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Cold, Heat, Wealth, and Culture

Evert Van de Vliert and Dejun Tony Kong

Abstract

This chapter entertains the question of how, or rather, why fundamental freedoms are unevenly distributed around the globe. We propose an explanation in terms of climatic cold and heat ranging from undemanding to demanding, and economic wealth ranging from poor to rich. Fundamental freedoms appear to increase in a stepwise manner in populations faced with *threatening* (demanding, poor) to *unthreatening* (undemanding, poor) to *unchallenging* (undemanding, rich) to *challenging* (demanding, rich) places of residence. This ecological regularity applies to freedom from ingroup-outgroup discrimination, freedom from hierarchical discrimination, freedom from corruption, freedom from aggression, freedom to trust, and freedom to be creative. As an additional discovery, we find increases in cultural expressions of freedom away from the threatening places of residence around the equator toward the challenging places of residence at higher latitudes in both hemispheres. The observed ecological and latitudinal trends are generalizable across cultural freedoms, across space, and across time.

Many civilizations have worshipped the Sun or the Earth—and for good reasons. If the Sun would shine from farther away or closer up, humankind would freeze to death in the cold or burn to death in the heat. If the Earth would not spin around the Sun and around its own tilted axis, its inhabitants would freeze to death in the one hemisphere with eternal winter or burn to death in the opposite hemisphere with eternal summer. Indeed, the Sun’s radiation and the Earth’s rotation support life. Conversely, all living species on our planet must carefully navigate between climatic cold and heat. These adaptations are particularly relevant to humans, who feed on plants and animals. As a notable consequence, few of our ancestors have migrated to arctic or desert regions, where livability is highly problematic. Elsewhere, our ancestors have created lots of practices and artefacts, including money, to meet basic needs during cold winters or hot summers. So pervasive are these adaptations that we have come to disconnect them from ambient temperatures.

This chapter concentrates on population-level connections between thermal climate and societal culture—the shared system of needs and stresses, and embedded behavioral goals, means, and outcomes at the place of residence (Van de Vliert, 2013a). We first describe Hofstede’s (1980) early discovery of some mysterious connections between a country’s distance from the equator and the national culture of its inhabitants. Hofstede speculated that the latitudinal gradient of average temperatures might be ultimately accountable for the latitudinal gradients of cultural individualism and power differences (see also Chapter 3 by Peter Smith for a review of Hofstede’s work). Inspired by recent work (Van Lange, Rinderu, & Bushman, 2017a), we refine that early climate-culture speculation by addressing the broader puzzle of latitudinality. The remaining sections then review and generalize latitude-related evidence of climato-economic pressures on cultural individualism and political democracy as components of freedom, and on four other cultural characteristics with

sufficient sample sizes in both latitudinal hemispheres: corruption and aggression as antisocial characteristics; trust and creativity as prosocial characteristics.

A Mysterious Discovery

Cold, heat, and culture have in common the spatial characteristic that they vary along the north-south axis of the Earth in a remarkable fashion. Cold extremes and some cultural characteristics increase, whereas heat extremes and other cultural characteristics decrease, toward the north and south poles. As a case in point, back in the 1970s, Hofstede (1980) detected that cultural individualism steeply increases, whereas power differences steeply decrease, at higher latitudes with colder winters and cooler summers. For example, compared to the Guatemalans and the Malaysians at lower latitudes, the Danes and the New Zealanders at higher latitudes appeared to place much more value on cultural individualism and power equality. This is a mystery because geographic latitude—an imaginary line connecting locations at a given distance from the equator—has descriptive rather than explanatory relevance.

Confronted with this mystery, Hofstede (1980, 2001) argued that thermal climate might be at the beginning of a causal chain toward individualism and egalitarianism because colder environments are more problematic and harder to cope with. In countries with colder winters and cooler summers, survival and population growth are more dependent on human intervention in nature, with the complicating effects that there is more need for technology, more technological momentum for change, more questioning of group rules and authority, and more two-way teaching and learning. In subtropical and tropical climates, by contrast, there is less need for human intervention and for technology, leading to a more static society in which boundaries between ingroups and outgroups are more persistent, authority is

questioned less, and teachers are increasingly experienced as omniscient and powerful. It was only decades later that others, to which we now turn, started to refine Hofstede's seminal speculations about latitudinal gradients of cold, heat, and culture.

Latitudinal Gradients of Cold and Heat

The most recent understanding of the latitude-related impact of climate on culture is that average temperature and seasonal variation in temperature jointly help shape the evolution of societal functioning (Gailliot, 2014; Van Lange et al., 2017a). Average temperature as such is an inaccurate determinant because it ignores the bipolarity of thermal livability. Clearly, 4°C and 40°C both pose existential problems, so that larger seasonal variations around the same mild average temperature have larger impacts on societal functioning (Van de Vliert & Tol, 2014). Also, higher latitudes have both lower averages and larger variations in temperature over the course of the year. These shortcomings of average temperature as a predictor of culture can be overcome by concentrating on winter and summer deviations from a biologically optimal point of reference.

Current climate-culture research adopts 22°C (~72°F) as a benchmark from which measurements of societal livability are made. This temperature is the approximate midpoint of the individual ranges of comfortable temperatures (Parsons, 2003) and the temperature preferred by tourists (Bigano, Hamilton, & Tol, 2006). Also, existential needs for nutrition and health are met more easily in climates with temperatures varying around a base range of, say, 17 to 27°C (Cline, 2007; Parker, 2000; Van de Vliert, 2009). Thus, climates are more demanding to the extent that their winter temperatures are colder than 22°C (cold demands) and their summer temperatures hotter than 22°C (heat demands).

Indices for cold and heat deviations from 22°C, and for total temperature deviations from

22°C, are available for at least 232 independent countries and dependent territories (Van de Vliert, 2013c; <http://www.rug.nl/staff/e.van.de.vliert/projects>). These indices reveal that the present-day Earth offers humans, and the plants and animals they feed on, larger cold deviations from 22°C ($M = 30.94$, $SD = 25.97$) than heat deviations from 22°C ($M = 21.28$, $SD = 7.61$). Additionally, these indices reveal that the latitudinal gradient of cold demands ($r = .89$, $p < .001$) is much steeper than the latitudinal gradient of heat demands ($r = -.51$, $p < .001$), so that the total of the current thermal demands increases from the equator toward the poles. By implication, compared with latitudinal decreases in heat demands, latitudinal increases in cold demands provide potentially more convincing explanations of latitudinal gradients of culture, at least within the context of the present Sun-Earth system.

Latitudinal Gradients of Culture

Back to the 1970s and to Hofstede's (1980) mysterious discovery. Across 40 countries, cultural individualism ($r = .75$, $p < .001$) and power differences ($r = -.65$, $p < .001$) were not only oppositely associated with absolute latitude; they were also negatively associated with each other ($r = -.67$, $p < .001$). More specifically, cultural individualism and power differences loaded on the same bipolar factor, which seemed to make little sense and therefore led Hofstede to treat them as if they represent distinct dimensions instead of opposite poles of the same dimension. Four decades onward, it has slowly but surely become clear how we should interpret and understand cultural individualism and power differences as opposite ends of one and the same dimension—freedom (Van de Vliert, 2013a).

Cultural individualism refers to freedom from the constraint of social discrimination, that is, freedom from identifying and maintaining sharp boundaries between ingroups and outgroups, between “us” and “them”. There is more individualism and less ingroup-outgroup

discrimination where there are fewer external threats to one's ingroups and thus less necessity of group defense (Brewer, 1999; Richter & Kruglanski, 2004; Triandis, 1995), and where there is less competition for scarce resources through coalitional activity (Bugental, 2000). Similarly, yet differently, power equality refers to freedom from the constraint of superordination and subordination where members of a society discriminate less between higher-ups and lower-downs. Power equality maximizes freedom from hierarchical discrimination by minimizing "the provision (or possible revision) of benefits (e.g., protection, resources) or limitation of costs (e.g., aggression) by the more dominant individual in return for the compliance or deference of the less dominant individual" (Bugental, 2000, p. 201).

So, cultural differences in individualism versus collectivism and in power equality versus inequality are both "daughters" of the "mother" dimension of differences in freedom from having to continuously and carefully scan the social environment for interactional requirements. However, this one-dimensional perspective of freedom from social constraints complicates rather than simplifies the biogeographic puzzle. Freedom from positive discrimination of ingroup members, freedom from negative discrimination of outgroup members, freedom from obedience to authority, and freedom from mutiny and rebellion all increase with distance from the equator. What on Earth is going on? Why do populations at different latitudes acquire, value and practice distinct algorithms of personal freedom from social constraint? Are these algorithms generalizable to freedom from other social constraints such as values and practices dealing with corruption, aggression, trust, creativity, and more? Are cold and heat—and tools to handle cold and heat—playing parts?

