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Do female parliamentarians improve environmental quality? Cross-country evidence

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Do female parliamentarians improve environmental quality? Cross-country evidence

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Abstract

This study explores the empowerment of women in politics on the environmental sustainability. Using data for the period 2015-2019 from 179 countries, we investigate the link between representation of women in parliament and the Environmental Performance Index (EPI). To explore the causal effect, we rely on gender quotas, language intensity and land suitability for agriculture as instruments for the share of women in parliament. Our results suggest that 10 percentage points increase in instrumented proportion of women in parliament leads to 7.1 points increase in the EPI. The results remain robust to a number of robustness checks.

Keywords: environmental performance, women in parliament

JEL Classification: Q50; Q54; Q58

1. Introduction

Environmental degradation has significantly increased over the past three decades. For example, global carbon dioxide (CO_2) emissions have increased by more than 60%, while the world has lost 1.3 million sq. km of forest area (World Bank, 2021). Therefore, pinpointing the causes of environmental degradation has crucial implications for society as it has been related to mortality and disability. Scholars have long been attempting to single out the antecedents of environmental performance. Ample studies have found that economic indicators, including economic growth, energy consumption, trade and financial development, have influence on quality of environment (Kais & Sami, 2016; Asongu and Odhiambo, 2021). A few recent studies suggest that political institutions that societies develop impact environmental quality. For example, Policardo (2016), using data for 47 transition economies over the period 1990-2012, finds that political regime transition influences environmental quality. Another important aspect of the quality of political institutions is female political empowerment.

In a growing strand of research, female political empowerment as measured by representation of women in parliament, is linked to a wide range of socio-economic outcomes such as wellbeing (Salahodjaev et al., 2020) or child labor (Güvercin, 2020). Female political empowerment may impact environmental performance in several ways. **First**, increase in the share of women in parliament improves quality of governance (Dollar et al., 2001), and there is ample evidence that institutions are instrumental for environmental improvement (Ali et al., 2019). For example, Jha and Sarangi (2018), using data for 17 EU member countries explore the effect of women's role in society and public life on quality of institutions. The authors using Moreira's conditional likelihood ratio approach find that women's presence in parliament has positive and causal effects on quality of anti-corruption policies. At the same time, it is documented that corruption

reduces environmental quality in OECD (Balsalobre-Lorente et al., 2019), APEC (Zhang et al., 2016), MENA (Hassaballa, 2015) and others. **Second**, female political participation fosters economic development (Jayasuriya & Burke, 2013) which influences environmental performance. While economic growth may lead to environmental degradation (Kahuthu, 2006), there is evidence that increase in the share of women in parliament is associated with more sustainable (green) economic growth (Salahodjaev & Jarilkapova, 2019). **Third**, studies report that female policymakers are more likely to exhibit greater concerns with regards to pro-social issues such ecological problems (Hunter et al., 2004). For example, Salahodjaev and Jarilkapova (2020), using data for 176 countries for the years 1990-2015, find that once the representation of women in parliament exceeds 38%, further increase in female parliamentarism leads to an increase in forest cover area. Sturgeon (1997) suggests a good interpretation for the link between gender and environment by coining the term ecofeminism – '*a movement that makes connections between environmentalisms and feminisms: more precisely, it articulates the theory that the ideologies that authorize injustices based on gender, race and class are related to the ideologies that sanction the exploitation and degradation of the environment*' (Sturgeon, 1997, p. 25).

To offer a preliminary visual checkup of the relationship between female representation in parliament and environmental quality, we have created a scatterplot of the share of women in parliament (2019) against Environmental Performance Index (2020). The scatterplot evidently suggests a positive link between female political empowerment and Environmental Performance Index (EPI): the greater is the representation of women in parliament, the better is environmental quality.

