

group selection actually crosscuts these climate categories: its absence or presence is not necessarily constrained by them.

Lastly, money can allow agents to cope with climatic stresses only if agents do care in priority about their existence needs. But evolutionary theorists (e.g., Sterelny 2012) have stressed that environment changes, including cultural change, tend to decouple individual utilities from fitness. If social evolution has made us pay disproportionate attention to social needs, then the increased freedom of choice enjoyed by members of rich societies could lead to a worse population-level state than should be expected by the target article's interpretation. Contrary to an early assumption of the target article, the appearance of new needs may well dwarf old ones. In other words, the various needs that drive the selection of behaviours cannot be straightforwardly juxtaposed, which impacts the adaptations we should expect.

So for several reasons, the evolutionary process at work behind the fascinating correlations discovered by Van de Vliert is likely to be much more complex than the target article hints, and possibly less influential on culture in general, which in turn is relevant for the inferences drawn about future trends. In any case, the premature resort to a notion of (collective) adaptation is likely to obscure the debate.

## Fundamental freedoms and the psychology of threat, bargaining, and inequality

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**Abstract:** Van de Vliert's findings may be explained by the psychology of threat and bargaining. Poor people facing extreme threats must cope by surrendering individual freedom in service of shared group needs. Wealthier people are more able to flee from threats and/or resist authoritarianism, so their leaders must concede greater freedom. Incorporating these factors (plus inequality) can sharpen researchers' predictions.

Van de Vliert argues that extreme climates have different effects on rich and poor nations, "pushing and pulling" toward freedom in rich groups and toward repression in poor groups. Accordingly, he finds that discrimination, workplace bullying, autocratic leadership, press repression, and reduced freedom of self-expression are (1) most severe where people with low average income face extreme climates, (2) least severe where people with high average income face extreme climates. Our goals in this commentary are to show that this pattern of results is well explained by the individual-level psychology of threat and bargaining and to highlight the importance of inequality as a macroeconomic variable predicting freedom outcomes. In doing so, we hope to encourage synthesis of related theory and findings in different disciplines, leading to improved models.

Van de Vliert emphasizes that humans must cope with climate-related threat by using available resources, including money and the support of one's social group. Poor people facing severe threats they cannot escape have no choice but to form very tight groups to meet shared needs. It is well established that group solidarity is higher when members face a common threat (reviewed by Benard & Doan 2011; Van Vugt et al. 2008); such effects are even found in nonhumans (Radford 2008). Group members have a stake in each other's well-being, so it pays to cooperate in order to address such mutual threats (Lahti & Weinstein

2005; Roberts 2005; West et al. 2007). As part of this general phenomenon, group threats also cause people to conform to group norms and increase their support for existing leaders (Van Vugt 2006; Willer 2004); leaders may in turn exaggerate such threats to promote cohesion and suppress attempts to supplant them (Lahti & Weinstein 2005; Willer 2004). The greater the threats, the more group members need to unite. (To avoid confusion about terminology, note that where we would say "minor threat," Van de Vliert says "challenge.") This research is consilient with Van de Vliert's findings that the people facing the most extreme climate threat with little means of escape (those in poorer countries with extreme climates) enjoy the least individual freedom.

Extreme climates are associated with reduced freedom among poor nations, but greater freedom among rich nations (according to the target article). This interaction may be because rich people confronted with threats have an option besides coping: avoiding the threats altogether. For humans confronted with a threat that is directly and permanently linked to their location (or social group), fleeing from threat will typically require relocating and/or joining a new group. Whether for purposes of coping or fleeing, earning the support of a social group is a bargaining process whereby individuals must make contributions and/or concessions in exchange for access to group benefits that are disproportionately controlled by the most powerful members of the group. When shared conditions are good and group members have many outside options, subordinates have more resources available to challenge dominants and pose a more credible threat to leave; thus, dominants must concede more to subordinates to entice them to stay in their groups. Predictions based on this logic have been supported in behavioral ecology by numerous mathematical models and empirical studies of inequality within nonhuman species, where it is called "reproductive skew theory" (e.g., Johnstone 2000; Shen & Reeve 2010). Psychology experiments have shown that when people think emigrating is easy, they are less supportive of the local political system (Kay et al. 2009; Laurin et al. 2010).

