

cultural group, and climate is important to the extent that it plays a role in creating rugged lands of frontier.

The article by Van de Vliert is timely, addressing an important issue. However, the data Van de Vliert reports are ambiguous. In fact, they are more consistent with an alternative perspective that highlights the potential significance of frontier migration as a force that produces an ethos of independence.

Regarding his international analysis, it is apparent from Figure 2 in the target article that what Van de Vliert calls “demanding” climate appears mostly the result of severe winter rather than extremity in climate in general. More important, however, countries located in the upper right quadrant are almost always Western or Northern European (e.g., United Kingdom and Finland) or the countries derived from them (United States, Canada), whereas countries located in the lower right quadrant are in large part ex-Communist (e.g., Russia, Kazakhstan).

Countries in the northern hemisphere underwent massive historical changes over the last several hundred years, culminating in capitalist economy in Western Europe and communism in Eastern Europe. Eventually the capitalist system flourished, whereas the communist system eventually collapsed. Although the climato-economic theory suggests that the different paths were the result of the economic resources each system had at the very beginning, given the fact that Western Europe was a rather poor and backward region during medieval times (Kennedy 1989), it is sensible to hypothesize that wealth is, for the most part, a product of any given sociocultural system.

We may suggest that cultures that prospered nearer to the equator expanded, over historical time, to colder regions with the advancements of living conditions (Diamond 1997). These colder regions were initially frontiers. Because people had no stable community to rely on, their frontier migration and eventual settlement are likely to have bred an independent mentality (Kitayama et al. 2006; 2010). Indeed, independent values including self-promotion and initiative, innovativeness and creativity, are likely to have been indispensable for survival. Independent ideas and practices, in turn, may prove highly successful in generating wealth (not vice versa) under certain conditions as in Western Europe. It may further be speculated that in regions where individualism was best suited for survival, following less individualistic practices (i.e., communism) was not suitable for wealth production and the system ultimately failed.

Van de Vliert’s regional analysis also meets with some challenges. Chinese regions that Van de Vliert identifies as relatively lower in collectivism are in the temperate south, whereas the regions he identifies as higher in collectivism are in the colder north, as well as in the western territories. The southern regions are conducive to rice farming, having rich, fertile land and abundant rain (Talhelm et al. 2012). Because rice farming requires substantial social coordination, one may expect the southern regions to be more collectivistic (Uskul et al. 2008). In contrast, the northern, as well as far-western, regions of China are not suitable for rice farming. Much of the western region is desert and high-elevation plateaus, where herding is a more dominant mode of living. Even when farming is tried, the main crop is not rice but wheat, which requires much less social coordination (Talhelm et al. 2012). Given these reasons, one would expect regions in the northwest to be more individualistic, contradicting Van de Vliert’s main claim. In fact, when we analyzed province-wise divorce rates (a face-valid indicator of individualism, taken from Talhelm et al. 2012) as a function of Van de Vliert’s climatic demand index, we observed a strong positive correlation, $r = .70$, $p = .005$. Harsher climates were strongly related to individualism. We suggest the frontier-like regions of the northwest may have fostered individualism.

In his analysis of China, Van de Vliert relies exclusively on a self-report measure of collectivism. While such rating scales are

excellent to assess individual differences within a group, they should be complemented by other measures when applied to between-group comparisons as there are some complex issues (Kitayama 2002). For example, different groups might have very different interpretations of each item. Does “attending a weekly community meeting” make one a loyal member of the community? It depends. The southern, more collectivist regions might have more stringent criteria in defining what counts as “loyal.” If so, a southerner might judge himself as less collectivist on this item than a northerner might.

Now regarding the regional variation within the United States (Fig. 3 of the target article), one major problem is that Van de Vliert neglects settlement history of the United States, which likely had major impacts on the contemporary mentality of Americans (Kitayama et al. 2010). To test whether settlement predicts collectivism, we analyzed cold climate demand (heat demand was not a significant predictor, thus excluded) and frontier settlement in relation to collectivism across the United States. We controlled for Hispanic and Asian births, as these groups can inflate collectivism scores (based on Vandello & Cohen 1999), and excluded Hawaii because of its unique island nature. We found that young state age, a proxy for settlement, is a significant predictor of less collectivism ($\beta = .32$, $p = .044$). In addition, cold (but not hot) climate had a significantly negative (or positive) effect on collectivism (or individualism), $\beta = -.44$ ($p = .004$), consistent with the notion that migration to colder regions fosters an independent ethos.

To conclude, one common thread running across the three cases discussed in this commentary is the significance of migration to “frontiers” or rugged lands of cold winter and sparse population. We suggest that once properly analyzed and understood, the data are more consistent with the idea that settlement in the frontier encourages independent mentality and individualistic social institutions (Kitayama et al. 2010). This cultural system can sometimes flourish, generating both wealth and power (Kennedy 1989), but clearly not always. In our view, wealth is, for the most part, a measure of success of any given cultural group. Climate is important to the extent that it plays a role in creating rugged lands of frontier. Thus, it is not climatic demand in general, but cold winter that matters the most. Future work should examine under what circumstances individualistic ideas and social practices might “succeed,” producing both wealth and power for a given nation.

Is there a role for “climatotherapy” in the sustainable development of mental health?

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Abstract: Climate, diet, lifestyle, and environmental settings have all been shown to modulate mood, play a role in mental disorders, and even pose a mental health risk. Can climatotherapy, in its adaptive approach aiming to restore balance among the economic, social, and ecological realms of human societies, situate itself as a therapeutic avenue for the promotion of sustainable mental health?

Van de Vliert is to be commended for revealing and explicating the importance of climato-economic habitats on patterns of human stress. This commentary presents further arguments to suggest that climate, diet, lifestyle, and environmental settings are also able to modulate mental health. Our alternative explanation builds on prior clinical practice of climatotherapy and recent researches demonstrating that climatotherapy might be a therapeutic avenue for the sustainable development of mental health.

