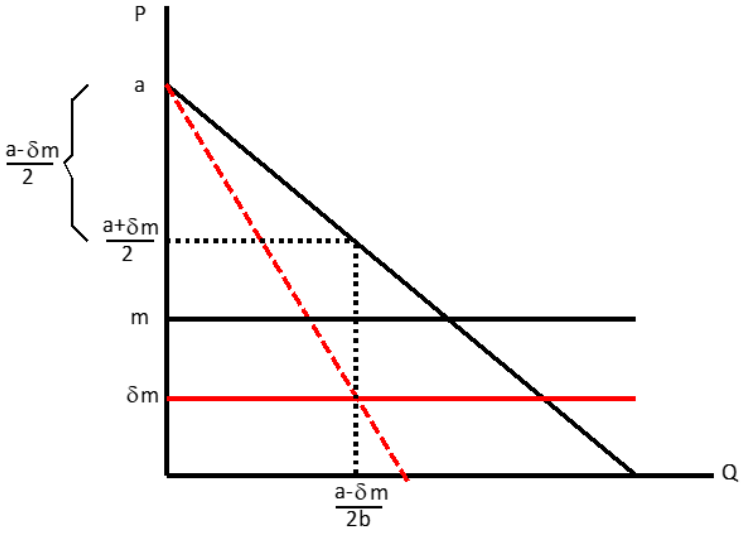
$$SC(Q^*) = \frac{am-\delta m^2}{2b} \tag{9}$$

The following figure summarizes our model where we have a government that extracts a natural resource based on where marginal cost is equivalent to marginal revenue, as a profit-maximizing monopolist. The difference between complete autocracies (δ =0) and complete

democracies ($\delta = 1$) extraction level results from the discrepancy in how each regime values environmental quality which is directly associated with how they value the lives of their people.

Autocracies account for a lower marginal social cost than what is actually present, causing them to extract more than a democracy which in turn puts them at an equilibrium price and quantity closer to the zero economic profit social optimum if $m < a/2$. If $m > a/2$, the autocratic equilibrium can also exceed the social optimum and lead to over-extraction.

**Figure 1:** Rent Extraction in a Democracy vs. Autocracy




Source: Authors' illustration.

This finding has an interesting implication. For one, we argue that a democracy has greater legitimacy, but find that the optimum natural resource extraction is more inefficient under democracy than the autocratic solution. To reconcile this paradox, a more precise definition of democracy is necessary. If we assume that the natural resource-extracting agency under a democracy is explicitly tasked to act like a single-price monopolist, then it is difficult to argue that the monopoly solution is not democratic. In fact, it would be democratically legitimized inefficiency. If the objective of society is to maximize profits from the natural resource extraction in the social optimum, this would require a perfectly price-discriminating monopolist, which in

practice is likely more difficult than being a single-price setting monopolist. Table 1 summarizes the comparative statistics of our findings under the assumption of single-price monopoly behavior.

**Table 1:** Comparative Statistics

| | Solution | Full democracy (δ=1) | Sign | Full Autocracy (δ=0) |
|---|---|---|---|---|
| Price | $P^* = \frac{a+\delta m}{2}$ | $P^* = \frac{a+m}{2}$ | > | $P^* = \frac{a}{2}$ |
| Quantity | $Q^* = \frac{a-\delta m}{2b}$ | $Q^* = \frac{a-m}{2b}$ | < | $Q^* = \frac{a}{2b}$ |
| Total Revenue | $TR(Q^*) = \frac{a^2-\delta^2 m^2}{4b}$ | $TR(Q^*) = \frac{a^2-m^2}{4b}$ | < | $TR(Q^*) = \frac{a^2}{4b}$ |
| Consumer Surplus | $CS(Q^*) = \frac{(a-\delta m)^2}{8b}$ | $CS(Q^*) = \frac{(a-m)^2}{8b}$ | < | $CS(Q^*) = \frac{a^2}{8b}$ |
| Producer Surplus | $PS(Q^*) = \frac{a^2-\delta^2 m^2}{4b}$ | $PS(Q^*) = \frac{a^2-m^2}{4b}$ | < | $PS(Q^*) = \frac{a^2}{4b}$ |
| Social Cost | $SC(Q^*) = \frac{m(a-\delta m)}{2b}$ | $SC(Q^*) = \frac{m(a-m)}{2b}$ | < | $SC(Q^*) = \frac{ma}{2b}$ |
| Total Welfare | $W(Q^*) = \frac{(a-\delta m)}{8b}(3a+\delta m-4m)$ | $W(Q^*) = \frac{3}{8b}(a-m)^2$ | ?* | $W(Q^*) = \frac{a}{8b}(3a-4m)$ |

