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Abstract

This paper examines the extent to which the cultural dimension of individualism-collectivism matters for the stringency of climate change policies across the world. I postulate that individualistic societies are endowed with a better capacity to implement stringent climate change regulations compared with their collectivistic counterparts. This notion is tested using data for a world sample of up to 92 countries. To achieve causal inference, I isolate exogenous sources of variation in individualistic cultures, based on blood distance to the UK and historical pathogen prevalence. The results lend strong empirical support to my propositions. I also find evidence that individualism exerts a positive influence on the stringency of climate change policies through enhancing the quality of governance and female political presentation. To account for unobserved country-specific factors, I perform subnational analyses using data from the World Values Survey. The results indicate that survey participants with an orientation towards individualistic cultures tend to self-report positive attitudes to pro-environmental policies, which is consistent with the international evidence.

Key words: climate change, environment, individualism, collectivism, culture.

JEL Classification: O44, Q54, Q58, Z10.

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1. Introduction

It is widely perceived that climate change is one of the most serious impediments to achieving the Sustainable Development Goals. Addressing this global concern requires drastic reductions of greenhouse gas emissions across the world (IPCC, 2014). In this regard, the objective of limiting global warming is reflected in the Paris Climate Agreement that calls for international commitments to keep the global temperature increase in this century below two degrees Celsius above pre-industrial levels. Unfortunately, there has been little success in undertaking these ambitious efforts at the global and regional levels. More specifically, climate change policies are still far from resulting in strong emission abatement (Ziegler, 2017). Part of the explanation for this holds that we lack a profound understanding of the social and economic environment that fosters effective climate change actions. Therefore, it is of importance to explore the drivers of the stringency of climate change regulations before we can formulate relevant policies to mitigate global warming.

There exist considerable worldwide discrepancies in the implementation of climate change policies (Bernauer & Böhmelt, 2013). To capture this global divergence, a recent study by Bernauer and Böhmelt (2013) constructs an index of climate change cooperation (*CCPI*) for up to 172 countries, covering the period from 1996 to 2008. The authors, in particular, attempt to measure international differences in efforts to reduce climate change. According to Bernauer and Böhmelt (2013), the cross-country variation in the stringency of climate change regulations is reflected in the extent to which a country is cooperative in international agreements to mitigate global warming, and the trend in its emission levels over years. Based on this information, the authors provide an internationally comparable indicator measuring the stringency of climate change policies with the broadest coverage of countries and years. Figure 1 demonstrates the unequal distribution of the stringency of climate change policies across the world, measured by the CCPI index of Bernauer and Böhmelt (2013).

These disparities motivate a growing number of studies examining the determinants of climate change regulations across countries. Institutional quality, among others, has been well documented as an essential driver of the implementation of climate change and environmental regulations (see, e.g., Congleton, 1992; Neumayer, 2002a; Fredriksson et al., 2007; Von Stein, 2008; Bernauer & Koubi, 2013; Fredriksson & Neumayer, 2013, 2016).[1] Recent

[1] There exists ample empirical evidence on the positive effect of institutions on environmental and climate change policies. Section 2 provides a more detailed discussion on this strand of literature.

contributions to this body of literature postulate that a country's legal heritage is relevant for addressing global warming (Fredriksson & Wollscheid, 2015; Ang & Fredriksson, 2017). Other scholars, however, put a premium on the role of trade openness and gender roles in strengthening the capacity to combat climate change (see, for instance, Neumayer, 2002b; Damania et al., 2003; Mavisakalyan & Tarverdi, 2019).

The above line of research provides important insights into the cross-country divergence in the stringency of environmental and climate change policies. Nevertheless, previous studies have predominantly focused on overall environmental performance while little attention has been paid particularly to the adoption of climate change policies.[2] Importantly, the main interest of most existing papers, as reviewed above, is the "*proximate"* determinants of environmental and climate change regulations, such as corruption, democracy, governance and trade policies. These factors are jointly determined and interrelated with environmental quality. Thus, they offer a limited understanding of the root causes of climate change policies. Indeed, fostering climate-friendly activities necessitates tracing their deep origins besides proximate factors. For this reason, a key inquiry emerging from the existing literature is what fundamentally explains the implementation of stringent climate change policies across the globe.[3] This paper, therefore, attempts to offer a deeper or more fundamental explanation to this strand of literature. To this end, I propose a novel hypothesis that individualistic cultures help strengthen climate change policies through enhancing the quality of governance and female political representation.

This study builds upon a recent contribution to the long-term comparative development literature asserting that individualistic cultures lie at the root of global income differences (Gorodnichenko & Roland, 2017). Specifically, these scholars posit that individualism puts a greater emphasis on personal autonomy and accomplishments, which strengthens incentives for innovation. Collectivistic societies, by contrast, value conformity and discourage any deviations from social norms. These cultural traits ultimately shape economic prosperity in the world by affecting innovative activities (Gorodnichenko & Roland, 2017). Recent studies find strong evidence that individualism improves the quality of governance (Kyriacou, 2016), and reduces corruption (Jha & Panda, 2017), income inequality (Nikolaev et al., 2017) and gender

[2] There are few empirical studies on the determinants of the stringency of climate change policies (e.g., Fredriksson & Neumayer, 2013; Fredriksson & Wollscheid, 2015; Fredriksson & Neumayer, 2016; Ang & Fredriksson, 2017; Mavisakalyan & Tarverdi, 2019).

[3] Specifically, if corruption, democracy and gender inequality matter for climate change mitigation, what further explains cross-country differences in these proximate determinants. The extent to which we can effectively implement climate change regulations critically depends on our understanding of their root causes.

discrimination (Davis & Williamson, 2019). This paper, however, offers a fresh perspective to this emerging body of research by documenting that individualism is also conducive to climate change policies.

To my knowledge, this is the first paper linking individualism and the stringency of climate change policies. I posit that individualistic societies have better capacity to implement stringent climate mitigation policies compared with their collectivistic counterparts. Two mechanisms that helps explain this positive relationship include the quality of governance and women's participation in national parliaments. The findings of this paper help advance our understanding of the long-term determinants of climate change and environmental regulations. The results, therefore, offer several useful implications for designing climate change policies, and potentially motivate a fruitful discussion on the link between cultures and the environment. This will be discussed in detail in the final section.

Furthermore, the current research directly relates to Xiang et al. (2019) who argue that an orientation toward individualistic cultures is negatively correlated with climate-friendly activities, which is in sharp contrast with my hypothesis. Their approach, however, relies on data obtained from a survey of 182 undergraduate students in China, making it difficult to draw an overall understanding of the link between individualism and climate change policies across the globe. In this respect, I differ from their paper by examining a world sample of countries to provide a broader insight into the role of cultural values in fostering climate-friendly actions. Later, I also perform an individual-level analysis, which also suggests that individualism is positively associated with pro-environmental policies. Importantly, the findings of Xiang et al. (2019) are based on estimating relatively parsimonious OLS regressions that may be biased and inconsistent essentially because of some endogeneity concerns. For this reason, I further depart from their study by considering these econometric issues more thoroughly.

To empirical test the main hypothesis, I estimate a model using cross-sectional data for up to 92 countries. A key challenge of identification in this framework stems from potential endogeneity concerns. Hence, I follow Gorodnichenko and Roland (2017) to generate the exogenous components of individualism, using an index of blood distance to the UK and the historical prevalence of infectious diseases as instrumental variables. The cross-country evidence, in particular, indicates that the exogenous variation in individualism exerts a positive influence on climate change policies. My findings appear to be largely robust to a variety of falsification tests. I also find evidence supporting the notion that individualism affects climate change regulations by enhancing the quality of governance and female political representation.

To control for unobserved country-specific factors, I further conduct subnational analyses using data from six waves of the World Values Survey. The results reveal that survey participants who self-report an orientation toward individualism tend to have positive attitudes toward pro-environmental policies. This provides strong empirical support to the international evidence.

The rest of the present paper is organized as follows. Section 2 provides a theoretical framework that links individualistic cultures and the stringency of climate change policies. Section 3 discusses empirical strategies and data. I present the cross-country evidence in Section 4, followed by an analysis of channels of transmission in Section 5. Next, Section 6 discusses individual-level evidence, and the final section concludes.

