Individualism and climate change policies: international evidence

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Abstract

Purpose – This paper aims to examine the extent to which the cultural dimension of individualism/collectivism matters for international differences in climate change policy performance. This study postulates that individualistic societies, relative to their collectivistic counterparts, are more likely to address global climate change.

Design/methodology/approach – The main hypothesis is tested using data for a world sample of up to 92 countries. To achieve causal inference, this study isolates exogenous sources of variation in individualistic cultures, based on blood distance to the UK and historical pathogen prevalence.

Findings – The core results suggest that individualistic countries are characterized by greater climate change policy performance. This study also finds evidence that individualism affects climate change policy adoption through enhancing governance and female political representation. Subnational analyses based on data from the World Values Survey indicate that survey participants with an orientation toward individualism tend to self-report positive attitudes to pro-environmental policies.

Research limitations/implications – The main findings help improve the understanding of the deep origins of climate change policy performance, which is relevant for formulating policies that help mitigate the consequences of changing climate conditions.

Originality/value – To the best of the author's knowledge, this paper is the first study to link cultural traits of individualism and climate change policy performance across countries.

Keywords Climate change, Environment, Individualism, Collectivism, Culture

Paper type Research paper

1. Introduction

There is a strong consensus that drastic reductions in greenhouse gas emissions around the world are central to addressing global climate change, which is one of the most serious impediments to fostering sustainable economic development (IPCC, 2014). However, countries differ substantially in their willingness to mitigate the far-reaching consequences of changing climate conditions. For example, European countries are strongly committed to reducing the carbon footprint of their economic activities (Steves *et al.*, 2011; Vu, 2021b). By contrast, African economies are less likely to implement emission-reducing policies and measures and collaborate on addressing global climate change (Steves *et al.*, 2011). International differences in the propensity to collaborate on addressing global climate change can be captured by the climate change cooperation index (CC) developed by Bernauer and Böhmelt (2013). More specifically, the CC offers an internationally comparable measure of climate change policy performance, captured by the level of emissions over time and countries' propensity to collaborate on global climate change. Against this background, this paper attempts to identify the fundamental driving forces of cross-country differences in climate change policy performance, focusing on the cultural dimension of individualism/collectivism.

JEL Classification — O44, Q54, Q58, Z10

The main hypothesis of this paper is that individualism is positively associated with climate change policy performance across the world. In particular, I propose that individualistic countries, relative to their collectivistic counterparts, tend to demonstrate greater climate change policy efforts because cultural traits of individualism help enhance the quality of government and female political representation. Adopting climate change mitigation policies and measures remains a major challenge in many societies across the world because it is prone to free-riding issues, thereby requiring government intervention (Dasgupta and De Cian, 2018; Fredriksson et al., 2007). It follows from this line of reasoning that good governance is key to fostering a country's climate change policy performance (Congleton, 1992; Welsch, 2004). An early study by Scott (1972) reveals that the prevalence of corruption in much of the developing world is attributable to parochial ties and gift-giving practices that nurture interpersonal relationships. Additionally, collectivism represents a cultural trait characterized by in-group favoritism. Thus, allegiance to social relationships and collective actions may be conducive to nepotism and clientelism, which ultimately induce patronage and corrupt activities in the public sphere (Greif, 2006; Smith, 2003; Tanzi, 1994). These narratives suggest that individualism is conducive to climate change actions through enhancing the quality of governance.

Another mechanism underlying the central hypothesis of this paper is that individualistic countries are typically characterized by greater participation of women in decision-making bodies, thus enhancing climate change policy performance. This argument rests upon the premise that women demonstrate greater concerns about climate change and environmental issues, compared to their male counterparts (Dietz et al., 2002; McCright, 2010; McCright and Dunlap, 2011; Xiao and McCright, 2015). Furthermore, women are arguably more vulnerable to the adverse impact of changing climate conditions. Therefore, the presence of women in a country's decision-making bodies contributes to strengthening climate change policy efforts. On this basis, Mavisakalyan and Tarverdi (2019) empirically establish that countries with larger shares of women in national parliaments tend to implement climate change policies. Meanwhile, individualism emphasizes the importance of autonomy, personal control and individual accomplishments. Importantly, these cultural values are prerequisites of an egalitarian society, and this may also transcend gender identities (Davis and Williamson, 2019). Collectivistic countries, by contrast, put a premium on in-group favoritism and mutual obligations, which may attach subordinate roles to women. As argued earlier, collectivistic countries are typically characterized by a strong hierarchical social structure, thus engendering greater social acceptability of gender inequality. These arguments suggest that cultural traits of individualism fundamentally drive female political empowerment, thus enhancing climate change policy performance.

