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Abstract

Good government is vital to human society. But what proximal and distal factors influence this collective goodness perception? Here, we investigate how and why multi-component evaluations by many institutional observers of public governance vary along the north-south rather than east-west axis of the Earth. Across 190 countries, we show that governance quality improves from the equator toward the North and South Poles in both the Eastern and Western Hemispheres. By contrast, governance quality hardly varies from east to west. National wealth, surfacing as the main driver of good government, is spatially distributed along latitude and longitude in the same striking way. In broader detail, governance quality is psychologically accounted for by cultural, economic, and pathogenic explanations, all nested within a climate-based explanation. Taken in total, the results suggest a chain of increasingly distal explanations of the equator-to-pole improvements in perceived governance quality.

Keywords

governance quality, political psychology, ecological psychology, climatic livability, latitudinal psychology

Countries are home to collections of human inhabitants, who have created habits to handle their habitats (Hofstede, 2001; Nolan & Lenski, 1999; Triandis, 1995). However, often the deep psychological links between habits and habitats are not immediately apparent to persons in those populations. Take corruption. It is very likely not intuitively obvious that the extent to which public power is exercised for private gain increases from the North Pole southward, peaks at 8°12' north of the equator, and then decreases toward the South Pole (Van de Vliert & Kong, 2018). Similarly, most laypersons and country administrators would not predict that legal discrimination of minority groups peaks near the equator and tapers off toward the North and South Poles, while being negligibly related to longitude (Van de Vliert & Conway, 2019). The common

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denominator of public corruption and legal discrimination is the unfair distribution of civic resources and opportunities

This prior research provides intriguing clues to latitude-related origins of unfair, unsound, and ineffective government. More specifically, and from a constructive viewpoint, governance quality is used here to illustrate the relevance and replicability of eco-cultural influences on societal functioning. Replication of the latitudinal gradients of governance quality above and below the equator is important not only because of the replication crisis in psychology (e.g., Lilienfeld, 2017), but also because the cross-equatorial replication goes beyond historical explanations of public governance restricted to either the Northern or the Southern Hemisphere. Moreover, the reverse north-south nature of the latitudinal replication points to a heretofore hidden ecological mechanism explaining non-trivial cross-cultural differences in how people are governed. Against this backdrop, we examined whether and (most importantly) *why* indicators of perceived governance quality—regulatory quality, government effectiveness, and rule of law—increase northward in the Northern Hemisphere but southward in the Southern Hemisphere.

In a well-cited paper on complex adaptive systems, Eidelson (1997, p. 63) opined: “It is important not to overlook the intellectual hazards associated with developing elegant metaphors while forsaking the construction of accurate models.” This lesson is important to our present case. Geographic latitude is, in one sense, tellingly simple and general. It allows researchers to offer elegant-sounding and sweeping models based on global positioning. However, it is of course clear that geographic latitude is just a series of horizontal lines on a map that has only descriptive and no explanatory relevance. Therefore, if we want to construct accurate models of the complex systems that shape collective perceptions of good government, the hypothesized existence of north-south gradients of governance quality raises fundamental questions about the latitude-related construction of psychological knowledge.

How is one to connect latitudes and attitudes, such as governmental attitudes, while doing reasonable justice to the complexity of ecological, economic, and cultural systems and influences? How can this jumble of natural and human-made systems be organized in a compelling manner? Answers to these epistemological questions abound (for overviews, see Nagy Hesse-Biber & Leavy, 2006). A basic conceptual and methodological choice to be made is between concentrating on top-down descriptions and explanations from global ecological systems downward (e.g., Hsiang et al., 2013; Wei et al., 2017), bottom-up descriptions and explanations from local human systems upward (e.g., Nowak et al., 2017), and dynamic mutual adaptations among ecological, economic, and cultural systems (e.g., Schill et al., 2019).

At first sight, governance quality can be fruitfully studied from all these perspectives. On closer consideration, it is difficult to see how bottom-up and mutual-adaptations approaches can produce the overarching structure of oppositely sloping north-south gradients of corruption and legal discrimination in the Northern and Southern Hemispheres. Indeed, economic and cultural conditions have no fixed hemispheric location and locational influence. It is easier to ultimately relate the oppositely sloping north-south gradients of corruption and legal discrimination to the oppositely sloping north-south gradients of ecology and livability in the Northern and Southern Hemispheres. Accordingly, the theoretical analysis in the next section takes this approach.

Our article proceeds as follows. After the theories and methods sections, we first report preliminary descriptive tests of the equator-to-pole improvements rather than simpler north-south or east-west variations in overall governance quality. The poleward improvements in perceived governance quality are validated by assessing their predictive power on reductions in corruption, discrimination, violence, and autocratic history toward the poles. Next, the explanatory section contains regression tests of a chain of influence from the abiotic system (represented by climate) to the nonhuman biotic system (represented by pathogens) to the economic system (represented by wealth) to the cultural system (represented by individualism) to the latitudinal distribution of perceived governance quality. The final section discusses practical implications of the descriptive

results for intervention and investigation, as well as strengths and weaknesses of the explanatory hypotheses, analyses, and inferences.

Theoretical Analysis

It is an unquestionable axiom that plants, animals, and humans would all die if the Earth were to stop rotating around the Sun and around its own tilted axis. This reality implies that the abiotic Earth system drives core parts of all biotic systems—presumably including economic, cultural, and governmental systems. That overly abstract causal link between abiotic and biotic systems has been crystallized in a new subdiscipline of psychology.

Latitudinal psychology echoes Diamond's (1997) famous vision that human diversity is primarily structured along the north-south axis of the Earth but is primarily transmitted along the east-west axis of the Earth. Latitudinal psychology postulates that the Earth (a) has North and South Poles but no East and West Poles, (b) offers oppositely sloping north-south gradients of ecological livability in the Northern and Southern Hemispheres, but similar conditions of ecological livability in east-west directions, (c) causes plants and animals to navigate between either inherently more variable cold and cool temperatures at higher latitudes or inherently more stable warm and hot temperatures at lower latitudes, and (d) requires humans, who feed on plants and animals and avoid pathogens, to adapt to conditions of rather variable lower temperatures at higher latitudes or rather stable higher temperatures at lower latitudes (Van de Vliert & Van Lange, 2019; Van Lange et al., 2017).