2. A theoretical perspective

The central hypothesis of this study postulates that individualistic cultures exert a positive influence on the stringency of climate change policies. This section, therefore, explores two potential channels of transmission that help explain this positive relationship. I propose that individualistic societies enjoy greater capacity to implement climate change policies because their cultures foster the quality of governance and female political representation.

Governance

There exists ample empirical evidence demonstrating that good governance is conducive to environmental performance and the stringency of energy and environmental policies. Part of the explanation is that environmental protection is characterized as a public good, thus requiring government intervention (Dasgupta & De Cian, 2018). Several studies, for example, find that good governance reduces pollution, emissions and deforestation, and improves the stringency of environmental regulations (e.g., López & Mitra, 2000; Damania et al., 2003; Fredriksson & Svensson, 2003; Welsch, 2004; Barbier et al., 2005; Wilson & Damania, 2005; Fredriksson et al., 2007; Bernauer & Koubi, 2013).[4] Further, countries with democratic institutions are more likely to ratify the Montreal Protocol, the United Nations Framework Convention on Climate Change, the Kyoto Protocol and other multilateral environmental agreements (see, e.g., Congleton, 1992; Fredriksson & Gaston, 2000; Neumayer, 2002a; Fredriksson et al., 2007; Von Stein, 2008).

[4] These studies mostly employ the perception-based measure of corruption as a proxy for the quality of governance.

It follows from the above line of inquiry that the quality of governance helps strengthen the stringency of environmental and energy policies, and a country's commitments to international agreements on climate change. An interesting question emerging from these findings is how to create a good institutional environment that fosters climate change policies. I propose that individualistic values exert a positive influence on the ability to adopt stringent climate change policies through affecting institutions. More specifically, the extent to which the cultural dimension of individualism-collectivism matters for governance has gained much attention among economists. An early study by Scott (1972), for example, demonstrates 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 (Tanzi, 1994; Smith, 2003; Greif, 2006).

Further, collectivistic countries characterized by a strong hierarchical structure may suffer from poorer governance because this social organization engenders the emergence of powerful elites. Meanwhile, powerful bureaucrats tend to engage in corrupt behaviors that exploit public resources for private gain (Vu, 2020). Recent empirical studies show that individualism is a strong predictor of cross-country differences in the quality of governance (e.g., Kyriacou, 2016; Gorodnichenko & Roland, 2017; Jha & Panda, 2017). As argued earlier, institutional quality plays an essential role in the implementation of climate change policies. Hence, it is plausible that collectivistic cultures hinder the adoption of climate change policies if they exert a negative influence on the quality of governance.

Another argument for the positive effect of individualism on climate change policies rests upon conventional wisdom holding that individualistic cultures are a key conduit of innovation. This is because individualistic societies attach greater social prestige to innovators, which stimulates a country's innovative activities (Gorodnichenko & Roland, 2017). Further, good institutions, which are partly affected by cultural values, arguably reduce the uncertainty costs incurred by innovators, thus strengthening the innovation process. This mechanism is particularly relevant for fostering climate change policies, which critically require a transition toward green technologies. In this vein, Fredriksson and Wollscheid (2008) find that strong governance spurs investments in pollution control technologies, which help reduce the ecological footprint of economic activities.

Female political representation

Another channel of influence rests upon the premise that individualism promotes female political representation that critically fosters the stringency of climate change policies. This mechanism of transmission, in particular, is mainly motivated by the proposition that women demonstrate a greater awareness and concern toward global warming relative to men (see, e.g., Dietz et al., 2002; McCright, 2010; McCright & Dunlap, 2011; Xiao & McCright, 2015). Indeed, gender differences in overall responsibilities for the well-being of others have been well documented by Beutel and Marini (1995). To the extent that women exhibit a greater awareness of climate change and other social issues, their participation in the public sphere may arguably facilitate formulating and adopting more stringent climate change regulation.

Moreover, the contribution to climate change is also gender-differentiated with men performing more economic activities that induce global warming. This is mainly attributable to gender differences in social roles (see, e.g., Spitzner, 2009). A recent report of the United Nations Environment Program indicates that the negative consequences of climate change are gender-differentiated (UNEP, 2016). Conventional wisdom holds that women are more vulnerable to the adverse effect of global warming compared with their male counterparts. These arguments, taken together, suggest that a greater inclusion of women in policy-making acts as a catalyst for climate-friendly policies. More recently, Mavisakalyan and Tarverdi (2019) find that the fraction of seats held by women in national parliaments exerts a positive influence on the implementation of climate change policies throughout the world.

There are good reasons to envisage that individualistic societies have better capacity to promote women's political participation. Foremost, 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 & 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 cultures characterize a strong hierarchical social structure within a society. This also engenders a greater social acceptability of gender inequality.

The positive link between individualism and gender equality is also in line with several studies documenting that strong family ties and participation in collective religious activities are detrimental for women's participation in the labor market and gender equitable attitudes (see, e.g., Seguino, 2011; Alesina & Giuliano, 2014). Employing data from the World Values

Surveys, Davis and Williamson (2019) indicate that people living in collectivistic countries are more likely to self-report negative attitudes toward gender equality. Therefore, it is plausible that gender equality may prevail in individualistic societies, which fosters women's representation in national parliaments. Overall, I posit that individualistic cultures help strengthen female political representation, which ultimately leads to more stringent climate change regulation.

A synthesis of hypotheses

The narrative presented above highlights that there exist strong theoretical arguments for why the cultural dimension of individualism-collectivism matters for cross-country differences in the stringency of climate change policies. Accordingly, individualistic cultures may transmit to global warming regulations via affecting institutional quality and female gender representation. The rest of this paper, therefore, explores the relationship between individualism and climate change policies. I also provide empirical evidence on the mechanisms of transmission discussed in this section.

3. Methods and data

Econometric methods

To explore the link between individualism and climate change policies, I estimate the following cross-country model:

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

where $CCPI$ is an index of climate change cooperation, reflecting the cross-country variation in the stringency of climate change policies (Bernauer & Böhmelt, 2013). IDV denotes a measure of individualism of Hofstede (2001). X is the set of control variables discussed in the following sections. β captures the causal effect of individualism on climate change policies. Subscript i stands for country i. ε represents the stochastic disturbance term.

A key issue when estimating the causal influence of individualistic cultures on climate change policies stems from potential endogeneity bias. More specifically, the identification of β can be biased and consistent if reverse causation exists. It is widely perceived that economic performance affects a country's cultural development (Gorodnichenko & Roland, 2017). This view posits that economic prosperity may induce more individualistic cultures. Hence, it is plausible that the implementation of climate change regulations, which is jointly determined and interrelated with economic prosperity, may exert an influence on a country's cultural

values. Further, obtaining causal inference requires paying special attention to unobserved country-specific factors that are difficult to account for in a cross-country framework. An additional concern is that proxies for individualism and climate change policies may be subject to measurement bias. These issues, if they exist, may engender endogeneity bias.

To address the above concern, I create exogenous sources of variation in individualistic cultures based on blood distance to the United Kingdom (*distB_UK*) and the historical prevalence of infectious diseases (*pathogen*), following Gorodnichenko and Roland (2017). In particular, *distB_UK* captures genetic distance to the UK, which consistently rank among the most individualistic societies in the world, based on frequencies of blood types.[5] According to Gorodnichenko and Roland (2017), the use of this instrumental variable is mainly motivated by several contributions in the epidemiological literature documenting a strong correlation between cultural values and the presence of several alleles. Specifically, cultural values and genetic traits simultaneously transmit across generations from parents to offspring.[6] This is suggestive that genetic distance is a strong instrument for the cross-country variation in cultural values.

