

The Impact of Culture on Loss Aversion

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ABSTRACT

Based on the literature on the relationship between culture, emotion, and loss aversion, we derive that culture can influence the degree of loss aversion. To test our hypotheses, we conduct a standardized survey in 53 countries worldwide that includes the questions from the Hofstede survey on cultural dimensions as well as lottery questions on loss aversion. The results show that individualism, power distance, and masculinity increase loss aversion as predicted, whereas the impact of uncertainty avoidance is less significant. Moreover, we also find a relation between the distribution of major religions in a country and loss aversion. In comparison, the connection of loss aversion to macroeconomic variables seems to be much smaller. Copyright © 2016 John Wiley & Sons, Ltd.

KEY WORDS loss aversion; risk preferences; prospect theory; cross-cultural comparison

It is a well-established fact that most people tend to be risk averse in situations where losses and gains are possible. Psychologically, losses loom larger than gains. Kahneman and Tversky first introduced the concept of loss aversion by noting that people are typically reluctant to play a lottery with a 50–50 chance of gaining or losing the same amount of money (Kahneman & Tversky, 1979). Loss aversion has important implications on economic behavior (Benartzi & Thaler, 1995; Camerer, 2005; Thaler, 1980; Tversky & Kahneman, 1991).

The goal of our current study is to investigate whether there are cross-cultural variations of loss aversion. On the one hand, previous literature has documented that emotion plays an important role in loss aversion (De Martino et al., 2010; Sokol-Hessner, Camerer, & Phelps, 2013). On the other hand, it is well known that the way in which we express and regulate emotions largely depends on culture (Mauss, Bunge, & Gross, 2009; Matsumoto, Yoo, & Nakagawa, 2008). Our study connects these two streams of literature by testing to what extent culture determines the degree of loss aversion. This can help us to understand how much loss aversion is internalized by the external cultural environment.

To this aim, we conduct an international survey and collect measurements of the loss aversion parameter in 53 countries, which allows us to examine the systematic difference of loss aversion across cultures and regions. Although nearly all countries in our sample show certain degrees of loss aversion on average, the cross-country variation is relatively large.

We find that several cultural dimensions as constructed by Hofstede are indeed significant predictors of loss aversion. Higher loss aversion is associated with higher individualism, higher power distance, and higher masculinity. Uncertainty avoidance also increases loss aversion, but the effect is

not as robust. These relationships are consistent with our hypotheses based on the relation between culture and emotion regulation.

Our findings can be seen as additional evidence that loss aversion is at least partially shaped by culture and environment. It also lays the foundation for further studies on the intermediating effect of emotion regulation between culture and loss aversion.

Risk aversion versus loss aversion

Loss aversion and risk aversion are related but distinct. In their framework of prospect theory by Kahneman and Tversky (1979), loss aversion is different from risk aversion in that, generally speaking, the latter captures the aversion to the dispersion in a distribution, whereas loss aversion mainly captures the psychological impacts of losses in comparison with gains. For example, even if a person is risk neutral in pure gains and pure losses (i.e., the value functions are linear in gains and losses), she may still reject a mixed-outcome lottery such as a 50–50 chance to win 200 and to lose 100 if she is sufficiently averse to losses (in this case, if her loss aversion coefficient is larger than 2). Loss aversion is reflected by a kink in the value function at the reference point, where the slope of the value function in losses is larger than the one in gains.

One may argue that the reluctance to accept a mixed-outcome lottery can be explained by a general risk aversion attitude, and loss aversion in itself seems to be compatible with classical rational theories on decisions under risk, in particular the expected utility framework (von Neumann & Morgenstern, 1944). The results by Rabin (2000), however, have shown that it is basically impossible to describe such a risk-averse behavior within the framework of expected utility theory without having to presume absurdly high degrees of risk aversion for larger stake gambles.

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Moreover, loss aversion also provides an elegant and powerful framework to explain a broad range of observed behavioral patterns even when there is no risk involved, such as the sunk cost fallacy, endowment effect, status quo bias, default preferences, and buying-selling price gaps (Camerer, 2000; Kahneman, Knetsch, & Thaler, 1990; Thaler, 1980; Tversky & Kahneman, 1991). Loss aversion plays a crucial role in such reference-dependent preferences, which cannot be easily explained by risk attitude alone.

Emotion and loss aversion

Recent evidence suggests that emotion plays a crucial role in loss aversion (Ariely, Huber, & Wertenbroch, 2005; Lerner, Small, & Loewenstein, 2004; De Martino et al., 2010; Novemsky & Kahneman, 2005a, 2005b; Sokol-Hessner et al., 2009). Loss aversion may reflect a simple Pavlovian approach-avoidance response mediated by the amygdala, a region well known for its link to vigilance and fear (Mason et al., 2006; Whalen, 2007). Experiments show that patients with lesions in “emotional regions” of the brain (e.g. amygdala) tend to be substantially less loss averse than control groups (Shiv et al., 2005; De Martino et al., 2010). Neural imaging studies provide further evidence that asymmetric reaction to gains and losses indeed has a neural basis (Tom et al., 2007).

Although affective emotions have a substantial impact on loss aversion at an unconscious or subconscious level, most of us are also able to control our emotions to some degree through emotion regulation. For example, one possible approach of emotion regulation is through cognitive reappraisal, that is, taking a different perspective on a situation, which makes it easier to accept a loss. In a recent experiment, asking participants to consider the investment options in a bigger context, “as if creating a portfolio,” substantially reduced the level of loss aversion (Sokol-Hessner et al., 2009). This is in line with findings by Benartzi and Thaler (1999) that most people are less loss averse if they are presented with the long-term stock returns.

Therefore, although loss aversion seems to be ubiquitous, it depends on the context and on individual characteristics (Novemsky & Kahneman, 2005a). In our survey, we measure loss aversion via two simple monetary lotteries to minimize the contextual differences and focus on identifying the cross-cultural difference in loss aversion.