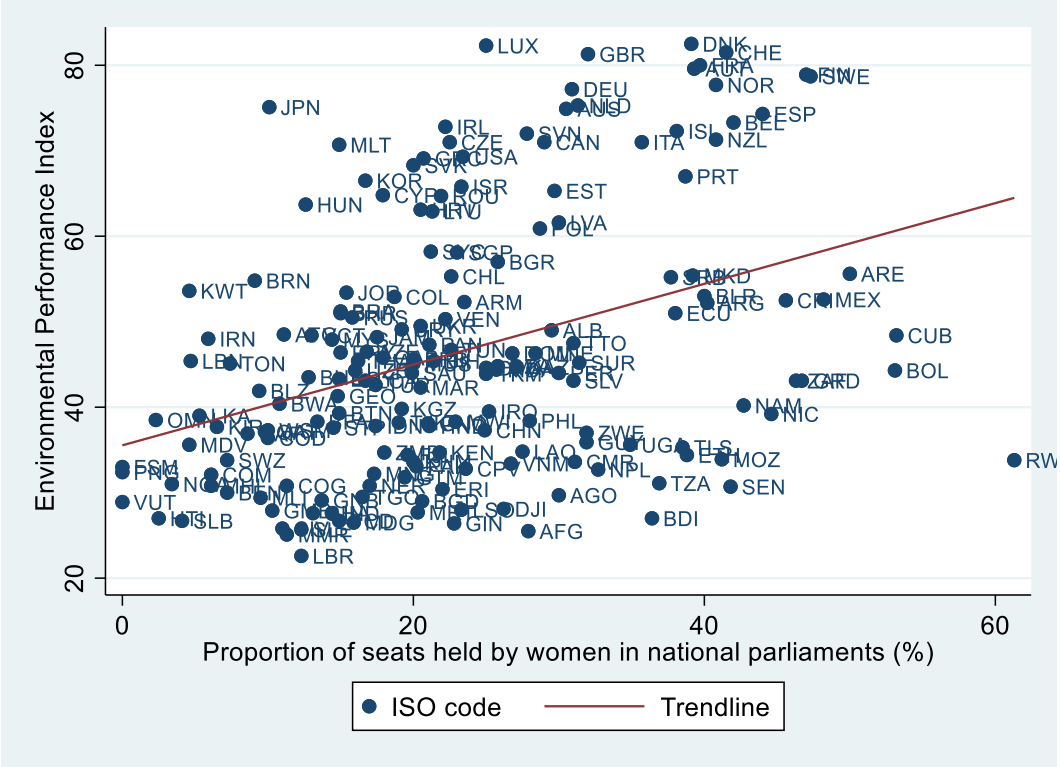

Fig. 1. EPI and proportion of seats held by women in national parliaments

However, the trendline in Fig.1. only suggests the positive association between gender and environment, it does not reveal whether female political empowerment is causal to environmental performance. Moreover, the causal impact of women in parliament on environmental quality is not as definite as it may seem. A number of challenges exist in this sense. First, the simultaneity problem has not been certainly resolved. The positive correlation between women in parliament and EPI may be caused by simultaneity of democratization, environmental improvement and female political empowerment processes. Midlarsky (1995) argues that it is still an open debated question whether political institutions influence the environment, or whether environmental conditions produce types of political regimes. In his study, Midlarsky (1995) empirically shows ecological conditions may influence political rights

and ‘hostile environments can generate autocratic responses, either subverting an early democratic development or preventing its organization altogether’ (Midlarsky, 1995 p. 254). Therefore, we may also interpret a reverse causality between proportion of women in parliament and environmental outcomes from his study. In this vein, the causal relationship between female political empowerment and environmental performance was overlooked in the empirical literature. For instance, Salahodjaev and Jarilkapova (2020), Ergas and York (2012) show that environmental degradation is lower in countries where women have higher political status, however, they left the issue of causality as avenue for future research. Second, environmental sustainability is a multidimensional concept, thus, measuring it is a daunting task. For example, studies in the field of environmental research use deforestation rates, carbon emissions and environmental legislation stringency as proxies for environmental quality (Obydenkova et al., 2016). However, these indicators do not capture all aspects of environmental degradation such as water quality, waste management and biodiversity or habitat.

Therefore, the aim of this study is two-fold. First, we explore the relationship between female parliamentarism and environmental sustainability addressing the endogeneity problem by using instrumental variable regression. Our first instrument comes from Güvercin (2020) and is a product of gender election quotas and index capturing intensity of gender marking in language. A number of studies show that quotas and language’s gender structure are good instruments for the female participation in politics (Gay et al., 2013; Hicks et al., 2016). Our second instrument is the agricultural suitability index from Alesina et al. (2013). In their study, the authors show that overall suitability of agriculture is positively correlated with gender equality measures. Second, we use the EPI as a proxy for environmental sustainability. The EPI captures an array of metrics on natural resource management and protection of human health from environmental

risks. As a composite index, the EPI distills data on many indicators of sustainability into a single number.