According to latitudinal psychologists, atmospheric cold stress and heat stress are more different than similar because cold-weather environments pose problems that are easier to solve. Of course, all extreme temperatures frustrate basic needs for thermal comfort, nutrition, and health similarly (Van de Vliert, 2013). However, whereas higher latitudes offer relaxing variability in extreme temperatures and pathogen prevalence, lower latitudes offer stressful stability in extreme temperatures and pathogen prevalence (Van Lange et al., 2017). This is a crucially important latitudinal difference also because flexible and creative adaptations are more effective in variable environments whereas inflexible and routine responses are more effective in stable environments (Ashby, 1958; Lawrence & Lorsch, 1967; Mintzberg, 1979; Schill et al., 2019). Applied to the case at hand, it means that for governance systems in colder environments to be more effective and efficient, they have to adopt more flexible and creative practices such as assisting citizens with relief efforts and services.

It seems reasonable to assume that a country's inhabitants perceive the country's government as being of higher quality to the extent that public policies and institutions are instrumental in helping restore basic loss of control due to stressful temperatures with a variety of livability problems in their wake (e.g., deluge, drought, and food and health problems) (cf. Friesen et al., 2014; Goode et al., 2014; Landau et al., 2015). The mediating role of livability problems implies that latitudinal psychology does not postulate direct effects—neither direct effects of rather variable lower temperatures at higher latitudes nor direct effects of rather stable higher temperatures at lower latitudes—on human mindsets and practices. If governance systems indirectly adjust their flexibility and creativity to the variability of their abiotic and biotic environments, it follows that perceived governance quality will neither increase nor decrease in east-west direction, but will increase northward in the Northern Hemisphere and southward in the Southern Hemisphere.

A further theoretical belief is that the above abiotic and biotic conditions are not only geographically organized, but that their mutual influences tend to be sequentially ordered as well. Immediate consequences of climatic temperatures are pathogenic diseases caused by infectious agents (e.g., flies, mosquitoes, and mollusks). Clearly, the relatively stable heat-based infectious diseases at lower latitudes (e.g., bilharzia, Chagas' disease, cholera, filariasis, leishmaniasis, leprosy, malaria, river blindness, schistosomiasis, sleeping sickness, trypanosomiasis, and yellow

fever) cause more persistent and greater livability problems than the relatively variable cold-based infectious diseases at higher latitudes (e.g., asthma, frostbite, gout, influenza, pneumonia, and rheumatism) (Cashdan, 2014; Epstein, 1999; Sachs, 2000). As a consequence, the dual problems of seasonally stable heat and diseases faced by lower-latitude governments are harder to solve than the dual problems of seasonally variable cold and diseases faced by governments at higher latitudes. Cold-climate governments are in a better position to develop solid plans and effective strategies that permit and promote the meeting of citizens' needs for health, cure, and care, including safe drinking water and uninfected food.

Next, we propose the additive impact of climatic temperatures and pathogen valence on governance quality will be mediated and modified by national wealth. Here we focus on the mediation function of wealth because the beneficial effects of wealth on how climatic stresses are managed (Van de Vliert, 2013) and how pathogen stress is reduced (Thornhill et al., 2009) have already been covered elsewhere. On the causal side of mediation, countries confronted with more variable cold stress enjoy the advantages of less continuous heat stress and lower pathogen prevalence, both of which contribute to economic productivity and income accumulation (Acemoglu et al., 2001; Easterly & Levine, 2003; Parker, 2000; Sachs et al., 2001; Theil & Galvez, 1995). On the consequence side of mediation, governments of richer countries may get credit for providing more goods and better services to temporarily mitigate or permanently overcome detrimental effects of weather and health disasters. If so, perceived regulatory quality, government effectiveness, and rule of law would decrease from the North Pole southward, would peak near the equator, and would then increase toward the South Pole.

A final link in the proposed causal chain from climatic temperatures to governance quality is the mediating role of cultural individualism (Kyriacou, 2020). There are theoretical and empirical reasons to expect that, after passing through pathogen prevalence and national wealth, this causal path will lead to the area of national culture before reaching governance quality. Notably, the well-tested pathogen stress theory asserts that infectious diseases are threatening and therefore conducive to collectivist rather than individualist culture (Fincher & Thornhill, 2012; Fincher et al., 2008), coming with restrictions of freedom of "inferior" strangers and other lower-downs in the form of autocratic government, legalized repression of civil liberties and individual freedoms, and formalized institutional control (Conway et al., 2006, 2017; Murray et al., 2011, 2013; Thornhill et al., 2009). The pathogen stress theory explicitly treats economic development as a confounding condition (Fincher & Thornhill, 2012).

There has been considerable debate between the economy-drives-culture camp, which believes that national wealth shapes national culture (e.g., Bell, 1973; Inglehart & Baker, 2000; Inglehart & Welzel, 2005; Kurtz & Schrank, 2007; Marx, 1973; Welzel, 2013), and the culture-drives-economy camp, which believes that national culture shapes national wealth (e.g., Hampden-Turner & Trompenaars, 1993; Harrison & Huntington, 2000; Hofstede & Bond, 1988; McClelland, 1961; Weber, 1904/1958). Most likely, wealth and culture make each other up (e.g., Sen, 2001). From the vantage point of latitudinal psychology, however, national wealth is immediately dependent on climatic temperatures and pathogenic diseases, much more so than cultural individualism (Van de Vliert, 2011a, 2013; Van de Vliert & Van Lange, 2019), and public governance (Van de Vliert & Conway, 2019; Van de Vliert & Kong, 2018). In short, economic development is thought to transform upstream ecology into downstream culture.

Wealth resources make people more individualistic and autonomous by enhancing their capabilities to exercise freedoms (Sen, 2001; Welzel, 2013), notably including freedom from injustice and from violations of the rule of law (Nussbaum, 2006). By contrast, ingroup-outgroup pressures in relatively poor collectivist societies appear to foster nepotism, clientelism, corruption, and unlawful obedience to authority (Gaygisiz, 2013; Kharlamov & Pogrebna, 2021; Kyriacou, 2016, 2020; Licht et al., 2007; Porcher, 2021). We therefore tested whether the poleward changes in cold and heat stresses can account for decreases in pathogen prevalence, increases in national

Table 1. Intercorrelations of Dependent Variable and Predictor Variables.