***** = It can be shown that welfare under an autocracy is greater than under democracy whenever m < a/2. Whenever m > a/2, welfare under an autocracy could be greater or less than under democracy.

## 4. Data and Methodology

In order to provide empirical evidence for our hypotheses, we collect data from various sources, summarized in Table 2. Democracy (Polity 2 score) is our main independent variable. Our dependent variables are CO2 emissions, Natural Resource Depletion, Natural Resource Rents, Mortality Rate, and Disability Adjusted Life Years. All other variables are control variables. Real GDP per capita controls for the general level of development in a country. We hypothesize that higher per capita incomes reduce the probability of environmental degradation. We also control for population density, hypothesizing that the exposure to environmental degradation over an (overall) less densely populated area causes fewer social costs.

Lastly, we control for regional fixed effects. Our units of observation are all countries listed in the World Bank Development Indicators Database. These are 217 countries, but due to missing

observations the actual number of country observations is less than 217 in each of our empirical analyses. Our final dataset is a cross-sectional dataset where all observations are 2011-2020 averages.

Before including our variables in our regressions, we checked their normality and introduced natural log-transformations whenever they improved their distributional characteristics. Table 2 also shows which variable we transformed.

**Table 2:** Data and Sources

| Variable | Abbreviation | Source | Description | Transformation |
|---|---|---|---|---|
| **CO2 emissions** | CO2cap | WDI (online) | CO2 emissions (metric tons per capita) | ln(CO2cap) |
| **Natural resources depletion** | NatResDep | WDI (online) | Adjusted savings: natural resources depletion (% of GNI) | ln(NatResDep) |
| **Natural resources rents** | NRR | WDI (online) | Total natural resource rents (% of GDP) | ln(NRR) |
| **Mortality rate** | mortair | WDI (online) | Mortality rate attributed to air pollution (per 100,000 population) | ln(mortair) |
| **DALYS** | AirPol | IHME (online) | Disability Adjusted Life Years (DALYs) resulting from air pollution | ln(AirPol) |
| **Polity2 score** | Polity2 | Marshall et al (2016) | Index between -10 and +10 with negative scores indicating autocracies, scores between 1 and 6 describing anocracies, and scores of 7 and greater identifying democracies | None |
| **Population density (people per sq. km of land area)** | PopDens | WDI (online) | Population density calculated as midyear population divided by land are in squared kilometers | ln(PopDens) |
| **GDP per capita** | yPPP | WDI (online) | GDP (constant 2017 international $) | ln(yPPP) |
| **Regional Dummies** | EAP, EECA, LAC, MENA, NAM, SA, SSA, WE | WDI (online) | EAP= East Asia and the Pacific<br>EECA= Eastern Europe and Central Asia (former socialist countries)<br>LAC= Latin America and the Caribbean MENA= Middle East and North Africa NAM= North America<br>SA= South Asia SSA= Sub-Saharan Africa, WE= Western Europe | 1, if country part of region, 0 otherwise |

Table 3 provides descriptive summary statistics of our dataset and Table 4 the number of country observations per region. As for Table 4, for example, the number 30 under EAP indicates that 30 countries have an observation for CO2cap.

