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Cultural, cognitive and personality traits in risk-taking behaviour: evidence from Poland and the United States of America

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ABSTRACT

The study analyses the susceptibility to risk-taking behaviour in relation to cultural, cognitive and personality traits. For the requirements of the research, undergraduate students with the same major but from two different cultural regions (Poland and the USA) were examined. In order to better understand them, the ten-item personality inventory (TIPI) method – a 10-item measure of the Big-Five personality dimensions – was used. A domain-specific risk-taking (DOSPERT) scale was used to assess risk-taking, while cognitive aspects of behaviour were measured by a cognitive reflection test. It is important to point out that Polish students reported significantly greater proneness to risk-taking than their American counterparts. It was revealed that participants scoring highly in the cognitive reflection test were characterised with lower risk-taking propensity. Consistent with past research, high scores in extraversion and low scores in conscientiousness predicted overall risk-taking behaviour. As follows from the study, men reported significantly greater willingness to take risks than women.

1. Introduction

Understanding risk-taking plays a vital role in economics, and is a subject of numerous research studies both in classical and behavioural or cultural domains of economics and finance.

According to classical understanding, 'homo economicus' is generally risk-averse. Due to the concavity of the utility function (and diminishing marginal utility of wealth) we dislike vast uncertainty in lifetime wealth because a dollar that helps us avoid poverty is more valuable than a dollar that helps us become very rich (Rabin, 2000).

In recent years, a considerable number of studies by behavioural economists revealed some limitations of the expected utility treatment of risk, and forced one to

take into consideration psychological aspects of human behaviour (Kahneman, Knetsch, & Thaler, 1991). It turned out that risk-aversion is not constant, and it depends on whether the outcome is a possible loss or gain (reflection effect). People tend to avoid risk under the gain domain and tend to seek risk under the loss domain (Kahneman & Tversky, 1979). Furthermore, the pain of losing is two to three times more intensive than the joy of winning the same amount of money (loss aversion). Interestingly, decisions often depend on the way the data are presented, that is, whether a possible effect is presented as a loss or as a gain (framing effect).

An interesting approach has been presented by Thaler (2016), who proposes to replace the classical, fictional creature called *homo economicus* ('Econs') with the concept of 'Humans'. He insists on stopping assuming that abstract models of imaginary Econs' behaviours accurately describe real people's choices. According to Thaler (2016), there are many *supposedly irrelevant factors* (SIFs) that influence the decision processes of Humans.

The main objective of this study is to show that risk propensity is not a unitary construct, and that multiple cultural and psychological (cognitive, personality, gender) determinants need to be considered. Previous research confirms that many factors, ranging from the behavioural to cultural areas of economics, influence risk-taking behaviour. The main contribution of the study is to simultaneously examine all those supposedly irrelevant factors in one multivariate model. The originality of this solution lies in the fact that broad analysis of SIFs can improve our understanding of decision-making in the economy and finance.

A substantial body of literature from cross-cultural studies in economics indicates that national culture influences human values (Breuer & Quinten, 2009; Hofstede & Hofstede, 2005) and economic outcomes (Frijns, Gilbert, Lehnert, & Tourani-Rad, 2013; Guiso, Sapienza, & Zingales, 2006; Siegel, Licht, & Schwartz, 2011; Zheng, El Ghoul, Guedhami, & Kwok, 2012). Zingales (2015) argues that in the last 10 years there has been an explosion of economic research on culture, which originates from the failure of traditional economic models to explain the reality of *homo economicus* embedded in a cultural context. Hsee and Weber (1999) analysed cross-national differences in risk perception among students from the U.S.A., China, Germany and Poland, and found that a culture's position on the individualism–collectivism continuum affects the objective risk to which members of that culture are exposed. In their *cushion hypothesis*, they argue that in socially-collectivist cultures, like China, family or other in-group members will step in to help out any group member who encounters a large and possibly catastrophic loss after selecting a risky option. On the other hand, in individualist cultures like the U.S.A., a person making a risky decision will be expected to personally bear its consequences (possibly adverse). Therefore, the collectivism acts as a cushion against possible losses, that is, as social diversification of the dangers of risky options and leads to more tolerance within risk-taking behaviour. Fan and Xiao (2006) confirm that the Chinese are more risk-tolerant than Americans when taking financial decisions. Therefore, the first hypothesis is as follows:

> H1: Culture matters. There will be general differences in the total, and specifically in the financial domain, of risk-taking behaviour between Polish and American students. Poles

coming from a more collectivistic culture will take risk more willingly than Americans (Hofstede & Hofstede, 2005).

