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Hard or Easy? Difficulty of Entrepreneurial Startups in 107 Climato-Economic Environments

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Driven by existential needs for thermal comfort, nutrition, and health, human populations create cultural adaptations to environmental conditions. Entrepreneurs starting new businesses in more threatening or more challenging environments may be a case in point. In a secondary analysis of population-level data from 107 nations, we cross-sectionally examined six adaptation hypotheses based on climato-economic theorising. The regression results show that new business creation is experienced as being the hardest in the threatening environments of poorer countries with colder winters and cooler summers (e.g. Bolivia and Ukraine), and as being the easiest in the challenging environments of richer countries with hotter summers and warmer winters (e.g. Singapore and United Arab Emirates). Rival explanations in terms of the historical trajectory of state emergence (state antiquity, colonial past, communist past) and societal development (industrialisation, democratisation, education) are ruled out and discussed. This article suggests that results of individual-level and group-level research into entrepreneurship are tentative at best as long as cultural adaptations to climato-economic environments are left out of consideration.

INTRODUCTION

Entrepreneurs who start a new business are creators of value. They produce not only jobs, goods or services and incomes, but also innovative ideas, challenges, and satisfaction for self and others. But being valuable is not equal to being easily realisable. On the contrary, entrepreneurs all around the globe inevitably have to face and take a variety of risks of waning gains and waxing losses. The very beginning of putting up a new business can already be seen as a series of uncertain transactions. Intriguingly, the transaction costs, including financial costs, administrative costs, social costs, and physical costs, are

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unevenly distributed around the globe (Freytag & Thurik, 2010; Petrakis & Valsamis, 2013; Van Stel, Storey, & Thurik, 2007).

This paper makes an initial contribution to a better psychological understanding of cross-national differences in entrepreneurial transaction costs. Economists have set a good example by debating and investigating whether or not objective costs of entrepreneurial transactions are more burdensome in poorer countries characterised by relatively higher capital requirements, more autocratic institutions and forms of governance, and greater corruption (Djankov, La Porta, Lopez-de-Silanes, & Shleifer, 2002; Van Stel et al., 2007), and in countries with cultural characteristics such as uncertainty avoidance (Petrakis & Valsamis, 2013). Given that many governments nowadays try to improve the speed and ease with which new businesses may be established in their country, it is important for psychologists to find out where and to what extent members of populations experience the combination of all entrepreneurial transaction costs to be difficult. *Difficulty* is defined here psychologically as the perceived amount of personal investment of money, time, and effort required to start a new business.

Preferring an explanatory rather than purely descriptive approach, we address the novel question: Why is the difficulty of entrepreneurial startups so unevenly distributed across the earth? Climato-economic theorising (Van de Vliert, 2009, 2013a) allows us to innovatively integrate the psychological and geographical realities underlying this problem by building on the following three cumulative propositions. First, existential needs for thermal comfort, nutrition, and health are among the ultimate drivers of much human activity including beginning a new business venture. Second, inhabitants of a country effortlessly appraise their root environment for signs of stressful threats versus stressful challenges to the satisfaction of existential needs and the success of activities including starting new enterprises. Third, people tend to perceive business creation as harder if they are residing in more threatening climato-economic environments but as easier if they are residing in more challenging climato-economic environments.

In a theoretical section, we expound that societal culture—what populations collectively value, believe, perceive, do, and institutionalise—is significantly shaped by three intertwined factors: existential needs, climate-based demands, and income-based resources to meet the needs and demands. The perceived amount of personal investment required to start a new business is inherently cultural in that it refers to perceptions, behaviors, and institutions. As one specific manifestation of national culture, the difficulty of starting new businesses is thought to increase in more demanding thermal climates, in poorer countries, and especially so in poorer countries with relatively demanding winters, summers, or both. The remaining sections report and discuss regression tests of the predicted geographical distributions of difficulty of entrepreneurial startups across 107 countries. Alternative readings of the results in terms of the

historical trajectory of state emergence and societal development are also considered.

WHY ARE POPULATIONS FINDING STARTUPS HARD OR EASY?

Existential Needs

To survive atmospheric cold and heat, our species must stay pleasantly warm, find good food, and remain healthy. Evolutionary processes have, therefore, equipped warm-blooded humans with basic needs for thermal comfort and healthy nutritional resources of plants and animals (Maddison & Rehdanz, 2011; Parsons, 2003). Building on these evolutionary roots, climato-economic theorising (Van de Vliert, 2009, 2013a) proposes that humans continuously, and often subconsciously, appraise their place of residence with respect to how well it meets homeostatic needs for thermal comfort, nutrition, and health. Appraisal domains include: Are cold winters or hot summers endangering our existential needs? Do we have income-based resources to secure need satisfaction? To what extent can cash and capital compensate for the demands of cold or heat? These all-pervasive matters of life and death are thought to be relevant for a proper understanding of culture.