Further, an advantage of employing data on frequencies of blood types rests upon their broad coverage of countries across the world. Importantly, as emphasized by Gorodnichenko and Roland (2017), genetic distance to the UK provides a plausibly exogenous source of variation in culture that is not related to economic performance. In particular, the authors argue that neutral genetic differences across countries, unaffected by the historical event of European colonization since the sixteenth century, were mainly shaped during the period of the Neolithic migration dating back several millennia ago. For this reason, genetic variation does not directly affect contemporary economic performance other than through shaping cultural values. Hence, the instrument reasonably exerts no direct influence on climate change policies, thus satisfying the exclusion restriction.[7]

I further employ an index capturing the historical prevalence of infectious diseases (*pathogen*) as an additional instrument, following a number of studies (e.g., Fincher et al.,

[5] Gorodnichenko and Roland (2017) note that they do not posit a causal influence of genetic distance on a country's cultures. Instead, the index of genetic distance to the UK constructed based on frequencies of blood types is strongly correlated with cultural values because these factors transcend from parents to offspring.

[6] See Gorodnichenko and Roland (2017) for a detailed discussion on this instrumental variable.

[7] The stringency of climate change polices, as proposed by this study, is affected by cultural differences via institutional quality and female political representation. If blood distance has no direct effect on economic outcomes, it is difficult to envisage another channel through which blood distance transmits to climate change regulations. This at least in part lends some support to the exclusion restrictions.

2008; Thornhill & Fincher, 2014; Gorodnichenko & Roland, 2017; Nikolaev et al., 2017). The basic argument for this rests upon the premise that places with stronger pathogenic stress created a favorable environment for collectivistic cultures, which constitute a key defense mechanism against infectious diseases.[8] Hence, the pervasiveness of morbidity shaped a culture of conformity, in-group favoritism and placed significant limits on personal autonomy (Murray & Schaller, 2010). Importantly, the main attraction of using two instrumental variables is to perform the test of over-identifying restrictions.[9]

Data

The main dependent variable is the Climate Change Cooperation index (*CCPI*) of Bernauer and Böhmelt (2013).[10] This indicator reflects the stringency of climate change policies for up to 172 countries from 1996 to 2008 (Figure 1).[11] As discussed earlier, this measure reflects the extent to which a country is cooperative in multilateral environmental agreements to mitigate climate change. Further, it also considers the variation in emission levels, which has been widely used as a proxy for cross-country differences in the stringency of climate change policies (Bernauer & Böhmelt, 2013). To my knowledge, this index is the best measure of the stringency of climate change policies across the world mainly because of its wide coverage of both countries and years.

CCPI encompasses two sub-components, namely the policy and emission sides. The policy component, in particular, captures a country's contribution to global environmental agreements. The policy side is mainly based on experts' assessments about the extent to which an economy was cooperative in multilateral environmental agreements, considering whether it did so in a timely manner.[12] The emission component utilizes the cross-country variation in the

[8] Thornhill and Fincher (2014) provide an extensive literature review on the relationship between historical pathogen prevalence and cultural values.

[9] This can be implemented if the number of exogenous instruments is greater than the number of endogenous regressors.

[10] This index is denoted as *C3-I* in Bernauer and Böhmelt (2013).

[11] I calculate the mean of this index across the period 1996-2008 to estimate cross-country OLS regressions. This specification is mainly motivated by the observation that the variation in cultural values and instrumental variables is largely driven by cross-country differences. Further, cultural values appear to be relatively stable within a country over years. This explains why a conventional approach is to estimate cross-sectional data to explore the relationship between cultures and economic performance. The instrumental variables used in this paper are also time-invariant, which further motivates using a cross-sectional framework.

[12] Specifically, this is based on whether a country ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, and whether it did so in a timely manner. Further, the policy component of the *CCPI* also considers whether a country submitted the latest climate change report and how

level of CO_2 emissions per capita in 1990 and its variation between 1990 and 2002. All this information is aggregated to obtain an overall measure of climate change policies, ranging between zero and 100 (Bernauer & Böhmelt, 2013). Higher values of this index correspond to more pro-active climate change policies.[13] Later, I will also check the sensitivity of the baseline estimates by using other measures of environmental performance.

To measure cross-country differences in cultural values, I employ an index of individualism (*IDV*) developed by Hofstede (2001).[14] This indicator ranges between 0 and 100, with higher values corresponding to a more individualistic society. Figure 2 illustrates the cross-country variation in individualistic cultures. According to Hofstede (2001), the national level measure of individualism is based on an aggregation of individual-level data of cultural values obtained through various surveys in each country. To avoid measurement bias induced by using a perception-based indicator, I will also use a series of other measures of individualism as a robustness check. Data on the historical prevalence of infectious diseases and blood distance to the UK are obtained from Gorodnichenko and Roland (2017). The original data sources of these instrumental variables are collected from various sources as presented in detail by Gorodnichenko and Roland (2017). See also the online appendix for some additional information regarding variables' descriptions and data sources.

4. Cross-country evidence

4.1. Main results

Figure 3 demonstrates unconditional correlations between the index of individualism and various measures of the stringency of climate change polices. Accordingly, individualism is positively correlated with *CCPI,* the main proxy for pro-active climate change policies (Panel A, Figure 3). Further, *IDV* is also positively associated with the Environmental Performance index and the Environmental Sustainability index as presented in Panels B and C of Figure 3, respectively.[15] These positive associations are consistent with the main hypothesis presented

quickly it did so. The financial contribution to the UNFCCC from 1996 to 2005 is also utilized to assess a country's cooperation in mitigating climate change. For more details, see Bernauer and Böhmelt (2013).

[13] See also the online appendix for summary statistics of this variable.

[14] This indicator has been extensively used in empirical studies examining the effect of individualistic cultures on economic performance (see, for instance, Kyriacou, 2016; Gorodnichenko & Roland, 2017; Jha & Panda, 2017; Nikolaev et al., 2017).

[15] These two measures of a country's overall environmental performance are employed as alternative dependent variables later in a sensitivity test. The rationale is that countries with greater environmental performance tend to implement more stringent climate change policies. These indicators have been widely used in previous studies exploring the link between economic development and environmental performance.

in Section 2. Nevertheless, it is worth noting that such correlations may not reflect a causal influence essentially because of some endogeneity concerns discussed earlier. For this reason, I estimate the benchmark model using IV-2SLS regressions.

The baseline estimates are represented in Table 1. I first regress *CCPI* on the individualism index, using an OLS regression in column (1) of Table 1. Accordingly, the estimated coefficient of individualism is positive and statistically significant at the 1% level. This is consistent with my propositions. As argued earlier, the OLS estimates can be biased and inconsistent if the main variable of interest (*IDV*) is correlated with the disturbance term. However, the results are reported essentially for purposes of comparison. From columns (2) to (4) of Table 1, I present the IV-2SLS estimates to correct for potential endogeneity bias. Specifically, I use *distB_UK* to isolate an exogenous source of variation in individualistic cultures in column (2) while *pathogen* is used as an instrument in column (3). The first-stage estimates indicate that these instrumental variables are strongly correlated with *IDV* (Panel B, Table 1). Turning to the results in panel A of Table 1, I find that individualism exerts a positive influence on climate change policies once I account for potential endogeneity bias. The effect is also precisely estimated throughout using different instruments.

Results remain largely unchanged when I employ both instrumental variables in the same regression (column 4, Table 1). The magnitude of the estimated coefficients of individualism suggests that a one-unit increase in the *IDV* is associated with approximately a 0.033-unit increase in the *CCPI*. This effect is much larger than the OLS estimates. 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 (Table A1, online appendix). If Iran were to experience the IDV values of Belgium, the predicted increase in the *CCPI* of Iran would be 1.12, approximately 0.7 of a standard deviation of *CCPI*.[16] This result implies that individualism exerts a reasonably sizeable impact on the stringency of climate change policies.

The endogeneity test of Hausman (1978) indicates that individualism is not strictly exogenous in the baseline model. This suggests that using the IV-2SL estimates is required for drawing causal inference on the effect of individualism on climate change policies. I also perform several diagnostics tests to check whether the IV-2SLS estimates provide a valid basis

[16] This discussion by no means suggests that fostering climate change regulations requires a cultural revolution. Instead, my findings should be interpreted with care as discussed in Section 7.

for statistical inference. In particular, the results of the F test of excluded instruments are much bigger than the rule-of-thumb value of 10 in all cases. This implies that *distB_UK* and *pathogen* are not 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 *CCPI* is zero in the structural equation. The results suggest that we can reject the null of no effect of individualism on the *CCPI* at the 1% level. Additionally, the test of weak instruments of Cragg and Donald (1993) further lends credence to the strong instrument argument.