The Broader Puzzle of Latitudinality

Latitudinal gradients in living species have been well-documented for centuries. Most notably, biologists are familiar with (a) the Bergmann effect—the increase of body size at higher latitudes, (b) the Allen effect—the decrease of surface-to-volume ratio at higher latitudes, and (c) the Forster effect—the smaller numbers of animal and plant species at higher latitudes, commonly referred to as the latitudinal gradient in biodiversity (Harcourt, 2015). Similarly, just like biodiversity in non-human species, linguistic diversity in humans decreases at higher latitudes (Nettle, 1998, 1999), whereas economic wealth increases at higher latitudes (Parker, 2000; Theil & Galvez, 1995; Van de Vliert, Kluwer, & Lynn, 2000; Williamson & Moss, 1993; Zuleta, 2012). Despite all this work on latitudinality, surprisingly little use has been made of the informative value of the opposite directions of distances from the equator in the northern and southern hemispheres.

Insert Table 1 about here

Borrowing from “Hell on Earth? Equatorial peaks of heat, poverty, and aggression” (Van de Vliert & Daan, 2017), we propose that latitudinal gradients of cold and heat are more plausible origins of latitudinal gradients of culture to the extent that these gradients (a) occur in the northern hemisphere, (b) replicate in the southern hemisphere, and (c) reverse their downward or upward sloping direction at a near-equatorial turning point. Table 1 illustrates for Hofstede’s (2001) 50 countries and 3 regions, how the prevalences of thermal demands and cultural freedom increase at more northern latitudes north of the equator but decrease at more northern latitudes south of the equator. What are the odds that this is a coincidence or that an ecological condition other than thermal climate must be held accountable for this remarkable north-south reversal of culturally anchored freedom?

Perhaps it may be wiser to think somewhat broader and deeper about the near-equatorial reversal points of the latitudinal gradients of cultural freedom in Table 1. These oppositely sloping northern and southern gradients of discrimination between ingroups and outgroups (cultural individualism) and between higher-ups and lower-downs (power differences) imply the existence of equatorial peaks of social constraints. If one thinks of them as equatorial troughs of freedom from social-psychological constraints, they elegantly match the pit of abject poverty that economists call the equatorial grand canyon of wealth (Parker, 2000; Theil & Galvez, 1995). Therefore, it is not inconceivable that national wealth mediates and modifies the impact of thermal climate on societal culture, an idea that has come to be known as the climato-economic theory of culture (Van de Vliert, 2009, 2013a).

Climato-Economic Pressures on Cultural Freedom

An incomplete and in fact painfully misleading story has it that climate determines culture. For more than twenty-five centuries, scientists have told that story over and over again (Feldman, 1975; Jankovic, 2010; Sommers & Moos, 1976). Ibn Khaldun, for example, observed that “the more emotional people were in the warmer climes with the prudes in the frigid North” (Harris, 1968, p. 41). At the beginning of the 20th century, proponents of the geographical school similarly argued how climate determines who we are and what we do (Sorokin, 1928; Tetsuro, 1971), sometimes with horrifying overtones of the superiority of some races and inferiority of others (Huntington, 1945; Taylor, 1937). As so often, the psychological truth is more complex.

It is an undeniable fact that colder winters and hotter summers entail larger deviations from physiological homeostasis, fewer nutritional resources, greater health problems, and shrinking control over everyday life until ultimately the zero point of freedom is reached

(death). But it is a mistaken idea that humankind has no other option than adapting passively to a fixed climatic habitat. Montesquieu (1748/1989) was the first to realize that money and property are used for coping with climate. The scientific breakthrough formulated by Montesquieu is the insight that people predominantly exchange money for goods and services that satisfy climate-related needs for thermal comfort, nutrition, and health. Basically, he saw a harsh climate as a crucial livability problem and national wealth as a proxy for the availability of resources to cope with that problem (i.e., as an economic modifier of climate–culture links).

Money is itself a cultural invention. Humans became more distinct from other warm-blooded animals when they started to obtain and store property. With the advent of agriculture, property became more important when people began keeping stores of food and domesticated animals. Property allowed trading. Trading led to the invention of money, which can be stored longer and more easily than agricultural products and creates more room for implementing free choice. Somewhere along this evolutionary path, humans started to use cash and capital for coping with bitter winters and scorching summers. There is much reason to believe—and ample evidence to support—the two-way notion that thermal demands undermine economic wealth, and that economic wealth influences the climatic impact on culture (Chen, Hsieh, Van de Vliert, & Huang, 2015; Conway et al., 2017; Fischer, 2013; Fischer & Van de Vliert, 2011; Karwowski & Lebuda, 2013; Kong, 2013, 2015; Robbins, 2015; Van de Vliert, 2009). Cash and capital can, to a large extent, help prevent and de-escalate climatic threats by turning cold demands or heat demands into climatic challenges.

Liquid cash is particularly useful for handling harsh winters or summers because it can be flexibly moved across goods and services, buyers and sellers, places and times. Earning, saving, and trading can help prevent and dispel discomfort, hunger, thirst, and illness in cold and hot areas and seasons. Economic modeling of climatic cold and heat as cost-raising

factors (Burke, Hsiang, & Miguel, 2015; Jankovic, 2010; Rehdanz & Maddison, 2005; Welsch & Kuehling, 2009) leads to the conclusion that both colder winters and hotter summers generate less income (Burke et al., 2015), and are more expensive (Van de Vliert, 2013c). In some places, such as in the equatorial grand canyon (Parker, 2000; Theil & Galvez, 1995), the tipping-point of poverty is passed with climato-economic misery as a result. Elsewhere, economic wealth can increase degrees of freedom by providing all the necessities of life including special clothing, housing, warming and cooling devices, appropriate meals, medical cure and care, and numerous other temperature-related goods and services.

Climato-economic theorizing proposes that the same degree of climatic cold or heat can be appraised as either negatively or positively demanding and stressful depending upon the money and property available for handling cold and heat (Van de Vliert, 2009, 2013a). The greater economic costs of living in colder or hotter places evoke stronger threat appraisals in case of poverty but stronger challenge appraisals in case of affluence. To clarify and specify how this climato-economic interaction works, it helps to think about the two underlying dimensions as providing from few to many resources. The climatic dimension ranges from few nutritional and health resources (demanding) to many nutritional and health resources (undemanding). The economic dimension, measured as log transformed income per capita in international dollars, ranges from few cash and capital resources (poor) to many cash and capital resources (rich).

Insert Figure 1 about here

A two-by-two conceptualization of this climato-economic space results in four prototypical circumstances of pressures on livability and culture creation. As visualized in

Figure 1, habitats can be understood as being (1) *threatening*—demanding, poor, (2) *unthreatening*—undemanding, poor, (3) *unchallenging*—undemanding, rich, or (4) *challenging*—demanding, rich. Recent regression analyses based on this typology have made Hofstede’s (1980, 2001) mysterious discovery about the bipolarity of cultural individualism at higher latitudes and power differences at lower latitudes less mysterious. Freedom from ingroup-outgroup discrimination and freedom from hierarchical discrimination both appear to be lowest in threatening habitats, intermediate in unthreatening and unchallenging habitats, and highest in challenging habitats (Van de Vliert, 2009, 2013a).

Freedom from Ingroup-Outgroup Discrimination

As small-group animals, by nature humans tend to distinguish between ingroups (positive discrimination) and outgroups (negative discrimination). Owing to various pressures, however, some are driven more by the unfree discriminatory boundaries between their ingroups and outgroups than others. The *some* we have come to call *collectivists*, the *others* we have come to call *individualists*, and the in-betweens we have come to place on a continuum of diminishing ingroup-outgroup discrimination (e.g., Gelfand, Bhawuk, Nishii, & Bechtold, 2004; Hofstede, 2001; Oyserman, Coon, & Kemmelmeier, 2002; Triandis, 1995). Treading in the footsteps of Harry Triandis (1989, 1995), collectivist versus individualist populations are defined here in terms of the degree to which individual members are allocentric versus idiocentric in orientation.

A population has a relatively unfree collectivist identity if there is a smaller proportion or under-representation of idiocentrics and a larger proportion or over-representation of allocentrics—“individuals who see themselves as parts of one or more collectives (family, co-workers, tribe, nation); are primarily motivated by the norms of, and duties imposed by, those

collectives; are willing to give priority to the goals of these collectives over their own personal goals; and emphasize their connectedness to members of these collectives” (Triandis, 1995, p. 2). In collectivist cultures, goals tend to be compatible with ingroup rules and roles, priority is given to relationships over rationality, behavior is primarily determined by sanctioned duties and obligations, and sharing of resources is common (Gelfand et al., 2004).

By contrast, a population has a relatively free individualist identity if there is an under-representation of allocentrics and an over-representation of idiocentrics—“individuals who view themselves as independent of collectives; are primarily motivated by their own preferences, needs, rights, and the contracts they have established with others; give priority to their personal goals over the goals of others; and emphasize rational analyses of the advantages and disadvantages to associating with others” (Triandis, 1995, p. 2). In individualist cultures, personal goals tend to be unrelated to other people’s goals, priority is given to idiosyncratic rationality over relational rationality, behavior is primarily determined by one’s own needs and perceptions, and sharing of resources is largely at the personal discretion of each individual member (Gelfand et al., 2004).