Cognitive appraisals of the stressfulness of environmental deprivations consist of two mutually integrated processes—primary and secondary appraisals (Lazarus & Folkman, 1984; LePine, LePine, & Jackson, 2004). In climato-economic theorising, primary appraisals register and process the extent to which winters and summers are comforting or stressfully demanding based on whether or not one's family can get too cold or hot, can get enough to eat and drink, and can get through the season in good health. Secondary appraisals register and process the extent to which stressfully demanding winters or summers are threatening or challenging based on whether readily available financial resources allow appraisers to meet their existential needs. Stressful and exhaustive threats are negatively related, whereas stressful and exhaustive challenges are positively related, to motivation to learn, problem solving, and performance (Bandura, 1997; LePine et al., 2004; Skinner & Brewer, 2002). In consequence, populations create culture in adaptive response to the stressfulness of climate-based demands by using income-based resources to turn detrimental effects of winters and summers into beneficial effects.

Climate-based Demands

Although climates are made up of temperature, precipitation, wind, and so on, warm-blooded humans are especially sensitive to cold and hot environments (Parsons, 2003). Warm winters and cool summers offer relatively stress-free

and healthy environments, and abundant nutritional resources owing to the rich flora and fauna. Colder winters and hotter summers require more and better clothing, shelter structures, warming or cooling systems, and increasing investments of time and effort in the pursuit of water, food, and health. Indeed, both arctic-like and desert-like conditions entailing larger deviations from physiological homeostasis, fewer nutritional resources, and greater health problems will be primarily appraised as more stressful. Because of these primary appraisals, people do not want to live there, and entrepreneurs do not want to start a new business there. As a case in point, comparative research shows that entrepreneurs from both cold countries (e.g. Kyrgyzstan and Mongolia) and hot countries (e.g. Chad and Burkina Faso) consider the stressful lack of infrastructure a major obstacle to doing business in their country (World Economic Forum, 2007).

Given that almost all places of residence have both cold stress and heat stress, a proper test of the relationship between thermal stress and entrepreneurial difficulty should take the interactive effects of winter cold and summer heat into account. In addition, national income per head should be controlled for because countries with warm winters and hot summers tend to be poor whereas countries with cold winters and cool summers tend to be rich (Van de Vliert, 2009).

Hypothesis 1: With income resources controlled for, the difficulty of entrepreneurial startups will be especially high in countries with both colder-than-temperate winters and hotter-than-temperate summers.

Income-based Resources

Secondary appraisals of the available monetary resources to meet existential needs and climate-based demands (Van de Vliert, 2009, 2013a) are also relevant in the present context as most entrepreneurial investments are either straightforwardly financial or can be contracted out or speeded up by spending more money. Thus, a higher income per head is likely to produce appraisals that make it easier for a country's inhabitants to start new businesses (Djankov et al., 2002; Van Stel et al., 2007). Indeed, a basic point of departure in this field could be that the monetary requirements to start up a business from scratch will loom larger for members of poorer populations, who have to spend a relatively larger percentage of their income on objectively the same kind of investments in technical assistance, a work location, raw materials, equipment, property rights, and so on.

Appraisals of income-based resources also influence to what extent potential customers and clients of beginning entrepreneurs spend their money on short-term necessities of life or luxurious things including long-term projects. Poor

populations appear to spend up to 90 per cent of their household incomes on goods and services that satisfy immediate needs for thermal comfort, nutrition, and health (Parker, 2000). Rich populations, by contrast, spend most money on luxurious goods and services that satisfy cultural needs (e.g. fashion, sports, parties, vacations, education, life projects; De Mooij, 2011). By implication, then, beneficial country-level appraisals of the available monetary resources empower starting entrepreneurs not only as buyers but also as sellers, which leads to the next prediction.

Hypothesis 2: The difficulty of entrepreneurial startups will be higher in poorer countries.

Demands–Resources Interactions

So far, our hypotheses concern main effects of appraisals of climatic and economic conditions on the difficulty of startups, and could therefore have been derived from main-effect theories such as the eco-cultural framework (Berry, 2011). Yet, the central tenet of climato-economic theorising (Van de Vliert, 2009, 2013a) is that monetary resources play an interactive role in coping with and adapting to demandingly cold and hot seasons. As a rule, necessities of life needed to secure thermal comfort, nutrition, and health are for sale and have a price if they have not already been bought. Consequently, cash as liquid money and capital as illiquid money alter the effects of colder winters and hotter summers through purchases and possessions of clothing, housing, transportation, meals, medical cure and care, and other climate-compensating goods and services. That is, populations create culture by using income-based resources to turn detrimental effects of winters and summers into beneficial effects.