This study builds upon and contributes to a growing body of research examining the role of individualism in shaping long-term comparative development. For example, Gorodnichenko and Roland (2017) indicate that slowly evolving cultural traits of individualism/collectivism lie at the deep roots of global income differences. The idea is that individualism places emphasis on personal autonomy and accomplishments, which strengthens incentives for innovation. By contrast, collectivistic societies tend to value conformity and discourage deviations from social norms. This helps explain why individualistic countries are endowed with greater innovative capabilities, thus sustaining long-run economic growth. Other studies provide suggestive evidence that individualistic countries are endowed with less corruption (Jha and Panda, 2017), better governance (Kyriacou, 2016), democratic institutions (Gorodnichenko and Roland, 2021), a more egalitarian distribution of income (Nikolaev et al., 2017), greater gender equality (Davis and Williamson, 2019) and lower rates of deforestation (Cai et al., 2020a). This paper goes beyond previous studies by investigating the role of individualism in driving cross-country differences in efforts to address global climate change. By doing so, this study improves our

understanding of the extent to which culture affects multidimensional economic development.

Furthermore, this study is closely related to several studies documenting that institutions (Congleton, 1992; Fredriksson and Neumayer, 2016), legal traditions (Ang and Fredriksson, 2017; Fredriksson and Wollscheid, 2015), trade openness (Neumayer, 2002), future orientation (Cai *et al.*, 2020b) and gender roles (Mavisakalyan and Tarverdi, 2019) are the key drivers of climate change policy performance across countries. The existing literature has predominantly focused on the role of several socio-economic factors that are jointly determined by and interrelated with the adoption of climate change policy. Therefore, our understanding of factors that fundamentally drive international differences in climate change policy actions remains limited. It is noteworthy that the exploration of the deep origins of climate change policy performance is relevant for explaining why many countries persistently exhibit less willingness to collaborate on addressing global climate change. Therefore, a key distinguishing feature of this paper is to shed light on the deep determinants of the cross-country variation in climate change policy performance. The main inquiry of this paper is also closely related to Xiang *et al.* (2019) who rely on a survey of 182 undergraduate students in China to explore the relationship between individualism and climate-friendly activities. This paper, however, departs from their work in using international data to provide a generalized understanding of how cultural traits of individualism help shape climate change policy performance across the globe.

Using cross-country data, I find evidence supporting the hypothesis that individualism is positively associated with climate change policy performance. Consistent with the above arguments, I also document that individualism transmits to a higher willingness to address global climate change through fostering good governance and women's political empowerment. Further analyses, based on data from the World Values Survey, reveal that individualism is linked to positive attitudes toward pro-environmental policies.

The rest of this paper is organized as follows. Section 2 discusses econometric methods and data. Sections 3 and 4 contain the results derived from cross-country analyses. Section 5 presents the individual-level evidence. Section 6 concludes the paper.

2. Methods and data
2.1 Model specification
To test the main hypothesis, I specify the following econometric model:

$$CC_i = \alpha + \beta IDV_i + \gamma X_i + \varepsilon_i$$

where CC_i is the CC, developed by Bernauer and Böhmelt (2013), for country i. IDV denotes a measure of individualism of Hofstede (2001). X is the set of key control variables. β captures the effect of individualism on climate change policy performance. ε represents the stochastic disturbance term.

2.2 Data description
As mentioned previously, I use the CC of Bernauer and Koubi (2013) to capture cross-country differences in climate change policy performance. The CC index is averaged over the period 1996–2008 to estimate the baseline cross-sectional model. It encompasses two sub-components, namely, the policy and emission sides. The policy component is based on whether a country ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, whether a country submitted the latest climate change report, and countries' financial contributions to the UNFCCC from 1996 to 2005.

The emission component utilizes the cross-country variation in the level of CO_2 emissions per capita in 1990 and its variation between 1990 and 2002. These subcomponents are aggregated into a comprehensive measure of climate change policy performance ranging between 0 and 100. Higher values correspond to countries' greater efforts in addressing global climate change. To measure cross-country differences in cultural values, I employ an index of individualism (IDV) developed by Hofstede (2001), taking values between 0 and 100 with higher values representing more prevalent individualism. According to Hofstede (2001), the national-level measure of individualism is based on an aggregation of individual-level data on cultural values obtained through various surveys in each country. The Online Appendix contains a more detailed description of all variables and data sources (see Appendix Table A1 and A2).