The first large-scale measure of this cross-national dimension of freedom from ingroup-outgroup discrimination (Hofstede, 1980, 2001) contrasted the work goals of training, physical conditions and use of skills on the collectivist pole with the work goals of personal time, freedom and challenge on the individualist pole. A more sophisticated measure (Van de Vliert, 2011a) later contrasted discriminatory treatment of members of the nuclear family, relatives at large, and fellow nationals on the collectivist pole with freedom from such discrimination on the individualist pole. Middle managers’ participative observations of values and practices of familism ($n = 17,370$ from 57 countries), top executives’ judgments of nepotism ($n = 10,932$ from 116 countries), and citizens’ self-reported norms of compatriotism

($n = 104,861$ from 73 countries) were integrated into a reliable and valid 123-nation index of ingroup favoritism and outgroup derogation (Cronbach's $\alpha = .89$).

Insert Figure 2 about here

Neither the original study (Van de Vliert, 2011a) nor follow-up studies (Van de Vliert & Postmes, 2012, 2014) have paid attention to the spatial distribution of ingroup-outgroup discrimination along the north-south axis of the Earth. Here, we correct this omission. Refining one of Hofstede's early findings, Figure 2 shows a latitudinal gradient of freedom from ingroup-outgroup discrimination that replicates across the northern and southern hemispheres, and reverses its direction at $9^{\circ}22'$ north of the equator.¹ Methodologically, the repetition across hemispheres reflects replicative reliability, whereas the near-equatorial reversal point reflects ecological validity. Populations reported less freedom from ingroup-outgroup discrimination at more northern latitudes in the southern hemisphere ($r_{23} = -.41, p < .05$) but more of such freedom at more northern latitudes in the northern hemisphere ($r_{100} = .40, p < .001$). This is where the climato-economic pressures on cultural freedom come in.

Thermal demands (4%), wealth resources (33%), and their interaction (10%) account for 47 percent of the variation in freedom from ingroup-outgroup discrimination, and for 84 percent of the descriptive latitudinal differences in this type of freedom represented in Figure 2. Familism, nepotism, and compatriotism are all over-represented among inhabitants of threatening habitats (e.g., Kazakhstanis and Mongolians), intermediately prevalent among inhabitants of unthreatening and unchallenging habitats (e.g., Guyanese and Singaporeans), and under-represented among inhabitants of challenging habitats (e.g., Icelanders and Americans). No evidence surfaced that the results were an epiphenomenon of the impact of

parasitic diseases (Van de Vliert & Postmes, 2012), state antiquity, language diversity, ethnic heterogeneity, religious heterogeneity, or income inequality (Van de Vliert, 2011a).

Two within-country investigations corroborated these cross-country findings. The first study, comparing inhabitants of unthreatening and threatening habitats, was done in a relatively poor country home to the largest collectivist civilization on Earth. Han Chinese in the economically more developed southern provinces with more temperate climates (e.g., Fujian and Guangdong) reported greater freedom from ingroup-outgroup discrimination than Han Chinese in the poorer northern provinces with more demanding climates (e.g., Inner Mongolia and Heilongjiang) (Van de Vliert, Yang, Wang, & Ren, 2013). These climato-economic results were robust against controlling for population density and percentage of minorities.

The second study, comparing inhabitants of unchallenging and challenging habitats, was done in a relatively rich country home to the largest individualist civilization on Earth. Americans reported more freedom from ingroup-outgroup discrimination to the extent that they resided in the richer northern states with more demanding climates (e.g., Alaska and North Dakota) rather than in the economically less developed southern states with more temperate climates (e.g., Louisiana and Hawaii) (Van de Vliert, 2013a). Taken together, the oppositely sloping latitude-freedom tendencies within two large northern-hemisphere countries that have similar latitudes support climato-economic theorizing rather than alternative latitude-related causes of freedom including magnetic field, daylength variation, average temperature level, seasonal cycle, and parasitic disease burden.

Freedom from Hierarchical Discrimination

To improve the effectiveness and efficiency of their activities, humans have invented organizational structures and cultures that distinguish between leaders and followers. Almost self-evidently, this distinguishing between higher-ups and lower-downs has been implemented first and foremost in one's own groups and not in other groups out there. What's more, the sharper the ingroup boundaries and the more dangerous the environment, the stronger the tendency to appoint leaders who defend these boundaries and maintain the group's integrity by coordinating the collective activities (Milgram, 1974; Richter & Kruglanski, 2004; Triandis, 1989, 1995). As a consequence, hierarchical discrimination tends to be superimposed onto ingroup-outgroup discrimination. It further clarifies why cultural individualism—the opposite of collectivist intergroup discrimination—and power differences stand out as opposite ends of a latent bipolar dimension of culture (Hofstede, 1980, 2001; Gelfand et al., 2004), which can be further demystified into a unipolar dimension of cultural freedom (Van de Vliert, 2013a).

Back again to the 1970s, when larger power differences between superiors and subordinates were not yet seen scientifically as basic restrictions to freedom. Hofstede (1980) superficially observed that subordinates at a greater distance from the equator had a weaker preference for an autocratic or paternalistic boss, actually had less autocratic or paternalistic bosses, and were less afraid to express disagreement with their managers. Hofstede did not, however, trace this observation back to the existence of a more general latitudinal gradient of freedom. The underlying dimension of freedom surfaced more saliently only when *Freedom House*, an independent watchdog organization dedicated to the expansion of freedom, started to report an annual survey of political rights and civil liberties around the world (Gastil, 1978). Ever since, country populations have been judged as being free, partly free, or not free on the basis of the opportunity to act spontaneously in a variety of fields outside the control of the government and other centers of potential domination.

Insert Figure 3 about here

A more extensive and inclusive measure, which adds effective democracy to Freedom House's formal democracy, combines civil liberties, free elections, party competition, and citizen participation (Pemstein, Meserve, & Melton, 2010). Just like the index of power differences in Table 1, this Unified Democracy Score (UDS), too, can be elegantly projected along the north-south axis of the Earth. Further refining Hofstede's (1980, 2001) seminal findings, Figure 3 pictures UDS as a latitudinal gradient of freedom from hierarchical discrimination that reliably replicates across the northern and southern hemispheres, and validly reverses its direction at $10^{\circ}47'$ north of the equator. Inhabitants of countries at more northern latitudes enjoy less freedom from hierarchical discrimination in the southern hemisphere ($r_{41} = -.41, p < .01$) but more of such freedom in the northern hemisphere ($r_{148} = .35, p < .001$). How come?

Across 174 nations, thermal demands (6%), wealth resources (22%), and their interaction (7%) account for 35 percent of the variation in freedom from hierarchical discrimination, and for 77 percent of its latitudinal distribution pictured in Figure 3. Parasite prevalence, a known predictor of democratization and liberalization (Thornhill, Fincher, & Aran, 2009), cannot alternatively explain this result. When the prevalences of human-to-human transmitted non-zoonotic diseases, animal-to-human transmitted zoonotic diseases, and their interaction, are first controlled for, climato-economic habitat still accounts for the largest part of the variation in freedom ($\Delta R^2 = .21$). However, when climato-economic habitat is first controlled for, parasitic disease burden cannot additionally account for any variation in freedom ($\Delta R^2 = .00$; Van de Vliert & Postmes, 2012). Freedom from hierarchical discrimination is lowest in

threatening habitats, intermediate in unthreatening and unchallenging habitats, and highest in challenging habitats.

All in all, the superimposition of hierarchical discrimination onto ingroup-outgroup discrimination produces so-called *vertical collectivism*, whereas the superimposition of freedom from hierarchical discrimination onto freedom from ingroup-outgroup discrimination produces so-called *horizontal individualism* (Triandis, 1989, 1995). What initially loomed as a mysterious discovery, in the end reveals itself as a reliably replicable latitudinal gradient of freedom in people ranging from minimally free vertical collectivists (e.g., Chadians and Laotians) through partly free horizontal collectivists and vertical individualists (e.g., Cypriots, Maldivians, Nicaraguans, and Omani), to maximally free horizontal individualists (e.g., Australians and Scandinavians).

Other Cultural Characteristics

The existence of a robust and meaningful latitudinal gradient of cultural freedom is addressed here for the first time. In three respects, the descriptive latitudinality of freedom hints at explanatory relevance beyond its immediate messages pertaining to the increases in cultural individualism, power equality and political democracy away from the equator and toward the poles. First, it is unlikely that the results in Table 1 and in Figures 2 and 3 emerge by chance—that the southern and northern gradients, and their near-equatorial reversal points occur randomly. Second, the complementary northern and southern gradients hint at worldwide explanations of cultural characteristics competing with explanations based on local circumstances in only one half of the planet. Third, steepness of latitudinal gradients and near-equatorial reversals can be used as criteria to select latitude-related predictors that help to indirectly or directly predict and explain latitudinal gradients of culture.