**Table 3:** Descriptive Summary Statistics

| Variable | Mean | Median | Min. | Max. | Std. Dev. | IQR | Missing Obs. |
|---|---|---|---|---|---|---|---|
| **CO2cap** | 4.26 | 2.60 | 0.04 | 32.44 | 5.00 | 5.36 | 26 |
| **NatResDep** | 3.60 | 1.10 | 0.00 | 32.74 | 5.74 | 4.80 | 37 |
| **NRR** | 6.19 | 1.57 | 0.00 | 57.58 | 9.74 | 7.63 | 9 |
| **mortair** | 92.21 | 68.60 | 7.00 | 324.10 | 71.93 | 115.50 | 34 |
| **AirPol** | 2481.50 | 1839.60 | 126.10 | 9687.70 | 2092.80 | 2537.80 | 17 |
| **Democracy** | 4.05 | 6.13 | -10.00 | 10.00 | 6.01 | 9.00 | 51 |
| **yPPP** | 20,917.00 | 12,818.00 | 811.64 | 129,120.00 | 21,826.00 | 23,993.00 | 24 |
| **PopDens** | 431.65 | 90.63 | 0.14 | 19,433.00 | 1,956.00 | 179.07 | 0 |

**Table 4:** Number of Observations per Variable and Region

| Variable | EAP (n=37) | EECA (n=29) | LAC (n=42) | MENA (n=21) | NAM (n=3) | SA (n=8) | SSA (n=48) | WE (n=29) |
|---|---|---|---|---|---|---|---|---|
| **CO2cap** | 30 | 28 | 33 | 20 | 2 | 8 | 48 | 22 |
| **NatResDep** | 25 | 28 | 32 | 18 | 2 | 8 | 47 | 20 |
| **NRR** | 34 | 29 | 40 | 20 | 3 | 8 | 47 | 27 |
| **mortair** | 26 | 28 | 31 | 20 | 2 | 8 | 48 | 20 |
| **AirPol** | 33 | 28 | 35 | 21 | 3 | 8 | 48 | 24 |
| **polity2** | 20 | 29 | 24 | 19 | 2 | 7 | 46 | 19 |
| **yPPP** | 31 | 29 | 37 | 19 | 3 | 8 | 45 | 21 |
| **PopDens** | 37 | 29 | 42 | 21 | 3 | 8 | 48 | 29 |

## 5. Empirical Results

Before running our regressions, we first look at a correlation matrix to identify possible multicollinearity problems (Table 5). The correlation matrix suggests that such multicollinearity concerns are not warranted as the correlation coefficient between our right-hand side variables Polity, GDP per capita, population density, and the regional fixed effects are regularly rather small.

Our regression results are summarized in Table 6. The results show that democratic regimes, on average, generate lower CO2 per capita emissions. The coefficient, however, is only significant at 10%. The coefficient of Polity also carries the expected sign when used as an explanatory variable for natural resource depletion and natural resources rents. The coefficient is also highly significant at 1%.

This finding is well in line with the rentier-state literature, "a growing literature [that] posits a causal relationship between resource abundance and important political-economic outcomes" (Neves, 2014). Rentier state theory takes the position that resource abundance tends to cause predatory state institutions to become weak (Neves, 2014). Here, rentier states are defined as countries that receive substantial amounts of external rents on a regular basis. Another example in addition to natural resource would be the payment for passage of ships through the Suez Canal (Mahdavy & Cook, 1970).