Variables	1	2	3	4	5	6	7	8
1. Governance quality (<i>n</i> = 190)	—							
2. Longitude-linear (<i>n</i> = 190)	-.03	—						
3. Latitude-linear (<i>n</i> = 190)	.36***	.01	—					
4. Latitude-squared (<i>n</i> = 190)	.39***	.02	-.18*	—				
5. Cold stress (<i>n</i> = 190)	.46***	.04	.65***	.48***	—			
6. Heat stress (<i>n</i> = 190)	-.42***	.08	-.29***	-.43***	-.57***	—		
7. Pathogen prevalence (<i>n</i> = 189)	-.59***	-.08	-.47***	-.30*	-.49***	.40***	—	
8. National wealth (<i>n</i> = 190)	.79***	-.01	.44***	.27***	.47***	-.34***	-.64***	—
9. Cultural individualism (<i>n</i> = 178)	-.66***	.02	-.21**	-.39***	-.31***	.35***	.36***	-.51***

Note. *N* = 190, except for pathogen prevalence (*N* = 189) and cultural individualism (*N* = 178).

p* < .05. *p* < .01. ****p* < .001.

wealth, increases in cultural individualism, and improvements in governance quality, in this sequential order. As is usual in latitudinal psychology, this nested explanation of governance quality does not exclude any other explanation in terms of, for example, rainfall or mode of subsistence (Van de Vliert, 2020). Our modest goal is to carve out a plausible latitude-related path from cold and heat stresses to perceived regulatory quality, government effectiveness, and rule of law.

Methods

Sample and Analysis

Countries served as units of measurement and analysis. The sample size was dictated by the availability of data on governance quality for 190 countries, and the availability of explanatory variables for 178 countries. We used SPSS 25.0 and process analysis (Hayes, 2018, model 6) to regress governance quality on indicators of longitude and latitude, climatic stresses, pathogen prevalence, national wealth, and cultural individualism (zero-order correlations are reported in Table 1). For reasons of comparability and comprehensibility, all predictor variables were standardized. Reported are unstandardized regression coefficients based on heteroskedasticity-corrected standard errors, two-tailed significance tests, and 95% confidence intervals. All data are available for reproduction and secondary analysis from Supplemental Tables S1 and S2.

Dependent Variable: Governance Quality

Quality of public governance is not an objective truth like election frequency or voter turnout. Rather, public governance is judged of higher quality if it better meets many observers' subjective standards. Building on this social-psychological perspective, the World Bank has designed six indicators of perceived governance quality for independent countries and dependent territories (<https://info.worldbank.org/governance/wgi>; Kaufmann et al., 2010). Retest reliability was created by assessment on an annual basis since 1996. Interobserver reliability was improved by integrating observational data from over 30 survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms. Convergent validity was maximized by covering the overlapping domains of voice and accountability, political stability and absence of violence, regulatory quality, government effectiveness, rule of law, and control of corruption (Kaufmann et al., 2007; Langbein & Knack, 2010).

The World Bank's indicators of perceived governance quality were chosen for the present study because of their relatively high reliability and validity. In fact, the internal consistency of the index is so high (for the year 2018: $.63 < r_{[188]} < .94, p_s < .001$; Cronbach's $\alpha = .96$) that some indicators yield essentially the same research results as the overall index. On closer consideration, this strength of convergent empirical validity is compromised by the weakness that the World Bank sampled rather divergent components of conceptual content. On the one hand, voice and accountability, and political stability in absence of violence are dealing with the centripetal processes by which governments are selected, monitored and replaced. On the other hand, regulatory quality, government effectiveness, rule of law, and control of corruption are centrifugal processes by which governments, more or less successfully, formulate and implement sound policies through widely respected institutions.

We decided to concentrate on the centrifugal processes of regulatory quality, government effectiveness, and rule of law, for four reasons. First, compared to the centripetal indicators, these centrifugal indicators are shaped less by external actors such as voters, journalists, rebels, and enemies. Second, of the 15 paired correlations among the six indicators, only the six pairs involving the centrifugal indicators share more than half their variance (Langbein & Knack, 2010). Third, in order to perform a really new and independent test of the presumed worldwide geography of the observed quality in public governance, control of corruption was left out, given the recently found bell-shaped distribution of corruption between the North and South Poles (Van de Vliert & Kong, 2018). Fourth, regulatory quality, government effectiveness, and rule of law represent three sequentially related social-psychological components of the governance system: input, throughput, and output.

The input component, regulatory quality, captures judgments of the ability of the government to potentially create, and institutionalize sound plans and strategies that permit and promote private sector development. The throughput component, government effectiveness, captures perceptions of the actual quality of public and civil services, the actual quality of policy formulation and implementation, and the corresponding credibility of the government's commitment to such policies. Finally, the output component, rule of law, captures judgments of the extent to which agents have come to have confidence in and abide by the rules of society, and in particular the quality of protecting property rights and enforcing contracts. These input, throughput, and output components were averaged to represent governance quality.

The most recent data, for the year 2018 (<https://info.worldbank.org/governance/wgi>), reconfirmed that regulatory quality, government effectiveness, and rule of law are manifestations of the same underlying dimension (eigenvalue $\lambda = 2.83, R^2 = .94$; Cronbach's $\alpha = .97$). This observational dimension of the quality of public governance, reproduced in Supplemental Table S1, served as our dependent variable in the present study. Governance quality—in standardized form ranging from -2.23 in Sudan, -2.15 in Venezuela, and -2.03 in Libya to 2.10 in Switzerland, 2.13 in Finland, and 2.26 in Singapore—had an approximately normal statistical distribution (skewness = $0.35, SE = 0.18$; kurtosis = $-0.32, SE = 0.35$). As further evidence of its validity, this index of the quality of public governance is positively associated with Robbins's (2015) index of generalized social trust ($r_{[111]} = .51, p < .001$).

The use of the World Bank's governance indicators has been criticized because of missing discriminant validity (Thomas, 2010)—the quality that a measure is uncorrelated with variables with which the measured construct should not be correlated. To mitigate this criticism, we argued that perceived governance quality improves happiness (for empirical evidence, see Njangang, 2019). We further argued that this feeling of happiness should be based more on satisfaction with freedom of choice than on satisfaction with personal health. Accordingly, using Gallup World Poll data (retrieved from United Nations Development Programme [UNDP], 2010), it could be demonstrated that our index of governance quality is related to satisfaction with freedom of choice while controlling for satisfaction with personal health ($r_{[135]} = .36, p < .001$) but not to

satisfaction with personal health while controlling for satisfaction with freedom of choice ($r_{[135]} = .03, p = .71$).