As outlined above, the oppositely sloping northern and southern latitudinal gradients of cold, heat, and wealth qualify as predictors, if not explainers, of the oppositely sloping northern and southern gradients of cultural individualism, power equality, and political democracy. This is an informative biogeographic statement. Psychologically, however, it is even more informative to have learned that cultural collectivism, power differences and political autocracy thrive in poor societies in demanding climates (threatened populations), whereas cultural individualism, power equality and political democracy thrive in rich societies in demanding climates (challenged populations), and that the cultural in-betweens thrive in societies in temperate climates irrespective of their level of wealth (neither threatened nor challenged populations).

The further sections of this chapter are designed in such a way that we seek to broaden and generalize these biogeographic and psychological backgrounds of description, prediction and potential explanation of culture. From publicly available data sources we sampled four characteristics of national culture representing (a) at least 25 data points on each side of the geographic equator, (b) antisocial and prosocial orientations that are broadly relevant for survival and welfare of individuals and groups in the here and now, and (c) behaviors as well as mindsets. Specifically, our sampling design led us to select two antisocial characteristics (corruption and aggression) and two prosocial characteristics (trust and creativity) of cross-cultural differences on a global scale across both latitudinal hemispheres.

Corruption

Corruption, as a global issue, has been identified by the World Bank as “the single greatest obstacle to economic and social development” (Hodgson & Jiang, 2007, p.1043). Corruption in both public and private sectors has many faces, but the commonality shared in all these

faces is simple. Appointed or elected incumbents of organizational positions are corrupt when they use the authority and power of their position to get or do something to which their position does not entitle them. The most obvious reason for being corrupt is to obtain money, goods or services, whether or not in response to bribery or social pressure, or in exchange for protection from harm. However, position incumbents may also become corrupt because they fall victim to ingroup-outgroup discrimination, hierarchical discrimination, or both.

The World Economic Forum (2007), an organization committed to improving international business, attempts to assess corruption by asking top executives questions such as: “In your country, diversion of public funds to companies, individuals, or groups due to corruption never occurs (... is common)”, “When deciding upon policies and contracts, government officials are neutral (... usually favor well-connected firms and individuals)”, and “Do illegal payments influence government policies, laws, or regulations, and impose costs or otherwise negatively affect your company (no, they have no impact ... yes, they have a significant negative impact)?” The resulting corruption scores tend to be relatively high in poor populations threatened by cold winters (e.g., Mongolians) or hot summers (e.g., Chadians), but relatively low in rich populations challenged by cold winters (e.g., Finns) or hot summers (e.g., Singaporeans). Thus, as hypothesized in Figure 1, this result supports the contrast between threatening and challenging pressures on livability and culture creation.

Insert Figure 4 about here

A more representative corruption perceptions index provided by Transparency International (<http://www.transparency.org/cpi2012>) incorporates the views of multiple observers including businesspeople, country risk analysts, and the general public. This

composite variable of corruption has a positive relationship with more northern latitudes in the southern hemisphere ($r_{34} = .59, p < .001$), and an oppositely sloping negative relationship with more northern latitudes in the northern hemisphere ($r_{140} = -.43, p < .001$). The latitudinal reversal point, located at $8^{\circ}12'$ north of the equator and portrayed in Figure 4, reflects ecological validity resting on the reliable replication of the corruption gradient across hemispheres. This picture may perhaps again support a climato-economic contextualization of a salient characteristic of culture, namely, corruption.

Thermal demands (8%), economic poverty (49%), and their interaction (4%) account for 61 percent of the worldwide variation in corruption. Poorer populations coping with more extreme temperatures are increasingly prone to corruption. Although bipolar latitude (6%) and bipolar latitude squared (19%) can also predict 26 percent of the global differences in corruption, these effects are almost totally overruled and wiped out by the latitudinality of the interacting climatic and economic predictors. In essence, the dual latitudinal gradient of corruption in Figure 4 is a reflection of the more meaningful tendencies that corruption is highest in threatening habitats, intermediate in unthreatening and unchallenging habitats, and lowest in challenging habitats. Future research should fine-tune this conclusion to the numerous chameleonic guises of corruption.

Aggression

In common with other animals, humans often exhibit a basic *flight-or-fight* response to a stressful or dangerous situation. No matter whether fight reactions are viewed as instinctive, as learned behavior, or as the consequence of frustration, for most scholars “aggression is in the perpetrator, by the perpetrator, and from the perpetrator” (Goldstein, 1994, p. vii). The alternative view expounded here emphasizes the impact of place and ecology on aggression

by building on a new model of CLimate, Aggression, and Self-control in Humans (CLASH; Van Lange et al., 2017a). CLASH postulates that lower temperatures, and especially larger seasonal variations in cold and heat, call for individuals and groups (e.g., Canadians and New Zealanders) to adopt a stronger future-orientation and exert more self-control, which in turn increasingly reduce aggression and violence (e.g., murder, rape, and rebellious riots).

Biogeographically put, CLASH states that aggression and violence decrease as one moves farther away from the equator, and that this latitudinal decline in fighting goes hand in hand with increases in both thermal demands and wealth resources (Van Lange, Rinderu, & Bushman, 2017b). This covariation of cold, heat, wealth, and aggression is of crucial importance for the central mission and message of this chapter. The extended and refined CLASH model incorporates climato-economic theorizing by hypothesizing that national wealth both mediates and modifies the impact of thermal climate on cultures of social and political unrest and riots, homicide, aggressive attacks, violent repression, harassment, bullying and abuse.

In order to test the integrated impacts of thermal demands and wealth resources on population-level conflict and violence, Van de Vliert and Daan (2017) averaged three national measures of aggressiveness and its consequences: the 2010 index of domestic conflict and violence ($n = 146$; obtained from <http://www.visionofhumanity.org/#/page/indexes/global-peace-index/2010>), mean press repression during the years 2005-2007 ($n = 160$; retrieved on 15 January, 2008 from <http://www.rsf.org>), and reported business costs of aggressive crime and violence ($n = 128$; World Economic Forum, 2007). This internally consistent index of aggression (Cronbach's $\alpha = .70$) can be unfolded into a positive southern-hemisphere gradient ($r_{35} = .42, p < .01$) and a negative northern-hemisphere gradient ($r_{132} = -.53, p < .001$) with a near-equatorial reversal point at $4^{\circ}59'$ north of the equator.

Insert Figure 5 about here

The tent-shaped north-south distribution of aggression in Figure 5 can be almost fully (for 93%) understood in terms of the interplay between extreme temperatures and extreme poverty. Regarding main effects, Van de Vliert and Daan (2017) have shown that the impact of increasingly warm winters and hot summers is not a direct effect but is completely mediated by economic poverty, accounting for 43 percent of the variation in societal aggression. Regarding interaction effects, they have additionally shown that the sizable impact of poverty on aggression is slightly modified by heat (an increase from 43 to 47%). Higher levels of poverty are associated with decreasingly higher levels of aggression at increasingly higher levels of heat. The interplay of hellish heat and abject poverty in overly threatening habitats thus appears to temper rather than fuel aggression, which remains nevertheless high relative to the levels of aggression in richer regions.

A supplementary analysis explored the validity and generalizability of the prediction model across the latitudinal hemispheres in an attempt to underscore the relevance of the equator as a biogeographic divide. Specifically, Van de Vliert and Daan (2017) regressed their measure of aggression and violence on the interaction of thermal demands and national wealth across the 124 countries above 4°59' N, and then used the resulting equation to successfully predict aggression and violence in the 43 countries below 4°59' N ($r = .44, p < .01$). Mirroring around the near-equatorial reversal point at 4°59' N, threatening alloys of heat and poverty in both the northern and southern hemispheres appear to provoke aggression.

Although gender differences in aggression and violence are well-documented (Goldstein, 1994; Krems & Varnum, 2017; Van Lange et al., 2017b), it is still an open question whether

and how males adapt differently to climato-economic pressures than females in this regard. It is also an intriguing question because there are two counteracting forces at work. On the one hand males and females are both warm-blooded creatures with basic needs for thermal comfort, nutrition, and health, who are sensitive to deviations from thermal neutrality at about 22°C (Parsons, 2003; Van de Vliert, 2009). On the other hand males, and especially young males, are unmistakably more aggression-prone than females.

Trust

Social trust—the willingness to accept vulnerability to the actions of others based on positive expectations of others’ intentions or behavior (Rousseau, Sitkin, Burt, & Camerer, 1998)—has important implications for the social and psychological functioning of markets, organizations, groups, and individuals (Gheorghiu, Vignoles, & Smith, 2009; Kong, 2013). Trusting other people provides the trust-senders as well as the trust-receivers with social capital (Fukuyama, 1995; Herreros, 2004; Welzel & Delhey, 2015). “Social capital increases as the radius of trust widens to encompass a larger number of people and social networks among whom norms of generalized reciprocity are operative” (Realo, Allik, & Greenfield, 2008, p. 447). Generalized trust—and social capital in its wake—might be considered a societal asset that can help actors manage numerous demands and stresses of daily life.