We suggest that residents of nations with low average income are less capable of bearing the costs of relocation and bring less bargaining power to efforts to join a new group, and they are thus more likely to choose a coping strategy than a flight strategy in response to threat. Conversely, we suggest that residents of nations with high average income are more capable of relocating and joining a new group, and thus they are more likely to choose a flight strategy. It is therefore possible that leaders of wealthy groups in extreme climates must offer a better bargain, using less violence and monopolizing fewer vital resources (i.e., conceding more freedom) than those in undemanding climates to prevent their subordinates leaving in search of better weather. Because moderate climates are more comfortable, wealthy citizens there cannot threaten to leave as credibly as can wealthy citizens of extreme climates, so leaders can exploit the former more.

Thus far we have explained how the psychology of threat and bargaining may help explain the observed relationship between climate, average income, and several freedom outcomes. We now offer two cautions. First, harsh climates are one of many kinds of survival threats. Models for predicting freedoms as a function of threat may be improved by considering different kinds of survival threats such as pathogens and parasites, predation, individual/coalitional violence, and resource scarcity. Further, threats to "higher" needs than survival, such as the need for status, may also explain freedom-relevant outcomes. For example, the most variable portion of homicide rates across groups is the rate at which young men kill other young men over status disputes (Daly & Wilson 1988). Models predicting freedom from fear may therefore be improved by including predictors of threats to status.

Our second caution emphasizes the importance of a specific predictor of status threat: income equality. Increasing inequality is a threat to status because it creates a larger gap between

current and desired state, which in turn motivates more extreme efforts to make up the difference (Mishra & Lalumière 2010). A large body of evidence has shown that income inequality, above and beyond average income, predicts a wide array of social, health, and well-being outcomes at the aggregate level, including many directly relevant to freedom (e.g., ingroup vs. outgroup comparisons, competition and discrimination, intergroup violence; reviewed in Wilkinson & Pickett 2009). Furthermore, average income and income inequality are poorly associated at the aggregate level. As a consequence, Van de Vliert's reliance on mean group income to explain outcomes like ethnocentrism and aggression may obscure important effects of within-group income inequality on these outcomes.

## Personality traits, national character stereotypes, and climate–economic conditions

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**Abstract:** Cross-cultural personality research suggests that individuals from wealthier countries tend to be more open-minded. This openness to values may support more democratic governments and the expansion of fundamental freedoms. The link between wealth and freedom is evident in cold-to-temperate climates, but not across wealthy nations in hot climates. Furthermore, temperature and economic conditions shape perceptions of national character stereotypes.

We agree with the basic tenets of Van de Vliert's argument that economic and climatic conditions of a country are closely linked to the levels of fundamental freedoms. In "climate–economic explanation of freedoms," Van de Vliert argues that, depending on climatic conditions, greater economic resources should increase open-mindedness and risk-seeking. He seems to imply that these dispositions favor free choices and the development of more egalitarian societies. This hypothesis has some support in cross-cultural research on personality traits (McCrae et al. 2005). In 51 cultures from around the world, we obtained observer ratings of 12,156 individuals, and we found that individuals from wealthier countries are significantly more likely to be rated as more open to experience. Indeed, the correlation between the average openness from each country and the gross domestic product (GDP) per capita was  $r = .47$ ,  $n = 51$ . The association was even stronger between GDP and openness to values ( $r = .65$ ,  $n = 51$ ), a facet that measures tolerance and openness to different social, religious, and political values (Costa & McCrae 1992). In turn, cultures with more open-minded individuals tend to be less conservative ( $r = -.70$ ,  $n = 22$ ) (Schwartz 1994), even after accounting for GDP. Cultures with high openness to values have also more democratic regimes ( $r = .65$ ,  $n = 49$ ; Unified democracy score) (Pemstein et al. 2010), even after accounting for GDP. Within the United States, states with higher openness are more likely to endorse liberal values, such as legalization of marijuana and same-sex marriage (Rentfrow et al. 2008). At both individual and culture levels, openness is also associated with lower discrimination, as is the case for HIV (McCrae et al. 2007a).