Drawing causal interpretations based on the benchmark findings requires that the instruments have no direct effect on the adoption of climate change policies other than through individualistic cultures. The earlier discussion suggests that this assumption is unlikely to be violated. Given that the number of instruments is larger than the number of endogenous regressors, I partly check for the exclusion restrictions by conducting the test of over-identifying restrictions. 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. For this reason, the empirical exercise presented here just partly lends some support to the assumption that my instruments are plausibly exogenous. Overall, I find that we fail to reject the over-identifying restrictions at conventionally accepted levels of significance. This at least in part lends some credence to the validity of my instruments. For this reason, the IV-2SLS estimates provide a valid basis for causal inference.

4.2. Sensitivity analysis

Omitted variable bias

The benchmark results rely on using plausibly exogenous sources of variation in individualism to achieve causal inference. This empirical exercise at least partially addresses a concern about omitted variable bias. This is because I employ the components of individualism that are uncorrelated with the error terms to explain cross-country differences in the stringency of climate change policies. I further check for this potential bias by incorporating a range of control variables in the regression, as represented in Tables 2 and 3.[17] The benchmark results are reproduced mainly for purposes of comparison.

As found by Gorodnichenko and Roland (2017), the cultural dimension of individualism-collectivism helps explain the cross-country variation in GDP per capita via affecting

[17] See also the online appendix for variables' descriptions and data sources.

institutional quality. There also exists a voluminous literature arguing that geographic endowments, either directly or indirectly, lie at the root of long-term comparative development across the world. In particular, geography may affect income levels through shaping motivations to work or the quality of institutions.[18] Hence, Gorodnichenko and Roland (2017) include a number of geographic controls in their regressions. If geography matters for institutional quality and income levels, it may also affect the implementation of climate change policies through these channels. As such, the positive effect of individualistic cultures on climate change policies may just reflect a proxy for the persistent effect of geographic endowments. To address this concern, I incorporate several geographic controls in the benchmark model, such as latitude, distance to coast, a landlocked dummy, mean elevation, and precipitation (column 2, Table 2).[19] Accordingly, the estimated coefficients of individualism appear to be highly precise even when I rule out the potential bias of omitting geographic controls.

Some recent contributions to the literature on cross-country differences in climate change regulations emphasize the role of a country's legal heritage (Fredriksson & Wollscheid, 2015; Ang & Fredriksson, 2017). These scholars posit that common-law countries have weaker climate change policies than their civil-law counterparts. Indeed, legal origin has been well documented as a key driver of comparative prosperity across the world (see, e.g., La Porta et al., 1999; La Porta et al., 2008; Klerman et al., 2011). Therefore, my findings may be biased and inconsistent if I fail to account for this effect.[20] The baseline estimates, however, remain largely unchanged (column 3, Table 2).

Another concern is that my findings may be confounded by a country's level of fractionalization and social trust. The basic argument for this holds that an ethnolinguistically-diversified economy may be subject to lower income levels, poorer governance and a weaker capacity to provide public resources (La Porta et al., 1999; Alesina et al., 2003). These factors are essential for improving environmental and climate change regulations. Further, social capital may shape overall social tolerance toward the wellbeing of others, thus strengthening

[18] Examples of such empirical studies include Bloom et al. (1998), Acemoglu et al. (2001), Sachs (2003), Rodrik et al. (2004), and Carstensen and Gundlach (2006).

[19] These variables have been widely used in the long-term comparative development literature. Because there exists a voluminous literature linking geography and economic performance, I maintain the use of geographic endowments in the remaining sensitivity checks.

[20] I follow the classification by Klerman et al. (2011) to include dummies of legal traditions. More specifically, I incorporate two dummies for common law and mixed law in the regression. The base group, which includes civil law and other laws, is excluded for comparison.

climate-friendly actions. For this reason, I control for an index of ethnolinguistic fractionalization and a measure of social trust.[21] As shown in columns (4) and (5) of Table 2, the effect of individualism on climate change policies remains precisely estimated. When all additional controls are added in one regression, the results are still statistically significant at conventionally accepted levels although the magnitude of the estimated coefficient reduces considerably (column 6, Table 2).

Following Gorodnichenko and Roland (2017), I control for a number of factors that have been well documented in the literature as key determinants of long-term comparative development in Table 2. Accordingly, the baseline results remain largely insensitive to this consideration. I further check the possibility that the benchmark findings are confounded by some other proximate determinants of climate change policies.[22] Specifically, one may well argue that in countries with higher levels of CO_2 emissions, producers have stronger incentives to use bribes to maintain weak environmental regulations (Fredriksson & Neumayer, 2013). Thus, I include this variable in column (2) of Table 3. As pointed out by Neumayer (2002b), trade openness may facilitate international cooperation in environmental regulations. Nevertheless, it may also hinder multilateral environmental agreements if such cooperation is harmful for exporting economies (Neumayer, 2002b). I account for this effect in column (3) of Table 3.

Further, countries in which oil and fossil fuel resources account for a significant proportion of their exports may be less likely to adopt climate change policies. Therefore, I add fuel exports to the regression (column 4, Table 3). A final concern is that countries who are more vulnerable to climate variability may have stronger incentives to implement climate change policies (Mavisakalyan & Tarverdi, 2019). Therefore, I include an index of climate vulnerability in column (5) of Table 3. All additional controls are added to the final column of Table 3.[23] Overall, my results are largely robust to including additional control variables.

[21] Social trust is obtained from the World Values Survey (http://www.worldvaluessurvey.org/wvs.jsp). This measure is calculated by the fraction of survey respondents' who agree with the statement "most people can be trusted". Further, I obtained data on cross-country differences in ethnolinguistic fractionalization from La Porta et al. (1999).

[22] Additional controls used in Table 3 are "proximate" determinants of the stringency of climate change policies because they are generally interrelated with and jointly determined by the dependent variable. Hence, they may be potential channels through which cultural values, which are a deeper or more fundamental determinant of climate change policies, exert an influence on *CCPI*.

[23] Data on CO_2 emissions per capita, trade openness, and fuel exports (as a percentage of merchandised exports) are collected from the World Bank's World Development Indictors. I calculate averaged values of these variables from 1990 to 2010, which is consistent with the period coverage of the *CCPI*. To capture the cross-country

Interestingly, most of these additional controls have no statistically significant influence on the stringency of climate change policies.[24] This suggests that the cultural dimension of individualism-collectivism plays a more important role in explaining the cross-country variation in climate change regulations.

Measurement bias

Another challenge in obtaining valid statistical inference lies in potential measurement bias. As demonstrated earlier, this issue may be induced by using a perception-based measure of cultural values. In addition, the construction of the *CCPI* partly relies on experts' assessments of a country's cooperation toward multilateral environmental agreements. To address this concern, I first reproduce the baseline estimates using alternative proxies for individualism (Table 4). Variables' descriptions and data sources are presented in the notes to Table 4. Using these alternative measures of individualistic cultures constrains the feasible sample size significantly (Table 4). Nevertheless, the baseline findings remain largely robust to adopting a variety of individualism indicators.

As far as I am aware, the index of climate change policies of Bernauer and Böhmelt (2013) provides a comprehensive measure of cross-country differences in the stringency of climate change regulations. To check for robustness to using this indicator, I employ conventionally used measures of a country's overall environmental performance. This empirical exercise also sheds light on the effect of individualism on environmental performance, which has received little attention in existing macro-level research. It is plausible that stringent environmental regulations improves the capacity to combat global warming. To this end, I use an index of environmental sustainability in columns (1) and (2) of Table 5.[25] Further, I employ the Environmental Performance Index in columns (3) and (4) of Table 5.[26] The estimates reported in Table 5 indicate that individualism has a positive effect on

variation in climate vulnerability, I employ an index of global climate risk published by Germanwatch (https://www.germanwatch.org/en/cri).

[24] The estimated coefficients of CO_2 emissions per capita, trade openness and climate vulnerability are statistically insignificant at conventionally accepted levels. The effect of fuel exports on the stringency of climate change policies is negative and precisely estimated at the 5% level of significant, which is consistent with my predictions. These results are not presented in Table 3 to conserve space, but are available upon request.