Longitude and Latitude

Each country's location was measured by midrange longitude (negative west of the Greenwich meridian and positive east of it) and midrange latitude (negative below the equator and positive above it) (retrieved from https://developers.google.com/public-data/docs/canonical/countries_csv, and reproduced in Supplemental Table S1). However, these measures cannot be treated identically. Given that the Earth has no East and West Poles, longitude is measured on a unidirectional scale with the Greenwich meridian as an imaginary and meaningless midpoint. Moreover, a proper descriptive test of the poleward improvements in governance quality should control for possible confounding east-west variations in regulatory quality, government effectiveness, and rule of law.

By contrast, given North and South Poles, latitude is measured on a bipolar scale with the Equator as a real and meaningful midpoint. Importantly, Northern-Hemisphere latitudes differ from Southern-Hemisphere latitudes in continental landmasses and in the extent to which these landmasses extend in poleward direction. Also, the Northern Hemisphere is uniquely home to three equators: the geographical equator at 0° latitude, the meteorological equator at about 6°N, and the biological equator of seasonal human mortality at about 10°N (Aschoff, 1981). For those reasons, compared to the Southern Hemisphere, the Northern Hemisphere has more cold stress ($t = -4.00, p < .001$), about equal heat stress ($t = -0.86, p = .39$), higher variability in temperatures ($t = -5.15, p < .001$), and in their wake higher variability in crop growth and animal life including pathogen prevalence.

For the same reasons, it would be inaccurate to collapse Northern-Hemisphere latitudes and Southern-Hemisphere latitudes into a unipolar absolute latitude scale. More precise information can be gathered by standardizing and squaring midrange latitude, and to then use latitude-linear and latitude-squared as complementary predictors of governance quality. Latitude-linear, ranging from the South to the North Pole in a unidirectional fashion, captures confounding hemispheric differences in abiotic, biotic, economic, and cultural latitudinal gradients. Latitude-squared, ranging from the geographical equator to the poles, represents the targeted latitudinal gradients in cold stress, heat stress, pathogen prevalence, national wealth, and cultural individualism. When a latitude-squared effect is visualized, it takes the shape of a U-curve or inverted U-curve distribution of the dependent variable between the North and South Poles.

Climatic Stresses

Ambient temperatures were operationalized across each country's major cities, weighted for population size (source: Parker, 1997). As has become customary, cold stress and heat stress were assessed with the thermometer for measuring local livability, which uses 22°C (~72°F) as a point of reference for optimally livable temperatures. Cold stress is the sum of the downward deviations from 22°C in centigrade for the lowest and highest temperatures in the coldest and hottest months (Supplemental Table S2: $M = 32.63, SD = 26.41$; skewness = 0.73, $SE = 0.18$; kurtosis = -0.57, $SE = 0.35$). Similarly, heat stress is the sum of the upward deviations from 22°C in these months ($M = 22.02, SD = 7.78$; skewness = 0.34, $SE = 0.18$; kurtosis = 0.32, $SE = 0.35$).

Note that the Earth offers its inhabitants more cold stress than heat stress and more between-country variation in cold stress than between-country variation in heat stress. In addition, and in agreement with our theoretical analysis, the within-country variability of the lowest and highest temperatures in the coldest and hottest months is strongly positively associated with the level of cold stress ($r_{[188]} = .91, p < .001$) and only weakly negatively associated with the level of heat

stress ($r_{[188]} = -.24, p < .001$). The likely consequence of this climatic configuration is that inherently more variable cold stress is a more promising predictor of governmental attitudes than inherently more stable heat stress (cf. Gasparrini et al., 2015).

Pathogen Prevalence

The number of cases of human-specific and multi-host parasitic diseases (e.g., measles, cholera, leishmaniasis, and leprosy) is available from Fincher and Thornhill (2012); Supplemental Table S2. Pathogen prevalence, thus measured ($M = 0.29, SD = 1.97$; skewness = 0.59, $SE = 0.18$; kurtosis = $-1.00, SE = 0.35$), is invariant along longitude, peaks at $1^{\circ}19'$ north of the equator and tapers off toward the North and South Poles (Van de Vliert & Van Lange, 2019).

National Wealth

Collective wealth was measured as the gross national income per head in 2018, converted to international dollars using purchasing-power-parity rates (retrieved from UNDP, 2019). The data for the entire sample of 190 countries, logged to reduce skewness and reproduced in Supplemental Table S2 ($M = 9.22, SD = 1.17$), are approximately normally distributed (skewness = $-0.23, SE = 0.18$; kurtosis = $-0.75, SE = 0.35$).

Cultural Individualism

Theorizing and research on the cultural dimension of individualism versus collectivism has been plagued by using a variety of definitions and operationalizations, with the consequence of a selection and specification problem (Fatehi et al., 2020; Voronov & Singer, 2002). Here this problem is automatically solved because we are interested in cultural individualism as a mediator between pathogen prevalence and governance quality. The pathogen stress theory (Fincher & Thornhill, 2012; Fincher et al., 2008) postulates that inhabitants of areas with high levels of parasitic diseases try to prevent infections through ingroup assortative sociality and the avoidance of contacts with members of outgroups. Thus, quite explicitly and clearly, cultural collectivism is defined as the presence of ingroup-outgroup discrimination, and individualism as the absence of ingroup-outgroup discrimination.

In line with this definition, cultural individualism was assessed as progress made in moving away from ingroup favoritism toward personal autonomy. Specifically, we borrowed a reliable and valid cross-national collectivism-versus-individualism index (Van de Vliert, 2011a) that combines reverse-coded mindsets and practices of familism, nepotism in business, and compatriotism. Familism was measured as favoritism shown to one's closest relatives in the nuclear family through mutually beneficial exchanges of time, effort, and feelings of pride. Nepotism in business contexts was measured as favoritism shown to relatives by giving them organizational positions because of their relationship rather than on their merits. Compatriotism was measured as favoritism shown to fellow nationals by giving them easier access to scarce jobs than immigrants. The resulting individualism index, reproduced in Supplemental Table S2 ($M = -0.24, SD = 0.73$; skewness = 0.96, $SE = 0.18$; kurtosis = 1.67, $SE = 0.36$), is strongly associated with Hofstede's well-known index of individualism ($r_{[68]} = .71, p < .001$).

Locating Governance Quality

Testing the Geographic Distribution

To replicate results, the predicted geography of governance quality was first tested on all countries, and then on the Eastern and Western Hemisphere countries separately. We modeled

Table 2. Tests of the Equator-to-Pole Improvements in Perceived Governance Quality.