2. Data and methods

The study uses cross section data or data average for the period 2015-2019 from 179 countries. The number of countries and corresponding periodicity are contingent on data availability at the time of the study. It is important to note that though the initial dataset consists of 179 countries for bivariate regressions, the number of countries reduce to 146 when control variables are involved and subsequently to 108 when an instrumental variable two stage least squares (IV 2SLS) technique is used. The dependent variable in this study is the Environmental Performance Index (EPI). The EPI is composite indicator on a 0–100 scale, from worst to best performance. A perfect 100 score corresponds to achievement of an internationally recognized sustainability target. The overall index is estimated from 32 indicators covering 11 issue categories (Biodiversity & Habitat, Air Quality, Heavy Metals, Sanitation & Drinking Water, Waste Management, Ecosystem Services, Climate Change, Fisheries, Pollution Emissions, Agriculture and Water Resources) and two policy targets (Environmental Health and Ecosystem Vitality)**.** In our sample EPI ranges from 22.6 in Liberia to 82.5 in Denmark. The data comes from Wendling et al. (2020).

Our key independent variable is the proportion of seats that women held in national parliaments (%). Hence, women in parliaments reflect the percentage of parliamentary seats held by women in a single or lower chamber. The data comes from World Bank.

Additionally, a set of additional essential control factors (i.e. GDP per capita, per capita carbon emissions, trade, democracy and financial development) are incorporated in the empirical

framework. Extant research suggests that these variables are linked to environmental indicators at the cross-national level (Adams and Klobodu, 2018). The descriptive statistics for the main variables in this study, including their definitions and sources are reported in Table 1.

Table 1. Summary statistics

Variable	Description	Mean	Std. Dev.
EPI	The Environmental Performance Index, 2020 Source: Wendling et al. (2020)	46.38	15.47
Parliament	The share of women in parliament, %, 2015-2019 Source: World Bank	21.63	10.73
GDP	GDP per capita at purchasing power parity, 2015-2019 Source: World Bank	20260.69	20614.50
CO2	Territorial emissions in tCO_2 per person, 2015-2019 Source: Carbon Atlas	4.70	5.72
Trade	Trade as % of GDP, 2015-2019 Source: Carbon Atlas	86.76	53.55
Democracy	Democracy index, 2015-2018 Source: Polity V project	4.18	6.09
Credit	Domestic credit to private sector (% of GDP), 2015-2019 Source: World Bank	59.18	43.31
Gender	Gender index Source: Gay et al. (2013)	1.84	1.63
Quota	A dummy variable if a country has Voluntary party quotas, 0 otherwise. Source: Gender Quotas Database / 2019	0.21	0.41
Agriculture	Agriculture sustainability Source: Alesina et al. (2013)	0.53	0.33

To estimate the effect of women in parliament on environmental performance, we estimate the following econometric model:

$$Y_i = \alpha + \beta * Parliament_i + X_i^{'}\gamma + \varepsilon_i \qquad (1)$$

where Y is the EPI score in i th country, *Parliament* is the percentage of women, X is the set of control variables and ε is an error term.

3. Main results

Table 2 first reports the results of estimating Eq. (1) using the ordinary least squares regression estimator. The bivariate relationship between the proportion of women in parliament and EPI is reported in column 1. As expected, the estimate is positive and significant: without control variables a 10 percentage points increase in the share of women in parliament is associated with 4.4 points increase in EPI. In column 2, we include GDP per capita as both the representation of women in parliament and environmental performance may be linked to the level of economic development. The results show that GDP per capita is positively related to EPI. We further include CO_2 emissions (Column 3), trade openness (Column 4), democracy index and financial development (Column 5). Across all specifications, the proportion of women in parliament remains positive and significant at the 1% level. Once we include all control variables in Column 5, a 10 percentage point increase in the female political empowerment is associated to nearly 2 points increase in the EPI. Turning to control variable we find that:

- In line with conventional wisdom, rise in CO_2 emissions is associated with greater environmental degradation. In terms of quantitative size, a one standard deviation increase in logged carbon emissions is associated with nearly 5 points decrease in EPI.
- Democratization enhances environmental quality, while trade openness was insignificant in our regression. A one-point increase in democracy index is associated with 0.5 points increase in EPI.
- Other factors being constant, financial development improves environmental performance index, although relationship seems to be non-monotonic. Indeed, Jiang and Ma (2019) report that the effect of financial development on environmental degradation is not the same across all countries, and financial development could improve quality of

environment as it reduces production costs and enables companies to adopt ecologically friendly technologies.