2.3 Estimation strategies

A major challenge with estimating the benchmark model stems from potential endogeneity bias, which may be induced by unobserved country-specific factors. Furthermore, measurement errors in the index of individualism invalidate statistical inference on the empirical findings. Therefore, following Gorodnichenko and Roland (2017), I create an exogenous source of variation in individualism by using blood distance to the UK (*Bdist_UK*) and the historical prevalence of infectious diseases (*pathogen*) as instrumental variables (IV) for the index of individualism. This strategy rests upon several contributions to the epidemiological literature documenting the association between culture and blood distance – a proxy for genetic distance based on frequencies of blood types. The underlying idea is that cultural values and genetic traits are transmitted across generations from parents to offspring (Gorodnichenko and Roland, 2017). Therefore, blood distance to the UK, which is consistently among the most individualistic societies in the world, is strongly correlated with the prevalence of individualism. Furthermore, neutral genetic differences between countries were shaped overwhelmingly over the period of the Neolithic migration dating back several millennia ago, thereby having no direct influence on contemporary socio-economic outcomes. Many studies suggest that collectivism tends to prevail in countries characterized by stronger pathogenic stress because the historical prevalence of infectious diseases gave rise to cultural traits of collectivism as a mechanism to cope with infectious diseases (Gorodnichenko and Roland, 2017; Nikolaev and Salahodjaev, 2017). For this reason, the pervasiveness of morbidity shaped a culture of conformity and in-group favoritism and placed significant limits on personal autonomy (Murray and Schaller, 2010). Building upon these ideas, I also use *pathogen* as an additional instrument for individualism.

3. Cross-country evidence

3.1 Main results

Figure 1 demonstrates unconditional correlations between the index of individualism and different measures of environmental and climate change policy performance. Accordingly, individualism is positively correlated with *CC*, the Environmental Performance Index (*EPI*) and the Environmental Sustainability Index (*ESI*). This is consistent with the central hypothesis that individualistic countries tend to exhibit greater efforts to address global climate change. However, these results may not necessarily carry a causal interpretation due to plausible concerns about endogeneity bias, as discussed previously.

Table 1 contains empirical estimates of the relationship between individualism and climate change policy performance. In Column (1), I regress *CC* on the individualism index. In Columns (2) to (4), I report the main IV estimates. Accordingly, the coefficient on *IDV* is
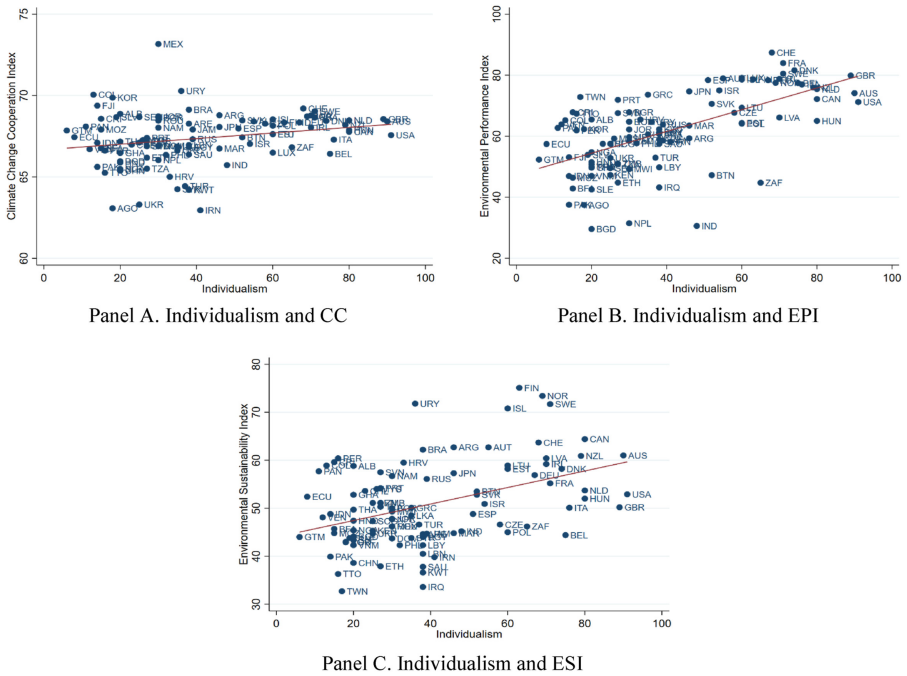
Panel A. Individualism and CC