Culture, emotion, and loss aversion

To a large extent, emotion and cognition are learned during childhood and are, therefore, largely shaped by culture, even though human beings are similar in fundamental emotions (Darwin, 1872; Kim & Sasaki, 2012; Levenson, Soto, & Pole, 2007; Mauss et al., 2009; Markus & Kitayama, 1991). Studies show systematic cross-cultural differences in emotion regulation, including appraisal and suppression (Butler, Lee, & Gross, 2007; Imada & Ellsworth, 2011; Matsumoto et al., 2008). The meta-analysis by Taras, Kirkman, and Steel (2010) suggests that the predictive power of Hofstede’s cultural values are strongest in emotions.

Because emotion has strong impacts on loss aversion, it is conceivable that people from different cultures vary in loss aversion because of different habits of emotion regulation.

In this paper, we test the extent to which culture and loss aversion is related. To measure culture, we follow the framework of Hofstede (2001) and focus on the four classical dimensions: individualism (IDV), power distance (PDI), masculinity (MAS), and uncertainty avoidance (UAI). In the following, we develop and explain our hypotheses regarding these four cultural dimensions.

Individualism

The difference between individualistic and collectivistic cultures lies in their dissimilar view on interpersonal relationships. In a society with a higher degree of collectivism, such as East Asia, individuals identify themselves as part of larger social groups, whereas in an individualistic society, personal values and achievements are considered to be more important. Maddux et al. (2010) predict that Westerners are subject to a stronger endowment effect than their East Asian counterparts because self-enhancement and independence are more emphasized in an individualistic culture, so that an object is more valued when self-object association is present. Their experimental results are consistent with this prediction. Because loss aversion is often used to interpret the endowment effect, their results can be taken as indirect evidence of cross-cultural variation in loss aversion.

From the emotion regulation perspective, because interpersonal relationships are much more important for a collectivistic society, people are more likely to engage themselves in reappraisal to adapt to the social environment by taking a more holistic perspective on a single event (Matsumoto et al., 2008; Nisbett, 2004). The loss of an isolated event would look smaller if it was seen in a bigger context and over a longer period of time (Benartzi & Thaler, 1999; Sokol-Hessner et al., 2009). Arkes et al. (2010) find that Asians adapt faster to prior outcomes, which may be due to smaller loss aversion. Moreover, according to the “cushion hypothesis,” social support from the in-group network provides a “cushion” for potential financial losses, inducing lower perceived risk and consequently less risk-averse behavior (Hsee & Weber, 1999). Social support can also be one of the most efficient ways to cope with emotional distress and reduce the negative impacts from losses (Cohen & Wills, 1985; Taylor et al., 1995).

Independent culture tends to encourage positive self-image, and happiness is one of the primary life goals. Conversely, interdependent culture, such as that of East Asia, tends to hold rather dialectical beliefs about emotions and believe that a balance between happiness and sadness is more desirable than maximizing pure happiness (Miyamoto & Ma, 2011; Miyamoto, Ma, & Petermann, 2014). In individualistic culture such as western society, and in a country such as the USA, negative emotions are socially less acceptable and are likely to be considered as signals of personal failure (Eid & Diener, 2001). It is found that the net difference between pleasure and displeasure is a good predictor of happiness for individualists but not for collectivists (Suh et al.,

1998). Consequently, Westerners tend to emphasize positive emotion and deemphasize negative emotion in order to feel happier, whereas Easterners feel less need to do so because maximizing positive emotion is not the goal (Kitayama, Markus, & Kurokawa, 2000; Miyamoto & Ma, 2011; Miyamoto et al., 2014). Asians also tend to believe in reversals and expect gains and losses to be mixed in life, such as described in Laotze, “Happiness rests in misery. Misery hides in happiness. Who knows where they end.” Compared with individualists, collectivists are more receptive to both gains and losses.

In summary, we predict that people from collectivistic culture are more able to cope with losses because of social norms on emotional regulation. They also receive more social support, which makes them perceive losses to be less severe and are, hence, less sensitive of losses.

Hypothesis 1: Individualism increases the degree of loss aversion.

Power distance index

Power distance captures the interpersonal relation based on wealth, power, and social status in general. A culture with a high PDI value would discourage assertiveness and encourage suppression of emotion (Matsumoto et al., 2008). The experimental results by Inesi (2010) demonstrate that the experience of power reduces loss aversion by reducing the perceived impacts of negative outcomes. Because of the inequality in a high PDI society, an average individual would feel more helpless and could be more pessimistic about the consequences of losses. Therefore, we expect power distance to increase the level of loss aversion.

Hypothesis 2: Power distance increases loss aversion.

Masculinity

Masculinity reflects the importance of “masculine” versus “feminine” work goals in a society. In a culture with high MAS, the society attaches more importance to ego goals, such as wealth and career, whereas in a more feminine (low MAS) culture, social goals such as relationship, helping each other, and physical environment are more important. According to Hofstede (2001), in high MAS cultures, children learn to be more ambitious, and the best student is the norm, whereas in low MAS cultures, children learn to be more modest, and the average student is the norm. High MAS is also associated with more aggression. Cross-cultural clinical studies show that MAS is positively correlated with national fear and depression levels (Arrindell et al., 2003a; Arrindell, Steptoe, & Wardle, 2003b; W. Arrindell et al., 2004; Fodor, 1974). A cross-national study by Schaufeli and van Dierendonck (1995) demonstrates that the emotional exhaustion level is higher for the American sample than for the Dutch sample, and one possible interpretation is that American society is more achievement-oriented, that is,

higher masculinity. Therefore, we expect that countries with higher values of MAS tend to set the reference point high and are less engaged in reappraisal to regulate emotion, and consequently more sensitive to losses. Note that here we are investigating the societal value of masculinity, rather than the gender difference. We will discuss this further when we present the results.

Hypothesis 3: Masculinity increases loss aversion.

Uncertainty avoidance index

Uncertainty avoidance measures the extent to which a society and its individuals can tolerate ambiguous situations. People living in a high UAI culture are less able to cope with uncertainty in life, leading to a higher degree of anxiety and fear (Hofstede, 2001; W. Arrindell et al., 2004). Thus, we expect people from a culture with a higher UAI to be more reactive to potential losses, leading to higher loss aversion.

Hypothesis 4: Uncertainty avoidance increases loss aversion.

