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## Advances in Culture and Psychology: Volume 3

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# Creating Cultures Between Arctics and Deserts

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## Abstract and Keywords

Climato-economic theorizing explains why and how inhabitants adapt culturally to their habitat. In demandingly cold or hot habitats with poor monetary resources, inhabitants create threat appraisals, survival goals, ingroup agency, and autocracy, converging into a cultural threat syndrome. In demandingly cold or hot habitats with rich monetary resources, inhabitants create challenge appraisals, self-expression goals, individual agency, and democracy, converging into a cultural challenge syndrome. In between, in undemandingly temperate climates, inhabitants create comfort appraisals, easygoing goals, convenient agency, and laissez-faire outcomes, converging into a cultural comfort syndrome. This review culminates with a regression equation that accounts for 56% of the variation in threat-based versus challenge-based cultural syndromes across 129 countries. On the basis of that regression equation and data from the Intergovernmental Panel on Climate Change, a plan is sketched to forecast worldwide changes in culture.

*Keywords:* climato-economic, collectivism-individualism, demands-resources, threats-challenges, cultural syndrome, culture forecast

## I. Introduction

Humans can easily be frozen or burned to death. This basic truth turns atmospheric climate into a friend or a foe, making humans move toward temperate zones and away from arctics and deserts. Historical settlement patterns may therefore be seen as a seminal set of unobtrusive measures of cultural adaptations to problems with extreme climates. For a warm-blooded

species **(p.228)** like us, empty arctics and empty deserts are in essence outermost monuments of our innermost needs for thermal comfort, nutrition, and health. Colder winters and hotter summers entail larger deviations from physiological homeostasis, fewer nutritional resources, greater health problems, and more cultural adjustment as a natural result. This line of reasoning is the starting point of the present review. It is a somewhat tricky starting point, however, because the thinking steps from *thermal climate* to *existence needs* to *cultural adaptation* are elegant enough to be misleading.

Misled by comparable ideas, many classic scientists, such as Hippocrates, Ibn Khaldun, Montesquieu, Quetelet, and Huntington, have creatively tried to directly relate climate to culture (Feldman, 1975; Sommers & Moos, 1976). For example, Hippocrates “noted that climate generally drives basic physiological wants and needs, psychological well-being, and health care in general” (Parker, 2000, p. 23), and Ibn Khaldun observed that “the more emotional people were in the warmer climes with the prudens 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 all sorts of psychosocial phenomena, including health, human energy, mental efficiency, insanity, crime, and suicide (Sorokin, 1928; Tetsuro, 1971). Until recently, scholars continued to search for such main effects of climate on culture (Georgas, Van de Vijver, & Berry, 2004; Hofstede, 2001; House, Hanges, Javidan, Dorfman, & Gupta, 2004; Van de Vliert, Schwartz, Huismans, Hofstede, & Daan, 1999; Van de Vliert & Van Yperen, 1996).

Going largely unnoticed, Montesquieu (1748) was the first to realize that the key to solving the climate–culture conundrum lies in money 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 existence needs. Basically, Montesquieu 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 conditioner of climate–culture links). Two and a half centuries later, Parker (2000) rediscovered the cross-cutting role played by liquid cash and illiquid capital in creating counterforces against demands of cold and heat.

Money, itself a cultural invention, serves as a major tool of constructing a cultural niche, which is a stable set of needs-based stresses, goals, means, and outcomes within a given habitat (see Boehm & Flack, 2010; Odling-Smee, Laland, & Feldman, 2003; Yamagishi, 2011). Tools of cash and capital turn the **(p.229)** given climatic habitat into a climato-economic habitat that is home to the cultural niche. Inhabitants are coping with bitter winters or scorching summers through property-based operations. Owning, earning, saving, buying, and selling can help prevent and dispel discomfort, hunger, thirst, and illness. Even without slipping toward unconditional effects of climate on the superiority

and inferiority of the races (Huntington, 1945; Taylor, 1937), climatic determinism may largely be a miscarriage of science because it overlooks changes in climatic impacts under the influence of monetary compensations.

A straightforward implication of the observation that cash and capital serve as tools to shape effects of climate on cultural niches is that too firm a belief in economic development as the sole motor of cultural change (e.g., Inglehart & Baker, 2000; Inglehart & Welzel, 2005; Sen, 2001) may also lead scholars astray. For example, the claim made by some members of the World Values Surveys team that “the only clear predictor of a country’s position on the cultural map appears to be its economic development” (Halman, Luijkx, & Van Zundert, 2005, p. 129) overlooks changes in economic impacts under the influence of bitter winters, scorching summers, and a long list of weather-related goods and services to spend the money on. On closer consideration, both unconditional climatic determinism and unconditional economic determinism can be criticized for being too simplistic and misleading.

This chapter on the climato-economic origins of culture creation is built around three definitional and theoretical assumptions. First, balancing on the shoulders of Triandis (1995), Hofstede (2001), House et al. (2004), Schwartz (2004), and Leung and Bond (2004), cultures are conceptualized here as stable sets of stresses that reflect needs-based problems, goals that reflect values, means that reflect beliefs, and outcomes that reflect practices. Second, stresses, goals, means, and outcomes are created in adaptation to climato-economic habitats and are then passed on and changed from generation to generation in predominantly nongenetic ways. Third, stresses, goals, means, and outcomes are not interrelated in a strictly sequential way but are assumed to be continuously and simultaneously in flux, converging into a cultural system that is characteristic of the inhabitants of a given climato-economic habitat.

The next section provides descriptions of cultural adaptations to three types of climato-economic habitats. Cultures are expected to differ according to different climato-economic conditions: (1) poorer societies in climates with colder-than-temperate winters or hotter-than-temperate summers, (2) poorer and richer societies in temperate climates, and (3) richer societies in climates with colder-than-temperate winters or hotter-than-temperate summers. The **(p.230)** third section considers methodological issues in regard to assessing climatic demands, monetary resources, societal cultures, and climato-economic effects on culture. The next-to-final section reviews empirical evidence on the climato-economic origins of variations in cultural stresses, goals, means, and outcomes. The final section sketches possible directions for future work on remaining puzzles surrounding the climato-economic explanation of culture.

## II. Climato-economic Theory of Culture

*Needs* are deprivations that energize drives to eliminate or reduce the deprivations. According to the climato-economic theory of culture, basic existence needs for thermal comfort, nutrition, and health shape the adaptation of warm-blooded humans to the deprivations of their habitat (Rehdanz & Maddison, 2005; Tavassoli, 2009; Van de Vliert 2009, 2011a, 2011b). Cognitive appraisal can transform the same environmental deprivation into different stresses ranging from threat to challenge and energizing different goals to eliminate or reduce that deprivation. More specifically, people become creators of culture in adaptive response to the stressfulness of climatic demands by using monetary resources to turn detrimental effects of winters and summers into beneficial effects of winters and summers. The following subsections unfold and discuss three climato-economic habitats, four cultural adaptations to these habitats, and two precursory models that enable the gradual formulation of climate–culture connections between habitats and inhabitants.

### A. Three Climato-Economic Habitats

Vast areas around the poles are rendered uninhabitable by ice sheets, and huge deserts at lower latitudes are equally effective in limiting human population. One reason is that, in common with all warm-blooded species, humans have to maintain constant levels of high body temperature. They have evolved a characteristic relation between ambient temperature and physiology. The so-called Scholander curve (Scholander, Hock, Walters, Johnson, & Irving, 1950) describes the U-shaped dependence of body heat production or rates of metabolism on ambient temperature. In an intermediate range of ambient temperatures, termed the thermoneutral zone, the metabolic rate required for the body to maintain a core temperature of approximately 37°C is both minimal and independent of the ambient temperature. Below the thermoneutral zone, metabolism increases to generate enough heat (e.g., by shivering) for the body to maintain its temperature and survive. Above the thermoneutral zone, **(p.231)** metabolism increases to support active cooling (e.g., by sweating or panting). The biological costs of maintaining body temperature and integrity increase on both sides of the thermoneutral zone.

The U-shaped dependence of heat production on ambient temperature equips humans with existence needs for thermal comfort, nutrition, and health (Rehdanz & Maddison, 2005; Tavassoli, 2009; Van de Vliert, 2009) and with greater strengths of these needs in colder and hotter conditions. Temperate climates and seasons offer thermal comfort, abundant nutritional resources owing to the rich flora and fauna, and relatively healthy habitats. Colder or hotter conditions require more and better clothing, shelter structures, and heating or cooling systems and increasing investments of time and effort in the pursuit of food and water. Because acclimatization through long-term adjustment in anatomy and physiology has negligible compensating effects (Parsons, 2003), more and more measures have to be taken in increasingly colder or hotter conditions to safeguard the viability of oneself and one's loved

ones. Arctic conditions lead to frostbite, pneumonia, asthma, rheumatism, gout, influenza, and common colds. In the tropics, there are “major vector-borne diseases (malaria, yellow fever, schistosomiasis, trypanosomiasis, ochocerciasis, Chagas’ disease, filariasis, among others), in which animals that flourish in the warm climate, such as flies, mosquitoes, and mollusks, play the critical role of intermediate hosts” (Sachs, 2000, p. 32).

These undeniable facts demonstrate that it is a climatic axiom rather than a hypothesis that our species finds cold and hot regions problematic and stressful. A complementary economic axiom is that money can compensate for demanding winters or summers, be it in addition to or instead of money-free exchanges of goods and services. As a rule, necessities of life needed to secure thermal comfort, nutrition, and health are for sale and have a price. In consequence, cash and capital can alter the effects of adverse winters and summers through purchases and exchanges of climate-compensating goods and services, including clothing, housing, heating and cooling, transportation, meals, and medical cure and care. As an example of the way in which this is visible in modern communities, families in richer nations spend up to 50% of their household income on climate-compensating goods and services, a figure that rises to more than 90% in poorer nations (Parker, 2000, pp. 144–147).

In different climates and seasons, money is differentially useful for different purchases. Money may be more of a *sine qua non* for heating and eating in colder regions and months but for preventing and recovering from diseases produced by substances, germs, bacteria, and insects in hotter regions and **(p. 232)** months. A related question is whether more money is needed for survival under both cold and hot circumstances. Economists have been struggling with this question for a long time, interested as they are in the cost of supplanting a demanding climate in terms of additional expenditures. Some of them have come to the realization that population-level happiness is an appropriate criterion for assessing the economic cost of climate (Frijters & Van Praag, 1998; Parker, 2000; Rehdanz & Maddison, 2005; Welsch & Kuehling, 2009). This sheds new light on interpreting the results of a 77-nation study into the climato-economic origins of happiness (Van de Vliert, 2009, pp. 68–72). Relying on the happiness criterion, both colder-than-temperate winters and hotter-than-temperate summers are more expensive.

The greater economic costs of colder and hotter environments are in accord with the greater biological costs of keeping body and soul together on both sides of the thermoneutral zone. On these grounds, the climato-economic theory proposes that the underlying psychosocial processes of long-term coping with deviations from comfortable temperatures are essentially the same in cold and hot circumstances. If more demanding temperatures are insufficiently compensated for by the availability of monetary resources, detrimental consequences for psychosocial functioning eventually follow. If they are

sufficiently compensated for by monetary resources, beneficial consequences follow. So viewed, as visualized in Figure 5.1, cultures can be linked back to three prototypical habitats: (1) demandingly cold or hot with poor resources, (2) undemandingly temperate with irrelevant resources, and (3) demandingly cold or hot with rich resources.