More scientifically put, primary appraisals of climate-based demands interact with secondary appraisals of income-based resources in construing and constructing different cultures, also for entrepreneurs. A straightforward application of this line of reasoning leads to the prediction that the difficulty of entrepreneurial startups will be maximal in poor countries with cold winters and hot summers and minimal in rich countries with cold winters and hot summers (a qualification of Hypothesis 1). Unfortunately, this is a hardly testable hypothesis because the world is short of poor and rich countries with both cold winters and hot summers (Van de Vliert, 2013b). We therefore formulated several theory-based hypotheses for more commonly occurring climato-economic environments, arguing as follows.

Poorer populations in colder climates with colder winters and cooler summers, or in hotter climates with hotter summers and warmer winters, are expected to appraise the suitability for human living as more stressful because

climate-based demands are higher. Relatedly, they are thought to appraise the locally available income-based resources for coping with the higher stress as less sufficient to the extent that they are poorer. These appraisals turn climatic stresses into threats that appear to make a country's inhabitants more closed-minded and risk-averse (Van de Vliert, 2009, 2013a) and less prone to learn, solve problems, and perform (Bandura, 1997; LePine et al., 2004; Skinner & Brewer, 2002). As a likely consequence, poor people with prevailing cold-threat or heat-threat appraisals will perceive relatively high difficulties in taking entrepreneurial risks, initiating new courses of action, motivating stakeholders, and attracting customers or clients (who are similarly poor and deprived).

Hypothesis 3a: The difficulty of entrepreneurial startups will be especially high in poorer countries with colder-than-temperate winters and temperate summers.

Hypothesis 3b: The difficulty of entrepreneurial startups will be especially high in poorer countries with hotter-than-temperate summers and temperate winters.

Richer populations in colder climates with colder winters and cooler summers, or in hotter climates with hotter summers and warmer winters, are also expected to appraise the suitability for human living as more stressful because climate-based demands are higher. By contrast, however, richer populations are thought to appraise the locally available income-based resources for coping with the higher stress as more sufficient to the extent that they are richer. These appraisals turn climatic stresses into challenges that appear to make a country's inhabitants more open-minded and risk-seeking (Van de Vliert, 2009, 2013a) and more prone to learn, solve problems, and perform (Bandura, 1997; LePine et al., 2004; Skinner & Brewer, 2002). As a likely consequence, rich people with prevailing cold-challenge or heat-challenge appraisals will perceive relatively low difficulties in taking entrepreneurial risks, initiating new courses of action, motivating stakeholders, and attracting customers or clients (who are similarly rich and endowed).

Hypothesis 3c: The difficulty of entrepreneurial startups will be especially low in richer countries with colder-than-temperate winters and temperate summers.

Hypothesis 3d: The difficulty of entrepreneurial startups will be especially low in richer countries with hotter-than-temperate summers and temperate winters.

METHOD

Although the difficulty of entrepreneurial startups can of course be studied at the level of individuals, groups, and nations, we will argue in favor of a country-level analysis. This study uses freely available data from international

sources, so that one can easily perform validity checks and replications (supporting Table S1, containing country values of difficulty of startups, climatic demands, and income resources, is available as an online supplement). To test the hypotheses, we regressed the difficulty of entrepreneurial startups on standardised indices of climatic cold, climatic heat, national income per head, and their multiplicative interaction terms. Economic progress and cultural change have become so confounded that we deemed it necessary to control for state emergence and societal development.

Tests uncontrolled for state emergence and societal development are reported first because historically anchored confounders could be “bad controls” that inappropriately affect the amount of true covariance in the relationship between climato-economic environments and the difficulty of entrepreneurial startups (for statistical details, see Angrist & Pischke, 2008). In addition, tests for state emergence and societal development are reported separately. This is done to prevent instability in the regression equation due to the ratio of the number of country cases to the number of predictor terms (required ratio > 10) and multicollinearity (required $VIF < 10$).

Level of Analysis

Trying to get to grips with the geographic variation in entrepreneurial transaction costs, we propose that individuals, groups, and nations form a social pyramid, with the layer of individuals at the bottom and the layer of national populations at the top. We further propose that each layer within this pyramid: (a) has an average baseline level of difficulty of entrepreneurial startups; (b) gradually adjusts this entrepreneurial baseline level to stable environments; (c) treats higher layers in the social pyramid as moderately remote and moderately stable environments; and (d) treats climatic and economic circumstances of nations as the remotest and most stable environments.

This perspective implies that higher social layers and climato-economic environments have a crucial part to play in explaining lower-layer baseline levels of difficulty of entrepreneurial startups. Given that an effect size in lower-layer research is the standardised deviation from the lower layer’s baseline level, the generalisability of the results of individual-level and group-level research across individuals or groups is anything but self-evident. By adopting the country level of analysis, not only do we avoid this generalisation problem, we also produce culture-level baselines of the difficulty of entrepreneurial startups as fruitful points of departure for multi-level research into this burgeoning field. Such multi-level research is necessary to demonstrate that the entrepreneurial component of national culture mediates the impact of climato-economic conditions on the difficulty of entrepreneurial startups within a country’s individuals and groups.