DATA AND METHODOLOGY

Questionnaire

The questionnaire used in our survey (International Test of Risk Attitudes, INTRA) consisted mainly of questions regarding risk and time preferences, cultural dimensions of Hofstede, and demographic information.¹

The most frequently used behavioral model of preferences under risk in recent years is prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992).² A key element of this theory is the parameter θ , which captures the amount of loss aversion of a person. If $\theta = 1$, this corresponds to loss neutrality. If $\theta > 1$, this corresponds to loss aversion. A person with $\theta = 2$ would be indifferent to participating in a 50-50 bet of losing amount A and winning amount $2 \times A$ or not participating. There are other more complicated definitions of loss aversion parameters (Abdellaoui, Bleichrodt, and Paraschiv (2007), Table 5, p. 1669). We use the variable θ as defined by Tversky and Kahneman (1992) (Table 6, p. 312), which is mathematically easier to handle.

To measure loss aversion, two classical lottery questions were used where the participants were asked about the lowest gain that made them accept or participate in a mixed lottery with 50–50 chance where the loss outcome was given. The implicit certainty equivalent (i.e., the fixed amount that made the subject indifferent to playing the lottery or not playing

¹See Rieger et al. (2015) and Wang, Rieger, and Hens (2016) for more information on the survey.

²Various competing models, some of which are pre-date prospect theory, such as rank-dependent utility (Quiggin, 1982, 1993) or SP/A theory (Lopes & Oden, 1999), are either structurally similar or turned out to be mathematically related (Rieger, 2010). In this paper, we will concentrate on loss aversion as specified by prospect theory.

the lottery) was therefore zero by definition. A similar formulation was used in Tversky and Kahneman (1992) (p. 312). The precise formulations were as follows:

In the following lotteries you have a 50% chance of winning or losing money. The potential loss is given. Please state the *minimum* amount \$X for which you would be willing to accept the lottery.

50% chance	loss of \$25
50% chance	win of \$X

X should be at least \$_____ to make the lottery acceptable.

50% chance	loss of \$100
50% chance	win of \$Y

Y should be at least \$_____ to make the lottery acceptable.

The loss aversion parameter θ has been defined by Tversky and Kahneman (1992) as the ratio between a gain X and a loss L such that a 50–50 lottery between X and L is as attractive as an outcome of zero.

If X and Y are the answers to the two lottery questions previously, we define two subindices for loss aversion as

$$\theta_1 := \frac{X}{25} \text{ and } \theta_2 := \frac{Y}{100},$$

where θ_1 and θ_2 are the loss aversion parameter for the smaller stake \$25 and the larger stake \$100, respectively.³ Because preference parameters can be sensitive to the size of stakes (Barsky et al., 1997), we compare θ_1 and θ_2 , and the paired t -test shows that the loss aversion parameter θ_1 for the smaller stake is significantly smaller than the one for the larger stake (2.81 vs. 2.96, $p < .001$). The magnitude of this difference, however, is relatively small. Moreover, Cronbach's α of the two measures is .73, demonstrating good reliability. Therefore, our loss aversion parameter θ is defined as the average of the two subindices

$$\theta := \frac{1}{2} \left(\frac{X}{25} + \frac{Y}{100} \right).$$

In later sections, we report results related to the aggregated loss aversion parameter θ . When we repeat the analyses with θ_1 and θ_2 , the results show very similar patterns (not reported here).

To measure the Hofstede cultural dimensions, 19 questions based on the Hofstede VSM94 questionnaire (Hofstede & McCrae, 2004) were included in the survey. Demographic information (gender and age) and information about personal background, nationality, and cultural origin of the participants were elicited as controls and for the categorisation of subjects into cultural clusters.

³It can be shown that this so-defined θ would be equal to the loss aversion parameter λ in the full prospect theory model if the value function is piecewise linear and there is no probability weighting. Benartzi and Thaler (1995) and Barberis, Huang, and Santos (2001) have adopted such value function for their theoretical work on equity premium and asset pricing.

Survey procedure and participants

As mentioned before, we chose to collect data on loss aversion in a worldwide survey as part of the “International Test of Risk Preferences” (INTRA), coordinated by the University of Zurich, Switzerland. For each country, the questionnaire was translated into local languages by professional translators or translators with an economics background. We adjusted the amount of monetary payoff in lottery questions based on purchasing power parity as well as the estimated monthly income and expenses of local university students.

Hofstede has emphasized that it is important to have homogenous subject groups for cross-country comparisons to control background factors (Hofstede, 2001). Therefore, we chose undergraduate students of business or economics classes at respective universities who were, if possible, in their first year. In this way, we could control the education background and age as much as possible. The individual differences are therefore more likely to be driven from the contrasting socioeconomic and cultural backgrounds in each country. To minimize typical problems with survey data (self-selection of participants, low response rate, and low motivation), the surveys were conducted at the beginning of a regular class and supervised by the students' professor or lecturer. This resulted in a very high response rate (higher than 90%) and a larger than usual amount of motivation to answer the survey questions reasonably accurately and completely (as we will see below).

Secondary data

Loss aversion can also be related to other factors such as wealth and religion. Because we could not collect data on the individual wealth of the participants, we use country-level GDP per capita during 2007 (the start of our survey) from the World Bank report as the proxy for wealth. We also use country-level religion composition data from the CIA World Factbook and the Pew Forum report.

EMPIRICAL ANALYSIS

Data preparation

Survey data quality sometimes suffers from outliers, because this can be a problem when numbers (in principal unbounded) are elicited. As this is the case with the elicitation of loss aversion, we needed to take this into consideration when analyzing the data. We therefore applied two methods to deal with this potential problem: we either omitted the highest and lowest 5% of the loss aversion data, or we used ranked regressions for the loss aversion, thus minimizing the impact of outliers. In the following, we essentially report the ranked regressions and use the outlier removal method only as a robustness check.

All other variables were inherently bounded; thus, the problem of outliers did not pose a serious threat. Nevertheless, we repeated some of the analysis with regressions where the cultural variables were transformed into ranks as well. These robustness checks led essentially to the same results and will not be reported in detail.