**Table 5:** Correlation Matrix

| Variable | lnCO2cap | lnNatResDep | lnNRR | lnmortair | lnAirPol | polity2 | lnyPPP | lnPopDens | EAP | EECA | MENA | SA | SSA | WE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **lnCO2cap** | 1.00 | | | | | | | | | | | | | |
| **lnNatResDep** | -0.25 | 1.00 | | | | | | | | | | | | |
| **lnNRR** | -0.27 | 0.82 | 1.00 | | | | | | | | | | | |
| **lnmortair** | -0.72 | 0.52 | 0.49 | 1.00 | | | | | | | | | | |
| **lnAirPol** | -0.73 | 0.41 | 0.46 | 0.94 | 1.00 | | | | | | | | | |
| **polity2** | 0.10 | -0.46 | -0.54 | -0.42 | -0.35 | 1.00 | | | | | | | | |
| **lnyPPP** | 0.92 | -0.39 | -0.39 | -0.83 | -0.83 | 0.21 | 1.00 | | | | | | | |
| **lnPopDens** | 0.04 | -0.36 | -0.45 | -0.09 | -0.08 | 0.00 | 0.17 | 1.00 | | | | | | |
| **EAP** | 0.05 | 0.06 | -0.09 | 0.05 | 0.00 | -0.06 | -0.02 | 0.10 | 1.00 | | | | | |
| **EECA** | 0.24 | -0.07 | -0.04 | -0.05 | 0.08 | 0.07 | 0.12 | -0.09 | -0.18 | 1.00 | | | | |
| **MENA** | 0.23 | 0.20 | 0.24 | -0.02 | -0.04 | -0.40 | 0.14 | 0.03 | -0.15 | -0.13 | 1.00 | | | |
| **SA** | -0.13 | -0.11 | -0.09 | 0.15 | 0.13 | 0.02 | -0.13 | 0.13 | -0.09 | -0.08 | -0.06 | 1.00 | | |
| **SSA** | -0.66 | 0.27 | 0.43 | 0.57 | 0.55 | -0.14 | -0.60 | -0.18 | -0.24 | -0.21 | -0.17 | -0.10 | 1.00 | |
| **WE** | 0.30 | -0.49 | -0.35 | -0.57 | -0.50 | 0.32 | 0.43 | 0.08 | -0.18 | -0.15 | -0.13 | -0.08 | -0.21 | 1.00 |

**Table 6:** Regression Results

| Independent Variables ↓ | Dependent Variables | | | | |
|---|---|---|---|---|---|
| | **lnC02Cap** | **lnNatResDep** | **lnNRR** | **lnmortair** | **lnAirPol** |
| **const** | -10.04 (0.49)*** | 5.62 (1.89)*** | 4.81 (0.76)*** | 8.53 (0.46)*** | 12.26 (0.45)*** |
| **polity2** | -0.01 (0.01)* | -0.11 (0.03)*** | -0.07 (0.01)*** | -0.03 (0.01)*** | -0.02 (0.01)** |
| **lnyPPP** | 1.19 (0.05)*** | -0.32 (0.19)* | -0.19 (0.08)** | -0.48 (0.05)*** | -0.55 (0.05)*** |
| **lnPopDens** | -0.08 (0.03)*** | -0.38 (0.11)*** | -0.3 (0.04)*** | -0.01 (0.03) | 0.03 (0.03) |
| **EAP** | Yes | Yes | Yes | Yes | Yes |
| **EECA** | Yes | Yes | Yes | Yes | Yes |
| **MENA** | Yes | Yes | Yes | Yes | Yes |
| **SA** | Yes | Yes | Yes | Yes | Yes |
| **SSA** | Yes | Yes | Yes | Yes | Yes |
| **WE** | Yes | Yes | Yes | Yes | Yes |
| **n** | 157 | 152 | 158 | 157 | 157 |
| **R-squared** | 0.91 | 0.47 | 0.6 | 0.81 | 0.79 |
| **F-Stat** | 170.45 | 13.8 | 24.2 | 70.5 | 64.19 |

Lastly, our regressions suggests that democracies tolerate less deaths from air pollution (lnmortair) and disability adjusted life years (lnAirPol) from air pollution. The economic significance of Polity is regularly in a similar range, suggesting that a transition from a complete autocracy (Polity 2 score of -10) to a full democracy (Polity 2 score of +10) promises an average reduction of the social cost dependent variable between 0.2% (20×-0.01%) to 2.2% (20×-0.11%).

As for the control variables, as expected, the variable GDP per capita regularly carries the expected negative sign, except for the model with CO2 emissions per capita as the dependent variable. This suggests, little surprisingly, that higher-income countries use more energy. However, its negative coefficient in the other model indicates that this energy input is used with a greater social responsibility as higher income countries rely less on natural resource depletion and natural resources rents and tolerate fewer deaths and disabilities from air pollution. This finding supports the idea that development and ultimately economic growth is the best recipe towards environmental sustainability.