Predictors	Worldwide (N=190)		Eastern Hemisphere (N=134)		Western Hemisphere (N=56)	
	B	B	B	B	B	B
Longitude-linear	-0.03 (-0.18 to 0.11)	-0.05 (-0.18 to 0.08)	0.15 (-0.14 to 0.44)	0.23 (-0.03 to 0.49)	-0.29 (-0.69 to 0.11)	-0.29 (-0.59 to 0.01)
Latitude-linear	0.37*** (0.23 to 0.51)	0.43*** (0.31 to 0.55)	0.42*** (0.23 to 0.60)	0.46*** (0.30 to 0.62)	0.44*** (0.18 to 0.71)	0.65*** (0.44 to 0.86)
Latitude-squared		0.44*** (0.33 to 0.55)		0.50*** (0.35 to 0.65)		0.43*** (0.29 to 0.56)
R ²	.13***	.35***	.14***	.35***	.18***	.54***

Note. Shown are unstandardized regression coefficients (B) with 95% confidence intervals between brackets (two-tailed tests). There is no multi-collinearity (Variance inflation factors < 1.24), and there are no outliers (Cook's distances < 0.37).

*p < .05. **p < .01. ***p < .001.

longitude-linear and latitude-linear as alternative descriptors of governance quality, followed by latitude-squared as the hypothesized descriptor. The results in Table 2 reveal, first of all, that governance quality does vary along latitude rather than longitude irrespective of whether the Eastern and the Western Hemisphere were or were not combined. Furthermore, and again in the East and the West alike, government quality does improve at higher latitudes in general (see coefficients for latitude-squared) and at higher latitudes in the Northern Hemisphere in particular (see coefficients for latitude-linear). Together, higher latitudes toward the North and South Poles appear to account for 35% of the variation in governance quality in the Eastern Hemisphere, and for 54% of the variation in the Western Hemisphere.

Figure 1 visualizes the east-west and north-south distributions of governance quality in the Eastern and Western Hemispheres. The east-west slopes indicate that there was no association between longitude and governance quality, either in the Eastern ($r_{[132]} = -.05, p = .57$) nor in the Western ($r_{[54]} = -.04, p = .74$) Hemisphere. By contrast, as hypothesized, governance quality improves toward the north in the north-east ($r_{[101]} = .54, p < .001$) and north-west ($r_{[43]} = .74, p < .001$) quarters of the Earth. Mirrorlike, governance quality also improves toward the south in the south-east ($r_{[29]} = -.48, p = .007$) quarter of the Earth. Due to small sample size, the latitudinal gradient of governance quality in the south-west quarter of the Earth does not reach significance below the geographical equator at 0° ($r_{[9]} = -.54, p = .09$), but does so below the meteorological equator at 6°N ($r_{[12]} = -.53, p = .05$) and below the biological equator at 10°N (Aschoff, 1981) ($r_{[20]} = -.49, p = .02$). Thus, there is robust evidence for the existence of poleward improvements in perceived governance quality.

Validation on Corruption, Discrimination, Violence, and Autocratic History

So far, we have established that governance quality—represented by perceived regulatory quality, government effectiveness, and rule of law—improves across the globe as we approach the Northern and Southern Poles. To provide further validation of the importance of latitude in understanding the quality of public governance, we next sought to show that the observed geography of governance can predict the global distributions of control of corruption (Van de Vliert & Kong, 2018), elimination of legal discrimination (Van de Vliert & Conway, 2019), prevention of aggressive violence (Van de Vliert & Daan, 2017), and the recent history of respecting political rights and civil liberties (Gastil, 1978). Specifically, we evaluated if the regression equations for the associations between longitude, latitude, and overall governance quality significantly predict reductions in corruption, legal discrimination, aggressive violence, and autocratic history toward the North and South Poles. The extent to which this is true was examined in a stepwise fashion.