Sampling

Annually, national partner institutes of the World Economic Forum, covering all continents, draw a stratified sample of organisations. The four stratification criteria are country (> 50 organisations per country), economic sector (agriculture, industry, services), organisation type (domestic private sector, foreign-owned, enterprise with government participation), and organisation size (number of employees < 101; 101–500; 501–5,000; 5,001–20,000; > 20,000). Each year, the partner institutes pursue one survey per entrepreneurial firm or institution—the Executive Opinion Survey. This study uses the answers of 25,806 respondents from 107 countries (for detailed breakdowns of the 25,806 respondents by year, country, economic sector, organisation type, and organisation size, see World Economic Forum, 2002, 2003, 2004a, 2004b).

More specifically, this study employs an informant sampling approach, which “relies on a limited selective sample of people who are the most knowledgeable of the global properties of interest” (Van de Ven & Ferry, 1980, p. 72). Executives of a country’s firms and institutions in a certain domain may indeed be the most knowledgeable informants on the obstacles and setbacks that people encounter when starting up a new business in that domain. Notably, these executives have much inside information about the specifics and particulars of required endowments, fruitful investments, and market opportunities in the domain at hand. Moreover, the stratified sample of executives used represents different economic sectors and different types and sizes of organisations per country, thereby providing a balanced perspective on entrepreneurial difficulties by averaging the executives’ observations.

There is yet another advantage to using observer-respondents (e.g. executives) instead of actor-respondents (e.g. registered entrepreneurs). Actors tend to overemphasise situational causes to explain obstacles and setbacks they face in their own goal strivings, whereas observers tend to overemphasise dispositional causes to explain other people’s obstacles and setbacks (Watson, 1982; Weary, Stanley, & Harvey, 1989). As a logical consequence, members of populations may thus view their own entrepreneurial startups as financially, organisationally, and economically more difficult than the startups of their compatriots. Given this actor-observer bias, and trying to tread cautiously, our interest here is in the observers’ underestimations rather than the actors’ overestimations of the difficulty of business startups.

Dependent Variable: Difficulty of Startups

Obstacles to starting a new business have been measured in the years 2000 (questions 1–5 in 59 countries), 2001 (questions 6–8 in 75 countries), 2002 (question 8 in 80 countries), 2003 (question 8 in 102 countries), and 2004 (question 8 in 104 countries). Answers to question 8 served as the dependent variable

because (a) question 8 is an improved version of question 5 qua both formulation and response format, (b) question 8 is not restricted to the rating of particular transaction costs such as capital requirements and obligatory administrative procedures (Van Stel et al., 2007), or property rights and entry density (Petrakis & Valsamis, 2013), (c) data are available from a larger cross-temporal sample, and (d) the repeated measurement allows the construction of an index across four time points.

The executives were asked the following question: “Starting a new business in your country is generally *extremely difficult and time consuming* (1) ... *easy* (7) (sources: World Economic Forum, 2002, p. 411; 2003, p. 624; 2004a, p. 510; 2004b, p. 562). This repeatedly asked question can be criticised because it is basically a single-item measure, combines elements of extremeness and duration, fails to provide response standards, and does not refer to specific startups. In addition, no interrater agreement coefficients have been reported. Nonetheless, there are several reasons to believe that the aggregated omnibus answers may be capturing the broader psychological construct of interest.

First, the advantage of multiple respondents tends to make up for the disadvantage of a single item (Van de Vliert, Van der Vegt, & Janssen, 2009). Second, the coefficients for test–retest reliability ($.85 < r < .91$) allow the construction of a reverse-coded index of difficulty of entrepreneurial startups across four time points. Third, the concurrent validity of this index is reflected in its meaningful associations with executive observations of four more specific obstacles to startups measured only once and in only 59 countries (source: World Economic Forum, 2000, pp. 308–309). In order of decreasing importance, difficulty of startups is associated with financial conditions as obstacles ($r = .80, p < .001$), administrative procedures as obstacles ($r = .78, p < .001$), lack of legal protection as an obstacle ($r = .65, p < .001$), and economic conditions as obstacles ($r = .63, p < .001$). Fourth, the predictive validity of this index is apparent from its cross-national relations with the 2004 World Bank data (www.doingbusiness.org) about the financial costs ($r = .30, n = 99, p < .01$), the number of days ($r = .42, p < .001$), and the number of administrative procedures ($r = .62, p < .001$) required to start a business.

Last but not least, the construct validity of the dependent variable has been established on the basis of the following line of reasoning. Entrepreneurs who start a new business must decide whether or not to do so in the formal economy (Thai & Turkina, 2012, 2014). If the difficulty of startups increases, the inclination to decide in favor of the informal economy increases as well. Consequently, the index can be thought of as having construct validity to the extent that it is positively associated with the size of the informal economy (as estimated by the World Bank: Schneider, Buehn, & Montenegro, 2010). Our measure of the difficulty of startups clearly meets this validation criterion ($r = .56, n = 106, p < .001$).