Panel B. Individualism and EPI

Panel C. Individualism and ESI

Figure 1.
Scatter plots

Estimator	OLS		IV-2SLS	
	(1)	(2)	(3)	(4)
Panel A. Second-stage estimates. Dependent variable is CC				
IDV	0.017***	0.040***	0.030***	0.033***
	[0.006]	[0.012]	[0.008]	[0.007]
Panel B. First-stage estimates. Dependent variable is IDV				
Bdist_UK		−16.136***		−8.638***
		[2.441]		[2.541]
Pathogen			−23.205***	−17.720***
			[2.151]	[2.401]
First-stage *F*-statistic		43.68	116.40	66.26
Cragg-Donald Wald *F*-statistic		46.77	80.23	52.87
Anderson-Rubin Wald test		19.00	13.89	12.44
Over-identification [*p*-value]				0.370
Observations	92	92	92	92
First-stage *R*-squared		0.346	0.467	0.539

Table 1.
Individualism and
climate change policy
performance

Note(s): All regressions include an intercept, which is omitted for brevity. Robust standard errors in squared brackets, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

positive and statistically significant in all cases. This provides empirical support for the hypothesis that cultural traits of individualism are positively associated with climate change policy performance. According to the results in Column (4), a one-unit increase in the *IDV* is associated with approximately a 0.033-unit increase in the *CC*. The individualism

index values for Iran and Belgium are 41 and 75, respectively. The difference between these two countries is 34, which is roughly 1.55 standard deviations of the *IDV* index. If Iran were to experience the *IDV* value of Belgium, the predicted increase in the *CC* of Iran would be 1.12, approximately 0.7 of a standard deviation of *CC*. Overall, I find evidence that individualism has an economically and statistically significant effect on climate change policy performance.

The first-stage results reported in Panel B of Table 1 suggest that *Bdist_UK* and *pathogen* are strongly correlated with *IDV*, thus lending support to the relevance of the instrumental variables. In addition, the values of the *F*-statistic of excluded instruments are much bigger than the rule-of-thumb value of 10 in all cases. This helps rule out the possibility of using weak instruments. Following Anderson and Rubin (1949), I conduct the test of robust inference to weak instruments under the null that the estimated effect of *IDV* on *CC* is zero. The results suggest that we can reject the null hypothesis at the 1% level of statistical significance. The test of weak instruments of Cragg and Donald (1993) also lends credence to the relevance of the instrumental variables. Given that the baseline model is over-identified, I partly check for the validity of the exogeneity condition by conducting the test of over-identifying restrictions [1]. Accordingly, the null hypothesis cannot be rejected at conventional levels, thus providing partial support for the validity of the IV estimates.

3.2 Robustness
3.2.1 Robustness to additional controls. To further address concerns about omitted variable bias, I include additional control variables in the baseline analysis. Many studies in the comparative development literature suggest that geography is a deep determinant of income per capita (Owen, 2017; Spolaore and Wacziarg, 2013). For this reason, the main results can be attributed to countries' fundamental (fixed) geographic characteristics that have a persistent influence on contemporary economic development. To address this concern, I incorporate several geographic controls in the benchmark model, such as absolute latitude, distance to coast, a landlocked nation dummy, mean elevation and precipitation. Recent studies emphasize the role of a country's legal heritage in shaping national responses to climate change (Ang and Fredriksson, 2017; Fredriksson and Wollscheid, 2015). Accordingly, common-law countries are less willing to address global climate change, compared to their civil-law counterparts. Thus, I augment the main analysis with dummy variables for legal heritage. Another concern is that my findings may be confounded by fractionalization and social trust. The basic idea is that ethnolinguistically diverse countries are characterized by heterogeneity in preferences for public goods provision, making it difficult to sustain collective climate action (Vu, 2021b). Furthermore, social capital may shape overall social tolerance toward the well-being of others, thus strengthening climate-friendly actions. This motivates the inclusion of an index of ethnolinguistic fractionalization and a measure of social trust in the regression. However, the coefficient on *IDV* retains its sign and statistical significance in all cases (Online Appendix Table A3).

It is argued that countries with higher levels of CO_2 emissions are less likely to address global climate change due to the influence of carbon-intensive industries (Fredriksson and Neumayer, 2013). As pointed out by Neumayer (2002), trade openness may facilitate international cooperation in environmental regulations. However, it may also hinder multilateral environmental agreements if such cooperation is harmful to exporting economies (Neumayer, 2002). An additional concern relates to the possibility that countries in which oil and fossil fuel resources account for a significant proportion of their exports have poorer climate change policy performance. One could also postulate that climate vulnerability is a potential alternative explanation for international differences in the willingness to address

global climate change. Against this background, I incorporate additional controls in the benchmark model, including the level of CO_2 emissions, trade openness, fuel exports and a measure of vulnerability to climate change. As demonstrated in Online Appendix Table A4, the inclusion of these potential confounding factors in the regression fails to explain away the relationship between individualism and climate change policy performance.