### B. Four Cultural Adaptations

In response to the given habitat, inhabitants create a vague assortment of problems, values, beliefs, and even subconscious practices. Attempting to master this conceptual chaos, the climato-economic theory of culture departs from the premises that cultural problems are preeminently reflected in *stresses*, cultural values in desired *goals* to manage the stresses, cultural beliefs in feasible *means* to achieve the goals, and cultural practices in likely *outcomes* of all of them. Although stresses, goals, means, and outcomes are represented in Figure 5.1 and discussed in that order in the following sections, they should not be assumed to operate as parts of the cultural adaptation process in a strictly sequential way. Rather, stresses, goals, means, and outcomes constitute a set of concurrent and closely interconnected components of a system, for which Triandis (1995) has coined the apt term “cultural syndrome.” (p.233)

#### 1. Stresses

Cognitive appraisal of the stressfulness of environmental deprivations consists of two mutually integrated processes—primary and secondary appraisal (Lazarus & Folkman, 1984; LePine, LePine, & Jackson, 2004). In the case at hand, primary appraisal assesses to what extent winters and summers are comforting or stressfully demanding, and secondary appraisal assesses to what extent stressfully demanding winters and summers are threatening or challenging given the available monetary resources to cope with these stresses. All

inhabitants of a certain area are exposed to the same winters, summers, and standard of living; are assessing and discussing this situation frequently; and are gradually pushing and pulling each other toward a predominantly shared appraisal of the stressfulness of local livability. Climato-economic theorizing

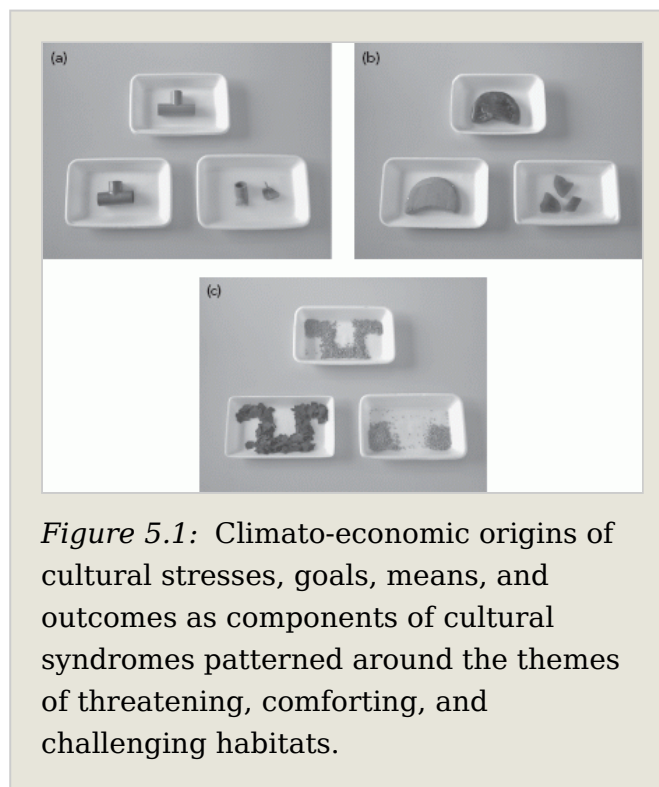


Figure 5.1: Climato-economic origins of cultural stresses, goals, means, and outcomes as components of cultural syndromes patterned around the themes of threatening, comforting, and challenging habitats.

integrates primary appraisal and secondary appraisal into the following trichotomy of population-level appraisals.

Poorer populations in climates with colder-than-temperate winters, hotter-than-temperate summers, or both are expected to appraise livability as stressful because the climatic demands are high and as threatening because **(p.234)** the monetary resources to cope with the high stress are insufficient. Experienced stress is expected to be low in comforting temperate climates irrespective of income per head, because monetary resources do not make much difference for how well existence needs are satisfied in those climates. Richer populations in climates with colder-than-temperate winters, hotter-than-temperate summers, or both are expected to appraise livability as stressful because the climatic demands are high and as challenging because the monetary resources to cope with the high stress are sufficient. Self-evidently, cognitive appraisals have affective complements. As a crude characterization, threateningly high stress is fearful, comfortingly low stress is restful, and challengingly high stress is cheerful.

The integration of primary and secondary appraisal is a blending of two cognitive–affective images. Viewed from the perspective of primary appraisal, threatening and challenging habitats are both more stressful than comforting habitats. Viewed from the perspective of secondary appraisal, threatening stresses stand in striking contrast to challenging stresses (Drach-Zahavy & Erez, 2002; LePine et al., 2004; Skinner & Brewer, 2002). A climato-economic habitat appraised as threateningly stressful elicits anxiety and is perceived as leading to failure with no available coping strategies to meet all the livability problems. A climato-economic habitat appraised as comforting elicits relaxation and is perceived as leading to success because livability problems are not so stressful and can be overcome easily. A climato-economic habitat appraised as challenging elicits positive emotions and is perceived as leading to opportunities for tests of ability and chances of personal growth. In sum, there are three ordinally different types of adaptational stresses: threat appraisals, comfort appraisals, and challenge appraisals.

### 2. Goals

The theory posits that threat and challenge appraisals are cognitively linked to motivated goal setting (Van de Vliert, 2009, 2011b). Threat appraisals are thought to promote closed-mindedness (strong desire for avoiding ambiguity in order to stay in control), whereas challenge appraisals are thought to promote open-mindedness (strong desire for seeking ambiguity in order to create something new). These propositions echo the central tenets of self-determination theory (Ryan & Deci, 2011) and of the broaden-and-build theory of positive emotions (Frederickson, 2001; Sheldon & Ryan, 2011), that controlling environments thwart whereas autonomy-supportive environments facilitate open-mindedness and **(p.235)** creativity. They also echo the empirical findings



that threatening existential hardships evoke defensive desires for cognitive closure (Gelfand et al., 2011; Richter & Kruglanski, 2004), whereas challenging existential hardships open people up to new information and experiences (Schaller & Murray, 2008), and that threat appraisals are negatively related to motivation to learn, whereas challenge appraisals are positively related to motivation to learn (LePine et al., 2004).

In a similar vein, World Values Surveys researchers (Inglehart & Baker, 2000; Inglehart & Welzel, 2005) have shown that conditions of existential threats produce closed-mindedness and emphasis on survival by giving priority to goals of physical and economic security over goals of self-actualization and quality of life. Conversely, conditions of challenging opportunities produce open-mindedness and emphasis on self-expression by giving priority to goals of innovation over conservation. My theory extends the World Values framework by linking survival versus self-expression goals to objectively threatening versus challenging climato-economic habitats. In addition, mid-range goals, halfway between the antipoles of closed-minded survival goals and open-minded self-expression goals, are thought to form an intermediate type of cultural goal setting promoted by objectively comforting climato-economic habitats.

To emphasize that the intermediate goals in comforting habitats radiate distinctiveness and uniqueness rather than mere absence of survival goals and self-expression goals, they are called *easygoing goals* (Van de Vliert, 2009). Easygoing goals are free from the onerous task of achieving survival, free also from the onerous task of achieving self-expression; they go beyond constraints and concerns originating from either survival or self-expression and lead to a relatively relaxed and easy life instead. The most dramatic illustration of the theoretical relevance of easygoing goals in temperate climates is the lower suicide rates in easygoing cultures compared with survival and self-expression cultures. Suicide rates peak in poor countries with cold winters and hot summers (e.g., Kazakhstan, Lithuania, Russia) but are also higher in rich countries with colder-than-temperate winters and hotter-than-temperate summers (e.g., Finland, Slovenia, Switzerland) (Van de Vliert, 2009, pp. 46–49, 76–77, 203–204). Perhaps relatedly, severe employee harassment is lower in easygoing cultures than in survival and self-expression cultures (Van de Vliert, Einarsen, & Nielsen, in press). In sum, quantitatively and qualitatively different goal adaptations are subdivided into survival goals, easygoing goals, and self-expression goals.

### **(p.236) 3. Means**

Of course, goals can be reached in multiple ways using multiple means. A crucially important issue, also with a view to the importance of cross-cultural differences in collectivism versus individualism (Brewer & Chen, 2007; Gelfand Bhawuk, Nishii, & Bechtold, 2004; Hofstede, 2001; Triandis, 1995), is whether people give primacy to achieving goals by means of their own groups (ingroup

agency) or by means of oneself (individual agency). Single-factor explanations of collectivism versus individualism have been sought in parasitic disease burden (Fincher & Thornhill, 2012; Schaller & Murray, 2011), voluntary settlement in frontier regions (Kitayama, Conway, Pietromonaco, Park, & Plaut, 2010; Kitayama, Ishii, Imada, Takemura, & Ramaswamy, 2006), and economic development (Inglehart & Baker, 2000; Inglehart & Welzel, 2005). Climato-economic contextualization of collectivism versus individualism goes beyond single-factor explanations in order to better understand the inevitably complex variation in ingroup agency versus individual agency.

Although the climato-economic theory seems unique in asserting that climatic hardships in concurrence with economic hardships promote collectivism, this may be largely a matter of specification in presentation. Richter and Kruglanski (2004, pp. 115–116) have professed that existential threats set in motion processes of culture building in directions of closed-mindedness, ingroup commitment, and ingroup favoritism, whereas the opposite processes endow people with a high enough degree of open-mindedness “to venture out on their own into the ambiguous, uncertain, and often risky realm of individualism.” In a similar vein, Gelfand et al. (2011) have provided evidence that greater environmental threats and a greater dearth of resources promote cultural tightness with clearer norms and stronger sanctions for nonconformity, traits that are also highly characteristic of collectivistic societies (Carpenter, 2000; Triandis, 1995).

From a completely different perspective, Inglehart and Welzel (2005) also sketched close associations between closed-mindedness, survival values, and ingroup orientation on the one hand and open-mindedness, self-expression values, and individual orientation on the other. Again refining their World Values framework, easygoing goals halfway between the antipoles of survival and self-expression may be manifested in convenient mixtures of ingroup agency and individual agency. For example, ingroup cooperation against an outgroup may be half-heartedly or even manipulatively used to create joint gains in order to subsequently claim these ingroup gains individually. Resting on all these foundations, the theoretical model in Figure 5.1 predicts that **(p.237)** collectivistic ingroup agency is most prevalent in poorer societies with threatening colder-than-temperate winters or hotter-than-temperate summers, somewhat prevalent in poorer and richer societies with comforting temperate climates, and least prevalent in richer societies with challenging colder-than-temperate winters or hotter-than-temperate summers. The reverse prediction holds for individual agency.

#### 4. Outcomes

It goes almost without saying that existentially threatened inhabitants of demandingly cold or hot habitats with poor resources create other cultural outcomes than do existentially challenged inhabitants of demandingly cold or

hot habitats with rich resources. A telling case in point is the situation in Scandinavia, where the demanding cold climate turned from a threat in the year 1000 to a challenge in the year 2000. In the 8th to 10th centuries, the extremely poor Vikings (the ancestors of the Norwegians, Swedes, and Danes) were pirates under autocratic leadership engaging in plundering, raping, kidnapping, and occupying parts of Europe. Today's extremely rich Scandinavians are negotiating rather than fighting peoples under democratic leadership, and it is also evident that they have relatively cooperative and peaceful ingroup–outgroup relations (Hofstede, 2001; House et al., 2004; Van de Vliert & Smith, 2004). A side lesson to be learned from this outcome reversal is that historical explanations of culture make sense only if changes in climato-economic habitat are taken into account.

People carrying around threat appraisals, survival goals, and ingroup preoccupations in closed minds do not seem to qualify as gifted constructors of democratic courses of action and interaction. Mirrorwise, people carrying around challenge appraisals, self-expression goals, and individual preoccupations in open minds do not seem to qualify as gifted constructors of autocratic courses of action and interaction. The proposed theory accords with common sense in predicting that more autocratic outcomes of leadership and governance match threatening climato-economic habitats but mismatch challenging climato-economic habitats. This generally formulated hypothesis, including its reverse formulation for democratic outcomes of leadership and governance, applies to families, schools, business organizations, and governmental institutions alike.