Predictor Variables for Climato-Economic Environments

Climatic Demands. As has become customary in this line of research, 22°C (about 72°F) was adopted as a biological point of reference for meeting existential needs for thermal comfort, nutrition, and health. Operationalised across each country's major cities, weighted for population size, cold demands were the sum of the downward deviations from 22°C for the average lowest and highest temperatures in the coldest month, and the average lowest and highest temperatures in the hottest month; heat demands were the sum of the upward deviations from 22°C for the same four average temperatures (source: Van de Vliert, 2013b, pp. 505–507). In Finland, for example, where temperatures range from -33°C to 5°C in the coldest month, and from 7°C to 33°C in the hottest month, the cold demands are $(|-33^{\circ}\text{C} - 22^{\circ}\text{C}| + |5^{\circ}\text{C} - 22^{\circ}\text{C}| + |7^{\circ}\text{C} - 22^{\circ}\text{C}|) = 87$, whereas the heat demands are $(|-33^{\circ}\text{C} - 22^{\circ}\text{C}|) = 11$.

Income Resources. National income per head was operationalised as the capacity of a country's currency to buy a given basket of basic goods and services (purchasing power parity in 2002, log transformed to reduce the skewed cross-national distribution; source: UN Development Programme, 2004, pp. 139–142).

Control Variables for Historical Development

Historically, economic progress has become so confounded with state emergence and societal development that it prompted us to control for state antiquity, colonial past, communist past, and current societal levels of industrialisation, democratisation, and education (a detailed account of the reasons for including these control variables is available as an online supplement).

State Emergence. To unravel the presumed impact of climato-economic conditions and the possible influence of the stages of state emergence on the difficulty of entrepreneurial startups, we controlled for state antiquity (interval scale; source: Putterman, 2004). For 50-year intervals up to 1950, state antiquity measures the extent to which territories were ruled in a manner that helped develop formal modes of self-government and secondary institutions. In addition, we also controlled for colonial past (yes or no; source: National Geographic Society, 1999) and communist past (yes or no; source: Parker, 1997).

Industrialisation. Each country's position on the historical continuum from agriculture to industrial and service employment was approximated by the national percentages of sectoral employment (source: UN Development

Programme, 2004, pp. 229–232 for OECD countries; 2007, pp. 299–301 for non-OECD countries). The employment percentages for agriculture, industry, and services loaded on a single factor that accounted for 72 per cent of the common variation. National factor scores were saved as a new variable and reversed to represent the extent to which each country is engaged in industrial and service activities.

Democratisation. To control for the century-long development of current levels of democracy, we chose Pemstein, Meserve, and Melton's (2010) Unified Democracy Score over other measures as it covers more aspects of political democracy, has been more carefully developed, reduces measurement error to a greater extent, and has a better internal consistency reliability (the average correlation among the 10 subscales is .79).

Education. The UN's education index served as an extra control variable (source: UN Development Programme, 2004, pp. 139–142), that is, we controlled for the historical progress made in developing adult literacy and higher gross enrolment ratios for primary, secondary, and tertiary schools.

RESULTS

Descriptive Background

Table 1 reports the means, standard deviations, and correlations of the difficulty of startups, the climato-economic predictors, and the control variables. Cold demands and heat demands tend to be mutually exclusive ($r = -.63$, $n = 107$, $p < .001$), thus making it necessary to inspect regression equations for multicollinearity (see footnote to Table 2). Income resources, however, have no potentially problematic overlap with cold demands ($r = .53$, $p < .001$) or heat demands ($r = -.40$, $p < .001$). As expected, industrialisation ($r = -.23$, $n = 93$, $p < .05$), democratisation ($r = -.28$, $n = 105$, $p < .01$), and higher education ($r = -.33$, $n = 105$, $p < .001$) all tend to reduce the difficulty of startups.

Tests Uncontrolled for Historical Development

Table 2 reports unstandardised regression coefficients and predicted proportions of difficulty of entrepreneurial startups. Model 1 estimates that cold demands ($B = .09$, *ns*), heat demands ($B = -.14$, *ns*), and income resources ($B = -.57$, $p < .001$) account for 31 per cent of the variation in the difficulty of starting a new business. These figures confirm that the difficulty of startups is higher in poorer countries (Hypothesis 2). Model 2 reveals that cold demands and heat demands have a significant interaction effect. When Model 3 controls for income resources, the climatic interaction effect turns out to be a qualified