Kong (2013), who was the first to explore the rough and untrodden territory of climatic, economic, and cultural precursors of generalized social trust, discovered that trust—in the terminology of this chapter—is higher in challenging habitats than in unchallenging, unthreatening, and threatening habitats. Greater tolerance for uncertain or unknown outcomes appeared to mediate the relationship between more challenging habitats and higher generalized trust. A follow-up study (Kong, 2016) further revealed that this pattern of results

is gene-dependent. The positive impact of challenging habitats on trust, mediated by tolerance for ambiguity, is weakened by population-level increases in the 5-HTTLPR S-allele prevalence. This gene-environment interaction is thought to be driven by the tendency of the 5-HTTLPR S-allele to narrow the scope of attention and to promote the appraisal of environmental stressors as threats rather than challenges.

Building on Kong's (2013) initial research, Robbins (2015) executed a more comprehensive longitudinal study that included representative data from 123 populations spread over a 29-year time period. Trustfulness was measured with the question, "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" Data were drawn from the World Values Survey (www.worldvaluessurvey.org), the European Values Study (www.europeanvaluesstudy.eu), the 1986 Euro Barometer 25 (Roth, 2009), the Afro Barometer (www.afrobarometer.org), the Arab Barometer (www.arabbarometer.org), the Asian Barometer (www.asianbarometer.org), and the Latino Barometer (www.latinobarometro.org). The proportion of a country's population that chose "most people can be trusted" was used as the dependent variable. Sophisticated analyses demonstrated that thermal demands and wealth resources interacted in determining generalized trust, even after controlling for Nordic habitat, monarchical government, and the communist past.

An interesting extra observation, exclusively reported here, concerns the distribution of trust along the north-south axis of the Earth. The tentatively negative gradient in the southern hemisphere ($r_{22} = -.35$, n.s.) turns into a positive gradient in the northern hemisphere ($r_{92} = .46$, $p < .001$) right at the equator ($0^{\circ}16' S$). Given that trusting other people is a building stone of education, leadership, negotiation and conflict management, organizational development, economic transactions, and public governance (e.g., Bachman, 2011; Colquitt, Scott, & LePine, 2007; Dirks & Ferrin, 2001, 2002; Gunia, Brett, Nandkeolyar, & Kamdar, 2011;

Kong, Dirks, & Ferrin, 2014; Lu, Kong, Ferrin, & Dirks, 2017; Realo et al., 2008), this J-curved north-south distribution emphasizes the importance of an ecological explanation of the evolution of culturally shared trust.

Depending on the modeling technique used, thermal demands plus wealth resources (24 to 29%), their interaction (8%), and the control variables (14 to 16%) account for 46 to 53 percent of the cross-national variation in trust. Corroborating Kong's (2013) results, Robbins (2015), too, came to the conclusion that only the inhabitants of challenging habitats develop mutual trust on a broad scale. Thus, the climato-economic pressures on culture seem to be less pronounced for trust than they are for other aspects of societal functioning. Cultural collectivism, power differences, corruption, and aggression are all able to mark their over-representation in threatening relative to unthreatening habitats, as well as their under-representation in challenging relative to unchallenging habitats. Trust, however, is only able to one-sidedly mark its over-representation in challenging relative to unchallenging habitats. There is not the slightest indication yet that the inhabitants of threatening and unthreatening habitats differ in how much they trust their fellow locals.

Creativity

Throughout human evolution, stressfully demanding winters and summers at different latitudes have required novel inventions and innovations. Perhaps, then, it should not come as a surprise that the worldwide variation in the prevalence of individual and cooperative creativity is still visible among contemporary inhabitants of threatening versus challenging habitats. The greater creativity triggered by seasonal challenges in rich populations, compared to seasonal threats in poor populations, presumably has been gradually generalized and sublimated into a wider variety of inventions and innovations as well as higher investments in

institutionalized research and development. Murray (2014) has shown that lower prevalence of disease-causing pathogens is robustly associated with higher creativity, but another study of the ecological origins of populational creativity (Karwowski & Lebuda, 2013) seems to suggest that parasitic pressure is in fact a manifestation of climato-economic pressure.

The apparent geography of creativity has led Van de Vliert and Murray (2018) to investigate which variable predicts creative behavior the best—parasitic stress or climato-economic stress. This is more than a matter of effect size because parasitic pressure is qualitatively—and thus theoretically—different from climato-economic pressure. Unlike humans, parasites cannot discriminate between unthreatening and unchallenging habitats in comforting climates, nor can they discriminate between threatening and challenging habitats in stressfully demanding climates. Or, put from another perspective, parasites may be better at undermining rather than underpinning human creativity, whereas wealth resources may be better at underpinning rather than undermining societal invention and innovation (cf. Van de Vliert, 2013c; Van de Vliert & Postmes, 2012).

Murray (2014) constructed a 155-country index of invention and innovation. Creativity was represented by (a) rates of Nobel Prize laureates per country of birth, (b) the technology index of the United Nations, (c) country rates of patent applications from the World Intellectual Property Organization, (d) Cornell University's global innovation index, and (e) a measure of innovation versus invention from the World Economic Forum. As can be seen in Figure 6—looking like Figures 2 and 3 while mirroring Figures 4 and 5—the strength of this broad composite of creativity varies depending on geographic latitude. Compared to southerners, northerners are more creative in the northern hemisphere ($r_{125} = .61, p < .001$) but less creative in the southern hemisphere ($r_{30} = -.53, p < .01$). The latitudinal tipping point is neatly located at the equator ($0^{\circ}36' \text{ N}$).

Insert Figure 6 and Table 2 about here

A conservative test reveals that climato-economic pressure is a better ultimate predictor of latitude-related creativity than parasitic pressure is (Van de Vliert & Murray, 2018). Lower prevalence of human-to-human transmitted non-zoonotic diseases initially seems to account for 37 percent of the variation in creativity (Table 2, model 1), but turns out to be an epiphenomenal effect of population-level intelligence and urbanization (model 2). Model 3 in Table 2 shows that thermal demands ($b = .17, p < .01$) and wealth resources ($b = .65, p < .001$) account for an extra 11 percent over and above the positive impact of national IQ ($b = .02, p < .01$). Most importantly, the interaction of thermal demands and wealth resources also reaches significance ($b = .28, p < .001$), increasing the total effect size from 71 to 77 percent (model 4). Finally, this climato-economic effect can predict 98 percent of the linear and quadratic effects of bipolar latitude on creativity ($R^2 = .44$).

These results bring to light that Nobel laureates, technological pioneers, and innovative entrepreneurs are under-represented in poorer populations, but more so to the extent that these poorer populations reside in threatening habitats. Also, Nobel laureates, technological pioneers, and innovative entrepreneurs are over-represented in richer populations, but more so to the extent that these richer populations reside in challenging habitats. Supplementary analyses suggest that imperfect sampling of small and adjacent countries within the same climatic subzone, and of large countries with different climatic subzones, have biased these results only to a trivial extent. In sum, climatic, economic, and parasitic precursors of creativity appear to be operating in concert rather than in competition as various creativity scholars would have it (e.g., Andersson, Andersson, & Mellander, 2011; Hsiang, Burke, & Miguel, 2013; Murray, 2014; Talhelm et al., 2014).

Generalization Across Cultural Freedoms

The Core of Culture

Does complex culture have a center point? Or, more definitionally phrased, do locally shared needs and stresses, and embedded behavioral goals, means, and outcomes, have a common denominator? Or phrased within the framework of the current essay, did Hofstede (1980) incidentally stumble upon this imaginable core of culture when he was failing to recognize that freedom from ingroup-outgroup discrimination (cultural individualism) and freedom from hierarchical discrimination (power equality) both load on a broader latitude-related dimension of fundamental freedom? Can corruption and aggression be essentially seen as restrictions to fundamental freedoms, whereas trust and creativity can be essentially seen as doors to fundamental freedoms?

These are crucial questions, not in the least because the Universal Declaration of Human Rights and the United Nations Development Programme (UNDP, 2000) attempt to attain fundamental freedoms in all societies on Earth. Both reflect a common motivation to advocate and secure (a) freedom from discrimination—by race, ethnicity, national origin, religion, gender, sexual orientation, age, disability, or other social categorical differences; (b) freedom from fear—of threats to personal security, from torture, arbitrary arrest and other violent acts; (c) freedom of thought and speech and to participate in decision-making and form associations; (d) freedom from want—to enjoy a decent standard of living; (e) freedom to develop and realize one's human potential; (f) freedom from injustice and violations of the rule of law; and (g) freedom for decent work—without exploitation.