In Figure 5.1, mid-range outcomes of leadership and governance between autocracy and democracy are expected to occur typically in comforting climato-economic habitats. Building on recent leadership work (Alvesson & **(p.238)** Sveningsson, 2003; Hinkin & Schriesheim, 2008), these outcomes are labeled *laissez-faire*. It is theoretically important to once again emphasize that all cultural adaptations in temperate climates have distinct and unique qualities of their own, and that *laissez-faire* in this case should not be misunderstood as passively doing and achieving nothing. In spite of the fact that *laissez-faire* outcomes reflect easygoingness and convenient use of ingroup and individual agency, they are anything but faceless for at least three reasons. First, it is impossible for people to suppress hundreds of reflexes and actions and achieve zero outcomes. Second, certain behavioral outcomes such as punishments or rewards may be meaningfully minimized on purpose. Third, *laissez-faire* manifestations in Figure 5.1 represent exclusive conglomerations of neither purely autocratic nor purely democratic outcomes (for conglomerated outcomes, see Van de Vliert, 1997).

### 5. Cultural Syndromes

Stresses, goals, means, and outcomes are not conceived as mutually independent cultural adaptations. On the contrary, climatic demands and monetary resources are viewed as factors that gradually push and pull a habitat's inhabitants toward constructing cultural syndromes of interconnected stresses, goals, means, and outcomes. Inspection of the cultural adaptations in Figure 5.1 reveals interesting conglomerations of ingroup agency and autocracy on the threatening side and individual agency and democracy on the challenging side. This makes sense, especially on the threatening side. Climato-economic survival crises, like other exogenous crises, may well increase power differences between leaders and followers (Muczyk & Reimann, 1987; Mulder, Ritsema van Eck, & De Jong, 1971) and groupthink as the nucleus of cohesion, harmony, and conformity in the group (Janis, 1982; Turner & Pratkanis, 1998). "The formation of hierarchically organized groupings lends enormous advantage to those so organized in coping with dangers of the physical environment" (Milgram, 1974, pp. 123–124).

On closer scrutiny, we are looking at something for which Triandis (1995) coined the terminology of vertical collectivism versus horizontal individualism. Interestingly, vertical collectivism and horizontal individualism have different manifestations at different levels of measurement and analysis (Chirkov, 2011; Hofstede, 2001; Shavitt, Torelli, & Riemer, 2011; Singelis, Triandis, Bhawuk, & Gelfand, 1995; Torelli & Shavitt, 2010; Triandis, 1989, 1995; Triandis & Gelfand, 1998). At the individual level, the vertical-horizontal dimension of power differences and the collectivism-individualism dimension (**p.239**) of agency differences are mutually independent, providing a  $2 \times 2$  array of cultural orientations (vertical collectivism, horizontal collectivism, vertical individualism, horizontal individualism). At the societal level, however, the vertical–horizontal dimension and the collectivism–individualism dimension tend to merge into a single bipolar dimension with vertical collectivism and horizontal individualism as opposite syndromes of culture (Triandis, 1989). Hofstede (2001) found that "vertical collectivism and horizontal individualism are the typical patterns around the world" (Triandis, 1995, p. 46).

Although the terminology of vertical collectivism versus horizontal individualism seems appropriate to represent cultural adaptations to climato-economic habitats as far as means and outcomes are concerned, it falls short in representing cultural adaptations in terms of stresses and goals. In fact, no terminology seems wholly adequate to cover the broad scope of inhabitants' adaptations to their habitat. Because of the centrality of stress appraisals in climato-economic theorizing, the world's main cultural syndromes are named after the psychosocial nature of the inhabitants' shared ecological assessment. As shown in the last row of Figure 5.1, populations with a threat syndrome generally attempt to achieve survival goals through ingroup agency and autocratic leadership patterned around the theme of threatening climato-

economic habitats. Populations with a comfort syndrome generally attempt to achieve easygoing goals through convenient agency and laissez-faire leadership patterned around the theme of comforting climato-economic habitats. Populations with a challenge syndrome generally attempt to achieve self-expression goals through individual agency and democratic leadership patterned around the theme of challenging climato-economic habitats.

### C. Precursory Models

The climato-economic theory of culture came into being as a cross-fertilization of demands-resources theories (Bakker & Demerouti, 2007; Bandura, 1997; Lazarus & Folkman, 1984; Skinner & Brewer, 2002; Tomaka, Blascovich, Kibler, & Ernst, 1997) and the ecocultural framework (Berry, 2011; Georgas et al., 2004). Demands-resources models posit that demands placed on individuals increase closed-mindedness and risk aversion if resources to meet the demands are insufficient but increase open-mindedness and risk seeking if resources to meet the demands are sufficient. These models provide the great insight that demands and resources have interactive effects on human functioning at the individual level but do not apply this insight to the overarching level of climatic demands and monetary resources. The ecocultural framework (**p.240**) posits that climatic and economic contexts shape societal culture but does not recognize that climate and economy have influenced each other's impact historically.

The climato-economic theory of culture is an attempt to integrate the idea of interactive effects of demands and resources with the idea of main effects of climatic and economic histories of the human habitat on human culture. The added value of the integration is elegantly apparent from the theoretical matrix in Figure 5.1. The columns in Figure 5.1 systematically interrelate stresses, goals, means, outcomes, and cultural syndromes in terms of climatic demands and monetary resources, whereas the rows systematically compare threatening, comforting, and challenging habitats from five cultural viewpoints. The columns are more important theoretically than the rows, because climatic demands and monetary resources help to explain cultural differences, whereas stresses, goals, means, outcomes, and syndromes only help to describe cultural differences.

Population-level application of individual-level theorizing about effects of interacting demands and resources was introduced by Bandura (1997). An interesting question is whether the present follow-up perspective has the potential to serve as a precursor model for future work on cultural adaptations. Specifically, are the income-dependent effects of demands, which serve as theoretical backbones of Figure 5.1, generalizable from climatic demands to other ecological demands? There might well be a universal tendency for humans to adapt culturally in similar ways to similar interactions of monetary resources and ecological demands other than winters and summers, including natural

disasters, food deprivation, disease prevalence, population density, and social violence.

### III. Methodological Considerations

#### A. Assessing Thermal Climate

Weather indicates “what is happening to the atmosphere at any given time, while climate is what we would normally expect to experience at any given time of the year on the basis of statistics built up over many years” (Burroughs, 1997, p. 3). Whereas weather changes continuously, climate has been extraordinarily stable for the last 10,000 years (Burroughs, 1997). Climate is commonly measured as the generalized weather of an area over a 30-year period. Here, *climate* refers to the generalized cold or hot weather of a national residential area over a 30-year period. In quantitative climate–culture research, thermal climate is measured across the country’s major cities, weighted for **(p.241)** population size. This has been done in four ways, which may be denoted as geotemperature, qualified geotemperature, imitated biotemperature, and biotemperature (Van de Vliert, 2006a, 2009).

*Geotemperature* is the average temperature over at least 3 decades.

Geotemperature, with freezing and boiling as physical points of reference, has typically been used as a linear predictor of national culture (Fought, Munroe, Fought, & Good, 2004; Georgas et al., 2004; Van de Vliert & Van Yperen, 1996). It is an inaccurate predictor, though, because it (1) neglects the existence of a thermal optimum (4°C and 40°C both pose existential problems), (2) overlooks the impact of year-round variations in temperature (small and large differences between winters and summers may have the same average), and (3) is negatively correlated with year-round variations in temperature (higher latitudes have both lower averages and larger variations).

*Qualified geotemperature* combines temperature ranges (frigid, temperate, torrid) and precipitation ranges (arid, semi-arid, subhumid, humid, wet) into major types or clusters of climate in multicountry regions (House et al., 2004). Using such a typological approach has the disadvantages that the impact of climate often covers a too large surface area to be specific enough for a single nation within that surface area and that it cannot be accurately attributed to temperature or precipitation. Moreover, rainfall and snowfall do not appear to alter the impact of thermal climate on culture, at least not at a worldwide level (Van de Vliert, 2007, 2009).

*Imitated biotemperature* is geotemperature squared. It represents a statistical attempt to capture the curvilinear idea that humans tend to create differences in culture depending on where they reside between arctics and deserts or, even more to the point, depending on the temperateness versus demandingness of the habitational climate (Tavassoli, 2009; Van de Vliert, Schwartz, et al., 1999). Although this operationalization of climatic demands does recognize the

importance of a thermal optimum, it still overlooks seasonal variations in cold and heat, including increases in these seasonal variations at higher latitudes.

*Biotemperature* has 22°C (about 72°F) as a biological point of reference, this being the approximate midpoint of the range of comfortable temperatures (Parsons, 2003) and the approximate optimum for meeting existence needs for nutrition and health (Cline, 2007; Fischer & Van de Vliert, 2011; Parker, 2000; Tavassoli, 2009). A country's climate is more demanding to the extent that winters are colder than 22°C and summers hotter than 22°C. Climatic demands are operationalized as the sum of the absolute deviations from 22°C for the average lowest and highest temperatures in the coldest (**p.242**) month and in the hottest month (Van de Vliert, 2009). Mongolia, for example, with its cold winters ( $| -44^{\circ}\text{C} - 22^{\circ}\text{C} | + | 1^{\circ}\text{C} - 22^{\circ}\text{C} | = 87$ ) and hot summers ( $| -6^{\circ}\text{C} - 22^{\circ}\text{C} | + | 36^{\circ}\text{C} - 22^{\circ}\text{C} | = 42$ ) has a *climatic demands* score of 129. Winter demands and summer demands worldwide have identical medians ( $Mdn = 25$ ), and only slightly different means ( $M = 30$  for winters;  $M = 24$  for summers) (Van de Vliert, 2009).

Based as they are on the most advanced assessment method to date, biotemperature measures have been used in the studies discussed later. Criticisms of this measure are concerns about 22°C as a questionable point of reference for temperate climate and about the inadequacy of a single index score for large countries spanning multiple climatic subzones. However, somewhat lower or higher reference points than 22°C always yield almost identical research results, and adjusting for error-inducing temperature variations within large countries strengthens rather than weakens the effects (Fischer & Van de Vliert, 2011; Van de Vliert, 2009, 2011a, 2011b). Therefore, the empirical results reviewed in section IV of this chapter may be interpreted as conservative estimates of support for the climato-economic theory of culture.

### B. Assessing Monetary Resources

Climatic history is one out of many determinants of national wealth. However, there is a positive instead of a negative worldwide association between climatic demands and national wealth, and this association fails to account for 86% of the variation in national wealth ( $r = .37, n = 175, p < .001$ ) (Van de Vliert, 2011b). The climato-economic theory of culture is formulated as an attempt to reach beyond the horizon of obvious climate–wealth relations and main effects of climatic demands and monetary resources on societal culture. One way of representing the theory is the claim that the purchasing power of cash and capital alters the impact of climatic demands on psychosocial functioning. To adequately test the viability of this claim, in the studies reported in section IV *income per head* was measured as the current capacity of a country's currency to buy a given basket of representative goods and services (in Geary-Khamis

dollars, log transformed to reduce the skewed cross-national distribution) (United Nations Development Programme, 2004).

### C. Assessing Societal Cultures

Proper tests of the climato-economic theory of culture require an adequate set of cultural stresses, goals, means, and outcomes measured in a large **(p.243)** number of countries. Cross-national research has produced numerous large-scale descriptions of variations in culture but very few explanations of these cultural differences. My work began simply as an attempt to judge the conceptual appropriateness of available culture dimensions for relating them to climato-economic conditions and to simultaneously acquire further skills in secondary data analysis (Van de Vliert, 2011c). After some journal reviews that unexpectedly attacked me based on how others had gathered, structured, and preanalyzed their data, I learned two lessons about single- and multiple-item measurements of culture that I mention here because they illuminate how culture researchers from other disciplines view what they may consider the weird research routines of psychologists. Both measurement routines derive from psychologists' reverence for psychometrics.