Lastly, the control variable population density regularly shows an unexpected negative sign as a control in explaining CO2 emissions, natural resource depletions, and natural resource rents.

This is likely capturing the fact that countries relying heavily on natural resource extraction simply lack the manufacturing industries that trigger urbanization. The absence of industries and manufactures then may also explain why our analysis presents lower CO2 emissions.

## 6. Conclusions

Through election and free-market activity, democracies more accurately reflect the views of the people. Democracies account for higher social costs of environmental degradation than autocracies because the people of a democracy have much more power to enact policy that promotes environmental concerns. Autocracies ignore social costs associated with environmental degradation to increase national productivity, and in turn profits, resulting in the extraction of a natural resource at a price and quantity that might be paradoxically closer to the social optimum, depending on the actual magnitude of social marginal cost and level of authoritarianism. However, the citizens of a democracy benefit from a lower level of extraction farther from the social optimum by internalizing a lower social cost and taking advantage of numerous social benefits due to lower levels of natural resource extraction. These include diverse recreational opportunities, educational opportunities that support valuable nature-based, experiential learning, and the ability to build and enhance community through connection to place. This results in increased social welfare and works as a buffer that counteracts the opportunity cost of consumer surplus lost by democracies' lower level of extraction.

In the literature of regime type related to impact on environmental degradation, existing empirical evidence is mixed and relatively scant. Seeking to contribute to this literature, we focus on natural resource extraction as an activity by government that directly damages the environment. We use an array of empirical measures of environmental degradation by selecting those closely

related to decreased social welfare and quality of human life. The empirical analysis focuses on five important types of environment degradation: CO2 emissions, disability adjusted life years attributed to air pollution, mortality rate by air pollution, natural resource rent, and natural resource depletion.

Our analysis contributes to the literature by empirically testing the net effect of regime type on environmental degradation. Through our research we have found that greater democracy is directly correlated with less environmental degradation due to the democratic regimes' ability to better account for the marginal social cost of government activities that directly degrade the environment. The substantive effect of democracy on the environment is considerable, but it varies in size across the aspects of environmental degradation as democracy reduces some types of environmental degradation more than others. In all cases, a rise in democracy produces a noticeable decrease in environmental degradation.

## References

Congleton, R. D. (1992). Political Institutions and Pollution Control. *The Review of Economics and Statistics*, 74:412–421. https://doi.org/10.2307/2109485

Gleditsch Nils P. Sverdrup Bjorn O.. (2003) Democracy and the Environment. *In Human Security and the Environment: International Comparisons*, edited by Paper Edward Redclift Michael. London: Elgar.

Hanna, M. and Marktanner, M. (2013). Legitimacy and market development risks of Sovereign Wealth Funds, International Journal of Public Policy 2013 9:4-5-6, 400-415.

Kotov V. Nikitina E.. (1995) Russia and International Environmental Cooperation. In *Green Globe Yearbook of International Cooperation on Environment and Developmen*t, edited by Bergesen H. O. Parmann G.. Oxford: Oxford University Press.

Li, Q., & Reuveny, R. (2006). Democracy and Environmental Degradation. *International Studies Quarterly*, *50*(4), 935–956. http://www.jstor.org/stable/4092786.

Mahdavy, H., & Cook, M. A. (1970). The patterns and problems of economic development in rentier states: the case of Iran. *Life, 1000(1),* 129-135.

Olson, M. (1991). Autocracy, democracy, and prosperity. *Strategy and choice*, *131*(157), 131-157.

Payne, R.A. (1995). Freedom and the Environment. *Journal of Democracy 6*(3), 41-55. doi:10.1353/jod.1995.0053.Schultz C. B. Crockett T. R.. (1990) Economic Development, Democratization, and Environmental Protection in Eastern Europe. *Boston College Environmental Affairs Law Review* 18:53–84.

Schwegler, V. (2017). The disposable nature: the case of ecocide and corporate accountability. *Amsterdam LF*, *9*, 71.Weiss E. B. Jacobsen H. K.. (1999) Getting Countries to Comply with International Agreements. *Environment* 41:16–23.