Descriptive results and between-country variation

A first look at the distribution of θ between countries reveals a substantial amount of variation. Table 1 lists all 53 countries with their median values for θ , the 25% and 75% percentiles, the number of participants with non-missing responses for the loss aversion questions, and the average percentage of completed lottery questions in the total survey. The latter gives a rough estimate of the survey quality in a country.

Table 1. Median values of θ by countries

Country	Median θ	25% perc.	75% perc.	Valid N	Answered questions
Angola	1.6	1.0	5.9	54	98.6%
Argentina	1.1	1.0	2.0	53	96.6%
Australia	1.2	1.0	2.2	138	97.7%
Austria	1.8	1.0	3.0	146	96.2%
Azerbaijan	1.1	0.7	4.1	96	82.6%
Belgium	2.0	1.1	2.8	45	97.4%
Bosnia Herz.	1.0	0.2	7.3	67	93.8%
Canada	2.0	1.0	4.5	79	96.0%
Chile	2.0	1.7	3.5	100	100.0%
China	1.8	1.1	3.1	255	99.7%
Colombia	2.0	0.9	3.3	144	99.1%
Croatia	2.3	1.0	6.0	115	100.0%
Czech Rep.	2.0	1.1	3.5	49	100.0%
Denmark	2.0	1.3	3.5	73	100.0%
Estonia	4.0	1.4	13.0	126	99.8%
Finland	2.0	1.4	3.4	124	99.2%
France	2.0	1.2	3.5	134	97.4%
Georgia	7.5	3.5	11.3	35	96.8%
Germany	2.0	1.2	4.0	529	98.9%
Greece	2.0	1.1	3.6	57	98.3%
Hong Kong	2.4	1.0	4.0	97	98.4%
Hungary	2.0	1.1	3.1	261	99.9%
India	2.3	1.5	4.2	61	100.0%
Ireland	2.0	1.0	2.4	190	99.2%
Israel	2.0	1.0	4.6	119	98.2%
Italy	2.5	1.0	4.1	81	99.4%
Japan	2.0	1.3	4.5	266	96.2%
Lebanon	1.7	1.1	2.7	90	96.0%
Lithuania	2.0	0.6	3.8	103	99.3%
Luxembourg	0.9	0.5	2.0	39	89.3%
Malaysia	1.5	1.0	3.0	97	98.9%
Mexico	1.5	1.0	2.5	88	99.6%
Moldova	3.4	1.6	9.2	100	100.0%
Netherlands	1.5	1.0	2.0	88	100.0%
New Zealand	1.5	1.0	3.1	84	97.1%
Nigeria	2.0	0.7	4.6	86	96.5%
Norway	1.8	1.0	3.0	190	99.8%
Poland	2.7	1.8	4.9	269	99.7%
Portugal	1.8	1.0	2.3	133	98.5%
Romania	3.3	1.7	5.8	333	99.3%
Russia	3.0	1.3	7.3	156	99.0%
Slovenia	2.1	1.0	6.9	96	99.7%
South Korea	1.4	1.0	2.0	100	98.6%
Spain	2.4	1.8	3.8	41	98.4%
Sweden	2.0	1.2	2.8	63	97.8%
Switzerland	2.0	1.0	4.0	465	98.9%
Taiwan	2.0	1.2	3.5	99	99.7%
Tanzania	1.0	0.5	1.7	55	93.2%
Thailand	3.0	1.0	10.0	44	99.8%
Turkey	1.8	1.1	2.5	128	91.7%
UK	1.4	1.0	2.0	61	99.7%
USA	1.7	1.0	3.5	71	99.6%
Vietnam	1.8	1.0	3.3	119	93.8%
Total	2.0	1.0	3.9	6692	98.0%

We see that median $\theta > 1$ in 50 out of 53 countries, indicating that loss aversion as defined by prospect theory seems to be a universal feature of preferences. The mean value of θ for all countries is 2.0, close to the classical value $\theta = 2.25$ measured by Tversky and Kahneman (1992).

An international comparison, however, is only meaningful if the between-country variation is sufficiently large, in particular compared with the individual variation. To test this, we perform a one-way ANOVA test. It reveals significant between-country differences ($F(52, 6639) = 8.13$, $p < .001$). The substantial cross-country and cross-cultural variation (shown later) justifies further investigation.

Distinguishing loss aversion and risk aversion

In the introduction, we discussed the conceptual differences and empirical implications of loss aversion and risk aversion. Because the INTRA survey also includes lottery questions that are either in pure gain or pure loss domain, we control the risk aversion in all regression analyses. Rieger, Wang, and Hens (2015) have shown that an efficient and robust measure to capture risk preferences in gains and losses are the *relative risk premia* over lotteries in the gain or loss domain, respectively, which are used as control variables.

Difference between cultural clusters

When combining similar countries into cultural clusters (e.g., Anglo-American countries and Eastern European countries) based on Chhokar, Brodbeck, and House (2008), between-cluster variations are also large, as an ANOVA test at the level of cultural clusters reveals ($F(8, 6683) = 16.44$, $p < .001$). The median values of loss aversion in all cultural clusters are plotted in Figure 1. It shows that Eastern European participants have the highest loss aversion on average, whereas African participants have the lowest.

Table 2 summarizes the regression results with dummy variables for each cultural cluster as the independent variable.⁴ Because the macro-level variables such as GDP/cap and cultural dimensions are used repeatedly for individuals within a country, we cluster the standard errors at the country level for all regression models. After controlling for macroeconomic factors, such as log GDP/capita and log growth rate, and demographic variables such as age and gender, some of the dummy variables for the cultural clusters are still statistically significant. In particular, we see a larger loss aversion in Eastern Europe (countries with a Slavic or Baltic language plus Romania, Hungary, and Georgia) and a lower loss aversion in Anglo-American countries.

⁴The cultural category "others" was used as the baseline ($N = 306$). This category includes participants who stated "world", "multi-national", "Europe", "Others", or similarly unclassifiable categories and those who did not answer the question about their cultural origins.