Table 2. Main results: OLS

	I	II	III	IV	V
Parliament	0.4438	0.2656	0.2305	0.2373	0.1979
	(4.30)***	(4.92)***	(4.37)***	(4.21)***	(3.82)***
GDP, log		10.6261	15.5275	15.3330	13.2181
		(15.81)***	(11.72)***	(11.22)***	(7.68)***
CO2, log			-4.1506	-4.0173	-3.4163
			(4.19)***	(3.89)***	(2.63)***
Trade				0.0066	0.0050
				(0.43)	(0.36)
Democracy					0.4948
					(3.88)***
Finance					0.0548
					(3.22)***
Constant	36.6810	-58.4480	-100.4406	-99.3465	-84.4057
	(17.58)***	(9.69)***	(8.81)***	(8.52)***	(5.78)***
R^2	0.12	0.72	0.75	0.75	0.80
F-stat	18.51***	157.09***	131.51***	94.66***	86.02***
N	179	176	176	168	146

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

On the other hand, the OLS results in Table 2 may be biased due to some dimension of endogeneity such as reversed causality. We utilize a set of variables from extant research that are significantly related to gender equality: a product of gender election quotas and index capturing intensity of gender marking in language and agricultural suitability index (Güvercin, 2020; Alesina et al., 2013). The first stage results in Table 3 report that both instruments as positively and significantly, at the 5% level, are related to the representation of women in parliament. We report the results of estimating Eq. (1) in Columns 1 and 2. The estimates for women in parliament are 1.34 and 0.71 excluding and including control variables, and they are highly significant. The full equation suggests that 10 percentage points increase in instrumented proportion of women in parliament leads to 7.1 points increase in the EPI.

Table 3. Main results: IV 2SLS

	I	II
Parliament	1.3397	0.7104
	(3.91)***	(2.27)**
GDP, log		11.7886
		(3.86)***
CO2, log		-1.3930
		(0.62)
Trade		0.0085
		(0.38)
Democracy		0.2966
		(1.27)
Finance		0.0313
		(1.20)
Constant	18.6075	-82.4603
	(2.35)**	(3.51)***
R^2	.	0.69
F-stat	15.32***	54.64***
N	124	108

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

4. Robustness test

Our baseline analysis adopted some of the factors that are widely cited in empirical literature as predictors of environmental indicators. However, there may exist other variables that are suggested by extant environmental research as antecedents of environmental sustainability and may be correlated with gender equality. Therefore, in Table 4 we re-estimate our main results by including a set of additional controls. First, following a number of studies highlighting the link between human capital and environmental degradation (Mahmood et al., 2019; Omanbayev et al., 2018), we include education index from the UN as a proxy for human capital. The results in Column 1 suggest that both female parliamentarians and education are positively linked to the EPI, confirming the results in above mentioned studies. On the other hand, the positive link between representation of women in parliament and the EPI may capture other aspects of gender equality. Therefore, we include average years of female schooling from Georgetown

University's Institute for Women in Column 2. Both female educational and political empowerments are linked to the EPI. We next include the economic complexity index (Column 3) and informal economy (Column 4) to capture the effects of innovation and shadow economy on environmental degradation (Churchill et al., 2019; Huynh, 2020). While economic sophistication is positively linked to the EPI, we also find that countries with higher levels of informal economic sector tend to have poor environmental quality. Across all models, the representation of women in parliament is positively and significantly related to the EPI.

Table 4. Robustness tests: additional controls

	I	II	III	IV	V
Parliament	0.1342	0.1871	0.2221	0.1793	0.1571
	(2.87)***	(3.74)***	(3.85)***	(3.45)***	(2.88)***
GDP, log	9.2219	11.1796	10.6059	13.1895	7.6194
	(5.64)***	(6.99)***	(4.86)***	(7.13)***	(3.70)***
CO2, log	-4.7849	-5.0063	-2.3679	-4.0374	-4.3891
	(4.33)***	(4.45)***	(1.43)	(2.91)***	(3.17)***
Trade	0.0130	0.0025	-0.0012	0.0089	-0.0023
	(0.93)	(0.20)	(0.06)	(0.61)	(0.13)
Democracy	0.3027	0.3138	0.3969	0.5244	0.2620
	(2.87)***	(2.81)***	(2.66)***	(3.99)***	(1.98)*
Finance	0.0511	0.0576	0.0292	0.0422	0.0349
	(3.37)***	(3.70)***	(1.56)	(2.53)**	(2.18)**
Human capital	45.2930				45.5763
	(6.38)***				(3.09)***
Female education		1.6256			-0.0205
		(5.80)***			(0.03)
Complexity			3.8364		1.9765
			(3.33)***		(1.97)*
Informality				-0.1687	-0.1255
				(2.50)**	(1.70)*
Constant	-73.8964	-76.5174	-58.5205	-78.1954	-53.9283
	(5.73)***	(5.83)***	(3.00)***	(4.58)***	(2.87)***
R^2	0.85	0.84	0.81	0.82	0.87
F-stat	111.04***	106.72***	64.54***	89.94***	86.87***
N	146	145	122	137	118

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

In Table 5 we further explore whether the effect of women in parliament on environmental performance differs depending on the policy objectives outlined in the EPI . Therefore, we explore the impact on female political empowerment on two core policy objectives as developed in the EPI, namely, environmental health and ecosystem vitality. While representation of women in parliament has significant effect on both sub-dimensions of EPI, the effect both with OLS and IV 2SLS regressions is quantitatively more sizeable for environmental health.