[25] This indicator is constructed by the Yale Center for Environmental Law and Policy, Yale University and the Center for International Earth Science Information Network, Columbia University, in collaboration with the World Economic Forum and the European Commission (Esty et al., 2005).

[26] I use the results taken from the most recent report conducted in 2019 by the Yale Center for Environmental Law and Policy (https://epi.envirocenter.yale.edu/). This index has been widely used in empirical studies exploring the environmental impacts of economic performance.

environmental performance across the world. This lends support to the main proposition that individualistic cultures help foster the stringency of climate change policies.

Other robustness checks

I report the results of other sensitivity tests in the online appendix.[27] First, I replicate the baseline estimates using alternative samples. To do this, I exclude countries located in the same continent. This helps address a concern that the baseline findings are confounded by sample selection, or just reflect regional differences in climate change policies and cultural values. The results reported in Table A3 are largely similar to the baseline estimates. *Second*, I check for robustness to spatial dependence. In particular, cultural values may transcend borders because neighboring economies are more likely to interact with each other. Further, it is also plausible that clean technologies, which are essential for climate change mitigation, may transmit across countries through trade or investments. This arguably affects a country's attitudes and policies toward global warming. As such, the error terms may be correlated across cross-sectional units in the sample, thus confounding the baseline findings. To mitigate this concern, I follow Conley (1999) and re-estimate the standard errors, accounting for potential spatial dependence (Table A4). The results, however, remain largely insensitive to this robustness test.

Finally, I carry out several tests to check for robustness to the presence of outliers (Table A5). 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 in this context). 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. My results, however, appear to be highly precisely estimated even when I restrict the baseline sample size using different methods. Overall, I find that the baseline findings are largely insensitive to sample selection, spatial dependence, and the presence of outliers.

5. A mechanism analysis

The main proposition of the current study posits that the cultural dimension of individualism-collectivism helps explain international differences in climate change policies by shaping institutional quality and female political representation. The benchmark findings lend strong

[27] See also the online appendix for detailed discussions on these additional robustness tests.

credence to this hypothesis. In this section, I further carry out some additional regressions to examine two main mechanisms of transmission discussed in Section 2.

First, if the quality of governance and female participation in parliaments are key channels of influence, the inclusion of these variables in the benchmark model may result in the effect of individualism on climate change policies being imprecisely estimated. For this reason, I control for an index of governance quality (*governance*).[28] I also include a measure of the proportion of seats held by women in national parliaments in the regression (*female*).[29] Further, individualism can foster economic performance, proxied by GDP per capita, through promoting institutional quality (Gorodnichenko & Roland, 2017). A more prosperous economy may arguably have better resources to adopt stringent climate change policies. Hence, I include GDP per capita as a control variable. The results reported in Table 6 indicate that the estimated effect of individualism on climate change policies becomes statistically insignificant when these variables are accounted for in the regression (except in column 4).[30] The size of the effect also reduces significantly. This reveals that much of the effect of cultural values on climate change policies is working through the quality of governance, female political representation and income levels. In this regard, the findings in Table 6 help advance our understanding of several mechanisms explaining the relationship between cultures and climate change policies.

Second, I regress different channels of influence on the baseline measure of individualism as shown in Table 7. To mitigate potential endogeneity bias, I also employ *distB_UK* and *pathogen* to isolate exogenous sources of variation in individualistic cultures. According to Table 7, individualism exerts a positive influence on income per capita, which lends strong support to the findings of Gorodnichenko and Roland (2017) (column 1). Hence, I find evidence supporting the hypothesis that individualism plays an essential role in shaping economic prosperity across countries. Consistent with the arguments in Section 2, I find that individualism positively affects the quality of governance and female political representation, which are two key mechanisms of transmission. The estimated effects are also statistically significant at the 1% level in all cases. The validity of the estimates in Table 7 is supported by

[28] I calculate the mean values of six dimensions of the quality of governance. Data are taken from the World Bank's World Governance Indicators across the period 2000-2010. The period chosen is mainly dictated by the availability of data.

[29] Following Mavisakalyan and Tarverdi (2019), I use this measure of female political representation. I collect data for this variable from the World Bank's World Development Indicators from 1990 to 2010, and then estimate the averaged values.

[30] When I control for women in parliaments, the estimated coefficient of individualism is still statistically significant at the 5% level, but its magnitude decreases considerably (see columns 1 and 4, Table 6).

the F test of excluded instruments and the test of over-identifying restrictions, which are broadly similar to those in Table 1.[31]

Finally, I estimate the effect of governance and female political representation on climate change policies.[32] As argued in Section 2, these channels help explain cross-country differences in the stringency of climate change policies. There also exist some endogeneity concerns when estimating the causal effect of *governance* and *female* on the implementation of climate change policies. To address these issues, I follow existing empirical studies examining the link between institutional quality, gender inequality and economic performance to select valid instrumental variables (Table 8). 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 8, the quality of governance is negatively correlated with the settler mortality rate, which is consistent with the findings of Acemoglu et al. (2001). Importantly, I find that the exogenous component of governance exerts a positive and statistically significant influence on climate change policies. This finding is consistent with my proposition that individualism helps improve the quality of governance, thus fostering stringent climate change policies.

It is also worth noting that data on settler mortality are only available for former colonies, which constrains the feasible sample size considerably. Hence, I follow some recent contributions asserting that the intensity of ultraviolet radiation (*UV*) helps explain cross-country differences in institutional quality, and employ *UV* as an alternative instrument to maintain the baseline sample size essentially for the purposes of comparison (Ang et al., 2018; Vu, 2019, 2020).[33] I report the results in column (2) of Table 8; these are broadly similar to

[31] The findings in Table 7 also lend strong support to recent empirical studies documenting a positive effect of individualism on institutions, gender inequality and economic performance (see, e.g., Kyriacou, 2016; Gorodnichenko & Roland, 2017; Davis & Williamson, 2019).

[32] The results shown in Table 6 suggest that income per capita is a potential mechanism of influence. According to Gorodnichenko and Roland (2017), cultures can affect economic prosperity through inducing good institutions that strengthen incentives for innovative activities. Higher levels of income may also foster institutional quality and provide available resources that promote the stringency of climate change policies. 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 in Table 8, 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.

[33] In particular, Vu (2020) 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).

those in column (1). However, *UV* can also affect climate change policies via some other channels, thus invalidating the results. For this reason, I use both instruments in column (3) of Table 8 to conduct the test of over-identifying restrictions, which partially helps check for the exogeneity of the instruments. The positive effect of governance on climate change policies remains largely unchanged when I adopt both instruments in one regression. The value of the test of over-identifying restrictions lends some credence to the validity of my instruments. Overall, I find that the quality of governance has a positive effect on climate change policies, which is in line with the main hypothesis.

From columns (4) to (6) of Table 8, I report the estimated effects of *female* on the stringency of climate change policies. Following Mavisakalyan and Tarverdi (2019), I use the length of time elapsed since women' suffrage was granted as an instrumental variable for *female*.[34] This empirical strategy is mainly motivated by the argument that a country's history of suffrage provides plausibly exogenous variation in today gender roles because it is unlikely to directly affect modern-day economic outcomes (Mavisakalyan & Tarverdi, 2019). Accordingly, I find strong evidence that fostering women's participation in national parliaments helps improve climate change policies (column 4, Table 8). I also utilize the timing of Neolithic transition as an alternative instrument in column (5) of Table 8. The main argument for this holds that countries that adopted sedentary agriculture earlier experience greater modern gender inequality (Hansen et al., 2015).[35] To check for the violation of the exclusion restrictions, I include both these instruments in column (6) of Table 8. The test of over-identifying restrictions provides support for the validity of my instruments. Importantly, the estimated coefficients of female on climate change policies remains largely robust to adding alternative instruments.

To summarize, this section empirically investigates potential mechanisms through which individualism affects the stringency of climate change policies across the globe. Consistent with the main propositions, I find strong evidence supporting the notion that the cultural dimension of individualism-collectivism matters for climate change regulations through enhancing the quality of governance and female political representation.