The first potential issue is that single-item measures of aspects of culture are inadequate because their measurement error is generally too high, their reliability cannot be computed, and their construct validity is questionable. This argument overlooks the fact that comparative investigations of culture, such as the executive opinion surveys of the World Economic Forum and the World Values Surveys, recruit hundreds of respondents and achieve excellent test-retest and interrater reliabilities. Compared to multiple-item measures, single-item measures have not only the disadvantage of slightly lower construct validity but also the advantage of slightly less method bias, with the consequence that neither measurement method is empirically better than the other (Gardner, Cummings, Dunham, & Pierce, 1998).

The second issue is that multi-item measures of culture must be homogeneous. Although psychologists do recognize a trade-off between bandwidth and reliability, they hold dear the idea that one should never add apples and oranges. By contrast, economists emphasize that one should combine as many measurements as possible to get indices that adequately represent inevitably complicated realities. The global competitiveness index of the World Economic Forum, for example, is an additive combination of 90 variables including cultural characteristics dealing with institutions, health and primary education, higher education and training, technological readiness, and innovation. In a less extreme vein, macrosociologists of the World Values Studies combined homogeneous subindices and heterogeneous items when constructing culture dimensions. They profess that they "deliberately selected items covering a wide range of topics" and could have obtained "more tightly correlated clusters of items" referring to a specific topic, but that they refused to do so because **(p.**



**244)** their “goal was to measure broad dimensions of cross-cultural variation” (Inglehart & Baker, 2000, pp. 24–25).

In testing my theory, I have made use of unobtrusive indicators, observations, single-item assessments, and both homogeneous and heterogeneous measures of culture. The best example of my interdisciplinary approach is the following set of three cross-national measures of press repression (Van de Vliert, 2011b), the testing results of which are discussed later in the chapter. A perpetrator measure of press repression was taken from Freedom House’s scientific analysts, who used a questionable rating system to assess governmental censorship (0 – 10 points), extralegal intimidation (0 – 10 points), laws restricting reporting (0 – 6 points), and so on. A victim perspective was taken from Reporters Without Borders, who arbitrarily coded numbers of murders (5 – 15 points), murders with the state involved (5 points), sentences for media-related offences (3 – 20 points), and other factors. A relational perspective, taken from the World Economic Forum, was included as a single-item assessment of top executives’ observation of press people’s fear of censorship or retaliation. These three contestable measures could be combined into a reliable press repression index ( $R^2 = .87$ ; Cronbach’s  $\alpha = .83$ ) because they reflected concurrent validity within consecutive years and predictive validity between consecutive years. Hence my rhetorical question: Are cross-cultural psychologists sometimes overdoing psychometrics?

#### D. Assessing Climato-Economic Effects

In an ideal experiment, we would manipulate climatic demands and monetary resources in one hemisphere of the earth, use the other hemisphere as a control condition, and demonstrate that societal cultures in the two hemispheres diverge as predicted. Even though such a demonstration of causality is impossible, the climato-economic theory of culture can still be tested in a quasi-experiment by assigning societies to a  $2 \times 2$  design of four ecological habitats (i.e., temperate vs. demanding climate and poor vs. rich resources). The prediction is that the differences in stresses, goals, means, and outcomes between poor and rich societies will be significantly larger in demanding climates than in temperate climates. However, tests of this prediction using analysis of variance have the disadvantage that median splits of the continuous predictors of climatic demands and monetary resources throw away information and reduce statistical power. For that statistical reason, rather than theoretical or experimental reasons, multiple regression analysis has been used instead, with countries as units of analysis.

**(p.245)** Although national borders are rarely cultural boundaries, multiple regression analysis can best be done at the national level, because countries “are political units with distinctive ecological, historical, political, educational, legal, regulatory, social, and economic characteristics. As such, they constitute systems and have cultures” (Smith, Bond, & Kağitçibaşı, 2006, p. 77). Higher-

and lower-level alternatives are worse: The number of world regions is too small to allow accurate analysis, and provinces or counties within nations tend to maximize rather than minimize the statistical problem of nonindependence of the predictors of climatic demands and monetary resources. Hence, all studies reviewed in the next section are at the national level of analysis.

### IV. Empirical Evidence

This section contains brief overviews of four regression studies supporting the climato-economic theory of culture. Other confirmatory studies include Chen, Hsieh, Van de Vliert, and Huang (2009); Van de Vliert (2003, 2006a, 2006b); Van de Vliert, Huang, and Levine (2004); Van de Vliert, Huang, and Parker (2004); Van de Vliert, Matthiesen, Gangsøy, Landro, and Einarsen (2010); Van de Vliert, Van Yperen, and Thierry (2008); and Van de Vliert, Yang, Wang, and Ren (in press). Each of the four studies was chosen because its dependent variable (1) best represents a prototype of cultural stresses, goals, means, or outcomes, respectively in the four studies; (2) rests solidly on at least three distinct measurements of its component of culture, and (3) is available for at least 50 countries.

#### A. Cultural Stresses

##### 1. Prediction

Inhabitants of objectively threatening, comforting, and challenging climato-economic habitats create threat appraisals, comfort appraisals, and challenge appraisals, respectively.

##### 2. Methods

Deprivation problems reflected in stress appraisals come in many types. This subsection concentrates on psychosomatic ill-being as an especially painful form of being and as an opposite of the luxury problem of having stressful challenges. Published individual-level scores of nonclinical adults on the General Health Questionnaire, the Maslach Burnout Inventory, the Spielberger State-Trait Inventory, and the Beck Depression Inventory were meta-analytically (p.246) compiled by Fischer and Boer (2011) and by Van Hemert, Van de Vijver, and Poortinga (2002). Ron Fischer and I then averaged the previously aggregated scores for perceived ill health, burnout, anxiety, and depression into a national indicator of mental ill-being (Fischer & Van de Vliert, 2011), here representing threatening stresses. The internal consistency measured by Cronbach's  $\alpha$  was .67, which makes the overall index neither too homogeneous ( $\alpha > .80$ ) nor too heterogeneous ( $\alpha < .60$ ) to yield problematic research conclusions (see preceding discussion). After normalized scores were averaged, data from 58 societies were available for comparison in light of the climato-economic habitat of inhabitants.

##### 3. Results

We tested the climato-economic theory by entering mean-centered main effect terms for climatic demands and monetary resources in the first two steps of a

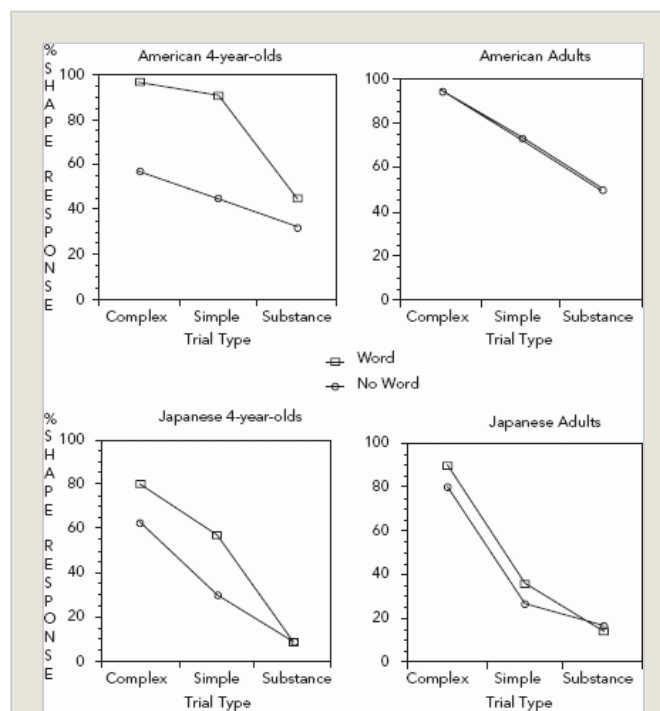
hierarchical regression analysis, followed by the interaction term in the third step. Cross-nationally, we found that climatic demands (0%), monetary resources (17%), and their interaction (21%) accounted for 38% of the variation in threatening stresses (Fischer & Van de Vliert, 2011). As shown in Figure 5.2, threatening stresses appeared to be most prevalent in poorer societies residing in climates with more demanding winters or summers (e.g., Iran, Serbia), somewhat prevalent in societies residing in temperate climates irrespective of income per capita (e.g., Hong Kong, Sri Lanka), and least prevalent in richer societies residing in climates with more demanding winters or summers (e.g., Finland, Switzerland).

China, Singapore, and Serbia and Montenegro were potential outliers that could cause arbitrarily large values of the statistical estimators. However, when we repeated the analysis after removing these countries, the interactive impact of climatic demands and monetary resources on threatening stresses increased from 21% to 27%, making the results in Figure 5.2 clearer rather than fuzzier. The contrasting prevalences of mental ill-being in threatening climato-economic habitats versus mental well-being in challenging climato-economic habitats, and the intermediate levels of prevalence in comforting climato-economic habitats, are in elegant agreement with the theoretical storyline for cultural stresses presented in Figure 5.1.

#### 4. Supplementary Analyses

Parasitic disease burden (Fincher & Thornhill, 2012; Schaller & Murray, 2008, 2011) and income inequality (Wilkinson & Pickett 2009) are known antecedent **(p.247)**

conditions of cultural threats and stresses. However, controlling for these rival predictors did not wipe out the climato-economic effects. Because we were relying on a relatively small sample of countries, we also ran a bootstrap analysis but found no indication that the results were due to spurious correlation or outliers (Fischer & Van de Vliert, 2011). Finally, we failed to generate evidence of reverse causation (i.e., that healthier and happier societies construct more beneficial climato-economic niches).



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### 5. Generalization Note

Although stresses have psychic and somatic sides, the applicability of the climato-economic theory to human physiology has not been investigated. The long-term

impact of the U-shaped dependence of heat production on ambient temperature could serve as an obvious point of departure. A first empirical exploration across 120 nations (Van de Vliert, Gans, & De Jongste, 2012) suggested that mismatches between climatic demands and monetary resources produce chronically elevated levels of blood pressure. In poorer countries (which are predominantly located in hotter climes), inhabitants who live in difficult-and-expensive environments with more threatening summers or (p.248) winters have higher blood pressures (*undermatching*) than those who live in just-right environments with more temperate summers and winters (*optimal matching*). In richer countries (which are predominantly located in colder climes), inhabitants living in easy-and-cheap environments with more temperate winters and summers (*overmatching*) have higher blood pressures than those living in just-right environments with more challenging winters or summers (*optimal matching*).

*Figure 5.2: Effect of climatic demands on threatening stresses, broken down for poorer societies (bow ties and upward slope) and richer societies (circles and downward slope).*

### 6. Conclusion

The results support the proposed idea that climato-economic habitats shape public health, at least the degree of public mental health, through threat appraisals, comfort appraisals, and challenge appraisals.

#### B. Cultural Goals

##### 1. Prediction

Inhabitants of threatening, comforting, and challenging climato-economic habitats create survival goals, easygoing goals, and self-expression goals, respectively.

##### 2. Methods

As alluded to earlier, no research program has paid more attention to cultural variation in survival-related goals than the World Values Surveys. Time and again, the World Values Surveys group has established a bipolar dimension ranging from setting survival goals to setting self-expression goals (Inglehart & Baker, 2000; Inglehart, Basáñez, Díez-Medrano, Halman, & Luijkx, 2004; <http://www.worldvaluessurvey.org>). Van de Vliert (2012) has supplied a 178-nation index of this dimension. Toward the survival pole, people give higher priority to goals of physical and economic security and are more distrusting of others. Toward the self-expression pole, people prioritize goals of self-realization and quality of life and are more trusting of others. Mid-range values on this bipolar dimension represent easygoing goals. The survival versus self-expression

measure is based on eight items that have appeared in the same format in all the waves of the still ongoing World Values Surveys.