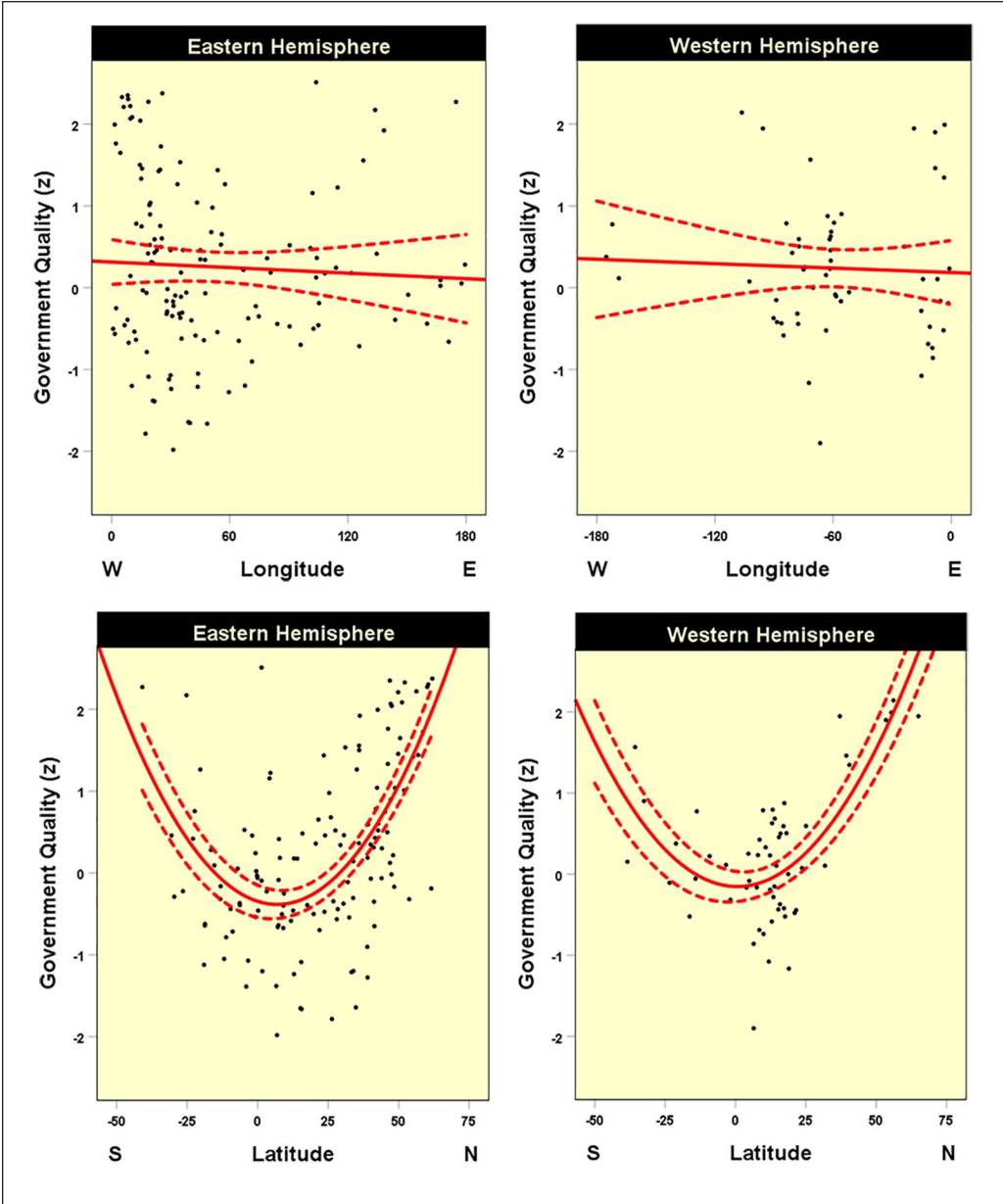


Figure 1. Scatter plots and regression fit lines for the distributions of perceived governance quality along longitude (at the top) and latitude (at the bottom), broken down horizontally for the Eastern and Western Hemispheres.

Note. W=West, E=East, S=South, N=North. Dots refer to countries. The broken lines represent 95% confidence interval limits.

First, applying the Eastern Hemisphere equation for the prediction of governance quality ($\hat{Y} = [0.231 \times \text{longitude-linear}] + [0.464 \times \text{latitude-linear}] + [0.498 \times \text{latitude-squared}]$) to the 190 countries' longitudes and latitudes, we estimated each country's governance quality. The second step was the same except that the Western Hemisphere equation ($\hat{Y} = [-0.286 \times \text{longitude-linear}] + [0.650 \times \text{latitude-linear}] + [0.428 \times \text{latitude-squared}]$) was used to estimate each

Table 3. Validation of the Equator-to-Pole Improvements in Perceived Governance Quality.

Country-level measures of corruption, discrimination, violence, and autocratic history	Geographic predictions of governance quality	
	Eastern equation ^a	Western equation ^b
Eastern corruption (N = 134)	-0.55***	-0.44***
Eastern discrimination (N = 133)	-0.71***	-0.69***
Eastern violence (N = 119)	-0.51***	-0.50***
Eastern autocratic history (N = 103)	-0.49***	-0.36***
Western corruption (N = 56)	-0.61***	-0.68***
Western discrimination (N = 56)	-0.62***	-0.59***
Western violence (N = 46)	-0.71***	-0.63***
Western autocratic history (N = 50)	-0.24*	-0.46***

Note. Eastern = Eastern Hemisphere. Western = Western Hemisphere.

^a $\hat{Y} = (0.231 \times \text{longitude-linear}) + (0.464 \times \text{latitude-linear}) + (0.498 \times \text{latitude-squared})$.

^b $\hat{Y} = (-0.286 \times \text{longitude-linear}) + (0.650 \times \text{latitude-linear}) + (0.428 \times \text{latitude-squared})$.

* $p < .05$. ** $p < .01$. *** $p < .001$, one-tailed test.

country's governance quality. The two sets of 190 predictions are reported in Supplemental Table S1.

In the third step, we computed the associations between the Eastern and Western Hemisphere predictions of governance quality and the World Bank's 2018 index of corruption (retrieved from <https://info.worldbank.org/governance/wgi>). The robustness of the results was tested by computing separate correlations for the Eastern and Western Hemisphere countries. The fourth step repeated the third step replacing the corruption index first with an index of the legal discrimination of minority groups (retrieved from Conway et al., 2017) and then with an index of domestic warfare and violence, press repression, and business costs of crime and violence (retrieved from Van de Vliert & Daan, 2017). Finally, we added historical backgrounds and realities by repeating step 3 for political rights and civil liberties about half a century ago (retrieved from Gastil, 1978).

As shown in Table 3, the equator-to-pole improvements in governance quality convincingly predict equator-to-pole reductions in corruption, legal discrimination, aggressive violence, and autocratic history, both within and across the Eastern and Western Hemispheres. This consistent pattern of results attests to the validity of the observed geography of governance quality, and thus its ability to predict a wide array of "traditions and institutions by which authority in a country is exercised" (Kaufmann et al., 2010, p. 4). On top of demonstrating the relevance of latitude-related explanations of good and bad government, the east-west cross-fertilizations in Table 3 illustrate the restricted value of purely historical explanations of good and bad government.

Explaining Governance Quality

The worldwide distribution of perceived governance quality, quantified in Table 2 and pictured in Figure 1, is of a purely descriptive nature. Nevertheless, this descriptive information provides several hints toward a better explanatory understanding of governance. Perhaps most strikingly, the absence of east-west gradients along longitude implies that east-west conditions have a negligible role to play in the explanation of the geography of governance quality. Furthermore, the consistent presence of latitudinal gradients of poleward improvements in governance quality in the north-east, north-west, south-east, and south-west quarters of the Earth implies that the geography of governance quality is difficult to explain without taking account of factors that also vary along latitude in opposite north-south directions in the Northern and Southern Hemispheres. Climatic stresses, pathogen prevalence, national wealth, and cultural individualism all meet this explanatory criterion (Van de Vliert & Van Lange, 2019). As discussed below, Table 4,

Table 4. Tests of the Main Effects of Cold and Heat Stresses on Perceived Governance Quality (Model 1), the Mediation Effects of Pathogen Prevalence, National Wealth, and Cultural Individualism (Models 2–4), and the Residual Effect of Latitude-Squared (Model 5).