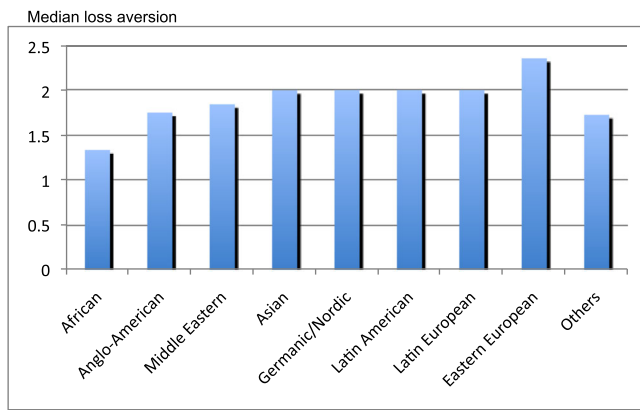


Figure 1. Median loss aversion θ for the cultural clusters in our study

Impacts of cultural dimensions and religions on loss aversion

After showing the differences between cultural clusters, we further test the relation between cultural dimensions and loss aversion. Because the distribution of loss aversion is highly skewed, we again use the rank of theta as the dependent variable for the whole sample. We split the cultural dimensions into two components:

- a country average (reflecting the culture of the external environment influencing individual behavior),
- the deviation of the individual cultural dimension value from the country average (reflecting the influence of one's own distinctive cultural characteristics).

We study all four classical Hofstede dimensions: power distance index (PDI), individualism (IDV), masculinity (MAS), and uncertainty avoidance index (UAI). The results of the regression analysis are presented in Table 3. Comparing

Models 1 and 3 in Table 3, we see that adding cultural dimensions increases the predictive power of the model. Model 2 tests the impacts of religions, whereas Models 4 and 5 include both cultural dimension variables and religion compositions. As shown in Table 3, higher IDV, PDI, and MAS are associated with higher degrees of loss aversion, supporting our hypotheses 1 to 3. The country average of uncertainty avoidance increases loss aversion in Model 5, consistent with our hypothesis 4. The effect, however, is not significant in Models 3 and 4. Note that only the country average level of masculinity is significant in predicting loss aversion, which implies that loss aversion is more determined by the societal value on masculine versus feminine work goals, but not by the personal value in this dimension. When a society places more emphasis on professional success or wealth (higher MAS), it may create more stress (Hofstede, 2001; Arrindell et al., 2003a), thereby leading to lower adaptation and tolerance to losses. Hence, the positive correlation between MAS and loss aversion does not necessarily contradict the findings of gender difference, where women are more loss averse, as reported in our tables and other studies (Brooks & Zank, 2005; Schmidt & Traub, 2002). It is important to distinguish between the impacts of culture and personal characteristics. We also find an impact of religion: Models 2, 4, and 5 in Table 3 show that participants from countries with a higher percentage of Orthodox Christians tend to be more loss averse. This point may be interesting to study in a follow-up work.

Taking all results together, this suggests that subjects with higher PDI and IDV are more loss averse, and that subjects living in countries with higher MAS are more loss averse, as well. Surprisingly, the influence of UAI—a variable that has been most frequently connected to risk aversion—seems to be rather elusive.

Table 2. Regression on culture cluster dummy variables

Loss aversion (Ranked θ)			
	Model 1	Model 2	Model 3
Gender (1 = male)	−239.1*** (3.81)	−214.6*** (3.55)	−212.5*** (3.48)
Age	−10.0 (1.00)	−4.6 (.45)	−4.2 (.39)
Risk avers. gain	−.2*** (2.69)	−.2*** (2.61)	−.2*** (2.59)
ln(GDP/cap)	−33.1 (.44)		(.15) 25.0
African		−131.3 (.59)	−178.7 (.71)
Anglo-American		−311.7** (2.15)	−298.1** (2.08)
Latin American		−132.6 (.53)	−151.2 (.56)
Latin European		92.2 (.48)	110.8 (.57)
Eastern European		460.2*** (2.83)	447.0 *** (2.58)
Germanic/Nordic		172.5 (1.47)	186.1 (1.58)
Middle Eastern		−107.0 (.82)	−127.5 (.80)
Asian		41.3 (.23)	21.7 (.10)
Constant	3828.0*** (9.99)	3451.1*** (12.10)	3440.0*** (7.69)
N	6177	6177	6177
R ² (%)	.50	1.92	1.93

Note: GDP/cap, gross domestic product per capita.

The absolute values of *t*-statistics are displayed below the coefficient estimates. They are based on standard errors clustered by country. “Risk avers. gain” and “Risk avers. loss” are measured by relative risk premia over lotteries in the gain or loss domain from the same survey (Rieger et al., 2015). Gross domestic product per capita (GDP/cap) and growth rate for each country are taken from the World Bank indicators in 2007. Each country is assigned to one of the seven cultural clusters based on Chhokar et al. (2008).

***Significance of 1%.

**Significance of 5%.

*Significance of 10%.

Table 3. Regression analysis on cultural dimensions and religions

Loss aversion (Ranked θ)					
	Model 1	Model 2	Model 3	Model 4	Model 5
Gender (1 = male)	−239.1*** (3.81)	−195.7*** (3.03)	−182.5*** (3.31)	−185.9*** (2.87)	−170.4*** (2.80)
Age	−10.0 (1.00)	−9.7 (0.92)	−9.2 (1.28)	−3.4 (.35)	−7.8 (.96)
Risk avers. gain	−.2***	−.1*** (3.34)	−.2*** (8.09)	−.2*** (3.26)	−.1*** (4.23)
Risk avers. loss	.7*** (2.69)	.8*** (2.67)	.8*** (2.87)	.8*** (2.91)	.8*** (3.30)
log GDP/cap	−33.1 (.44)	32.6 (.50)	39.7 (.52)	43.5 (.67)	48.0 (.74)
log growth rate	−15.4 (.11)	3.8 (.03)	37.9 (.24)	48.9 (.35)	78.8 (.58)
IDV average			10.8* (1.96)	8.6* (1.75)	8.7* (1.79)
IDV ind. di.			1.4** (2.32)		1.4** (2.26)
PDI average			7.2 (1.50)	6.6 (1.26)	5.8 (1.13)
PDI ind. di.			1.6** (2.41)		1.5** (2.34)
MAS average			8.0*** (3.43)	7.0*** (2.00)	7.0*** (3.01)
MAS ind. diff.			.2 (.91)		.2 (.91)
UAI average			1.5 (.30)	7.0 (1.47)	7.9* (1.74)
UAI ind. diff.			.4 (.99)		.3 (.95)
Protestant		−194.7 (.47)		476.6 (1.24)	421.0* (1.80)
Catholic		−191.2 (.47)		−80.5 (.31)	−131.5 (.51)
Orthodox		738.1*** (2.67)		533.7* (1.88)	490.9* (1.80)
Muslim		−618.0 (1.63)		−372.6 (1.06)	−397.6 (1.14)
Jewish		6.7 (.02)		−247.9 (0.98)	−273.4 (1.16)
Buddhist		65.3 (0.17)		299.3 (1.04)	255.9 (0.94)
Constant	3827.9*** (9.99)	3640.5*** (9.62)	1938.5** (2.66)	1635.8** (2.42)	1691.8** (2.57)
N	6177	6177	5801	6146	5801
R ² (%)	.50	1.80	2.60	3.01	3.25