3.2.2 Using alternative outcome variables and measures of individualism. To further address plausible concerns about measurement errors in the index of individualism, I replicate the main analysis using an alternative proxy for the main variable of interest. As shown in Online Appendix Table A5, I consistently find evidence that individualistic countries tend to be characterized by better climate change policy performance. Furthermore, I re-estimate the baseline model using two different measures of environmental performance as alternative dependent variables. It is plausible that stringent environmental regulations improve the capacity to combat global warming. To this end, I use the Environmental Sustainability index developed by the Yale Center for Environmental Law and Policy of Yale University and the Center for International Earth Science Information Network of Colombia University, in collaboration with the World Economic Forum and the European Commission (Esty *et al.*, 2005). In addition, I employ the Environmental Performance Index in 2019 obtained from the Yale Center for Environmental Law and Policy (https://epi.envirocenter.yale.edu/). The results presented in Online Appendix Table A6 reveal that my findings are insensitive to using alternative outcome variables.

3.2.3 Other robustness checks. Countries in the same world region arguably share some similar characteristics, such as cultures and histories, possibly confounding the baseline estimates. To mitigate this concern, I replicate the main analysis by sequentially excluding countries in the same region (Online Appendix Table A7). Next, I check for robustness to spatial dependence because cultural values, clean technologies and economic development may transcend borders between geographically proximate countries (Online Appendix Table A8). Additionally, I implement several tests to check for robustness to the presence of outliers (Online Appendix Table A9). There are various methods of identifying outliers. For example, I estimate the Cook's distance and exclude those with a value greater than a typical cut-point (four divided by the number of countries). Next, I remove observations with a standardized residual bigger than 1.96. As suggested by Li (1985), I perform robust regression weights and use these weights to re-estimate the benchmark model. In all cases, the coefficient on *IDV* remains positive and precisely estimated at conventionally accepted levels of statistical significance.

4. Possible mechanisms

The main hypothesis is that the cultural dimension of individualism/collectivism helps shape international differences in climate change policy performance by affecting the quality of governance and female political representation. This section, therefore, contains empirical evidence on these two mechanisms underlying the relationship between individualism and the propensity to address global climate change across countries.

To check for evidence of the underlying mechanisms, I attempt to capture cross-country differences in the quality of governance by using the average of six dimensions of worldwide governance between 2000 and 2010, taken from the World Bank Worldwide Governance Indicators (https://info.worldbank.org/governance/wgi/). Consistent with Mavisakalyan and Tarverdi (2019), I measure the cross-country variation in female political representation by the share of seats held by women in national parliaments averaged between 1990 and 2010; data are derived from the World Bank's World Development Indicators (http://wdi.worldbank.org). It is plausible that individualism may transmit to climate change policy actions by fostering the level of economic development because countries with higher

incomes may have better resources for investment in addressing the consequences of changing climate conditions. Hence, I use GDP per capita to capture the level of economic development. The first empirical exercise is to include these potential mechanisms in the baseline model specification. The results reported in Table 2 reveal that the inclusion of the underlying mechanisms in the regression significantly reduces the magnitude and statistical precision of the coefficient on *IDV*. This lends support to the argument that cultural traits of individualism affect climate change policy performance by shaping the quality of governance, women's political empowerment and the level of economic development.

An additional empirical exercise is to regress the proposed mechanisms on *IDV* and the set of key control variables (Table 3). Accordingly, individualism exerts a positive influence on

	Baseline	Controlling for potential mechanisms			
	(1)	(2)	(3)	(4)	(5)
Panel A. Second-stage estimates. Dependent variable is CC					
IDV	0.045***	0.025	0.016	0.039**	0.015
	[0.012]	[0.029]	[0.040]	[0.016]	[0.055]
Log of GDP per capital		0.237			0.033
		[0.325]			[0.324]
Governance			0.640		0.514
			[0.757]		[0.764]
Female political representation				0.015	0.007
				[0.022]	[0.019]
Panel B. First-stage estimates. Dependent variable is IDV					
Bdist_UK	−7.757***	−4.847*	−4.360*	−7.392***	−3.721
	[2.567]	[2.659]	[2.504]	[2.679]	[2.537]
pathogen	−16.203***	−10.391	−5.939	−14.631***	−5.542
	[3.213]	[3.765]	[4.222]	[3.512]	[4.520]
Geographic controls	✓	✓	✓	✓	✓
First-stage *F*-statistics	27.25	6.42	3.32	16.40	2.26
Over-identification [*p*-value]	0.824	0.754	0.435	0.748	0.401
Observations	82	81	78	82	77
First-stage *R*-squared	0.660	0.695	0.753	0.668	0.757
Note(s): Robust standard errors in squared brackets, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$					