TABLE 1
Means, Standard Deviations, and Correlations of the Study Variables

Variable	M	SD	1	2	3	4	5	6	7	8	9
1. Difficulty of startups	3.90	0.89									
2. Cold demands	39.82	24.77	-.14								
3. Heat demands	20.45	7.80	.03	-.63***							
4. Income resources (ln)	8.86	1.14	-.52***	.53***	-.40***						
5. State antiquity	37.69	10.97	.06	.24*	-.32***	.38***					
6. Colonial past	0.59	0.94	.09	-.70***	.39***	-.51***	-.19				
7. Communist past	0.18	0.38	.21*	.41***	-.19	-.02	-.25*	-.41***			
8. Industrialisation level	0.15	0.93	-.23*	.38***	-.32*	.76***	.66***	.25*	.02		
9. Democratisation level	0.70	0.76	-.28**	.49***	-.49***	.66***	.79***	-.38***	-.13	.54***	
10. Education level	0.81	0.17	-.33***	.58***	-.58***	.79***	.72***	-.49***	.17	.72***	.59***

Notes: N = 107 except for state antiquity (N = 101), and the current levels of industrialisation (N = 93), democratisation (N = 105), and education (N = 105). Indicators for two-tailed significance: *p < .05; **p < .01; ***p < .001.

TABLE 2
Summary of Hierarchical Regression Analyses of Climato-Economic Environments Predicting Difficulty of Entrepreneurial Startups

<i>Regression equation</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>	<i>Model 6</i>	<i>Model 7</i>	<i>Model 8</i>	<i>Model 9</i>
<i>Number of countries</i>	<i>107</i>	<i>107</i>	<i>107</i>	<i>107</i>	<i>107</i>	<i>101</i>	<i>101</i>	<i>92</i>	<i>92</i>
State antiquity						.02	.03***		
Colonial past						.49*	-.21		
Communist past						.82**	.47*		
Industrialisation								.08	.29*
Democratisation								-.16	.17
Education								-1.91*	-.89
Cold demands (CD)	.09	-.04	.24*	.32*	.25*		.08		.35**
Heat demands (HD)	-.14	-.08	-.14	-.14	-.25		-.21*		-.19
Income resources (IR)	-.57***		-.57***	-.55***	-.41***		-.52***		-.64***
CD × HD		.27*	.29**	.28*	.09		.14		.13
CD × IR				-.20	-.06		-.11		-.24
HD × IR				-.10	-.05		-.13		-.12
CD × HD × IR					.33**		.27*		.28*
Δ <i>R</i> ²	.31***	.07*	.29***	.01	.05**	.11**	.39***	.14**	.37***
<i>R</i> ²	.31***	.07*	.36***	.37***	.42***	.11**	.50***	.14**	.51***

Note: Coefficients shown are unstandardised regression weights from the final step. There was no multicollinearity (*VIFs* < 4.28 for Models 1 to 5; *VIFs* < 6.68 for Models 6 to 9), and there were no outliers (Cook's *Ds* < .29).
*p < .05; **p < .01; ***p < .001.

FIGURE 1. Difficulty of starting a new business in poorer and richer environments characterised by warm or cold winters alternated with cool or hot summers.

main effect of cold demands. In partial support of Hypothesis 1, startups tend to be seen as more difficult in countries with relatively cold winters, especially if these colder winters are alternated with relatively hot summers (supporting Figure S1, containing the interaction plot, is available as an online supplement).

Model 4 provides no extra insight, but the significant three-way interaction in Model 5 indicates that cold and heat demands have different impacts on poor and rich populations. The left panel of Figure 1 shows that the difficulty of entrepreneurial startups is higher in the threatening environments of poorer countries with colder winters and cooler summers (e.g. Bolivia, Georgia, and Ukraine; confirming Hypothesis 3a, $B = .54$, $p < .05$ for the low-heat slope), but not in the threatening environments of poorer countries with hotter summers and warmer winters (e.g. Chad, Mali, and Mozambique; disconfirming Hypothesis 3b, $B = .06$, ns for the high-heat slope). The right-hand panel shows that the difficulty is lower in the challenging environments of richer countries with hotter summers and warmer winters (e.g. Hong Kong, Singapore, and United Arab Emirates; confirming Hypothesis 3d, $B = .61$, $p < .01$ for the high-heat slope), but not in the challenging environments of richer countries with colder winters and cooler summers (e.g. Canada, Iceland, and Sweden; disconfirming Hypothesis 3c, $B = -.22$, ns for the low-heat slope).