This listing of human-rights and human-development goals makes clear that it is difficult to find a more telling center point of culture than fundamental freedom, and that corruption, aggression, trust, and creativity may all meaningfully relate to it. Indeed, the cultural characteristics in this chapter may be manifestations of the latent variable of fundamental freedom. Freedom from ingroup-outgroup discrimination, from hierarchical discrimination, from corruption and from aggression, and the freedom to trust and to be creative may even be treated as a six-pack of features of freedom. The average of the six standardized measures (Cronbach's $\alpha = .92$) is an elegant representation of freedom from ingroup-outgroup discrimination ($r_{123} = .83, p < .001$), freedom from hierarchical discrimination ($r_{189} = .81, p < .001$), freedom from corruption ($r_{174} = .92, p < .001$), freedom from aggression ($r_{167} = .86, p < .001$), freedom to trust ($r_{114} = .69, p < .001$), and freedom to be creative ($r_{155} = .90, p < .001$).

At this point of our discourse, it comes as no surprise that the resulting overall index of fundamental freedom has a relatively flat southern gradient ($r_{42} = -.35, p < .05$), a somewhat steeper northern gradient ($r_{152} = .49, p < .001$), and a near-equatorial turning point ($7^{\circ}33' \text{N}$). Similarly, it should not amaze any reader anymore that thermal demands (10%), wealth resources (45%), and their interaction (8%) account for 63 percent of the variation in fundamental freedom, and for 92 percent of the descriptive latitudinal differences in fundamental freedom.

Insert Figure 7 about here

The plot of this differential climatic effect in poor and rich populations (Figure 7) can be thought of as a worldwide ladder with stepwise increases in fundamental freedom. At the first step of the ladder are minimally free vertical collectivists residing in threatening habitats (e.g.,

Afghans, Sudanese, and Chinese in the northern provinces of China; Van de Vliert, 2013a). At the second step are partly free horizontal collectivists residing in unthreatening habitats (e.g., Nicaraguans, Papua New Guineans, and Sierra Leoneans). At the third step are partly free vertical individualists residing in unchallenging habitats (e.g., Dominicans, Malaysians, and Seychellois). And at the fourth and final step are maximally free horizontal individualists residing in challenging habitats (e.g., Norwegians, Swiss, and Americans in the northern states of the United States; Van de Vliert, 2013a).

If future research confirms that our reading of Figure 7 is a valid mirror of cultural reality around the globe, climatic and economic changes can both cause upward and downward movements on this ladder of fundamental freedom, albeit in completely different ways. The impact of climate change is restricted to smaller changes in freedom between the threat-steps 1 and 2, and larger changes in freedom between the challenge-steps 3 and 4. By contrast, the impact of economic change is restricted to smaller increases or decreases in freedom between unthreatening and unchallenging habitats (steps 2 and 3), and larger increases or decreases in freedom between threatening and challenging habitats (steps 1 and 4).

Strengths and Weaknesses

Of course, inevitably, this latitude-related perspective of climato-economic pressures on unfree versus free culture has inherent strengths and weaknesses as a result of the assumptions and methods employed. The strength of emphasizing latitudinal gradients in ecological causes and cultural consequences comes with the weakness of biogeographic description rather than psychological explanation. The strength of concentrating on the climatic ecology of culture comes with the weakness of neglecting those population-genetic influences that cannot be traced back to climate. The strength of going beyond climatic and economic determinism

comes with the weakness of cross-sectional support for the climato-economic origins of culture (but see the later section on historical evidence). The strength of explaining the spatial distribution of freedom in terms of threat versus challenge appraisals comes with the weakness that these appraisals and the underlying gratification of basic needs for thermal comfort, nutrition, and health have not been measured and analyzed.

Another strength of climato-economic theorizing is the realization that, in order to survive and thrive, humans must continuously avoid or manage climatic deviations from 22°C (~72°F). However, it remains largely unclear whether and when cold and heat shape culture in additive or interactive ways. An insufficiently addressed question is to what extent inhabitants of a given habitat react culturally to cold and heat in general (i.e., to downward and upward deviations from 22°C in total), and to specific combinations of climatic cold and heat. The interacting predictive powers of cold and heat deserve explicit attention also because (a) present-day Earth offers more and higher cold demands and stresses than heat demands and stresses (for details, see Van de Vliert, 2013c), (b) warm winters can compensate extremely hot summers, and (c) cool summers can compensate extremely cold winters (for preliminary results, see Van de Vliert, 2009; Van de Vliert & Tol, 2014).

Generalization Across Space

Climato-economic origins of fundamental freedom are hypotheses rather than experimentally verified facts. An ideal field experiment would randomly manipulate thermal demands and wealth resources in one hemisphere of the Earth, use the other hemisphere as a control condition, and demonstrate that freedoms in the two hemispheres start to diverge as predicted. Convenience sampling of geographic areas and correlation analysis of only the most recent climatic and economic histories cannot provide such proof of causality. Granted, it is a step

forward on the path of generalization across space that attention is now being paid to reverse replication of latitudinal gradients of cold, heat, wealth, and culture. A further step forward can be made by cross-validating climato-economic predictions of culture along lines of longitude. This can be illustrated with the above-introduced six-pack of fundamental freedoms.

Insert Table 3 about here

Table 3 first reports estimates of the impact of thermal demands and wealth resources on fundamental freedom, while controlling for two known confounders across longitudes (human-to-human transmitted non-zoonotic diseases and country size). The results are then broken down for countries in the eastern hemisphere (up to 180 degrees longitude east of the Greenwich meridian) versus countries in the western hemisphere (up to 180 degrees longitude west of the Greenwich meridian). The pattern of regression coefficients in the equation is remarkably stable, so much so that Figure 7 in hindsight can be applied to both the eastern as well as the western hemisphere. Although the replicative robustness of the equation across longitudes should not be mixed up with causation, such cross-validation does seem to narrow the gap between climato-economic description and explanation.

Generalization Across Time

Historical Evidence

Some qualitative support for the climatic ecology of fundamental freedom has been reported elsewhere (Van de Vliert, 2013b), and is summarized here. Most likely, the Norse communities in medieval Greenland collapsed because climato-economic hardships pushed them on a slippery slope toward extinction. Historical and archaeological studies (e.g., Diamond, 2005; Dugmore, Keller, & McGovern, 2007; Fagan, 2008; Seaver, 1996) converge in a picture of Norse and Inuit societies inhabiting southwest Greenland during the 13th and 14th centuries and coping with the same climatic demands in different economic ways. The Norse had a sedentary lifestyle and agricultural economies, whereas the Inuit had a nomadic lifestyle and aquacultural economies. For example, Norse but not Inuit boys and girls learned from their youth up to tend and milk cattle and sheep, to churn butter and make cheese, and to spin and weave wool. The Norse imported tar, lumber, and iron from Europe in exchange for locally woven cloth, arctic furs, and, above all, walrus ivory; the Inuit supported themselves.

When the Little Ice Age gradually replaced the Medieval Warm Period, increasingly long and bitter winters reduced crop and livestock production, increased overgrazing and deforestation, caused malnutrition, weakened immunity to a variety of illnesses, and brought trade with Europe to a virtual standstill. Whereas the colder climate was tolerable or even beneficial for the Inuit with their fishing economy, it was a full-blown disaster for the Norse, whose agricultural economy was too dependent on pasturing animals, growing hay, and long-distance trading by boat. Increasingly, this must have resulted in threat appraisals and discrimination between higher-ups and lower-downs: “There were many innovations that might have improved the material conditions of the Norse. ... But those innovations could have threatened the power, prestige, and narrow interests of the chiefs. In the tightly controlled, interdependent society of Norse Greenland, the chiefs were in a position to prevent others from trying out such innovations” (Diamond, 2005, p. 276).

The most counterproductive adaptation seems to have been the entwinement of hierarchical and ingroup-outgroup discrimination. Perceived threat, common survival goals, power politics, and ingroup love are the ideal seedbed for outgroup hate (Brewer, 1999). More and more, the Christian Norse began to see the Inuit as despicable and mean pagans. This prevented the Norse from trading with the Inuit and learning from them how to build fast kayaks by stretching sealskins over frameworks, how to make harpoons and other whale-hunting equipment, and how to sophisticatedly hunt ringed seals, fish, and whales. Climate-economically reinforced ingroup–outgroup discrimination seems to have pushed away the very lifebelt of intergroup cooperation with the Inuit that could have saved the Norse from downward roads to rack and ruin. Around 1450, the “superior” Norse died out, literally through starvation or Inuit aggression or figuratively through migration, abandoning exhausted lands, farm buildings, and churches to the hands of the “inferior” Inuit.

It is interesting to add that the depth of the Little Ice Age (1500-1700; Burroughs, 1997) started in poverty and ended in riches. Baumeister, Park and Ainsworth (2013) therefore entertain the notion that even the Renaissance in Europe may be seen as a cultural adaptation of rich societies coping with a demanding climate. It may indeed be no coincidence that the Medieval Warm Period was followed by centuries characterized by a challenging palette of global cooling, economic growth, and greater freedom (politically, religiously, scientifically, and artistically), resulting in, for example, the Golden Age of the Netherlands. In the words of Baumeister et al. (2013, p. 484), the sixteenth and seventeenth century saw “the emergence of the individualistic form of selfhood that promotes inner exploration of the single person, and allows people to choose and define who they are.”