Predictors	Model 1	Model 2	Model 3	Model 4	Model 5
Cold stress	0.32*** (0.16 to 0.48)	0.11 (-0.04 to 0.26)	0.06 (-0.11 to 0.12)	0.01 (-0.10 to 0.12)	-0.02 (-0.13 to 0.09)
Heat stress	-0.22** (-0.37 to -0.07)	-0.15* (-0.28 to -0.01)	-0.13* (-0.24 to -0.03)	-0.07 (-0.16 to 0.03)	-0.06 (-0.15 to 0.04)
Pathogen prevalence		-0.47*** (-0.60 to -0.34)	-0.11 (-0.23 to 0.01)	-0.11* (-0.22 to -0.00)	-0.11* (-0.22 to -0.01)
National wealth			0.66*** (0.54 to 0.78-)	0.52*** (0.40 to 0.63)	0.53*** (0.41 to 0.64)
Cultural individualism				0.33*** (0.23 to 0.42)	0.30*** (0.21 to 0.40)
Latitude-squared					0.07 (-0.01 to 0.15)
ΔR^2	.24***	.17***	.24***	.07***	.01
R^2	.24***	.41***	.65***	.72***	.73***

Notes. $N = 178$ countries. Shown are unstandardized regression coefficients with 95% confidence intervals between brackets (two-tailed tests). There is no multi-collinearity (Variance inflation factors < 2.12), and there are no outliers (Cook's distances < 0.08). * $p < .05$. ** $p < .01$. *** $p < .001$.

supplemented with Supplemental Table S3, suggests that the cultural explanation is nested within the economic explanation, that both are nested within the pathogenic explanation, and that all are nested within the climate-based explanation.

Testing the Explanations

Climatic cold and heat stresses ($R^2 = .24$; $B = 0.32$, $p < .001$ for cold stress; $B = -0.22$, $p < .01$ for heat stress), pathogen prevalence ($R^2 = .37$, $B = -0.59$, $p < .001$), national wealth ($R^2 = .62$, $B = 0.79$, $p < .001$), and cultural individualism ($R^2 = .43$, $B = 0.66$, $p < .001$) are all associated with governance quality. The positive effect of cold stress and the negative effect of heat stress are largely mediated (20% out of the 24%) by the negative effect of pathogen prevalence on governance quality (Table 4, Models 1 and 2). The negative effect of pathogen prevalence, in turn, is completely mediated (37% out of the 37%) by the positive effect of national wealth on governance quality (Models 2 and 3). And the remaining negative effect of heat stress (4% out of the 4%) is finally mediated by the positive effect of cultural individualism on governance quality (Models 1 and 4). This stepwise pattern of mediation effects supports our hypothesis of nested explanations. Entering cultural individualism ($\Delta R^2 = .19$, $p < .001$) before national wealth ($\Delta R^2 = .13$, $p < .001$) weakens rather than strengthens the proposed latitude-related path from cold and heat stresses to governance quality.

The observed geography of regulatory quality, government effectiveness, and rule of law raises the further question whether climatic stresses, pathogen prevalence, national wealth, and cultural individualism fully account for the poleward improvements in governance quality. Supplementary regression analysis demonstrates that this is indeed the case in both the Northern (R^2 reduces from .30 to .00) and the Southern (R^2 reduces from .28 to .00) Hemisphere. On a worldwide scale, the nested explanations account for 72% of the variation in governance quality (Table 4, Model 4), including the poleward improvements in governance quality (Model 5). Closer scrutiny of the mediated impact of thermal stress, using Hayes's (2018) serial multiple mediator model, revealed that cold stress plays a more prominent explanatory role than heat stress by taking a longer path to deliver its impact on governance quality.

The shortest possible path is one-factor mediation by either pathogen prevalence or national wealth or cultural individualism. Together with the conceivable two-factor and three-factor

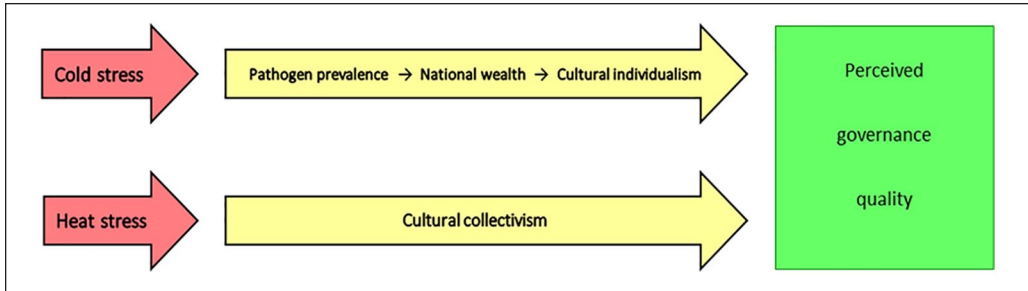


Figure 2. Dual eco-cultural explanation of perceived governance quality.

mediations, there are seven possible paths. The process analysis in Supplemental Table S3, part A shows a significant path from greater cold stress to lower pathogen prevalence to higher national wealth to more cultural individualism to better governance quality, while controlling for heat stress (bootstrap range from 0.02 to 0.06; see upper part of Figure 2). Higher national wealth stands out as the most important mediation link between cold stress and governance quality because each shorter path reaches significance only if national wealth is part of it. By contrast, there is only one significant path from greater heat stress to worse governance quality, while controlling for cold stress (Supplemental Table S3, part B). The impact of greater heat stress is exclusively mediated by more cultural collectivism (bootstrap range from -0.12 to -0.02 ; see lower part of Figure 2).

Checking Inaccuracies

A potential problem of the explanatory analyses is the widely varying physical size of the 178 countries (ranging from 20 to 17,100,000 km²) as units of measurement and analysis. The smaller countries, being part of multi-country regions with similar climatic and economic conditions (e.g., Bahrain, Liechtenstein, and Singapore), tend to violate the assumption of independent observations. The larger countries, internally characterized by much climatic, economic, and cultural diversity (e.g., China, Russia, and the United States), tend to produce inaccurate overall measures. To gauge the seriousness of these shortcomings, we repeated the analyses, assigning increasingly higher weights to more moderately sized countries. This weighting procedure does not affect the findings in Table 4 to a noticeable extent (Supplemental Table S4).

Another inaccuracy of our study is the unequal representation of different parts of the Earth. This problem was addressed in two distinct ways. The first check was a rerun of the regression models in Table 4 with proportionally higher weights for parts of the Earth represented by fewer countries (weight 0.458 for the north-east quarter, 0.763 for the north-west quarter, 0.837 for the south-east quarter, and 0.942 for the south-west quarter). This weighted regression analysis again replicated the results (Supplemental Table S5). A second check was performed by using the regression equation from Table 4, Model 4, to predict the country levels of governance quality in the major continents of the world. This revealed, not surprisingly from the viewpoint of latitudinal psychology, that the predictability of governance quality increased from the equator toward the poles: $r_{[51]} = .53, p < .001$ for Africa, $r_{[30]} = .70, p < .001$ for South America, $r_{[44]} = .78, p < .001$ for Asia, and $r_{[37]} = .87, p < .001$ for Europe.