The eight items with varying response scales include a four-item subindex tapping whether the respondent gives priority to self-expression and quality of life over physical and economic security (2-point scale), and four singular items tapping whether the respondent “would say that most people **(p.249)** can be trusted” (2-point scale), “thinks that homosexuality is justifiable” (10-point scale), “has signed a petition” (3-point scale), and describes himself or herself as “happy ... taking all things together” (4-point scale). The resulting dimension has good test–retest reliabilities ( $r_s = .98, p < .001$  after 1 to 2 years;  $r_s = .83, p < .01$  after 2 to 3 years), and good cross-cultural measurement equivalence (Van de Vliert, 2007). Here, I summarize the results of a 77-nation examination (Van de Vliert, 2009) of the covariation of climato-economic habitats with this goal-setting dimension of survival versus self-expression.

### 3. Results

Climatic demands (0%), monetary resources (52%), and their interaction (20%) accounted for 72% of the cross-national variation in survival versus self-expression goals (Van de Vliert, 2009). As predicted, survival goals thrive in poorer societies threatened by climates with more demanding winters or summers (e.g., Armenia, Latvia); easygoing goals tend to prevail in societies comforted by temperate climates irrespective of income per capita (e.g., Ghana, Singapore); and self-expression goals thrive in richer societies challenged by climates with more demanding winters or summers (e.g., Canada, Sweden). Figure 5.3 provides a detailed picture for the optimal contrast between 54 poorer societies and 23 richer societies, which convincingly confirms the theoretical storyline for cultural goals presented in Figure 5.1.

### 4. Supplementary Analyses

The overrepresentation of European countries was a matter of concern. However, when the 9 African, 9 South American, and 19 Asian countries were given a proportionally higher weight, the three climato-economic habitats of the three types of culture were not swallowed up by the cross-continental correction. If anything, the culture niches became even clearer. The interaction term of climatic demands and monetary resources initially accounted for 20% of the variation in goal setting; this figure now rose to 28% (Van de Vliert, 2009). There is no indication that the biased sampling of societies undermines the cross-continental applicability of the observed adaptations of culture to the entwined climatic and economic circumstances.

An individual-level analysis explored whether household income plays a part over and above the impact of national income. Climatic demands **(p.250)**

(16%), monetary resources (21%), and their interaction (5%) accounted for 42% of the within-country correlation between a respondent's household income and his or her personal endorsement of survival versus self-expression goals (Van de Vliert, 2007, 2009). In line with the theory, a person's own household income made a difference only for inhabitants of more threatening climato-economic habitats. Families living in poorer countries with more demanding winters or summers (e.g., Belarus, Latvia) appeared to endorse survival goals over self-expression goals to the extent that their household incomes (in these already lower-income countries) were lower as well. Finally, country-level changes in survival versus self-expression goals during 8- to 19-year periods between 1981 and 2002

( $M = 14$  years) were analyzed. No less than 54% of the cultural changes in 38 countries covaried with changes in climato-economic habitats. Climatic demands contributed at least 37% in and of themselves and at least another 11% in interaction with economic growth (Van de Vliert, 2007, 2009). Notably, the inhabitants of Estonia, Latvia, Lithuania, and Russia all moved further from self-expression goals toward survival goals after the collapse of communist rule and the subsequent economic decline. Given the view of most theorists that cultures are extremely stable over time, this degree of cultural goal adaptation to climato-economic changes is impressive for the limited span of time investigated.

### 5. Generalization Note

The World Values Surveys rest on the implicit assumption that happiness is an integral part of the goal-setting dimension of survival versus self-expression. Toward the survival pole, people describe themselves as unhappier; toward the self-expression pole, they describe themselves as happier. Personally, I associate unhappiness with threatening stresses rather than survival goals, and happiness with challenging stresses rather than self-expression goals. Yet I have explicitly admitted (Van de Vliert, 2012) that the construct of culturally embedded happiness has added value over and above treating happiness as an antecedent

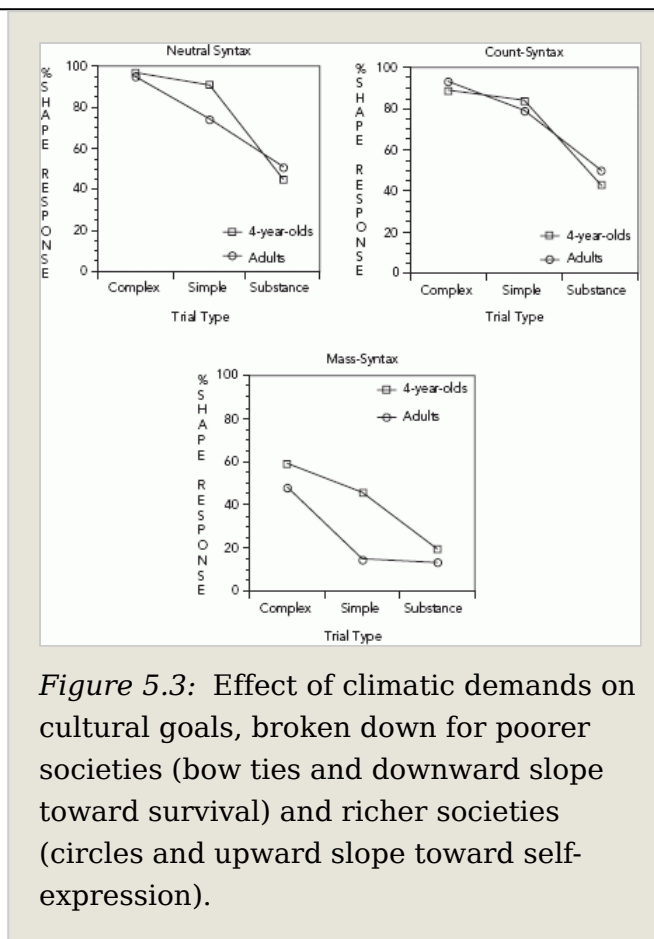


Figure 5.3: Effect of climatic demands on cultural goals, broken down for poorer societies (bow ties and downward slope toward survival) and richer societies (circles and upward slope toward self-expression).

or consequent of culture. Specifically, the World Values Surveys approach allows the conclusion, illustrated in Figure 5.3, that the climato-economic theory can also account for 72% of the cross-national variation in culturally embedded happiness.

Addressing cultural transmission of goal-setting priorities, the World Values Surveys gather information also about the most important things to teach a child, including unselfishness, tolerance, and respect for other people. Secondary analysis of these previous data revealed that the findings are additionally generalizable from setting survival goals to transmitting egoistic goals, and from setting self-expression goals to transmitting cooperative goals (Van de Vliert, 2009; Van de Vliert, Van der Vegt, & Janssen, 2009). Adults in threatening climato-economic habitats placed greater value on egoistic enculturation of children, serving as models of selfishness and giving lectures about looking after one's own interests first. Adults in challenging climato-economic habitats placed greater value on cooperative enculturation of children, setting examples and providing instructions about acting unselfishly or prosocially. In between, adults in comforting climato-economic habitats seek the middle road by placing greater emphasis neither on egoistic nor on cooperative enculturation of the next generation.

### **6. Conclusion**

The results favor the proposed idea that climato-economic habitats shape the survival goals, easygoing goals, and self-expression goals people set for themselves in order to increase satisfaction with life as a whole.

#### **(p.252) C. Cultural Means**

##### **1. Prediction**

Inhabitants of threatening, comforting, and challenging climato-economic habitats create ingroup agency, convenient agency, and individual agency, respectively.

##### **2. Methods**

As a methodological complication of research into existential threats and goal setting, climatic survival in a particular place is confounded with genetic survival over time. To address that complication, covariations of climato-economic conditions and ingroup agency versus individual agency as a means to climatic survival were investigated in target groups that differed in genetic relevance. Proliferation of one's gene pool is thought to be minimal for fellow nationals, moderate for relatives at large, and maximal for members of one's nuclear family. Correspondingly, three population-level analyses were undertaken that concentrated on compatriotistic agency, nepotistic agency, and familistic agency, respectively. Compatriotistic agency was measured as favoritism shown to fellow nationals by giving them easier access to scarce jobs than is given to immigrants (Inglehart et al., 2004). Nepotistic agency was



measured as favoritism shown to relatives by giving them organizational positions because of their relationship rather than based on their merits (World Economic Forum, 2004, 2005, 2006). Familistic agency 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 (House et al., 2004).

National baselines of these three forms of ingroup agency versus individual agency, and their intraclass correlations, internal consistencies, interrater reliabilities, and construct validities are reported elsewhere (Van de Vliert, 2011a). In separate analyses, compatriotistic agency, nepotistic agency, and familistic agency were regressed on climatic demands, monetary resources, and their interaction, controlling in each analysis for the most salient alternative predictor. Compatriotistic agency with nonemployment rate as a rival predictor was available for 73 nations, nepotistic agency with organizational size as a rival predictor for 116 nations, and familistic agency with institutional collectivism as a rival predictor for 57 nations.

### 3. Results

In the first analysis, nonemployment rate (12%), climatic demands (1%), monetary resources (13%), and climato-economic interaction (8%) accounted **(p.253)** for 34% of the variation in compatriotistic agency. In the second analysis, organizational size (40%), climatic demands (1%), monetary resources (12%), and climato-economic interaction (8%) accounted for 61% of the variation in nepotistic agency. In the third analysis, institutional collectivism (13%), climatic demands (8%), monetary resources (25%), and climato-economic interaction (11%) accounted for 57% of the variation in familistic agency. At each of the three levels of genetic relevance, the findings were comparable to those pictured in Figures 5.2 and 5.3 (Van de Vliert, 2011a). Consistently, individual agency was weakest in poorer societies threatened by climates with more demanding winters or summers (e.g., Kazakhstan, Mongolia), intermediately strong in societies comforted by temperate climates irrespective of income per capita (e.g., Guyana, Taiwan), and strongest in richer societies challenged by climates with more demanding winters or summers (e.g., Iceland, United States). These findings support the adaptational storyline of predominant ingroup agency in threatening habitats, convenient agency in comforting habitats, and predominant individual agency in challenging habitats.

### 4. Supplementary Analyses

Care was taken to exclude competing explanations of ingroup agency versus individual agency other than those represented by nonemployment rate, organizational size, and institutional collectivism. The disease burdens of nonzoonotic parasites, zoonotic parasites, and their interaction had no explanatory role to play once the interactive impacts of climatic demands and monetary resources had been accounted for (Van de Vliert & Postmes, 2012). In



addition, no evidence surfaced that the results were an epiphenomenon of the impact of state antiquity, language diversity, ethnic heterogeneity, religious heterogeneity, or income inequality (Van de Vliert, 2011a). Finally, longitudinal and cross-sectional challenges of the direction of causality showed that the interaction of climatic demands with, respectively, the importance of fellow nationals, relatives at large, and members of the nuclear family could not predict income per head (Van de Vliert, 2011a).

### **5. Generalization Note**

Ingroup love and outgroup hate are not necessarily two sides of the same coin (Allport, 1954). In the face of shared threat, however, identification and interdependence with the ingroup tends to be directly associated with fear and hostility toward one or more outgroups (Brewer, 1999). As a likely consequence, **(p.254)** ingroup agency and outgroup hate may both be more prevalent in threatening than in challenging climato-economic habitats. This expectation was successfully put to the test in an 85-nation study about discrimination against neighbors of a different race, immigrants, homosexuals, AIDS patients, and criminals (Van de Vliert & Yang, in press). Outgroup hate was strongest in poorer societies threatened by demanding climates, intermediately strong in poorer and richer societies comforted by temperate climates, and weakest in richer societies challenged by demanding climates. Additionally, ingroup love appeared to fully mediate the interactive impact of climatic demands and monetary resources on outgroup hate (Van de Vliert, in press).

### **6. Conclusion**

The results support the proposed idea that climato-economic habitats shape ingroup agency to achieve survival goals, convenient agency to achieve easygoing goals, and individual agency to achieve self-expression goals.

#### D. Cultural Outcomes

##### **1. Prediction**

Inhabitants of threatening, comforting, and challenging climato-economic habitats create autocratic leadership and governance, laissez-faire leadership and governance, and democratic leadership and governance, respectively.