When taking care of a goldfish, we take into consideration water quality and oxygenation, temperature and luminosity of the aquarium, diet, and so forth. When it comes to taking care of ourselves, the impact of these environmental factors on our behaviours and mental health is often less evident.

Long before the development of theories linking the economy to climate, however, theories have involved climate as a factor in the regulation of emotions. Under the term climato-therapy, the influence of climate was described as a causal factor in mental disorders. Its action could be direct, either brutal (acute delirium linked to sun stroke) or insidious (depressive state of a more or less long duration). Its action could also be indirect, either through specific infectious diseases in countries and climates (malarial psychosis, dysenterial psychosis, etc.), or through toxic habits (opium addiction, colonial alcoholism, etc.), or finally through moral and social conditions in which they are found (nostalgia, disorientation, etc.). Admittedly, Van de Vliert discusses patterns of prevalence of mental health problems according to threat, comfort, or challenge appraisals as a competing explanation. However, for Van de Vliert climate is perceived as an element of fate and not a therapeutic tool applicable in mental health.

Surprisingly, the concept of climatotherapy, formerly used in mental health, has been taken up again primarily with regards to dermatologic disorders, such as psoriasis, atopic dermatitis (Adler-Cohen et al. 2012) or vitiligo (Czarnowicki et al. 2011). Depending on the disorder, the described effects can either be acute or chronic (Schuh & Nowak 2011).

Several hypotheses could review the first intuitions of mental treatments. First is the hypothesis that there is a link between depression and vitamin D (of which a deficiency is more important in less sunny climates), which rests on the observation that vitamin D improves depression and other mental disorders (Penckofer et al. 2010), that it increases following climatotherapy, and that it reduces musculoskeletal pain, such as that encountered in fibromyalgia (Harari et al. 2011). A second hypothesis is that mental disorders are linked to diet (Desseilles et al. 2013), for example, the concentration of lithium in the groundwater influencing the prevalence of mood disorders (Schrauzer & Shrestha 1990). Third is the hypothesis linking lifestyle to mental disorders, such as the notion of the urban environment posing a mental health risk. Indeed, anxiety and mood disorders, as well as schizophrenia, are more prevalent among city dwellers (Krabbendam & van Os 2005; Mortensen et al. 1999; Pedersen & Mortensen 2001; Peen et al. 2010; van Os et al. 2004). Living in a city has also been associated with increased activity of the amygdala, known for its role in emotion regulation (Lederbogen et al. 2011; Mikolajczak & Desseilles 2012).

We could also easily imagine that architecture (e.g., Roesler 2012) and the living environment have a psychological impact on individuals and that climate, topography, or both could influence mental health through their previous impact on what and how individuals have built and planned their surroundings. These ideas have led to the notion of environmental psychology (De Young 1999) and to that of sustainable development, which has been popularised by the report from the World Commission on Environment and Development, created in 1983 by the United Nations. The report aims to reconcile the economic, social, and ecological

dimensions of human societies. Indeed, historical sites, representations, and objects that have a cultural, scientific, symbolic, spiritual, or religious value are important manifestations of the culture, identity, and religious beliefs of a society, and they are also important factors to stability and humanity within society (United Nations 1997). Therefore, historical sites and monuments could be used as remedies to psychological imbalance caused by the rapid urbanisation of society (Council of Europe Parliamentary Assembly 1970).

Furthermore, convalescence and treatment settings – prized for their environmental or natural qualities (natural sources, thermal cures, sunbathing,...) and their services (lodging, dietary, distractions), – combined to cures of hydrotherapy, act through mental and physical rest, through the interruption of activities and professional preoccupations, and through disorientation or a change of scenery. These hydro-climatic cures were one of the first physical treatments of mental disorders.

Of course, we can isolate a lot of climatic factors, which are actually studied scientifically in dedicated protocols enabling us to shed light on their physiopathological and psychopathological implications. Let us therefore note the studies linking ambient temperature to the physiopathology of depression (Rosenthal & Vogel 1994), or dehydration to mood (Armstrong et al. 2012), or light to mood (Golden et al. 2005), as well as high altitude and hypoxic condition to mood and cognition (de Aquino Lemos et al. 2012). Among bipolar patients, meteorological factors such as temperature could influence the onset of new episodes (Christensen et al. 2008).

Last but not least, Van de Vliert's climato-economic theory also points to the effect of global warming, but without contemplating its opportunities, consequences, or risks on mental health. Indeed, climate and its catastrophic variations can also lead to numerous psychological damages, particularly among vulnerable persons (Neria & Shultz 2012). The challenge in mental health comes from the fact that interventions bear on unforeseeable elements – their occurrence, extent, and consequences. These dramatic consequences to climates could become more frequent and virulent as a result of global climate change (Aldy & Stavins 2012). In this way, early identification of exposed persons and a rapid and efficient intervention for individuals at risk of developing mental health disorders seem vital, alongside the consideration of climatic refugees or eco-refugees (Myers 1994). Climate modifications can therefore be an occasion to promote mental health (Berry 2009) adapted to specific environments, populations, and available budgets.

Improving climato-economic theorizing at the individual level

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Abstract: Using representative data from 55 nations, I show that individual level wealth interacts with climate in predicting individual happiness but not postmaterialism values. I propose that more research is needed to identify (a) the specific mechanisms of how wealth buffers climatic demands at the individual level and (b) the neurocognitive and physiological reactions of individuals situated in different ecological niches.

Van de Vliert argues that demands placed on humans, if not met by sufficient resources to cope with these demands, will lead to malfunctioning and stress of the individual. Impressive evidence is