Note: IDV, individualism; PDI, power distance index; MAS, masculinity; UAI, uncertainty avoidance index; GDP/cap, gross domestic product per capita. The absolute values of *t*-statistics are displayed below the coefficient estimates. They are based on standard errors clustered by country. "Risk avers. gain" and "Risk avers. loss" are measured by relative risk premia over lotteries in the gain or loss domain from the same survey (Rieger et al., 2015). GDP/cap and growth rate for each country are taken from the World Bank indicators in 2007. Each country is assigned to a cultural cluster (e.g., Anglo-American countries and Eastern European countries) based on Chhokar et al. (2008). We denote the country average score of individualism, uncertainty avoidance index, and long-term orientation by IDV average, UAI average, and LTO average. We denote the difference of individual scores with the country average score of the respective cultural dimension by IDV ind. diff., UAI ind. diff., and LTO ind. diff. Country-level religion composition data are from the CIA World Factbook and the Pew Forum report.

***Significance of 1%.

**Significance of 5%.

*Significance of 10%.

In all models, we also observe that female subjects are more loss averse than male subjects, which supports the existing literature on gender difference regarding risk preferences (Brooks & Zank, 2005; Schmidt & Traub, 2002). Moreover, macroeconomic factors such as GDP per capita and growth rate are not significant in any model. Tests of other variables (economic freedom index, human development index, population density, or education indices) give similar results (not reported here). All in all, it seems that loss aversion is far more a product of cultural than of economic differences.

Robustness checks

So far, we have used ranked regressions for θ . This has been justified by its highly skewed distribution: very few people are loss seeking, and even for them, we necessarily have $\theta > 0$. However, the degree of loss aversion can, in theory, be arbitrarily large. This leads to a high skewedness.

An alternative method to dealing with this problem is to take the logarithm of θ . In this case, however, we need to deal with outliers and remove the lowest and highest 5% of all values of θ from the data analysis. Repeating the same regression analyses as before leads essentially to the same findings as for the ranked regressions. Table 4 shows that the results basically remain similar. Models 4 and 5 show that, when religions are controlled, the average IDV is no longer

significant, whereas UAI becomes significant. Moreover, participants from countries with a high percentage of Protestants also tend to be more loss averse.

Although we allowed participants to assign themselves freely to a culture they feel they belong to, non-native students may still have different degrees of loss aversion, either because living in a foreign country generally affects risk attitudes or because of self-selection effects. To rule out such problems, we added a dummy variable to indicate whether a student is native or not. We also had a number of students who studied neither economics nor business administration or finance, yet simply attended a class on such a subject but had a different major. To see whether economics students have different preferences than other majors, we also added a dummy variable to indicate whether a participant was pursuing an economics-related major or not. Moreover, because students in public universities and private universities may differ as well, distinguish between private and public universities. Repeating the main analysis with these additional three dummy variables (i.e., native vs. foreign students, students with economics-related majors vs. non-economics students, and private vs. public universities) did not change the basic pattern of previous results. None of these three variables is significant in predicting loss aversion. We will not report the detailed results here. However, as the sample in our study is not well balanced on these characteristics, the results should not be taken here as conclusive.

Table 4. Regression analysis on cultural dimensions and religions

Loss aversion ($\ln(\theta)$)	Model 1	Model 2	Model 3	Model 4	Model 5
Gender (1 = male)	-.111*** (3.74)	-.093*** (3.21)	-.086*** (3.44)	-.084*** (2.99)	-.077*** (2.92)
Age	-.008* (1.98)	-.009** (2.25)	-.008** (2.48)	-.007** (1.95)	-.008** (2.21)
Risk avers. gain	-.000*** (6.97)	-.000* (1.81)	-0.000*** (6.12)	-.000* (1.76)	-0.000** (2.65)
Risk avers. loss	.003* (1.81)	.0003* (1.86)	.000* (1.98)	.000* (2.00)	.000* (2.03)
log GDP/capita	-.019 (.66)	.006 (.26)	.012 (.36)	.01 (.38)	.015 (.52)
log growth rate	.028 (.52)	-.011 (.26)	-.012 (.17)	-.001 (.02)	.016 (.30)
IDV average			.004* (1.83)	.003 (1.55)	.0003 (1.41)
IDV ind. diff.			.001** (2.19)		.001** (2.15)
PDI average			.004** (2.12)	.004** (2.07)	.0004* (1.94)
PDI ind. diff.			.001* (1.95)		.0001* (1.95)
MAS average			.002* (2.61)	.002** (2.29)	.002** (2.42)
MAS ind. diff.			0.000 (.75)		0.000 (.72)
UAI average			.000 (.47)	.036** (2.32)	.004** (2.55)
UAI ind. diff.			.000 (1.43)		.0000 (1.25)
Protestant		.009 (.06)		.289** (2.09)	.0268* (1.97)
Catholic		-.034 (.22)		-.003 (.03)	.0023 (.25)
Orthodox		.357*** (3.03)		.276** (2.54)	.280** (2.55)
Muslim		-.168 (.99)		-.105 (.71)	-.131 (.89)
Jewish		.072 (.54)		-.029 (.29)	.010 (.11)
Buddhist		.083 (.51)		.0145 (1.26)	.111 (.98)
Constant	1.048*** (6.96)	.942*** (5.99)	.293 (1.09)	.157 (.72)	.177 (.82)
N	5550	5550	5220	5527	5520
R ² (%)	.68	1.92	2.22	2.93	3.02

Note: IDV, individualism; PDI, power distance index; MAS, masculinity; UAI, uncertainty avoidance index; GDP/cap, gross domestic product per capita.