Both the extinction of the Greenland Norse and the growth of the Renaissance spirit throughout Europe address past cultural changes. By contrast, negligible change in cultural freedom is predicted if the ecological conditions of thermal demands and wealth resources are

kept constant. Therefore, there is further qualitative support for the climato-economic theory of culture in the example of the Amish people, who originally lived in Alsace, a small part of France near the German–Swiss border. Thousands of Amish migrated to North America between 1815 and 1860, settling in rural areas with climatic and agricultural conditions similar to those prevailing in Alsace: Indiana, Illinois, Iowa, New York, Ontario, Ohio, and Pennsylvania. Totally opposed to the American dream of large profits and innovation, they explicitly sought a farming life with climatic and techno-economic stability. As a consequence, even today, they continue to cling to their traditional goals, means, and outcomes, including values of vertical collectivism and the use of horsepower and natural fertilizers, growing and rotating a variety of crops, and raising livestock in small numbers.

Contemporaneous Evidence

Climato-economic theorizing has been fruitfully applied also to investigate present-day domains of fundamental freedom other than the above-discussed six-pack of fundamental freedoms. The most notable extra domains covered are freedom from fear (Fischer & Van de Vliert, 2011; Van de Vliert, Einarsen, & Nielsen, 2013; Van de Vliert, Huang, & Parker, 2004), freedom to develop and realize one's human potential (Van de Vliert, 2007), freedom from work exploitation (Van de Vliert, Van Yperen, & Thierry, 2008), and press freedom (Van de Vliert, 2011b). Time and again, look alike of Figures 2 to 7 loom up, thus supporting both a latitudinal description and a climato-economic explanation of fundamental freedom. Time and again, too, the research results make clear that scholars and practitioners with human-rights or human-development agendas could benefit from the complementary existence of a human-needs perspective.

Practical Prospects

The human-rights agenda is driven by a normative perspective on freedoms to meet human needs, the human-development agenda by an action perspective on freedoms to meet human needs. However, both human-rights and human-development adherents place freedoms in the foreground and needs in the background. The complementary psychological perspective (Van de Vliert, 2013a) reverses foreground and background by putting human needs on stage with human rights and human development in the wings. A need, that is “a deprivation that energizes a drive to eliminate or reduce the deprivation” (Van de Vliert, 2009, p. 37), is considered basic if it applies to all human beings and seeks to redress a stressful deprivation of a fundamental freedom of choice. Basic needs for thermal comfort, nutrition, and health drive collectives to adaptively respond to the threats and challenges of thermal demands and wealth resources in order to increase fundamental freedoms of choice.

The discussed historical and contemporaneous evidence seems to be leaning toward the following recommendations for politicians, economic advisors, and psychological interventionists. To promote fundamental freedoms throughout the world, one has to empower people to generate more monetary resources if they are living in a more demanding thermal climate—be it cold, or hot, or both. With the help of visualizations such as those in Figures 2 to 7, psychologists may also “want to enter into scientific debates on climate protection and poverty reduction led by colleagues from other disciplines who seem to be less reluctant than the psychobehavioral science community to take their informed guesses for the truth” (Van de Vliert, 2013a, p. 479). Indeed, there may be a hitherto hidden ethical obligation for psychologists to contribute to realizing human-rights and human-development ideals.

Quite apart from such strategic human-rights and human-development considerations, and perhaps surpassing it in importance, is the spontaneous role of technological progress in

disseminating climato-economic and cultural knowledge. Especially latitudinal gradients of cold, heat, wealth, and culture are easily communicable to large numbers of internet and smartphone users on all continents. The day may not be far off when space- and satellite-based systems such as the Global Positioning System (United States) and the BeiDou Navigation System (China) provide latitude-related information about not only cold and heat but also wealth and culture. Within reach is a psychologically explicable and understandable map of fundamental freedom covering every inhabited spot on Earth.

Coda

By trial and error, cross-cultural science has discovered a latitudinal gradient of fundamental freedom, explainable by threatening versus challenging climato-economic conditions. Freedom around the world can be improved by empowering Earthlings to generate more monetary resources if they are inhabiting a more demanding colder or hotter habitat.

¹ Here—and similarly elsewhere in this chapter—the near-equatorial reversal point of the northern and southern latitudinal gradient of freedom is computed as $X_m + (-b_1 / 2b_2)$, where X_m = mean midrange latitude of the sampled countries, b_1 = the regression coefficient for regressing freedom on bipolar latitude linear (X), and b_2 = the regression coefficient for regressing freedom on bipolar latitude squared (X^2).

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Table 1. Opposite Latitudinal Gradients of Thermal Demands and Cultural Freedom in Opposite Northern and Southern Hemispheres^a

	Northern gradient (<i>n</i> = 42 countries)	Southern gradient (<i>n</i> = 11 countries)
Thermal demands (Van de Vliert, 2013c)	.89 ^{***}	-.67 [*]
Cold demands	.91 ^{***}	-.71 [*]
Heat demands	-.60 ^{***}	.25
Cultural freedom (Hofstede, 1980, 2001) ^b	.82 ^{***}	-.71 [*]
Cultural individualism	.80 ^{***}	-.68 [*]
Power differences	-.72 ^{***}	.82 ^{**}

^a Shown are Spearman rank correlations of thermal demands and cultural freedom with midrange latitude (ranging from -40.90 in New Zealand to +61.92 in Finland).

^b Cultural freedom is the average of the standardized indices of freedom from discrimination between ingroups and outgroups (cultural individualism) and freedom from discrimination between higher-ups and lower-downs (inverse power differences).

Table 2. Regression Analysis for Variables Predicting Populational Creativity ($N = 155$)^a

Predictor	Model 1	Model 2	Model 3	Model 4
Non-zoonotic diseases ^b	-.61***	-.09	.02	.01
National IQ ^c		.03***	.02**	.02***
Industrialization ^d		.01	-.01	.01
Urbanization ^e		.01*	.00	.00
Thermal demands (TD)			.17**	.12*
Wealth resources (WR)			.65***	.55***
TD x WR				.28***
ΔR^2	.37***	.23***	.11***	.06***
Total R^2	.37***	.60***	.71***	.77***

^a Shown are unstandardized regression coefficients. There was no multicollinearity ($VIFs < 6.79$), and there were no outliers (Cook's $Ds < .22$). ^b Fincher and Thornhill (2012). ^c Lynn and Vanhanen (2006). ^d UNDP (2004, 2007). ^e Parker (1997).

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

Table 3. Regression Analysis for Variables Predicting Fundamental Freedom, Broken Down for Eastern and Western Hemisphere Countries^a

	Entire	Eastern	Western
Predictor	Earth ^b	hemisphere	hemisphere
	(<i>N</i> = 180)	(<i>n</i> = 125)	(<i>n</i> = 55)
Non-zoonotic diseases ^c	-.01	-.05	.05
Country size ^d	-.06*	-.01	-.15***
Thermal demands (TD)	.08	.05	.26*
Wealth resources (WR)	.50***	.50***	.51***
TD x WR	.28***	.28***	.34***
Total <i>R</i> ²	.66***	.67***	.75***

^a Shown are unstandardized regression coefficients. There was no multicollinearity (*VIFs* < 4.12), and there were no outliers (Cook's *Ds* < .02). ^b The eastern hemisphere is 0 to 180 degrees longitude east of the Greenwich meridian; the western hemisphere is 0 to 180 degrees longitude west of the Greenwich meridian. ^c Fincher and Thornhill (2012). ^d Country size is the natural log of the total land area (Parker, 1997).

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

Thermal Climate			
		Demanding	Undemanding
Wealth	Poor	<i>1. Threatening</i>	<i>2. Unthreatening</i>
Resources	Rich	<i>4. Challenging</i>	<i>3. Unchallenging</i>

Figure 1. Four types of climato-economic pressures on livability and culture creation.

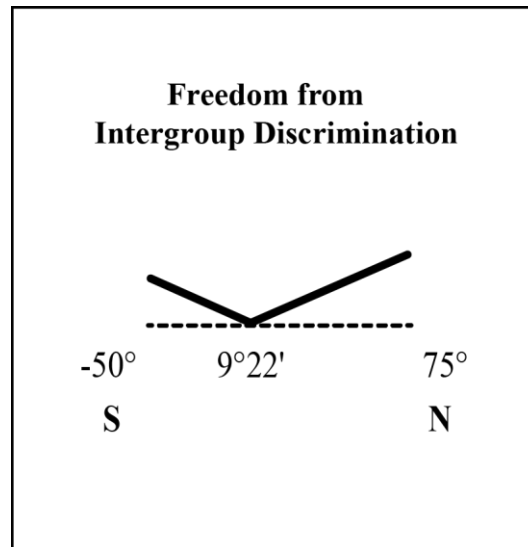


Figure 2. Distribution of freedom from ingroup-outgroup discrimination along the north-south axis of the Earth. The oppositely sloping latitudinal gradients can be largely explained by cold, heat, and wealth.