[34] Data are obtained from the 2011-2012 Progress of the World's Women report conducted by the UN Women – the United Nations Entity for Gender Equality and the Empowerment of Women. This variable is measured by the number of years elapsed since women's suffrage was granted in each country.

[35] Hansen et al. (2015) postulate that agricultural history created cultural beliefs and norms of gender inequality, which matter for today's gender roles. Further, an early transition to agriculture facilitated the historical adoption of technologies, which reduced female roles outside the household and increased fertility (Hansen et al., 2015).

6. Subnational evidence

A central focus of this paper rests upon the premise that individualism fosters the stringency of climate change policies by promoting the quality of governance and female political representation. The international evidence presented above provides strong empirical support for this notion. The baseline findings also appear to be insensitive to performing a series of robustness checks. However, it is important to emphasize that a key remaining 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, at least partially, is minimized by using exogenous components of individualistic cultures. To consider this issue more thoroughly, I carry out a subnational analysis in this section.

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 behavior at the individual level. Therefore, I employ data across six waves from 1981 to 2014 to examine the relationship between individualistic cultures and attitudes towards 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. Further, the effect of time specific-factors can be accounted for by using wave fixed effects. I also utilize religion dummies to control for other religious and cultural factors that may shape the overall tolerance toward environmental regulations.[36] Unfortunately, the baseline instrumental variables vary at the country level. For this reason, I do not replicate IV-2SLS estimates in the cross-country analysis.

To measure the cultural dimension of individualism-collectivism, I construct an individual-level measure of individualism. More specifically, I draw from the following six questions to capture whether a survey respondent demonstrates an orientation toward individualism: (*i*) independence is an essential child quality; (*ii*) imagination is an essential child quality; (*iii*) obedience is *not* an important child quality; (*iv*) a survey participant does not live with his or her parents; (*v)* divorce is justifiable; (*vi*) 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,

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

e.g., Schwartz, 1994; Vandello & Cohen, 1999; Hamamura, 2012; Beugelsdijk et al., 2015; Olsson & Paik, 2016; Ang, 2019).[37] Based on survey participants' responses, I create an overall measure of individualism by using the first principal component of these values. Higher values of the summary index correspond to a more individualistic orientation.

There is no question directly related to climate change policies in the World Values Survey. For this reason, instead, I employ respondents' 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. Because of the binary nature of the dependent variable, I carry out probit regressions to estimate the marginal effect of individualism on pro-environmental policies at the individual level. A number of individual controls are also incorporated to mitigate potential omitted variables bias.[38]

The individual-level evidence is reported in Table 9. An orientation toward individualism is positively associated with the probability that survey participants self-report positive views about pro-environmental policies. This is largely consistent with the cross-country evidence. This finding is also robust to accounting for a number of control variables and unobserved country-specific factors. Importantly, the results presented in Table 9 are in stark contrast with the findings of Xiang et al. (2019). Drawing from the psychological literature, the authors 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 policies. Even when using individual-level data that are more comparable to Xiang et al. (2019), I find that individualism is positively associated with attitudes toward pro-environmental policies.

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

[38] Specifically, I include age, age squared, income, dummies variable of being male, married, and having children. I also create two dummies of educational levels, including upper and middle educations with lower being excluded as the base group. Social trust is a binary variable reflecting whether survey participants agree "most people can be trusted".

7. Conclusion

Mitigating global warming requires adopting stringent environmental regulations to reduce greenhouse gas emissions. For this reason, the drivers of the stringency of climate change policies across the world are an important topic of debate not only for economists but also for policy-makers. 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 the adoption of stringent climate change regulations. By contrast, collectivistic societies suffer from a weaker capacity to implement climate-friendly activities.

To explore the above proposition, I carry out a wide range of empirical analyses at the country and subnational levels. In particular, I first estimate cross-sectional data using a world sample of countries. The cross-country evidence indicates that individualism positively affects climate change policies, which is consistent with my predictions. To maintain valid identification, I conduct a number of sensitivity tests none of which alters my findings. I also find evidence that individualism transmits to climate-friendly regulations through improving the quality of governance and women in parliaments. Using data from the World Values Survey, I further demonstrate that an orientation toward individualism is positively correlated with positive views to pro-environmental policies. This empirical exercise helps control for a number of confounding factors that are difficult to account for using a cross-country framework. The results lends strong credence to the international evidence.

Several implications can be drawn from the findings of this paper. The empirical findings highlight that cultural values lie at the deep root of the stringency of climate change policies. In particular, this study suggests that collectivism emphasizes social relationships and collective actions, which are detrimental to the quality of governance. This arguably affects a country's ability to foster climate-friendly activities. Further, individualistic societies have 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.

Further, fostering women political empowerment and institutional quality would be two potential mechanisms, as pointed out by this study, to address the negative consequences of existing cultural values. It is also necessary to avoid a misinterpretation of my findings 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 origin of the stringency of climate change policies across the world. To my knowledge, this paper, for the first time, puts forward the idea that individualistic cultures help strengthen the capacity to adopt climate change policies from a cross-country perspective. Hence, it is hoped that these results motivate a fruitful discussion on the link between cultural values and climate-friendly policies in future research.

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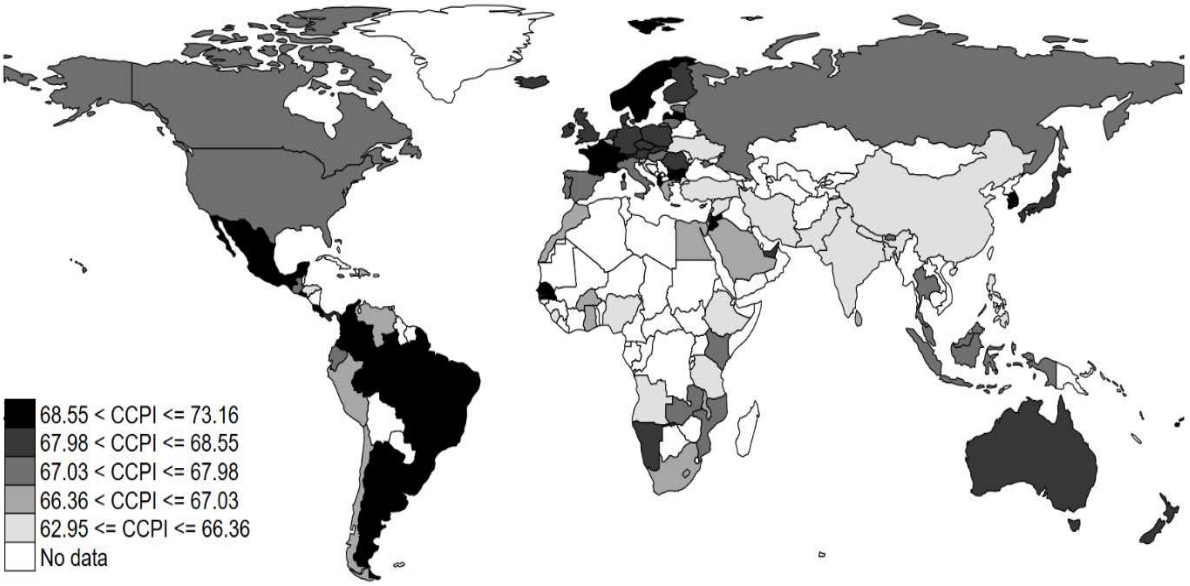


Figure 1. Cross-country differences in the stringency of climate change policies

Notes: This figure illustrates international differences in the implementation of climate change regulations, measured by the *CCPI*. Darker regions reflect more stringent climate change actions.