The absolute values of *t*-statistics are displayed below the coefficient estimates. They are based on standard errors clustered by country. "Risk avers. gain" and "Risk avers. loss" are measured by relative risk premia over lotteries in the gain or loss domain from the same survey (Rieger et al., 2015). GDP/cap and growth rate for each country are taken from the World Bank indicators in 2007. Each country is assigned to a cultural cluster (e.g., Anglo-American countries and Eastern European countries) based on Chhokar et al. (2008). We denote the country average score of individualism, uncertainty avoidance index, and long-term orientation by IDV average, UAI average, and LTO average. We denote the difference of individual scores with the country average score of the respective cultural dimension by IDV ind. diff., UAI ind. diff., and LTO ind. diff. Country-level religion composition data are from the CIA World Factbook and the Pew Forum report.

***Significance of 1%.

**Significance of 5%.

*Significance of 10%.

Finally, we controlled for time effects: because the study was not conducted everywhere on the same date, but instead over a longer period of time (mainly between 2007 and 2009, and with a few countries added as late as 2012), it is conceivable that loss aversion has changed over this time. One particular noteworthy event was the onset of the financial crisis that might have increased loss aversion globally, thus influencing our results.

To exclude this possibility, we added a dummy variable for all data collected after the collapse of Lehman Brothers (15 September 2008). This did not change the results, and the dummy variable was in fact not significant.

Alternatively, we added year dummies, but again the main results were unaffected. Interestingly, the year dummies showed a slight increase in loss aversion between 2007 and the following years. However, because we only collected data from a few countries in 2007, we cannot draw a definite conclusion.

CONCLUSIONS

Loss aversion has been successfully applied in recent years to explain biases in decision making that are at odds with the standard expected utility theory, such as the endowment

effect, the status quo bias, and buying-selling price gaps (Camerer, 2000, 2005). Countless experiments and field data have demonstrated loss aversion, even with animal experiments (Chen, Lakshminarayanan, & Santos, 2006).

Is loss aversion a stable preference pattern? Studies show that, although loss aversion in general exists, the degree of loss aversion seems to vary (Schmidt & Traub, 2002; Tanaka, Camerer, & Nguyen, 2010; Vendrik & Woltjer, 2007). In particular, it depends on psychological factors such as intention and emotion (Ariely et al., 2005; Lerner et al., 2004; De Martino et al., 2010; Novemsky & Kahneman, 2005a, 2005b; Sokol-Hessner et al., 2009).

Experimental and neural studies show that loss aversion can be mediated by emotion regulation such as reappraisal of the choice problem (Sokol-Hessner et al., 2013). At the same time, cross-cultural psychologists argue that the way in which we regulate our emotion is largely shaped by culture. Our paper connects these two streams of literature and tests whether systematic and predictable cultural differences exist in loss aversion.

Investigating the interaction between economic decisions and culture has been an active area in the last few years. There has been, however, one problem that limited previous research: lack of data. While it is certainly non-trivial, but feasible to collect data from laboratory experiments on risk

preferences in several culturally different places, this task becomes increasingly difficult with a larger number of countries. Therefore, most studies that investigated cultural effects on risk preferences compared only relatively few countries (Bontempo, Bottom, & Weber, 1997; Fan & Xiao, 2006; Harrison, Humphrey, & Verschoor, 2010; Hsee & Weber, 1999; Wang & Fischbeck, 2004, 2008). These studies have nevertheless found interesting patterns and serve as a foundation for further theoretical inquiry. In particular, Hsee and Weber (1999) find that Chinese are more willing to accept financial risks than North Americans and explain it with a “cushion hypothesis,” which predicts that collective societies offer stronger social supports to reduce the potential risks. Bontempo et al. (1997) find that undergraduate students from Hong Kong and Taiwan tend to be more affected by potential losses in their risk perception than students from the Netherlands and the USA and explain it with differences in uncertainty avoidance. Although the hypotheses are very plausible, cultural differences tend to be confounded with economic, historical, and political differences. If we observe a difference in risk attitude between China and the USA, for instance, it is hard to say whether this is a result of cultural differences, varying wealth levels, or political differences. Even the cultural values per se include different dimensions. Many studies, including Hsee and Weber (1999), explain the difference between East Asians and Westerners by the collectivism-individualism dimension, whereas Bontempo et al. (1997) attempt to explain it with uncertainty avoidance. Other cultural dimensions such as masculinity and power distance can also contribute to the between-cultures variation.

Our study can be seen as an extension of this line of research. The comparatively large sample allows us to test relative impacts of cultural dimensions with controlling national wealth and growth. We find that IDV tends to increase loss aversion, which is in line with the “cushion hypothesis” that predicts higher IDV leading to more risk aversion. We also notice that UAI is not a robust predictor of loss aversion. It is interesting to compare these results with a recent study by Rieger et al. (2015) based on the same survey, which shows that IDV is not a robust predictor of risk attitudes in pure gains and losses, but that UAI increases risk aversion in both pure gains and losses. It seems that IDV may increase general risk aversion through higher sensitivity to losses as compared with gains (consistent with the “cushion hypothesis” and the emotion regulation perspective), whereas UAI is more related to the distribution variance in pure gains and losses. Combining these results with the previous results from Hsee and Weber (1999) and Bontempo et al. (1997) could refine our understanding of cross-cultural differences on risk attitudes and offer further evidence on the relationship between specific cultural dimensions and specific aspects in risk attitude. Although these results are by no means the final conclusions, they provide potential directions for future investigation.

Using an experimental approach provides one possibility to manipulate or measure the key factors, such as in the study on the cross-cultural endowment effect by

Maddux et al. (2010). Yet usually only a limited number of factors can be manipulated or controlled in experiments. A larger sample of countries such as in our survey has the advantage of investigating several cultural dimensions at once, while at the same time controlling for other relevant macroeconomic and demographic factors.⁵ To overcome the logistic problems and the self-selection issues of laboratory experiments in such a global project, we decided to conduct a survey instead of controlled laboratory experiments.