Discussion and Conclusion

Latitudinal psychology is a metatheory in the making. Nowhere in textbooks do we learn that Northerners differ more from Southerners in the democratic quality of public governance than

Easterners differ from Westerners. Nor are we told that the world has two oppositely sloping latitudinal gradients of perceived governance quality originating from the equator. Indeed, laypersons and country administrators are both unaware of the northward equator-to-pole improvements in governance quality in the Northern Hemisphere and the southward equator-to-pole improvements in the Southern Hemisphere. The results of the present study may help fill these gaps in our knowledge by replacing and refining the too crude observation that in a hot and poor belt around the equator, more poorly governed countries can be found than anywhere else (Acemoglu et al., 2001; Parker, 2000; Sachs et al., 2001). As a further result, the reported descriptive geographical information on regulatory quality, government effectiveness, and rule of law has some salient practical implications.

Irrespective of how the observed northward and southward latitudinal gradients of governance quality might be explained, habits of poor governance should be attributed to habitats rather than their inhabitants. In consequence, international organizations should use habitats rather than inhabitants as strategic policy tools. For example, providing access to justice for all and building effective, accountable, and inclusive institutions at all levels is the United Nations' sustainable development goal Number 16 (UNDP, 2018). Thus, if the research results in Figure 1 are correct, achieving goal Number 16 requires a north-south rather than east-west agenda for promoting regulatory quality, government effectiveness, and rule of law. Ideally, and more specifically, the United Nations program for governance development may adopt a southward orientation and concentration in the Northern Hemisphere but an opposite northward orientation and concentration in the opposite Southern Hemisphere.

Similarly, again irrespective of causation and explanation, the key finding that opposite north-south differences above and below the equator dwarf east-west differences in country-level governance can be put to use in future research. Hypothesized latitudinality of, for example, electoral fraud and malpractice (Lehoucq, 2003; Norris, 2019) or press repression (Van de Vliert, 2011b) could be tested against the dual null hypothesis of no linear relationships with the coordinates of longitude and latitude. The presence of opposite north-south gradients of decreasing electoral flaws or press repression toward the North and South Poles, if any, would establish the convergent validity of latitudinality. If such convergent validity were to exist, it could then be upgraded into discriminant validity of the latitudinality by additionally rejecting the hypothesis of the presence of any east-west gradient of electoral flaws or press repression.

Going beyond pure geography, we have attempted to decipher the mystery of the spatially varying quality of public governance using a refined set of scientific tools. Longitude and latitude were used to establish discriminant validity in the measurement of not only latitude-related governance quality but also of its latitude-related predictors. Moreover, the Northern, Southern, Eastern, and Western Hemispheres were used to establish the test-retest reliability and predictive validity of the latitudinal gradient of governance quality. Ecologically, sophisticated distinctions were made between the climatic stresses of temporally variable cold and temporally stable heat, with typical patterns of pathogen prevalence in their wake. Socio-economically, we have statistically demonstrated that national wealth functions as a crucially important linking pin between the country's habitat and the inhabitants' cultural and governmental habits to handle their habitat.

This research approach was combined with full recognition of the fallacy of geographical determinism, and considerable respect for the merit of more proximal explanations nested within more distal explanations. A more distal climate-based explanation is not only more general and fundamental (strengths), but also more simplistic and questionable as the causal chain is longer and thus more sensitive to mediating and modifying influences (weaknesses). Going beyond these strengths and weaknesses, we have unfolded two complementary trajectories leading from climate-induced problems and solutions to governmental mindsets and practices (see Figure 2). Higher variability in cold stress, especially in Europe, is associated with lower pathogen prevalence, higher national wealth, more cultural individualism, and better governance quality. Greater

stability in heat stress, especially in Africa, is associated with more cultural collectivism, which in turn is associated with worse governance quality.

A weakness of our study is that we restricted the cultural mediation function to individualism versus collectivism, thus neglecting the influences of cultural power distance and uncertainty avoidance (Hofstede, 1991, 2001; House et al., 2004). However, this weakness is compensated by further invalidating the myth of individualistic Westerners versus collectivistic Easterners (cf. Figure 1; Van de Vliert & Van Lange, 2019). Indeed, there are no individualism-based differences in perceived governance quality between Westerners and Easterners in the Southern Hemisphere. Moreover, the Northern-Hemisphere differences in individualism and perceived governance quality are north-south differences disguised as latitudinally confounded east-west differences (e.g., North-Western Europeans versus South-Eastern Chinese and Indians in Asia).

The limits of the proposed explanation are clearly visible in clusters of countries sharing the same latitude zone but differing widely in wealth, culture, and regulatory quality, government effectiveness, and rule of law. A good example are the countries in the Middle East and Central Asia (e.g., Turkey, Cyprus, Egypt, Syria, Israel, Kuwait, Iran, Turkmenistan, and Afghanistan), where the impact of global warming on governance quality at the beginning of the 22nd century will vary greatly depending on the current and forecasted levels of economic development. Extensive climato-economic simulations (Van de Vliert, 2013) have shown that the greatest winners and losers of global warming are to be found in Central Asia. “The Turkmen, the Uzbeks, and the Kazakhstans, for example, will even surpass the Britons, the New Zealanders, and the Dutch” in freedom from discrimination, press repression, and political autocracy, whereas “Afghans and Pakistanis, and the great majority of Africans (e.g., Somalis, Nigerians, Burkinabe, and Sierra Leoneans) will lose rather than gain freedom” (Van de Vliert, 2013, p. 477).

Of course, our regression-based path analysis of governance quality cannot firmly establish causation. Like the vast majority of ecological investigations, our study looks at associations for which causality cannot be directly inferred. However, regardless of how they are viewed, our data are clearly consistent with a climatic-stress explanation of why governance quality robustly varies along latitude rather than longitude. Indeed, a viable alternative hypothesis or theory should be able to explain why governance quality improves toward the north in the north-east and north-west quarters of the Earth but toward the south in the south-east and south-west quarters of the Earth (Figure 1). No alternative theory that we know of does so. As a result, our study provides novel evidence that brings global geography, local ecology, and socio-economic circumstances together to help us better understand psychologically why some governments rule better or worse than others. Given the importance of quality governance for human societies, this is no small gap to fill.

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Supplemental Material

Supplemental material for this article is available online.

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