Table 2.
Controlling for potential mechanisms

Potential mechanisms	Log of GDP per capita (1)	Governance (2)	Female political representation (3)
Panel A. Second-stage estimates. Dependent variables are potential mechanisms			
IDV	0.073***	0.044***	0.348***
	[0.010]	[0.006]	[0.076]
Panel B. First-stage estimates. Dependent variable is IDV			
Bdist_UK	−7.523***	−7.608***	−7.524***
	[2.502]	[2.501]	[2.503]
pathogen	−16.238***	−16.083***	−16.342***
	[3.229]	[3.292]	[3.211]
Geographic controls	✓	✓	✓
First-stage *F*-statistic	28.15	25.03	28.79
Over-identification [*p*-value]	0.789	0.517	0.317
Observations	84	79	85
First-stage *R*-squared	0.661	0.663	0.660
Note(s): Robust standard errors in squared brackets. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$			

Table 3.
The effect of individualism on potential mechanisms

income per capita, in line with the findings of Gorodnichenko and Roland (2017). The empirical estimates reported in Table 3 also indicate that individualistic countries are characterized by better governance quality and greater female political representation. These findings are consistent with Davis and Williamson (2019) and Kyriacou (2016).

A final test is based on estimating the effect of governance and female political representation on climate change policies [2]. There also exist some endogeneity concerns when estimating the impact of *governance* and *female* on climate change policy performance. To address these issues, I rely on identification methods adopted by existing empirical studies examining the link between institutional quality, gender inequality and economic performance. More specifically, I utilize the settler mortality rate constructed by Acemoglu *et al.* (2001) as an instrument for *governance*. As shown in Column (1) of Table 4, the estimated coefficient on *IDV* is positive and statistically significant at the 1% level. Therefore, individualism helps foster the quality of governance, thereby enhancing countries' willingness to address global climate change. To maximize the feasible sample size, I follow Vu (2022) to use the intensity of ultraviolet radiation as an alternative instrument for *governance*, as shown in Column (2) [3]. In Column (3), I use both instruments to implement a test for over-identifying restrictions, in which I fail to reject the null hypothesis. In all cases, I find evidence that individualism is linked to better governance quality, possibly leading to greater climate change policy actions.

From Columns (4) to (6) of Table 4 report the estimated effect of *female* on the stringency of climate change policies. Following Mavisakalyan and Tarverdi (2019), I use the number of years that elapsed since women's suffrage was granted in each country as an instrumental variable for *female* [4]. This empirical strategy is mainly motivated by the argument that a

	Governance and CC			Female political representation and CC		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Second-stage estimates. Dependent variable is CC						
Governance	0.808***	0.616**	0.658**			
	[0.285]	[0.296]	[0.289]			
Female political representation				0.103**	0.098**	0.100***
				[0.044]	[0.046]	[0.035]

	Governance			Female political representation		
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Panel B. First-stage estimates. Dependent variable is governance or female political representation						
Settler mortality (log)	−0.449***		−0.237***			
	[0.066]		[0.082]			
Ultraviolet radiation		−0.011***	−0.008***			
		[0.001]	[0.002]			
Women's suffrage				0.182***		0.141***
				[0.051]		[0.048]
Neolithic transition					−2.152***	−1.822***
					[0.484]	[0.489]
Geographic controls	✓	✓	✓	✓	✓	✓
First-stage *F*-statistic	46.25	95.49	41.68	12.77	19.73	18.98
Over-identification [*p*-value]			0.377			0.943
Observations	39	78	39	82	82	82
First-stage *R*-squared	0.543	0.611	0.678	0.158	0.182	0.253
Note(s): Robust standard errors in squared brackets. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$						

Table 4.
The effect of governance and female political representation on climate change policy performance

country's history of suffrage provides a plausibly exogenous source of variation in today's gender roles because it is unlikely to directly affect modern-day economic outcomes (Mavisakalyan and Tarverdi, 2019). Accordingly, I find strong evidence that fostering women's participation in national parliaments helps improve climate change policy performance. I also utilize the timing of the Neolithic transition as an alternative instrument. The basic idea is that countries that adopted sedentary agriculture earlier tend to experience greater modern gender inequality (Hansen *et al.*, 2015). To partly check for the validity of the exclusion restrictions, I include both instruments in one single regression. The test of over-identifying restrictions provides some support for the validity of my instruments. Importantly, the estimated coefficient on *female* retains its sign and statistical significance.