##### **2. Methods**

Although political oppression and freedom are crucially important outcomes of societal processes, cross-cultural psychologists tend to treat them at a great distance. In beginning to remedy this lacuna, I have recently taken the position that repression and freedom are ultimately motivated by existence needs and are awaiting cultural and climato-economic readings by psychologists (Van de Vliert, 2011b). Political oppression versus freedom is a seemingly unmeasurable hodgepodge of aspects including civil liberties, free elections, party competition, and citizen participation. Mirroring this complexity, scholars from various disciplines have constructed a plethora of ratings. Because each of these

outcome measures brings different strengths and weaknesses to the table, Pemstein, Meserve and Melton (2010) used a Bayesian latent variable approach to synthesize an overarching index, the Unified Democracy Scores (UDS); their findings are available at <http://www.unified-democracy-scores.org>.

**(p.255)** The UDS integrates measures of (1) participation, inclusiveness, competitiveness, and coerciveness (Arat, 1991); (2) political liberties, competitive elections, inclusive participation, civilization supremacy, and sovereignty (Bowman, Lehoucq, & Mahoney, 2005); (3) political liberties and sovereignty (Bollen, 2001); (4) political rights and civil liberties (Freedom House, 2007); (5) elections and political freedoms (Hadenius, 1992); (6) executive elections, legislative elections, and party competition (Przeworski, Alvarez, Cheibub, & Limongi, 2000); (7) competitiveness of participation and executive recruitment, openness of executive recruitment, and constraints on the executive (Marshall, Jaggers, & Gurr, 2006); (8) fair elections, freedom of organization and expression, and pluralism of the media (Coppedge & Reinicke, 1991); (9) competitiveness, inclusiveness, and political liberties (Gasiorowski, 1996; Reich, 2002); and (10) competition and participation (Vanhanen, 2003). When Tom Postmes and I planned a climato-economic analysis of political autocracy versus democracy (Van de Vliert & Postmes, 2012), we chose the UDS over other indices for its careful development, breadth of domain, reduction of measurement error, and internal consistency (the intercorrelations of the 10 subscales range from .60 to .95;  $M_r = .79$ ).

### 3. Results

Across 174 nations, climatic demands (6%), monetary resources (22%), and their interaction (7%) accounted for 35% of the variation in autocratic versus democratic governance (Van de Vliert & Postmes, 2012). The visualization of the significant interaction effect in Figure 5.4 illustrates that sociopolitical democracy is lowest in poorer societies threatened by climates with more demanding winters or summers (e.g., Afghanistan, China), and highest in richer societies challenged by climates with more demanding winters or summers (e.g., Czech Republic, Norway). Neither autocracy nor democracy predominates in societies comforted by temperate climates irrespective of income per capita (e.g., Sierra Leone, Singapore). Confirming the adaptational storyline for cultural outcomes, autocratic forms of governance tend to be found in threatening habitats, laissez-faire forms of governance in comforting habitats, and democratic forms of governance in challenging habitats.

### 4. Supplementary Analyses

Parasitic diseases are well-established predictors of democratization and liberalization (Fincher & Thornhill, 2012; Schaller & Murray, 2011). However,  
**(p.256)**

when the disease burdens of nonzoonotic parasites, zoonotic parasites, and their interaction were controlled for, climato-economic circumstances still accounted for the largest part of the variation in political autocracy versus democracy ( $\Delta R^2 = .21$ ; total  $R^2 = .35$ ). By contrast, when climato-economic circumstances were controlled for, the parasitic disease burdens could not additionally account for any variation in political autocracy versus democracy ( $\Delta R^2 = .00$ ; total  $R^2 = .35$ ) (Van de Vliert & Postmes, 2012). Therefore, in comparison with latent concerns over parasites, it would appear that climato-economic habitat is the more powerful predictor of cultural outcomes of political autocracy versus democracy.

Previous analyses (Van de Vliert, 2009; Van de Vliert & Einarsen, 2008) supplement and strengthen this pattern of findings. Climatic demands (4%), monetary resources (13%), and their interaction (14%) accounted for 31% of the variation in selfish autocratic versus cooperative democratic leadership among more than 17,000 managers from over 900 organizations in 60 societies. Highly similar analyses revealed that climatic demands (0%), monetary resources (1%), and their interaction (17%) accounted for 18% of the variation in cooperative teamwork among more than 150,000 members of organizational (p.257) groups in 53 countries. Time and again, climato-economic interaction effects produced findings similar to those displayed in Figure 5.4, with a downward sloping line for the poorer communities, negligible differences between poorer and richer communities in temperate climates, and significant differences between poorer and richer countries in more demanding climates. All in all, the climato-economic theory of culture seems to shed interesting new light on the international ladder leading from overall autocracy up to overall democracy.

### 5. Generalization Note

As alluded to earlier (in the discussion of the homogeneity of multi-item measures of culture), these findings are generalizable from political autocracy versus political democracy to press repression versus press freedom. Across 175 countries, climatic demands (0%), monetary resources (31%), and their interaction (8%) predicted 39% of the variation in a 3 × 3 format (i.e., point of view of scientific analysts, journalists, top executives and point in time of year 1, year 2, year 3) providing 9 measures of press repression versus press freedom (Van de Vliert, 2011b). Press repression and press freedom are additional

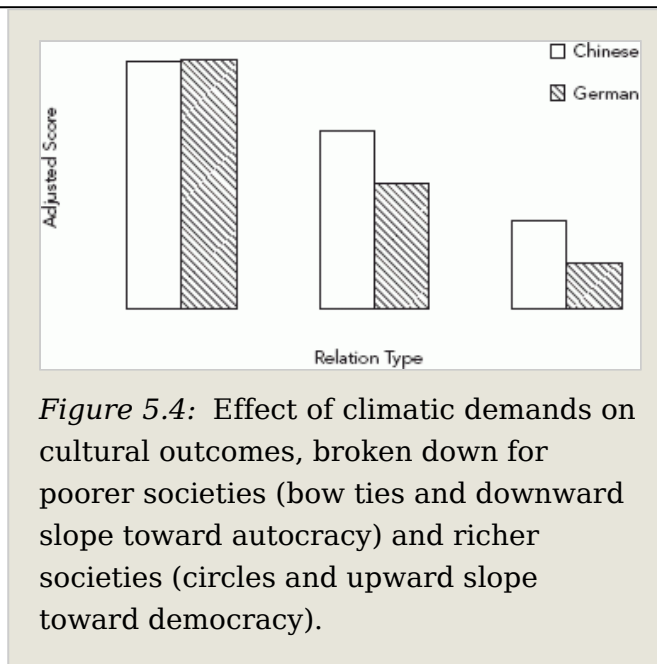


Figure 5.4: Effect of climatic demands on cultural outcomes, broken down for poorer societies (bow ties and downward slope toward autocracy) and richer societies (circles and upward slope toward democracy).

outcome components of threat-based and challenge-based cultural syndromes, respectively. By implication, comfort-based cultural syndromes in poor and rich countries with temperate climates are plagued by neither too little nor too much freedom of the media (Van de Vliert, 2011b).

### 6. Conclusion

Again, the results favor the proposed idea that climato-economic habitats shape autocracy reflecting survival goals, laissez-faire management reflecting easygoing goals, and democracy reflecting self-expression goals.

#### E. Cultural Syndromes

The empirical evidence presented so far suggests that inhabitants adapt their stresses, goals, means, and outcomes to threatening, comforting, and challenging climato-economic habitats. Here, I address the overarching question of whether a more parsimonious and generic presentation of the cultural components and adaptations is possible. First, the zero-order correlations among the investigated stresses, goals, means, and outcomes were inspected and scrutinized for the existence of a common denominator. Next, averages of cross-nationally standardized stresses, goals, means, and outcomes were (**p. 258**) calculated. They constitute a Cultural Syndrome Index (CSI), representing threat syndromes, comfort syndromes, and challenge syndromes, respectively. After countries with only a single indicator of CSI are excluded, the resulting index covers 129 nations (see CSI column in Table 5.1).

As expected, the correlations among challenging stresses, self-expression goals, individual agency means, and democratic outcomes, reported in Table 5.2, reflect a common denominator ( $M_r = .57$ ; single factor predicts 73% of the variance; Cronbach's  $\alpha = .87$ ), which represents all four components of cultural adaptation satisfactorily (see CSI row in Table 5.1;  $M_r = .83$ ). In agreement with the overall theoretical framework in Figure 5.1, threat syndromes and challenge syndromes seem appropriate anchor points of the cultural syndromes underlying the four components of cultural adaptation (for interpretations of these syndromes in terms of human rights, human development, and fundamental human freedoms, see Van de Vliert, in press).

In Table 5.1, national cultures are ordered from threat-based through comfort-based to challenge-based on the basis of their CSI score. Threat syndromes are strongest in 35 Asian countries ( $M_z = -0.56$ ;  $SD_z = 0.46$ ), in 23 African countries ( $M_z = -0.46$ ;  $SD_z = 0.55$ ), and in 22 Central and South American countries ( $M_z = -0.17$ ;  $SD_z = 0.51$ ), in that order. Challenge syndromes are strongest in Australia and New Zealand ( $M_z = 1.59$ ;  $SD_z = 0.08$ ), in Canada and the United States ( $M_z = 1.23$ ;  $SD_z = 0.64$ ), in 39 European countries ( $M_z = 0.40$ ;  $SD_z = 0.91$ ), and in Oceania ( $M_z = 0.24$ ;  $SD_z = 0.36$ ), in that order. The relatively large standard deviation for Europe masks the relevant additional information that (1) East European countries such as Belarus, Bulgaria,

Macedonia, Montenegro, and Serbia have clearly threat-based cultures, (2) South European countries represented by Cyprus, Greece, Italy, Portugal, and Spain tend to have easygoing cultures, and (3) North European countries such as Denmark, Finland, The Netherlands, Norway, and Sweden have clearly challenge-based cultures.

### V. Remaining Puzzles

#### A. Addition-Or-Interaction Puzzles

An unaddressed question is whether inhabitants adapt culturally to climatic demands in general (i.e., to winter and summer demands in total) or to specific combinations of winter and summer demands. In the next paragraphs, this theoretical issue is discussed from the following methodological angles: the desirable number of climatic predictors, the achievable predictive power **(p. 259)**

**Table 5.1: Cultural Adaptations of Challenges, Goals, Means, and Outcomes Converging into a Cultural Syndrome Index (CSI) for 129 Countries**

Countries	Cultural Adaptations				CSI <sup>b</sup>
	Challenges <sup>a</sup>	Goals	Means	Outcomes	
Chad			-2.66	-1.05	-1.86
Serbia	-3.00	-0.96	-1.02		-1.66
Morocco	-2.00	-1.07	-1.53	-1.07	-1.42
Tajikistan			-1.39	-1.31	-1.35
Azerbaijan		-1.40	-1.32	-1.30	-1.34
Cuba			-0.22	-2.40	-1.31
Iran	-1.88	-0.29	-1.22	-1.39	-1.20
Paraguay			-2.03	-0.25	-1.14
Belarus		-1.13	-0.67	-1.42	-1.07
Montenegro		-1.07	-1.02		-1.05
Jordan		-0.96	-0.90	-1.27	-1.04
Cambodia			-1.01	-0.98	-1.00
Ethiopia	-1.09		-1.01	-0.87	-0.99
Russia	-1.52	-1.74	-0.44	-0.16	-0.96
Bahrain			0.12	-2.02	-0.95