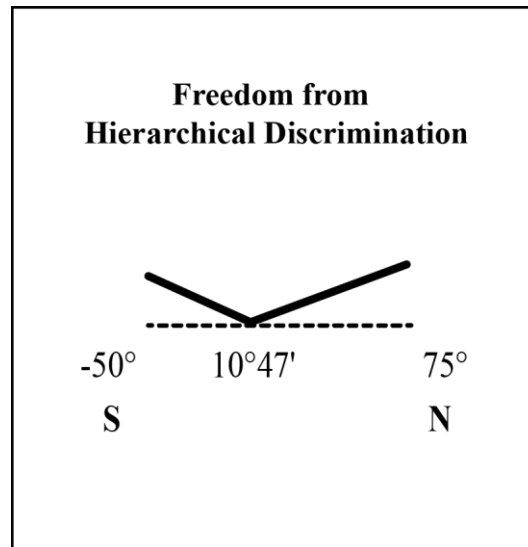


Figure 3. Distribution of freedom from hierarchical discrimination along the north-south axis of the Earth. The oppositely sloping latitudinal gradients can be largely explained by cold, heat, and wealth.

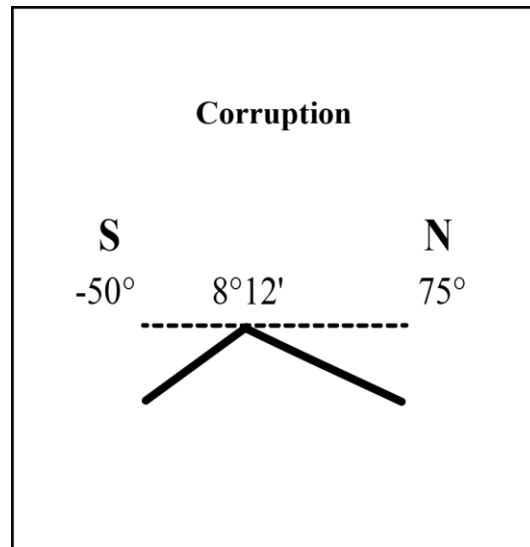


Figure 4. Distribution of corruption along the north-south axis of the Earth. The oppositely sloping latitudinal gradients can be almost totally explained by cold, heat, and wealth.

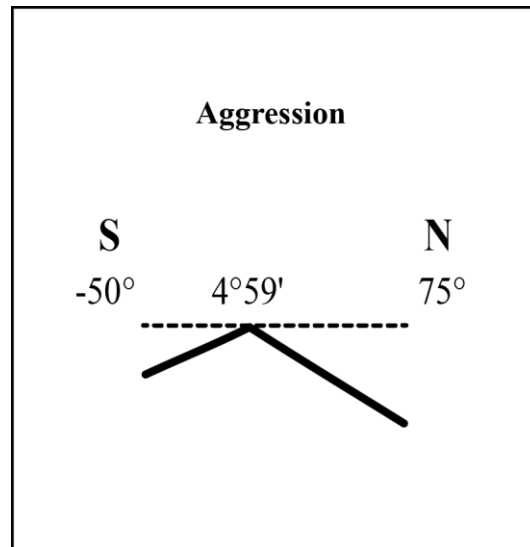


Figure 5. Distribution of aggression along the north-south axis of the Earth. The oppositely sloping latitudinal gradients can be almost totally explained by cold, heat, and wealth.

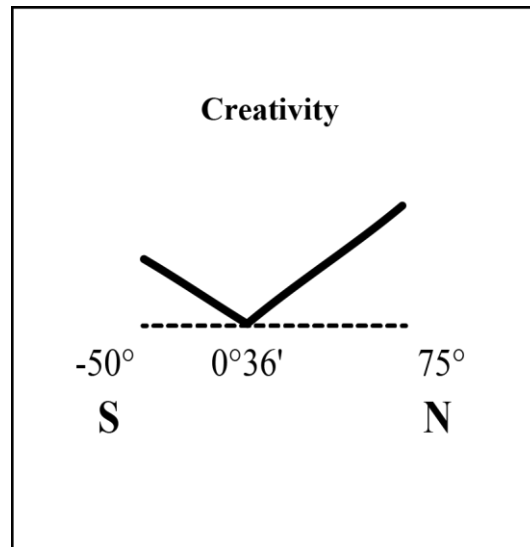


Figure 6. Distribution of creativity along the north-south axis of the Earth. The oppositely sloping latitudinal gradients can be almost totally explained by cold, heat, and wealth.

Fundamental Freedom

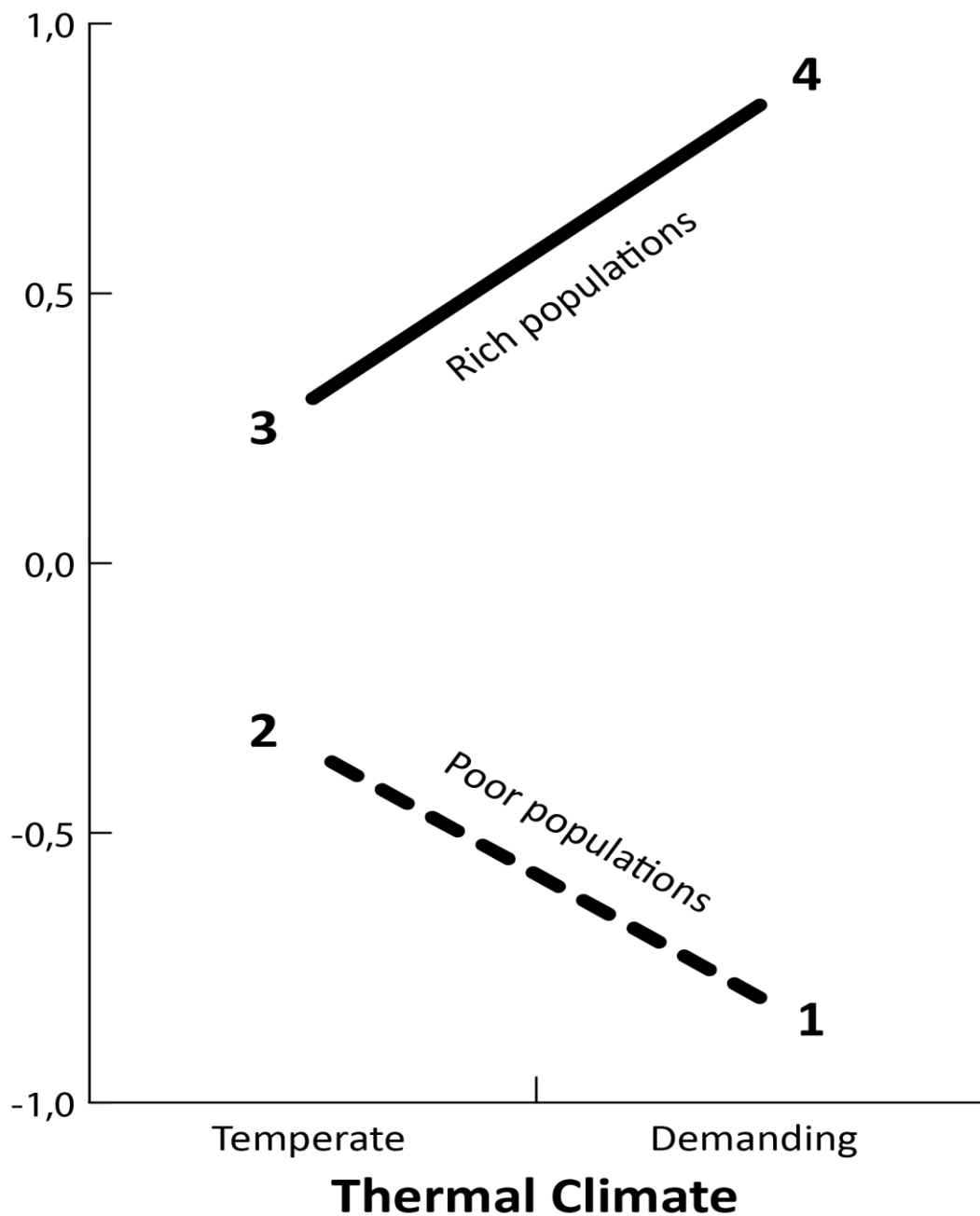


Figure 7. Interaction effects of thermal demands and wealth resources on the six-pack of fundamental freedoms in 180 countries, anchored by (1) threatening habitats, (2) unthreatening habitats, (3) unchallenging habitats, and (4) challenging habitats. Effects of thermal demands at ± 1 *SD*: $b = -.23$, $p < .001$ for the 1-2 slope; $b = .27$, $p < .001$ for the 3-4 slope. Effects of wealth resources at ± 1 *SD*: $b = .33$, $p < .001$ for the 2-3 gap; $b = .83$, $p < .001$ for the 1-4 gap.