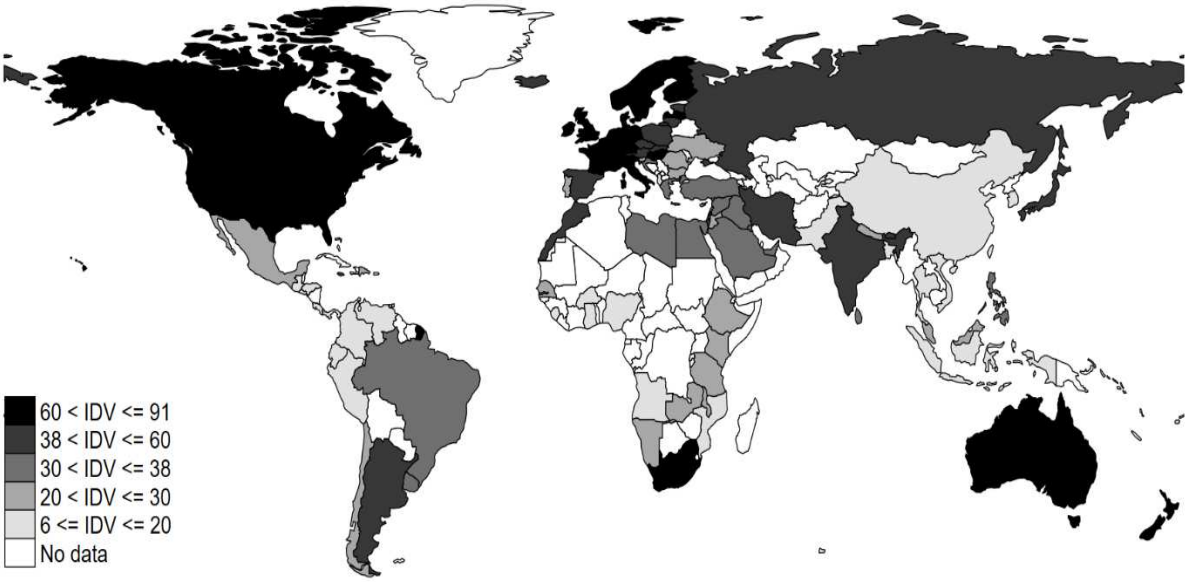
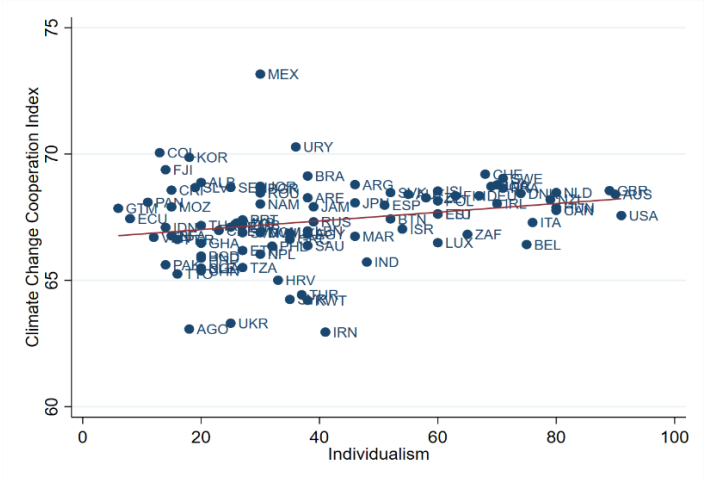
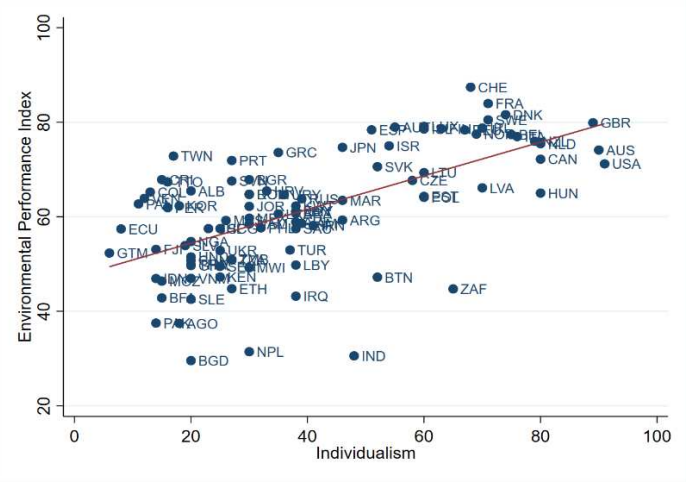


Figure 2. Cross-country differences in individualism (*IDV*)

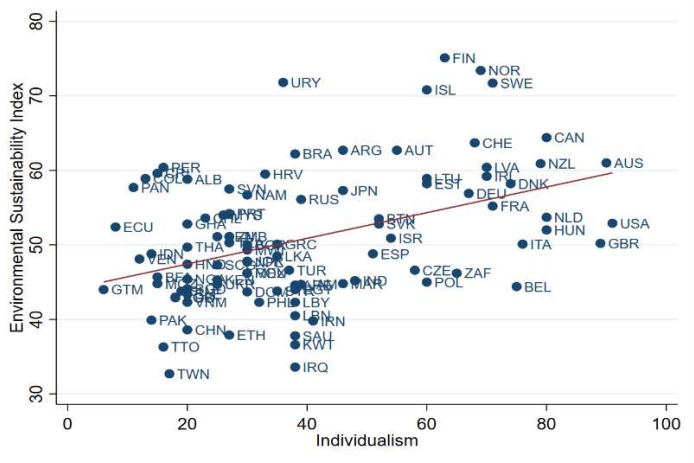
Notes: This figure illustrates international differences in cultural values, measured by Hofstede's (2001) index of individualism. Darker regions correspond to more individualistic areas.



Panel A. Individualism and CCPI



Panel B. Individualism and EPI



Panel C. Individualism and ESI

Figure 3. Correlation between individualism and the environment

Notes: These figures demonstrate the correlation between the index of individualism and different measures capturing cross-country differences in the stringency of climate change policies. EPI and ESI stand for the Environmental Performance index and the Environmental Sustainability index, respectively. See also the online appendix for variables' descriptions and data sources.

Table 1. Main results

Estimator	**OLS**	**IV-2SLS**		
	(1)	(2)	(3)	(4)
Panel A. Regression of climate change policies on individualism				
IDV	**0.017*** **	**0.040*** **	**0.030*** **	**0.033*** **
	[0.006]	[0.012]	[0.008]	[0.007]
Panel B. Regression of IDV on instrumental variables				
Blood distance from the UK (*distB_UK*)		-16.136***		-8.638***
		[2.441]		[2.541]
Historical pathogen prevalence (*pathogen*)			-23.205***	-17.720***
			[2.151]	[2.401]
Diagnostics				
First-stage F statistics		43.68	116.40	66.26
Cragg-Donald Wald F statistics		46.77	80.23	52.87
Anderson-Rubin Wald test		19.00	13.89	12.44
Endogeneity [p-value]		0.018	0.069	0.007
Over-id [p-value]				0.370
Observations	92	92	92	92
First-stage R-squared	n/a	0.346	0.467	0.539

Notes: Diagnostics tests include the F test of excluded instruments, the Cragg-Donald test of weak instruments, and the test of robust inference with weak instruments (see, e.g., Anderson & Rubin, 1949; Cragg & Donald, 1993; Sanderson & Windmeijer, 2016). Further, endogeneity denotes the test of exogeneity of regressors (Hausman, 1978). Over-id is the test of over-identifying restrictions. All regressions include an intercept, which is omitted for brevity. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2. Individualism and climate change policies, adding controls

	Baseline	Adding control variables				
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Second-stage estimates. Dependent variable is the *CCPI*						
IDV	**0.033***** [0.007]	**0.045***** [0.012]	**0.031***** [0.007]	**0.022**** [0.008]	**0.026***** [0.010]	**0.022*** [0.013]
Panel B. First-stage estimates. Dependent variable is the *IDV*						
distB_UK	-8.638*** [2.541]	-7.757*** [2.567]	-9.899*** [2.547]	-9.977*** [2.747]	-8.769*** [2.657]	-9.877*** [2.733]
pathogen	-17.720*** [2.401]	-16.203*** [3.213]	-19.361*** [2.628]	-22.327 [3.084]	-16.618 [3.348]	-13.434*** [4.033]
Controls						
Latitude		✓				✓
Distance to coast		✓				✓
Landlocked		✓				✓
Mean elevation		✓				✓
Precipitation		✓				✓
Common law			✓			✓
Mixed law			✓			✓
Ethnolinguistic fractionalization				✓		✓
Social trust					✓	✓
First-stage F-statistics	66.26	27.25	86.26	64.96	30.86	27.62
Over-id [p-value]	0.370	0.824	0.522	0.733	0.141	0.504
Observations	92	82	88	72	78	66
First-stage R-squared	0.539	0.660	0.601	0.615	0.566	0.777

Notes: ✓ denotes the inclusion of control variables. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See also notes to Tables 1 and 2.