5. Subnational evidence

A central focus of this paper rests upon the premise that individualism fosters climate change policy performance by promoting the quality of governance and female political representation. It is important to re-emphasize that a key challenge of achieving causal inference stems from unobserved country-specific factors, which are difficult to account for properly in a cross-country framework. This concern is at least partially addressed by using plausibly exogenous sources of variation in individualism. To further rule out the possibility that my findings can be confounded by unobserved time-invariant country-specific factors, I implement individual-level analyses at the subnational level.

As far as I know, data at the regional level for both climate change policies and individualistic cultures are not available. Fortunately, the World Values Survey, conducted through face-to-face interviews in roughly 100 countries, provides relevant information about individualism and pro-environmental behaviors at the individual level. Therefore, I employ data across six waves from 1981 to 2014 to examine the relationship between individualistic cultures and attitudes toward pro-environmental policies. The main advantage of using these data is that I can control for unobserved country-specific factors by including country-fixed effects in the regression. Furthermore, the effect of time-specific factors can be accounted for by including wave-fixed effects in the regression. I also augment the regression analysis with religion dummies to control for other religious and cultural factors that may shape the overall tolerance toward environmental regulations [5].

To measure the cultural dimension of individualism/collectivism at the individual level, I use the following six questions to capture whether a survey respondent demonstrates an orientation toward individualism: (1) independence is an essential child quality; (2) imagination is an essential child quality; (3) obedience is not an important child quality; (4) a survey participant does not live with their parents; (5) divorce is justifiable; and (6) private ownership of business should increase. These cultural values are broadly consistent with Hofstede's definition of individualism–collectivism and are widely used as measures of individualistic cultures (see, e.g. Ang, 2019; Beugelsdijk *et al.*, 2015; Hamamura, 2012; Olsson and Paik, 2016; Schwartz, 1994; Vandello and Cohen, 1999) [6]. Based on survey participants' responses, I create an overall measure of individualism by using the first principal component of these values. This provides a comprehensive index of individualism, in which higher values correspond to a greater individualistic orientation of each surveyed respondent. I employ survey participants' attitudes toward pro-environmental policies as an outcome variable. In particular, survey participants are asked whether enhancing environmental protection or economic growth is a priority. For ease of interpretation, I recode data for this variable, taking a value of one if respondents choose environmental protection and zero otherwise. I also control for individual-level characteristics [7].

Table 5 contains probit estimates of the relationship between cultural traits of individualism and attitudes toward pro-environmental policies. Consistent with the cross-

	(1)	(2)	(3)	(4)
Dependent variable is attitudes toward pro-environmental policies				
Individualism	0.049***	0.046***	0.032***	0.031***
	[0.003]	[0.003]	[0.003]	[0.003]
Female	0.033***	0.034***	0.028***	0.031***
	[0.006]	[0.006]	[0.006]	[0.006]
Age	0.003***	0.003***	0.002*	0.002**
	[0.001]	[0.001]	[0.001]	[0.001]
Age squared	−0.000***	−0.000***	−0.000***	−0.000***
	[0.000]	[0.000]	[0.000]	[0.000]
Married	−0.003	−0.007	−0.000	−0.001
	[0.007]	[0.007]	[0.008]	[0.008]
No children	−0.038***	−0.040***	0.004	0.006
	[0.009]	[0.009]	[0.009]	[0.009]
Income	0.007***	0.008***	0.009***	0.009***
	[0.001]	[0.001]	[0.001]	[0.001]
Education (upper)	0.215***	0.223***	0.201***	0.210***
	[0.009]	[0.009]	[0.009]	[0.010]
Education (middle)	0.050***	0.057***	0.067***	0.072***
	[0.007]	[0.007]	[0.008]	[0.008]
Social trust	0.106***	0.105***	0.116***	0.113***
	[0.007]	[0.007]	[0.007]	[0.008]
Wave FE		✓	✓	✓
Country FE			✓	✓
Religion FE				✓
Observations	181,610	181,610	181,610	175,886
Pseudo *R*-squared	0.008	0.009	0.048	0.048

Table 5.
Probit estimates of
individualism and pro-
climate behaviors

Note(s): The dependent variable is a dummy, taking a value of one if survey participants agree that environmental protection is a priority and zero if their choice is economic growth. Individualism is constructed by using the first principal component of six values of individualistic cultures as presented in the main text. Robust standard errors in squared brackets. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

country results, I find that individualism is positively associated with positive attitudes toward pro-environmental actions. The results are robust to controlling for an extensive set of individuals' characteristics, unobserved country-specific factors and wave- and religion-fixed effects. Importantly, the results presented in Table 5 are in contrast to the findings of Xiang *et al.* (2019). Drawing from the psychological literature, Xiang *et al.* (2019) postulate that individuals who self-report an orientation toward individualistic cultures are less likely to take action on climate change. As argued earlier, their findings are based on conducting a survey of 182 undergraduate students in China, making it difficult to generalize the results across the world. My findings, by contrast, provide a broad understanding of the relationship between individualism and climate change behaviors. Even when using individual-level data comparable to Xiang *et al.* (2019), I find that individualism is positively associated with attitudes toward pro-environmental policies.