A problem inherent to these tests surfaces if each country is assigned to one of eight conditions of cold demands (50% low, 50% high) by heat demands (50% low, 50% high) by income resources (50% poor, 50% rich). The resulting cell frequencies range from only four countries with cold winters and hot summers (one poor, three rich), through 18 countries with warm winters and cool summers (11 poor, seven rich), and 41 countries with cold winters and cool summers (nine poor, 32 rich), to 44 countries with hot summers and warm winters (31 poor, 13 rich). In response to this skewed distribution of country cases, we reran the regression weighting each country for the ratio of the expected number of cases in its cell (13.375) to the observed number of cases in its cell. This supplementary analysis revealed that cold demands (CD; $B = .03$, *ns*), heat demands (HD; $B = -.35$, $p < .001$), income resources (IR; $B = -.40$, $p < .001$), $CD \times HD$ ($B = -.03$, *ns*), $CD \times IR$ ($B = .08$, *ns*), $HD \times IR$ ($B = -.00$, *ns*), and $CD \times HD \times IR$ ($B = .36$, $p < .01$) accounted for 34 per cent of the variation in the difficulty of entrepreneurial startups, a pattern of regression effects that is essentially similar to the pattern in Model 5. We concluded that the world's shortage of countries with cold winters and hot summers, reflected in our sample, cannot be held accountable for the research results.

Tests Controlled for Historical Development

Table 2 also reports the estimated influences of the historical trajectory of state emergence (state antiquity, colonial past, communist past) and societal development (industrialisation, democratisation, education). Together, Models 6 to 9 suggest that state antiquity, communist past, and industrialisation increase the difficulty of entrepreneurial startups, but that colonial past, democratisation, and higher education have no effect whatsoever. Most importantly, the three-way interaction of cold demands, heat demands, and income resources retains its statistical significance. Thus, the results from these extra models attest to the robustness of the climato-economic impacts on the collective cultural experience of entrepreneurial startups as being hard or easy.

DISCUSSION

Present-day psychology of entrepreneurship still largely concentrates on the influence of personal factors (for overviews, see Frese & Gielnik, 2014; Miner & Raju, 2004; Rauch & Frese, 2007; Stephan & Roesler, 2010; Stewart & Roth, 2001; Zhao & Seibert, 2006). Increasingly, however, attention is also being paid to the influence of person–environment interactions (e.g. Hmieleski & Baron, 2008; Korunka, Frank, Lueger, & Mugler, 2003) and other environmental impacts (e.g. Obschonka, Schmitt-Rodermund, Silbereisen, Gosling, & Potter, 2013; Rauch et al., 2013; Stephan & Uhlaner, 2010). In this vein, the reported

study pays systematic attention to (a) existential needs for thermal comfort, nutrition, and health in relation to climatic cold and heat, (b) primary appraisals concerning the stressfulness of local winters and summers, and (c) secondary appraisals of income-based resources as adaptational tools for coping with climate-based demands of cold and heat.

The need-based appraisals of the environment played a theoretical instead of empirical role because of their axiomatic and predominantly subconscious nature. Thus, one disadvantage of our approach is that aggregated person–environment interactions were studied statistically rather than phenomenally. As related limitations, our research does not provide evidence that the entrepreneurial startup question was understood in a similar way across countries and that there was interrater agreement on the answers within countries, and neither does it include actual measures of entrepreneurial behavior such as the rate of entrepreneurial startups in a country. Counterbalancing these weaknesses is the advantage of tracing back obstacles of entrepreneurial activity to difficulty of the environment for starting entrepreneurs. Yet another disadvantage of our approach is the danger of sliding away from personalistic determinism toward climatic determinism. Counterbalancing this danger is the advantage of not tracing back obstacles of entrepreneurial activity to conditions of cold and heat *per se* but to climato-economic configurations at the place of residence. The upshot is that the present study can claim to move science further “beyond the myopic single-factor explanation offered by climatic determinism” (Van de Vliert, 2013b, p. 504).

Psychologists working on person–environment interactions, often in the tradition of Lewin (1951), tend to concentrate on proximal contexts at the micro level (e.g. family, club, work team) or meso level (e.g. neighborhood, school, company). But do environments really end there? This study attempts to keep peeling off layers of context to expose and investigate the distal country-level contexts of state emergence (state antiquity, colonial past, communist past), societal development (industrialisation, democratisation, education), thermal climate, and income per head. Using difficulty of entrepreneurial startups as a prototypical example, our study demonstrates that it might be especially fruitful for psychologists and other scholars to scrutinise the so-far neglected impact of climate in concert with the financial compensation of climate on a wide range of human capabilities and functionings.

In addition to person–environment interactions, climato-economic theorising (Van de Vliert, 2009, 2013a) also highlights psychological demands–resources interactions (e.g. Bandura, 1997; Lazarus & Folkman, 1984; LePine et al., 2004; Skinner & Brewer, 2002). It is widely believed that demands placed on people are a double-edged sword: greater demands in interaction with insufficient resources increase anxiety, closed-mindedness, and a desire to stay in control; greater demands in interaction with sufficient resources increase risk-seeking, open-mindedness, and a desire to be creative. In elegant agreement

with this psychological truth, the results in Figure 1 show that greater cold demands in interaction with insufficient income resources increase the difficulty of entrepreneurial startups (Hypothesis 3a), whereas greater heat demands in interaction with sufficient income resources increase the ease of entrepreneurial startups (Hypothesis 3d).