## Creating Cultures Between Arctics and Deserts

Countries	Cultural Adaptations				
	Challenges <sup>a</sup>	Goals	Means	Outcomes	CSI <sup>b</sup>
Georgia		-1.24	-0.84	-0.73	-0.93
Qatar			0.14	-2.00	-0.93
Kazakhstan			-0.60	-1.21	-0.90
Tunisia			-0.51	-1.30	-0.90
Lebanon	-0.94			-0.75	-0.84
Bulgaria	-0.71	-1.44	-1.06	-0.07	-0.82
China	0.03	-0.55	-0.45	-2.23	-0.80
Vietnam		0.23	-0.41	-2.23	-0.80
Egypt		-0.37	-0.78	-1.25	-0.80
Cameroon			-0.26	-1.33	-0.79
Honduras			-1.65	0.07	-0.79
Kyrgyzstan			-0.38	-1.19	-0.79
Macedonia		-1.04	-0.88	-0.39	-0.77
Bangladesh		-0.88	-0.99	-0.43	-0.77
Albania		-1.43	-0.57	-0.28	-0.76
Armenia		-1.43	-0.51	-0.30	-0.75
Zambia			-0.81	-0.66	-0.73

## Creating Cultures Between Arctics and Deserts

Countries	Cultural Adaptations				
	Challenges <sup>a</sup>	Goals	Means	Outcomes	CSI <sup>b</sup>
Uganda		-0.48	-0.68	-0.97	-0.71
Zimbabwe		-1.26	0.20	-1.04	-0.70
Algeria		-0.48	-0.65	-0.87	-0.67
Mozambique			-0.89	-0.40	-0.65
Guatemala			-0.95	-0.28	-0.61
Moldova		-1.77	0.15	-0.22	-0.61
Mali			-1.14	-0.05	-0.59
Ukraine		-1.58	-0.13	-0.01	-0.57
Nicaragua			-1.39	0.26	-0.56
Madagascar			-0.76	-0.32	-0.54
Bolivia			-1.18	0.11	-0.53
Mongolia			-1.14	0.13	-0.50
United Arab Emirates	-0.32		0.76	-1.89	-0.49
Pakistan	-0.42	-0.48	0.52	-1.34	-0.43
Kuwait	1.04		-0.77	-1.51	-0.41
Kenya			0.00	-0.81	-0.41
Romania		-1.53	-0.06	0.38	-0.40



## Creating Cultures Between Arctics and Deserts

Countries	Cultural Adaptations				
	Challenges <sup>a</sup>	Goals	Means	Outcomes	CSI <sup>b</sup>
Gambia			0.25	-1.06	-0.40
Ecuador			-0.89	0.09	-0.40
Hong Kong	-1.18		0.43		-0.37
Chile	-2.34	0.11	0.29	0.45	-0.37
Bosnia and Herzegovina	-1.79	-0.48	1.43	-0.49	-0.33
South Korea	-0.65	-0.36	-0.26	-0.01	-0.32
Guyana			-0.63	0.09	-0.27
Lithuania		-0.90	-0.36	0.49	-0.26
Philippines		-0.13	-0.67	0.11	-0.23
Sri Lanka	-0.26		0.00	-0.42	-0.23
Latvia		-1.18	0.19	0.31	-0.23
Turkey	-0.07	-0.38	-0.19	-0.27	-0.22
Peru		-0.12	0.10	-0.62	-0.22
India	-0.44	-0.46	-0.25	0.32	-0.20
Solomon Islands	0.03			-0.43	-0.20
Poland	0.08	-0.54	-0.48	0.19	-0.19
Malaysia			0.44	-0.76	-0.16

## Creating Cultures Between Arctics and Deserts

Countries	Cultural Adaptations				
	Challenges <sup>a</sup>	Goals	Means	Outcomes	CSI <sup>b</sup>
Namibia	-1.15		0.78	-0.10	-0.16
Fiji	1.00			-1.29	-0.15
Thailand			-0.28	0.09	-0.10
Tanzania		-0.03	0.41	-0.66	-0.09
Nigeria	0.34	0.19	-0.16	-0.59	-0.05
Indonesia	0.86	-0.37	-0.58	-0.12	-0.05
Croatia		0.35	-0.58	0.10	-0.04
Colombia		0.26	-0.04	-0.33	-0.04
Benin			-0.26	0.18	-0.04
Venezuela	0.02	0.35	-0.17	-0.28	-0.02
Slovakia	-0.31	-0.38	-0.18	0.80	-0.02
South Africa	-1.00	-0.20	0.78	0.46	0.01
Panama			-0.26	0.36	0.05
Mexico	0.04	0.55	-0.46	0.11	0.06
Singapore	1.33	-0.17	0.19	-0.99	0.09
Mauritius			-0.26	0.49	0.12
Brazil	0.29	0.02	-0.09	0.28	0.13

## Creating Cultures Between Arctics and Deserts

Countries	Cultural Adaptations				
	Challenges <sup>a</sup>	Goals	Means	Outcomes	CSI <sup>b</sup>
Taiwan	0.68	-0.71	-0.09	0.69	0.14
Hungary	1.01	-1.19	-0.07	0.85	0.15
El Salvador		0.46	-0.17	0.20	0.16
Uruguay		0.44	-0.53	0.69	0.20
Samoa	0.44			-0.03	0.21
Dominican Republic		0.34	0.10	0.17	0.21
Israel	-1.00	0.38	0.96	0.53	0.22
Cyprus			-0.89	1.33	0.22
Estonia		-1.07	1.40	0.42	0.25
Malawi			0.63	-0.11	0.26
Ghana		-0.03	0.88	0.04	0.30
Argentina		0.31	0.06	0.54	0.30
Malta		0.02	-0.80	1.80	0.34
Papua New Guinea	0.35			0.37	0.36
Slovenia		0.32	-0.10	0.86	0.36
Jamaica			0.63	0.16	0.39
Costa Rica			0.05	0.79	0.42

## Creating Cultures Between Arctics and Deserts

Countries	Cultural Adaptations				
	Challenges <sup>a</sup>	Goals	Means	Outcomes	CSI <sup>b</sup>
Botswana			1.01	-0.14	0.43
Czech Republic	0.27	0.37	0.14	1.13	0.48
Kiribati	0.51			0.46	0.48
Portugal		0.11	0.17	1.17	0.48
Greece	0.51	0.60	-0.06	0.93	0.49
Japan	-0.73	0.71	1.23	0.86	0.52
Italy	0.00	0.91	0.16	1.12	0.55
Trinidad and Tobago			0.50	0.63	0.57
Spain	0.77	0.52	0.55	0.95	0.70
Vanuatu	0.78			0.69	0.73
Germany	0.62	0.52	1.55	0.63	0.83
Andorra		0.31		1.43	0.87
Belgium	0.16	1.01	1.38	1.12	0.92
Ireland	0.58	1.11	0.72	1.34	0.94
France	1.06	0.86	1.33	0.69	0.98
United Kingdom	0.16	1.31	1.78	0.95	1.05
United States	0.18	1.57	1.93	1.05	1.18

## Creating Cultures Between Arctics and Deserts

Countries	Cultural Adaptations				
	Challenges <sup>a</sup>	Goals	Means	Outcomes	CSI <sup>b</sup>
Austria	0.90	1.43	0.79	1.81	1.23
Canada	0.42	1.69	1.80	1.16	1.27
Luxembourg		1.12	1.62	1.11	1.28
Switzerland	1.22	1.35	1.53	1.05	1.29
Iceland	1.07	1.64	1.01	1.80	1.38
Finland	1.35	1.01	1.51	1.82	1.42
Australia	0.57	1.79	1.93	1.84	1.53
Norway	0.96	1.43	2.09	1.83	1.58
New Zealand	0.77	1.77	2.25	1.82	1.65
Netherlands	1.28	1.88	2.43	1.83	1.85
Sweden	1.16	2.13	2.88	1.83	2.00
Denmark		1.79	2.40	1.81	2.00

(a) Challenges are threatening stresses reversed.

(b) CSI is the average of cross-nationally standardized challenges, goals, means, and outcomes.

**(p.260) (p.261) (p.262) (p.263) (p.264)** of climatic demands, the winter–summer asymmetry in cultural adaptation, and the exogenous potential for refinement of the climate–culture predictions.

Winter demands and summer demands can shape societal culture in additive or interactive ways, and both ways have their academic merits. The additive combinations used in the empirical studies reviewed here have the scientific strength of having only three predictors (climatic demands, monetary resources, and their interaction) and tip the inevitable trade-off between theoretical parsimony and theoretical accuracy in favor of parsimony. Interactive combinations of winter demands and summer demands, by contrast, tip the trade-off in favor of theoretical accuracy by estimating

**Table 5.2: Correlations Among Cultural Adaptations of Stresses, Goals, Means, and Outcomes and the Cultural Syndrome Index (CSI)**

<b>Cultural Adaptations</b>	Sample (n)	1	2	3	4
1. Stresses: challenges <sup>a</sup>	58				
2. Goals: self-expression	77	.57***			
3. Means: individual agency	121	.46***	.75***		
4. Outcomes: democracy	126	.44***	.67***	.55***	
5. CSI <sup>b</sup>	129	.75***	.89***	.85***	.82***

(a) Challenges are threatening stresses reversed.

(b) CSI is the average of cross-nationally standardized stresses, goals, means, and outcomes.\*\*\*p ( .001.

**(p.265)** cultural adaptations with seven predictors (winter demands, summer demands, monetary resources, three two-way interactions, and one three-way interaction). Results of comparative research should allow a decision as to when the more accurate seven-predictor approach has greater predictive power and theoretical payoff than the more parsimonious three-predictor approach.

To illustrate this point, I compared the capacities of the three-predictor and seven-predictor approaches to climato-economically explain the 129 country scores in the CSI ranking from Table 5.1. Climatic demands (1%), monetary resources (41%), and their interaction (14%) accounted for 56% of the variation in the CSI. In a more detailed look, winter demands (3%), summer demands (6%), the winter-by-summer interaction (1%), monetary resources (34%), the winter-by-resources interaction (17%), the summer-by-resources interaction (1%), and the winter-by-summer-by-resources interaction (2%) accounted for 64% of the variation in the CSI. A plot of the three-way interaction uncovers a winter-summer asymmetry showing that cultural adaptation to colder-than-temperate winters in conjunction with monetary resources is stronger than cultural adaptation to hotter-than-temperate summers in conjunction with monetary resources. In consequence, impacts of winter–summer configurations are one promising way of moving from greater theoretical parsimony toward greater theoretical accuracy.

On closer consideration, the winter–summer asymmetry in predicting cultural adaptation does not come as a surprise. Around the globe, colder-than-temperate winter demands (worldwide:  $M = 30$ ,  $SD = 22$ ; sample:  $M = 37$ ,  $SD = 22$ ) are greater than the hotter-than-temperate summer demands (worldwide:  $M = 24$ ,  $SD = 7$ ; sample:  $M = 24$ ,  $SD = 6$ ). In addition, it is more difficult to compensate for cold winters than for hot summers, as exemplified by the World Bank's definition of poverty (Van de Vliert, 2009, p. 63):

In otherwise equal circumstances, money resources are needed least in temperate climates, much more in hot continental climates, and most in cold continental climates. The poverty line is a dollar a day in African countries with sweltering hot summers, including the Central African Republic, Chad, and Nigeria; it is more than twice as high in East European and Asian countries with ice-cold winters, where more money is needed for heating and clothes (e.g., Belarus, Moldova, Ukraine, Pakistan, Tajikistan, and Uzbekistan).

The greater predictive power of the more accurate seven-predictor approach should not necessarily be read as a dismissal of the more parsimonious **(p.266)** three-predictor approach. The simpler approach has the distinctive advantage of leaving room for refinement by introducing exogenous predictors that may alter the climato-economic impact on cultural stresses, goals, means, or outcomes. For example, if one wants to examine whether genetic responsibility for offspring influences the climato-economic impact on mental health problems



discussed previously, the two- and three-way interaction effects of climatic demands, monetary resources, and genetic responsibility have to be included in a multilevel analysis. Such multilevel research would be most welcome because, to date, cross-level effects on individuals in support of the climato-economic theory are still restricted to cultural adaptations in knowledge-seeking behavior (Chen et al., 2009), motives for volunteer work (Van de Vliert, Huang, & Levine, 2004), and collectivistic orientations across China (Van de Vliert, Yang, et al., in press).