Table 5. Robustness test: policy objectives

	I	II	III	IV
	OLS	2SLS	OLS	2SLS
	Environmental health		Ecosystem vitality	
Parliament	0.2244	0.8571	0.1792	0.6118
	(2.73)***	(2.11)**	(3.17)***	(1.97)*
GDP, log	20.5707	21.9490	8.3200	5.0371
	(8.21)***	(5.26)***	(4.16)***	(1.66)
CO2, log	-6.2922	-5.7559	-1.5051	1.5015
	(3.73)***	(1.91)*	(1.01)	(0.66)
Trade	0.0040	0.0010	0.0055	0.0133
	(0.29)	(0.05)	(0.30)	(0.46)
Democracy	0.5523	0.1188	0.4563	0.4140
	(3.91)***	(0.43)	(2.82)***	(1.56)
Finance	0.1513	0.1059	-0.0094	-0.0183
	(5.86)***	(3.08)***	(0.44)	(0.64)
Parliament	-158.7101	-181.6563	-34.8802	-16.4981
	(7.64)***	(5.74)***	(2.06)**	(0.67)
R^2	0.85	0.78	0.54	0.42
F-stat	156.43***			
N	146	108	146	108

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

The findings are broadly consistent with the attendant literature on the relevance of gender inclusion in favorable economic development externalities, *inter alia*, the importance of women's political empowerment in mitigating climate change vulnerability (Asongu et al., 2021); the perspective that engaging more women in decision-making owing to their responsiveness to natural disasters is conducive to formulating and implementing policies that are against global warming (Alber and Roehr, 2006; Gaard, 2015); the engagement of women in

political and administrative spheres leading to reduced corruption levels (Swamy et al., 2001) and the contingent importance of enhancing gender inclusion to reduce gender inequality (Asongu and Odhiambo, 2020).

5. **Conclusion**

Related literature on environmental sustainability shows that social (education, culture and religion), economic (GDP, trade, finance, energy use) and political (democracy, corruption, rule of law) factors are among antecedents of environmental degradation (Stern et al., 1996; Obydenkova et al., 2016; Cai et al., 2020). This study aims to extend related cross-country empirical research by exploring the link between representation of women in parliament and environmental performance index for the years 2015-2019.

We make two important contributions to the field of environmental research. This is the first study to robustly explore the role that female representation in parliament plays in the various domains of environmental degradation. Second, we use the instrumental variable two-stage least squares estimator method to address the problem of causality that exists in the cross-country research. We carried out a number of robustness tests to confirm the durability of this relationship. We provide strong support for the theoretical claims that greater female political empowerment causally improves environmental performance. In addition, we show that female parliamentarians have positive effects on two dimensions of the environmental performance: environmental health and ecosystem vitality.

The empirical results in this study offer important policy implications for academia and governments. While earlier studies report that female political empowerment is important for social wellbeing (Salahodjaev et al., 2020), we further show that greater representation of women

in parliament leads to improvement in environmental quality. Therefore, policymakers should use policy tools such as quotas to foster greater representation of women in government. Apart from that our results confirm that democratization is also positively linked to environmental outcomes. Therefore, further improvement of civil rights and political freedoms should play an important role in climate change mitigation in developing countries. Finally, the informal economic sector seems to be a variable that negatively influences environmental sustainability. Policy measures aimed at the improvement of institutional quality and liberalization of business climate should indirectly improve environmental conditions in emerging markets via reduction of underground economy.

Our study has a number of limitations. First, the instruments used in this study are not available over time. Therefore, the use of panel data methods is not feasible in our study. Second, once we adopt the IV 2SLS regression, the number of countries in our sample decreases from 146 to 108. Hence, prospective studies should further explore the relationship between gender equality and environmental indicators using instruments that are available for majority of nations. Finally, prospective studies could also explore the relationship between representation of women in parliament and various environmental indicators such as carbon emissions, climate change and etc, using panel data techniques.

6. Declaration

Ethics approval and consent to participate: Not applicable
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