Surveys without monetary incentives sometimes give rise for concerns. The selection of the subject group and the setup of the survey, however, ensured good data quality. A data collection effort of this magnitude also seemed infeasible to us in a rigorous laboratory setting, if only for the lack of appropriate laboratories in many places. In particular, the monetary incentive of losses is difficult to implement. All in all, this gives us enough justification for our choice to conduct a survey. To quote Peter Wakker, one of the leading researchers on prospect theory: “... real incentives are highly desirable for descriptive purposes and should be used whenever possible. Descriptive studies exist, however, where the implementation of real incentives is not possible, so that hypothetical choice then should be used nevertheless.” (Wakker, 2010, p. 138). Dispersing remaining doubts, we tested whether the results of some of the lottery questions in the survey were influenced by the lack of incentives in a pretest designed as a laboratory experiment with monetary incentives. The results were very similar to the survey results in the same country. Further details can be found in Rieger et al. (2015).

Our measurement of loss aversion is based on the acceptance of lotteries with mixed outcomes (e.g., 50–50 chance of winning X and losing 25), as in Tversky and Kahneman (1992). The loss aversion, however, could be correlated with the more general gambling attitude. Although we observe the impacts of cultural dimensions after controlling risk aversion from lottery questions in pure gains and losses, it would be more convincing in future studies to directly measure riskless loss aversion or use choices between gambles to disentangle loss aversion and risk attitude.⁶

Our study contributes to the currently growing field that studies the impact of cultural differences on economic decision making. We find that loss aversion is a universal phenomenon, but that substantial cross-cultural differences exist, even after controlling for economic and demographic factors. In particular, we find that individualism, power distance, and masculinity are significantly correlated with loss aversion. Our empirical results suggest that further inquiry

⁵There are a couple of recent large-scale international studies on risk preferences. Statman (2008) conducted a survey in 22 countries in which he included two questions on risk preferences. Vieider et al. (2014) conducted laboratory experiments on risk aversion in 30 countries. Both papers implicitly assumed that risk aversion can be captured with only one parameter (as in classical expected utility theory with a utility function with constant relative risk aversion). Rieger et al. (2015) reported risk preference in gains and losses in 53 countries from the same INTRA survey. However, all these papers say little about loss aversion.

⁶We thank the anonymous referees for raising this point.

into the mediating effect of emotion regulation between culture and loss aversion would be very promising.

1. Universities participating in INTRA

The following universities participated in INTRA: Catholic University of Angola, Universidad Torcuato Di Tella (Argentina), Universität Innsbruck (Austria), Alpen-Adria-Universität Klagenfurt (Austria), University of Adelaide (Australia), Khazar University (Azerbaijan), Catholic University of Leuven (Belgium), University of Windsor (Canada), University of British Columbia (Canada), Fudan University (China), Peking University (China), Renmin University (China), Universidad de Chile, Universidad de los Andes (Colombia), Buiseness College Vern' (Croatia), CERGE-EI (Czech Rep.), University of Southern Denmark, University of Copenhagen (Denmark), Tallinn University of Technology (Estonia), University of Helsinki (Finland), Universität Hamburg (Germany), Universität Trier (Germany), Universität Konstanz (Germany), Otto-von-Guericke Universität Magdeburg (Germany), University of Thessaly (Greece), Hong Kong Chinese University, Hong Kong Baptist University (Hong Kong), University of Pécs (Hungary), Indian Institute of Technology Kanpur, Ben Gurion University (Israel), NUI Maynooth (Ireland), Università degli Studi di Venezia (Italy), Foreign Trade University (Vietnam), Doshisha University (Japan), American University of Beirut (Lebanon), Vilnius University (Lithuania), University of Luxembourg, University of Malaya (Malaysia), Universidad de Guanajuato (Mexico), MAES Kishinev (Moldova), Massey University (New Zealand), University of Ibadan (Nigeria), NHH Bergen (Norway), University of Lisboa (Portugal), Bucharest Academy of Economic Studies (Romania), Russian Customs Academy Vladivostok (Russia), University of Ljubljana (Slovenia), Seoul National University (South Korea), Universidad pablo de Olavide (Spain), University of Zurich (Switzerland), National Sun Yat-sen University (Taiwan), University of Dar es Salaam (Tanzania), Chulalongkorn University (Thailand), Middle East Technical University (Turkey), Bogazici University (Turkey), Keele University (UK), Emory University (USA), Santa Clara University (USA), and Princeton University (USA).

ACKNOWLEDGEMENTS

We are very grateful to all participating universities for their generous support. We thank Julia Buge, Chun-Houh Chen, Shiyi Chen, Mihnea Constantinescu, Simona Diaconu, Oliver Dragicevic, Anke Gerber, Wolfgang Hardle, Ljilja Jevtic, Renata Kovalevskaja, Dana Liebman, Takeshi Momi, Andres Mora, Koji Okada, Hersh Shefrin, Fangfang Tang, Bodo Vogt, HanneloreWeck-Hannemann, Tonn Talpsepp, Evgeny Plaksen, Xiao-Fei Xie, Levon Mikayelyan, Andres Mora, Ante Busic, Alexander Meskhi, Christos Iossifidis, Janos Mayer, Istvan Laszlo_y, Stephan Passon, Salim Cahine, Renata Kovalevskaja, Besart Colaku, Thierry Post, Bjorn Sandvik, Ermira Mehmetaj, Aleksandra Przywuska, Sonja Ratej Pirkovic, Antonio Avillar, Rosemarie Nagel,

Pattarake Sarajoti, Haluk Bilge Halas, Markus K. Brunnermaier, Jing Qian, Markus Leippold, Thuy Bui and numerous other people for generous help with data collection and translation. The financial support by the National Centre of Competence in Research "Financial Valuation and Risk Management" (NCCR FINRISK), Project 3, "Evolution and Foundations of Financial Markets", and by the University Research Priority Program "Finance and Financial Markets" of the University of Zürich is gratefully acknowledged.

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