### B. Foreground-Background Puzzles

Cultures reduce problems (Baumeister, 2005). Two universal problems, empirically addressed earlier, are climatic survival in a particular place and genetic survival over time. Climatic survival is the more important one in the foreground, because it forms a necessary condition for genetic survival in the background. This raises the novel question: Under what circumstances do reversals of foreground and background take place? When will climatic survival be superseded by genetic survival as the more important origin of variation in culture? A clue to an answer may be found in the observation that “climatic survival emphasizes the part played by warm-bloodedness rather than gender, whereas genetic survival emphasizes the part played by gender rather than warm-bloodedness” (Van de Vliert, 2011a, p. 510). Given that cultures reduce problems, this asymmetry in the nature of our two universal survival problems is bound to evolve distinct cultural responses. Threats to climatic survival in a particular place may primarily promote cultural adaptations that push gender issues into the background, whereas threats to genetic survival over time may primarily promote gendered adaptations such as cultural masculinity and femininity. Gendered cultures have been studied by Hofstede (1998), by Van de Vliert and Janssen (2002) and by Emrich, Denmark, and Den Hartog (2004).

Another dilemma of the foreground–background type is whether climatic hardships alter the impact of economic hardships on culture, or vice-versa. Across the six studies whose results were reported earlier in this chapter, climatic demands ( $M = 3\%$ ) always accounted for considerably less variation in culture than either monetary resources ( $M = 24\%$ ) and the climato-economic (**p. 267**) interaction term ( $M = 13\%$ ). This is a remarkable finding, given that the main effect of climatic demands had the advantage of being entered in the regression analyses before the main effect of monetary resources. Empirically, it is tempting, but inaccurate, to conclude that climatic demands alter the impact of monetary resources rather than the other way round, although both formulations are defensible. The content and format of follow-up questions should help resolve this dual-perspective dilemma inherent in theory-building about climato-economic imprints on culture.

A third incompleteness of the theory is its overemphasis on existence needs at the expense of growth needs and social needs. Typologies are discussed by Alderfer (1972); Bakker and Demerouti (2007); Herzberg (1966); Kenrick, Griskevicius, Neuberg, and Schaller (2010); and Maslow (1954). I am currently working on the hypothesis that needs for personal growth are weak in threatening habitats, intermediately strong in comforting habitats, and strong in challenging habitats. Social needs lead to a cumulative speculation. Threat appraisals in poor and demanding habitats are thought to increase the salience and motivational valence of meeting one's own existence needs and those of family members and close friends and of primarily meeting social needs through those ingroups. By contrast, challenge appraisals in rich and demanding habitats are thought to increase the salience and motivational valence of meeting one's own growth needs and of primarily meeting social needs through individual others, acquaintances and strangers alike, who facilitate or contribute to the achievement of personal growth. In any case, growth needs and social needs deserve to be incorporated into future tests of the climato-economic theory of culture.

### C. Past-Change Puzzles

Although cultural adaptation takes time, the cross-sectional studies reviewed here ignore time lags, with only a single exception: Between 1981 and 2002, societies living in more demanding climates appear to have moved from setting self-expression goals toward setting survival goals to the extent that they were exposed to economic decline rather than economic growth (Van de Vliert, 2007, 2009). Qualitative evidence of dramatic cultural adaptation in the opposite direction comes from the cold case of the Scandinavian Vikings, who turned from poor fighters and pirates in the past into rich cooperators and benefactors today, although it took them a millennium to accomplish this. Granted, not all of them survived genetically. The Norse communities in medieval Greenland collapsed, most likely because climato-economic hardships **(p.268)** pushed them on a slippery slope toward extinction. My inevitably speculative reading of what happened to the Greenland Norse follows. It may encourage similar long-term analyses of other vanished societies such as the Maya people, who once lived in the seasonal desert environment of the Copán Valley in western Honduras.

Arctic anthropological and archaeological studies (Dugmore, Keller, & McGovern, 2007; Lynnerup, 2000; McGovern, Amorosi, Perdikaris, & Woollett, 1996), combined with historical, geographical, and palynological research (Diamond, 2005; 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. As a consequence, many generations of Norse and Inuit must have had the cultural worldview that completely different economic policies and resources make it possible to survive the same cold and demanding winter seasons. But this was an illusion.

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. To make matters worse, the initial Greenland–Europe market for walrus ivory was replaced by Asia–Europe and Africa–Europe markets for elephant ivory. 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, setting survival goals, and falling back on chiefs and church officials as part of a desperate search for crisis management (see earlier discussion of cultural adaptations): “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).

**(p.269)** The most counterproductive adaptation to the threatening climato-economic habitat seems to have been the entwinement of autocratic leadership and ingroup agency. Such vertical collectivism promotes outgroup discrimination. Perceived threat, common goals, moral superiority, 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, calling them *skraeling*, that is, wretches. This prevented the Norse from trading with the Inuit and learning from them how to use blubber for heating and lighting, 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. Climato-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.

Alternative explanations for the collapse of the Greenland Norse settlements in medieval times are of course possible, but some may be linked back to the demandingness of thermal climate as a more exogenous origin. The role of subsistence technology and economy is an example. A sedentary agrarian economy like that of the Norse may have led to vertical collectivism, whereas a nomadic fishing economy like that of the Inuit may have produced a less hierarchic and bureaucratic cultural syndrome (Nolan & Lenski, 1999; Wells, 2010). However, this is not really a rival explanation, because the flourishing agricultural economy of the Norse settlers can easily be traced back to the Medieval Warm Period, and the later economic downturn can equally easily be traced back to the nasty conditions of the subsequent Little Ice Age. The nomadic fishing economy of the Inuit, by comparison, was almost by definition less dependent on changing winter and summer demands.

Interestingly, even longitudinal investigations of past cultural changes are not necessarily studies of adaptation or extinction. Negligible cultural change is predicted if the ecological conditions 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 America between 1815 and 1860, settling in rural areas with climatic and agricultural conditions similar to those prevailing in Alsace: Indiana, Illinois, Iowa, **(p.270)** New York, Ontario, Ohio, and Pennsylvania. Totally opposed to the American dream of large profits and innovation, they explicitly sought a farming life with climato-economic and techno-economic stability. As a consequence, even today, they continue to cling to their traditional goals, means, and outcomes, including the use of horsepower and natural fertilizers, growing and rotating a variety of crops, and raising livestock in small numbers. For many reasons, all this is now starting to change, not in the least because the Amish are now taking part in a long-term climatic experiment.

### D. Global Warming Puzzles

The research results reviewed here are not about climatic change, and are hardly about economic decline and growth. Nevertheless, the ecology–culture links found are bound to have implications for the cultural consequences of climatic and economic changes in the long run, as exemplified by the cascading collapse of the Norse settlements in Greenland. Specifically, the regression equations obtained can be used to model future changes in cultural stresses, goals, means, and outcomes as a result of two huge threats humanity faces today: global warming and local poverty. The quality of our ability to predict culture necessarily depends on the quality of climatic and economic forecasts, with the consequence that predictions need to be made very carefully and results should not be overinterpreted. Even so, it would be foolhardy not to use insights from research on the recent past to make predictions of the further future that might help locate, diagnose, and potentially mitigate livability

problems. An American Psychology Association task force even claimed that it is an ethical obligation for psychologists to contribute to understanding and addressing global climate change (Doherty & Clayton, 2011; Swim et al., 2011).

Investigations of links between global warming and cultural adaptation have focused on overt cultural outcomes. Fruitful scholarly attention has been paid to migration (Lee, 2009; Warner, Ehrhart, Sherbinin, Adamo, & Onn, 2009), agriculture (Challinor, Wheeler, Garforth, Craufurd, & Kassam, 2007; Cline, 2007; Liu, Li, Fischer, & Sun, 2004; Parry, Rosenzweig, & Livermore, 2005), and large-scale conflict (Burke, Miguel, Satyanath, Dykema, & Lobell, 2009; Lee, 2009; Nordås and Gleditsch, 2007; Raleigh & Urdal, 2007; Tol & Wagner, 2010; Welzer, 2012; Zhang, Jim, Lin, He, Wang, & Lee, 2006). The climato-economic theory of culture might enrich and extend this research agenda by replacing geotemperature with biotemperature, by introducing the interactive impact of monetary resources, and by helping to explain the **(p.271)** underlying covert processes in terms of existence needs, threat appraisals, survival goals, and ingroup orientation. My group did some preliminary brainstorming. As discussed next, one way to proceed is to first select a future time target, then select appropriate climato-economic predictors, and finally select one or more cultural adaptations for projection.

There is a practical reason for adopting a time lag of 100 years. The Intergovernmental Panel on Climate Change (IPCC, 2001; <http://www.ipcc.ch>) has done an excellent job of simulating thermal climate and national income levels that will exist late in this century, albeit in a highly aggregated form for four world regions. Building on this solid foundation, others have undertaken downscaling of forecast data to the national level for monthly temperatures (Cline, 2007) and for income per capita (Gaffin, Rosenzweig, Xing, & Yetman, 2004; Van Vuuren, Lucas, & Hilderink, 2007). Cline's temperature projections for 2070 through 2099, and the income projections by Gaffin's and Van Vuuren's groups for 2100 enable future researchers to simulate countries' climato-economic habitats at the end of this century and subsequently estimate cultural adaptations of stresses, goals, means, and outcomes between 2012 and 2112.

There are also good reasons for adopting variations on the CSI as a dependent variable. First, as theoretically outlined in Figure 5.1 and empirically demonstrated in Table 5.2, stresses, goals, means, and outcomes are interrelated and integrated into three cultural syndromes which are at home in threatening, comforting, and challenging habitats, respectively. Second, estimates of these CSI variations, listed in Table 5.1, are available for 129 countries. Last but not least, the corresponding regression equation to be used for culture projections radiates predictive power. Climatic demands ( $\Delta R^2 = .01$ ,  $B = -.110$ ,  $p < .05$ ), monetary resources ( $\Delta R^2 = .41$ ,  $B = .409$ ,  $p < .001$ ), and their interaction ( $\Delta R^2 = .14$ ,  $B = .344$ ,  $p < .001$ ) account for no less than 56% of the variation in the CSI

as a representation of national cultures ranging from threat syndromes through comfort syndromes to challenge syndromes.

### E. Broader Evolutionary Puzzles

Although the introductory section of this chapter referred to property-based operations as major tools for cultural niche construction within climatic habitats, this far-reaching evolutionary perspective has been too hastily and implicitly restricted to national wealth as a structural condition for cross-sectional climatic effects. Clearly, static climato-economic covariations (**p.272**) of threat-based, comfort-based, and challenge-based cultures provide only a start to solve the total cryptogram of dynamic niche construction (Boehm & Flack, 2010; Boyd & Richerson, 2005; Chirkov, 2011; Odling-Smee et al., 2003; Tomassello, 2011; Whiten, 2011; Whiten, Horner, & Marshall-Pescini, 2003). Evolutionary psychologists (Baumeister, 2005; Buss, 2005; Plotkin, 2002; Yamagashi, 2011) can easily generate many questions about how precisely cash and capital have been gradually constructed as ingenious tools that exist independently of place, time, and the climate-compensating goods and services they can buy.

Although this overview article raises more problems than it answers, especially about the natural way in which warm-blooded species have developed throughout history to become the humans and animals that we know today, it does make a point. The climato-economic covariations of human culture reviewed here seem to render it impossible to sketch a convincing picture of present-day niche construction by humans if we continue to neglect or underemphasize the crucially important part played by the interaction of winters, summers, and monetary resources. A good deal of the still unsolved evolutionary puzzles can be summarized in the following overarching question for further research: In what domains, in what ways, and to what extent has evolution of culture in humans, unlike evolution in animals, contrived to integrate climatic and economic underpinnings?

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