Table 3. Robustness to controlling for other effects

	Baseline	Controlling for other effects				
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Second-stage estimates. Dependent variable is the *CCPI*						
IDV	**0.045***** [0.012]	**0.067**** [0.026]	**0.045***** [0.012]	**0.039***** [0.012]	**0.042***** [0.012]	**0.062**** [0.026]
Panel B. First-stage estimates. Dependent variable is the *IDV*						
distB_UK	-7.757*** [2.567]	-6.629** [2.577]	-7.349*** [2.648]	-7.538*** [2.613]	-7.813*** [2.586]	-5.995** [2.709]
pathogen	-16.203*** [3.213]	-9.332** [3.727]	-17.159*** [3.353]	-16.305*** [3.294]	-15.971*** [3.295]	-9.529** [3.899]
Controls						
CO_2 emission per capita		✓				✓
Trade openness			✓			✓
Fuel exports				✓		✓
Climate vulnerability					✓	✓
Geographic controls	✓	✓	✓	✓	✓	✓
First-stage F-statistics	27.25	9.27	29.72	25.28	26.11	8.99
Over-id [p-value]	0.824	0.786	0.871	0.715	0.998	0.638
Observations	82	82	81	81	80	78
First-stage R-squared	0.660	0.714	0.666	0.664	0.662	0.728

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See also notes to Tables 1 and 2.

Table 4. Using different measures of individualism

	Baseline	Embeddedness	Affective autonomy	Intellectual autonomy	Tang & Koveos's (2008) index	In-group favoritism	Cultural tightness index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Second-stage estimates. Dependent variable is the *CCPI*							
IDV	**0.045***** [0.012]	**1.693***** [0.492]	**1.438***** [0.472]	**2.105***** [0.631]	**0.023*** [0.013]	**1.059***** [0.331]	**0.021**** [0.010]
Panel A. First-stage estimates. Dependent variable is the *IDV*							
distB_UK	-7.757*** [2.567]	-0.238*** [0.042]	-0.228*** [0.064]	-0.208*** [0.039]	-6.835*** [2.452]	-0.209** [0.089]	-16.363*** [4.799]
pathogen	-16.203*** [3.213]	-0.219*** [0.072]	-0.349*** [0.097]	-0.134** [0.059]	-21.024*** [4.688]	-0.695*** [0.169]	-22.901** [8.792]
Geographic controls	✓	✓	✓	✓	✓	✓	✓
First-stage F-statistics	27.25	48.81	18.69	27.41	21.24	15.95	16.73
Over-id [p-value]	0.824	0.549	0.951	0.384	0.610	0.355	0.747
Observations	82	59	59	59	45	73	48
First-stage R-squared	0.660	0.672	0.585	0.629	0.759	0.400	0.529

Notes: From columns (1) to (7), I use different measures of individualism. In particular, data for embeddedness, affective autonomy and intellectual autonomy are collected from Schwartz (1994, 2004). I also use an index of individualism developed by Tang and Koveos (2008). Following Van de Vliert (2011), I utilize an indicator of in-group favoritism to capture cross-country differences in culture values. Finally, I use a measure of cultural tightness across the world constructed by Uz (2015). For ease of interpretation, I re-transform embeddedness and in-group favoritism by multiplying them by minus one so that higher values correspond to more individualistic cultures. See also the online appendix for variables' description and data sources. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See also notes to Tables 1 and 2.

Table 5. Robustness to using alternative dependent variables

	Environmental sustainability index		Environmental performance index	
	(1)	(2)	(3)	(4)
Panel A. Second-stage estimates. Dependent variables are alternative measures of environmental stringency				
IDV	**0.292*** **	**0.384*** **	**0.615*** **	**0.643*** **
	[0.052]	[0.074]	[0.075]	[0.110]
Panel B. First-stage estimates. Dependent variable is the *IDV*				
distB_UK	-8.517***	-7.524***	-8.596***	-7.523***
	[2.469]	[2.503]	[2.468]	[2.502]
pathogen	-17.813***	-16.342***	-17.540***	-16.238***
	[2.418]	[3.211]	[2.403]	[3.229]
Geographic controls		✓		✓
First-stage F-statistics	65.65	28.79	66.82	28.15
Over-id [p-value]	0.407	0.962	0.329	0.057
Observations	95	85	96	84
First-stage R-squared	0.539	0.660	0.539	0.660

Notes: Alternative dependent variables are two measures of overall environmental performance. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See also notes to Tables 1 and 2.

Table 6. Controlling for transmission mechanisms

	Baseline	Controlling for channels of transmission			
	(1)	(2)	(3)	(4)	(5)
Panel A. Second-stage estimates. Dependent variable is the *CCPI*					
IDV	**0.045*** **	**0.025**	**0.016**	**0.039** **	**0.015**
	[0.012]	[0.029]	[0.040]	[0.016]	[0.055]
GDP per capita (log)		0.237			0.033
		[0.325]			[0.324]
Governance			0.640		0.514
			[0.757]		[0.764]
Female in parliament (%)				0.015	0.007
				[0.022]	[0.019]
Panel B. First-stage estimates. Dependent variable is the *IDV*					
distB_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-id [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

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See also notes to Tables 1 and 2.

Table 7. The effect of individualism on channels of influence

Dependent variable	GDP per capita (log)	Governance	Female in parliaments
	(1)	(2)	(3)
Panel A. Regression of channels of influence on the *IDV*			
IDV	**0.073***** [0.010]	**0.044***** [0.006]	**0.348***** [0.076]
Panel B. Regression of individualism on instrumental variables			
distB_UK	-7.523*** [2.502]	-7.608*** [2.501]	-7.524*** [2.503]
pathogen	-16.238*** [3.229]	-16.083*** [3.292]	-16.342*** [3.211]
Geographic controls	✓	✓	✓
First-stage F-statistics	28.15	25.03	28.79
Over-id [p-value]	0.789	0.517	0.317
Observations	84	79	85
First-stage R-squared	0.661	0.663	0.660

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See also notes to Tables 1 and 2.

Table 8. The effect of governance and female in parliament on climate change policies

	Governance and climate change policies			**Female in parliaments and climate change policies**		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Second stage estimates. Dependent variable is the *CCPI*						
Governance	**0.808***** [0.285]	**0.616**** [0.296]	**0.658**** [0.289]			
Female in parliament				**0.103**** [0.044]	**0.098**** [0.046]	**0.100***** [0.035]
Panel B. First-stage estimates						
Dependent variable	**Governance**			**Female in parliament**		
	(1)	(2)	(3)	(4)	(5)	(6)
Settler mortality (log)	-0.449*** [0.066]		-0.237*** [0.082]			
Ultraviolet radiation		-0.011*** [0.001]	-0.008*** [0.002]			
Women's suffrage				0.182*** [0.051]		0.141*** [0.048]
Neolithic transition					-2.152*** [0.484]	-1.822*** [0.489]
Geographic controls	✓	✓	✓	✓	✓	✓
First-stage F-statistics	46.25	95.49	41.68	12.77	19.73	18.98
Over-id [p-value]	n/a	n/a	**0.377**	n/a	n/a	**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

Notes: Governance is an averaged index of six Worldwide Governance Indicators, taken from the World Bank's data. Female in parliament represents women's political participation. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See also notes to Tables 1 and 2.

Table 9. Individual-level evidence

	(1)	(2)	(3)	(4)
Dependent variable is pro-environmental policies				
Individualism	**0.049*** **	**0.046*** **	**0.032*** **	**0.031*** **
	[0.003]	[0.003]	[0.003]	[0.003]
Male	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
Regression model	Probit	Probit	Probit	Probit

Notes: 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 parentheses. *** p<0.01, ** p<0.05, * p<0.1.