We found mixed evidence regarding the hypothesis that individuals in wealthier countries are more willing to take risk. Although individuals in high GDP countries were rated as less cautious (deliberation:  $r = -.44$ ,  $n = 51$ ) and more impulsive (impulsiveness:  $r = .35$ ,  $n = 51$ ), GDP was unrelated to

excitement-seeking and was positively associated with self-discipline ( $r = .29$ ,  $n = 51$ ). Furthermore, we found no support for the hypothesis that climatic demands (Van de Vliert 2009) or average temperature contribute to the prediction of openness or risk-taking traits. In a hierarchical regression with GDP in a first step, there was no significant contribution of climatic demands or the interaction of economic resources with climatic demands on openness or risk-taking traits ( $p > .05$ ).

Although we found little support for climate effects on individuals' personality traits, we have found that temperature has a profound effect on the perceptions of groups, or national character stereotypes (Terracciano et al. 2005). Indeed, we found that those living in warmer climates were perceived as interpersonally warmer ( $r = .54$ ,  $n = 49$ ), and temperature was associated with other aspects of national character stereotypes even after accounting for GDP (McCrae et al. 2007b). Especially for cultures from Southern Europe and South America, there seem to be a conflation of hot climate and hot temperament. In many languages, words such as "hot," "warm," and "cold" can be used to describe temperature and temperament, suggesting that the climate-temperament link has deep roots in human cultures. Perceptions of national character were also related to wealth, with those living in rich countries rating the typical member of their country as relatively more conscientious ( $r = .44$ ), less interpersonally warm ( $r = -.60$ ), and with more business-like traits, even after accounting for temperature. Consistent with this pattern, raters from poorer countries (e.g., Nigeria and Indonesia as compared to Germany and the United Kingdom) tend to perceive Americans as more competent (Chan et al. 2011; Terracciano & McCrae 2007). These national character stereotypes do not reflect the actual average traits of these groups (Terracciano et al. 2005), but they seem to shape a national identity that reflects economic strengths and helps distinguish a country from its neighbors. Thus, whether evaluating ingroup or outgroup members, there is a general tendency to attribute traits to groups based on climate-economic conditions, which has some commonality with Van de Vliert's theory.

As noted above, we found little evidence for an interaction between economic and climatic conditions in predicting personality traits (or national character stereotypes). Overall, the evidence for a climate-economic interaction seems weak, particularly the idea that people from wealthy countries in hot climates enjoy high levels of freedoms. Arab states (Saudi Arabia, Qatar, Oman, Bahrain, Kuwait, and United Arab Emirates) and Singapore have high standards of living (e.g., low infant mortality). These wealthy countries in hot climates, however, score low on indices of democracy (Pemstein et al. 2010) and have limited freedoms of expression, press, and religion. In these countries, discrimination based on sex, sexual orientation, and ethnicity is not uncommon. Much greater freedom can be found in wealthy countries with more temperate and colder climates. Van de Vliert's (2009) summer climate index seems also problematic: summer harshness is rated for Russia at 30 as for Nigeria, Bahrain, Iraq, and Kuwait; Canada at 27 as for Bangladesh and Brazil; and Estonia and Finland at 26 as for Ghana and Indonesia. Although climatic demand measures that improve over the average temperature would be desirable, the above examples call into question the face validity of Van de Vliert's (2009) summer index. Finally, some of the evidence in support for a role of climatic demands on discrimination is ambiguous. Indeed, the collectivism index (Vandello & Cohen 1999) used for the 50 United States seems a poor proxy for discrimination and oppression of fundamental freedoms. According to Van de Vliert's reasoning, states such as Hawaii, Maryland, and California rank among the worst in fundamental freedoms along with states such as Louisiana, South Carolina, Mississippi, and Utah. These states differ drastically in political orientation, tax and economic policy, gun control, death penalty, same-sex marriage, and abortion rights. Furthermore, whether these 7 states have worse fundamental freedoms compared to the other 43 states is debatable. In particular, Maryland was the first state with a majority of voters