A remaining question is why two other parts of Hypothesis 3 had to be rejected. Why is it observed not to be harder to start a new business venture in poorer countries with hotter summers and warmer winters (Hypothesis 3b)? A plausible explanation may lie in our research approach. By controlling for the current level of industrialisation, we have removed the relevant pieces of information that industrialisation is lower in poorer countries (see reversed correlation from Table 1: $r = -.76$, $p < .001$) with hotter summers ($r = -.32$, $p < .05$) and warmer winters (reversed $r = -.38$, $p < .001$). It is indeed plausible that the tropical countries concerned have predominantly agricultural economies where each family already conducts its own business, so that entrepreneurial initiatives are neither hard nor easy, such that the difficulty of entrepreneurial startups is rather irrelevant.

The more thorny opposite question is why the ease of starting a new business does not increase in richer countries with colder winters and cooler summers (Hypothesis 3c). In this case, an approach to an answer may perhaps be found in the fact that cold demands range from 0 in Micronesia to 115 in Mongolia, whereas heat demands range from 0 on the Faroe Islands to only 44 in Sudan (Van de Vliert, 2013b). Indeed, the earth has a double temperature bias in that its cold demands ($M = 30.81$) are higher than its heat demands ($M = 21.29$; $t = 4.68$, $df = 231$, $p < .001$), and its variation in cold demands ($SD = 25.99$) is also higher than its variation in heat demands ($SD = 7.59$; Levine statistic = 5.49, $p < .001$).

The earth's cold bias, also reflected in the means and standard deviations for climatic demands in Table 1, may provide a clue to the following tentative explanation of the rejection of Hypothesis 3c. The worldwide temperature distributions of cold and heat imply that arctic climates with colder winters and cooler summers (and global cooling) are generally more demanding and stressful than desert climates with hotter summers and warmer winters (and global warming). It is therefore entirely possible that the arctic-like climates are so extremely demanding that even income-based resources in richer countries cannot fully compensate for them, thus turning local entrepreneurial challenges into local entrepreneurial threats. If so, it is consistent with climatoeconomic theorising that challenging desert-like conditions rather than threatening arctic-like conditions produce the lowest levels of difficulty of starting new businesses in richer countries.

In support of this explanatory line of argument, richer populations have more income per head available for compensating each degree of deviation from 22°C in climates with hotter summers and warmer winters (e.g. Hong

Kong, Singapore, and United Arab Emirates: $M = \$642$ per 1°C) than in climates with colder winters and cooler summers (e.g. Canada, Finland, and Switzerland: $M = \$303$ per 1°C). More climate-free income in hotter compared to colder conditions means more freedom to easily start new businesses in hotter climato-economic environments. While this is an a posteriori explanation of an unpredicted finding, if proven correct, it would enrich climato-economic theorising by drawing attention to the psychological fact that even rich populations can get overwhelmed by the effects of extreme cold exposure, and then have to adapt accordingly.

A final point to be discussed is that of starting new businesses as being a cultural activity. Theorising has made tremendous progress by placing entrepreneurial phenomena in a wider cross-cultural context (Freytag & Thurik, 2010; Kropp, Lindsay, & Hancock, 2011; Petrakis & Valsamis, 2013; Tung, Walls, & Frese, 2007). However, these advances should not blind scholars to some inconvenient questions raised by the present article. First, how much can be learned really from attributing individual-level and group-level variations in entrepreneurial phenomena to societal culture? To what extent does that represent vicious description rather than sound explanation? Second, is societal culture the ultimate driver of entrepreneurial values and practices of individuals and groups, or is it rather an alternative expression of the impact of distal contextual conditions on flexibility and creativity? Third, is there a viable cultural explanation for negligible levels of entrepreneurial activity in virtually empty arctics and deserts other than collectively avoiding harsh climato-economic conditions?

To be sure, these questions are asked not to discourage research on cross-level relationships between organisational entrepreneurship and societal culture, but to encourage cautious interpretation of the results as descriptions of covariations instead of causal explanations. Our basic point of view is that baseline levels of entrepreneurial phenomena in individuals and groups gradually adjust themselves to environmental circumstances including climato-economic environments. An important implication of this perspective is that results of individual-level and group-level research into the origins and manifestations of entrepreneurial activity are tentative at best as long as cultural adaptations to climato-economic environments are left out of consideration.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

TABLE S1. Difficulty of Entrepreneurial Startups, Climate-Based Demands, and Income-Based Resources for 107 Countries.

FIGURE S1. Difficulty of starting a new business in environments characterized by warm or cold winters alternated with cool or hot summers.

[Correction added on 7 January 2016 after initial publication on 3 December 2015. The Supporting Information section has been added, and Table S1 and Figure S1 are available with the online version of the article.]