6. Conclusion
Mitigating global warming requires adopting stringent environmental regulations to reduce greenhouse gas emissions. For this reason, a better understanding of the driving forces of climate change policy actions around the world is relevant for addressing the far-reaching consequences of changing climate conditions. This paper attempts to provide new insights into this line of inquiry by linking cultural values and climate change policies. More

specifically, the main novelty of the current study lies in the premise that individualistic cultures foster climate change policy performance. By contrast, collectivistic societies suffer from a weaker capacity to implement climate-friendly activities. Using cross-country data, I consistently find evidence that individualistic countries are characterized by greater climate change policy performance. The results are robust to accounting for numerous potential confounding factors. I also document that individualism affects the adoption of climate change policies by shaping the quality of governance and female political representation. Based on data from the World Values Survey, I provide suggestive evidence that cultural traits of individualism are associated with positive attitudes toward pro-environmental policies.

The empirical findings highlight that cultural values lie at the deep root of cross-country differences in climate change policy performance. I propose that collectivism emphasizes social relationships and collective actions, which are detrimental to the quality of governance. This arguably affects a country's ability and willingness to address global climate change. Furthermore, individualistic societies have a better capacity to combat global warming by strengthening women's participation in legislation. A key implication from these findings is that environmental policies aiming at reducing global warming should consider the persistent effect of cultural values as given. Therefore, designing effective policies requires being compatible with the prevailing cultural environment. This is particularly important in collectivistic societies where their cultures hinder governance and gender equality, thus presenting significant challenges to combating global warming. In addition, fostering women's political empowerment and institutional quality would be two potential mechanisms to address the negative consequences of existing cultural values. A possible misinterpretation of my findings is that a cultural revolution is required to address climate change because such a drastic change in the cultural environment can be deleterious. By contrast, the main objective of this research is to advance our understanding of the deep origins of climate change policy performance across the world. In this regard, it is hoped that my results would motivate further discussions on the link between cultural values and climate-friendly policies.

Notes

1. It is important to highlight that the validity of the exclusion restrictions cannot be tested directly mainly because of the unobserved nature of the error terms.

2. The results shown in Table 2 suggest that income per capita is a potential mechanism of influence. According to Gorodnichenko and Roland (2017), cultures can affect economic prosperity by inducing good institutions that strengthen incentives for innovative activities. Higher levels of income may also foster institutional quality and provide available resources that enhance climate policy performance. These arguments suggest that institutional quality is a key mediating channel. For this reason, I only estimate the effect of institutional quality and female political representation on climate change policies, which partly helps explain the link between income levels and climate change regulations. Importantly, it is relatively challenging to find an exogenous instrument for GDP per capita to examine its causal effect on climate change policies.

3. In particular, Vu (2021a) posits that countries with higher levels of UV face a long-lasting threat of contracting eye diseases, such as cataracts. This significantly shortens the period of work-life expectancy, thus inducing corruption via the horizon channel. In addition, the permanent risk of diseases also affects the early investment in obtaining human capital, resulting in fewer well-trained and competent bureaucrats who could focus on designing the rule of law. The prevalence of diseases in high UV regions also deters (historical) investment in cooperation by institutional building, and this is detrimental to modern institutional quality (Ang et al., 2018).

4. Data are obtained from the 2011–2012 Progress of the World's Women report conducted by the United Nations Entity for Gender Equality and the Empowerment of Women.

5. It is plausible that people sharing similar religious beliefs may have common cultural values and attitudes toward environmental protection.

6. According to Beugelsdijk *et al.* (2015), the country-level measure of individualism based on responses from the Word Values Survey correlates with 0.77 with Hofstede's index of individualistic cultures.

7. Specifically, I include age, age squared, income and dummy variables of being female, married and having children. I also create two dummies of educational levels, including upper and middle education with lower education being excluded as the base group. Social trust is a binary variable reflecting whether survey participants agree that "most people can be trusted" and zero otherwise.

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Appendix
The supplementary material for this article can be found online.

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