It is worth noting that behavioural economists consider risk-taking in the aspect of cognitive reflection. People in general make their decisions based on whether they are more rational or emotional. Tversky and Kahneman (1986) noticed that, due to bounded rationality, we are unable to make decisions rationally. They state that the processing of cognitive information is conducted by 'System 1' or 'System 2'. System 1 operates quickly, automatically, without requiring a lot of time and intuitively, with little or no effort; while System 2 requires us to conduct effortful, demanding and reflective mental activities, and is slower, more deliberate and analytic (see Evans (2008)). It has been found that that cognitive reflection can predict the susceptibility to decision-making biases (Duttle & Inukai, 2015; Oechssler, Roider, & Schmitz, 2009; Toplak, West, & Stanovich, 2011, 2014) and helps to predict rational (or selfish) behaviour in economic games (Czerwonka, Staniszewska, & Kompa, 2018). As for risk preferences, Frederick (2005) has demonstrated that in the domain of gains, groups characterised by high cognition were more willing to gamble and take risk, but in the domain of losses they were less risk-seeking. It is interesting that Campitelli and Labollita (2010) found the same positive relation between cognitive reflection and risk-taking in the gains domain. Thoma, White, Panigrahi, Strowger and Anderson (2015) confirmed the same pattern, but only in the financial risk domain. Hence, the second hypothesis is as follows:

> H2: Cognitive aspects of decision-making matter. A cognitive reflection test will be correlated positively with proneness to risk (in total and in the financial domain) (Campitelli & Labollita, 2010; Frederick, 2005).

It is worth emphasising that recent evidence on the individual differences that influence willingness to take risks also comes from studies of personality. Personality refers to individual differences in characteristic patterns of thinking, feeling and behaving, and is one of the areas of interest of behavioural economics. Nicholson, Soane, Fenton-O'Creevy and Willman (2005) found that risk propensity is strongly rooted in personality, and is related directly to the factors of personality traits such as extraversion and openness, as well as being related inversely to neuroticism, agreeableness and conscientiousness. Mayfield, Perdue and Wooten (2008) indicate that more extraverted individuals tend to engage in short-term investing, while those with higher neuroticism and risk-aversion levels avoid it. Agnew and Harrison (2017) argue that males who report higher levels of impulsiveness and extraversion and lower levels of neuroticism record higher levels of general risk willingness. Prompted by the absorbing evidence in this field, we wanted to explore the relationship between personality and risk propensity. For that reason, the third hypothesis is as follows:

> H3: Risk propensity (in total and in the financial domain) will be positively correlated with extraversion and openness levels, and negatively correlated with neuroticism, agreeableness and conscientiousness (Nicholson et al., 2005).

Not less important is the research on gender differences that contributes to better risk-taking understanding. An important implication of these studies is that men in general are more prone to risk-taking behaviour than women, and trade more

excessively (Barber & Odean, 2001; Dwyer, Gilkeson, & List, 2002). Gilliam, Chatterjee and Zhu (2010) observed that gender differences in risk tolerance are consistent across generations and when controlling for other personal and household characteristics. A recent study by Faccio, Marchica and Mura (2016) shows that even the chief executive officer (C.E.O.)'s gender might help to explain corporate decision-making, and that firms run by female C.E.O.s have lower leverage, less volatile earnings and a higher chance of survival than firms run by male C.E.O.s. Therefore, the fourth hypothesis is as follows:

> H4: Men are more confident than women (Barber & Odean, 2001), and therefore they should be more prone to risk-taking behaviour (especially in the financial domain).

2. Data and methodology

2.1. Participants

The data reported was collected from two samples of undergraduate students enrolled in chemistry courses at two public universities: Warsaw University and Brooklyn College in New York. The aim of the research was to examine two homogenous samples of students, studying the same subject, but representing two different cultural regions. One hundred and ninety three surveys were completed ($N = 193$), $n_1 = 98$ Polish and $n_2 = 95$ American students. The sample consisted largely of women (72%), and the median age was 21 years (M = 20.89, S.D. = 3.75). In the Polish sample the median age was slightly lower (M = 20.33; S.D. = 1.7) than in the American sample (M = 21.46; S.D. = 5); $t(114.92) = -2.10$; $p = 0.038$; $r = 0.19$. Sex differences were split equally: PL ($n_1 = 70$, 71.4%), U.S.A. ($n_2 = 69$; 72.6%); $\chi^2(1) = 0.03$; $p = 0.852$. All data were computed in R version 3.4.1.

2.2. Materials and procedure

The paper-and-pencil questionnaire consisted of 49 questions. Personality traits were measured with the ten-item personality inventory (TIPI) – a 10-item measure of the Big-Five personality dimensions (Gosling et al., 2003). Risk-taking behaviour was measured on the 30-item domain-specific risk-taking (DOSPERT) scale (Blais, 2006), while a cognitive reflection test, CRT 7, checked the cognitive aspects of behaviour (Toplak et al., 2014). Additionally, students answered two demographic questions concerning gender and age (Appendix 1). Students from Poland completed the test in Polish (TIPI-PL, DOSPERT in Polish and a translated version of CRT 7). In the Polish sample, the data were collected during one exam session. Its American counterpart was completed throughout the academic year.

As mentioned above, TIPI is a brief measure of the Big-Five personality dimensions. Studies show that TIPI displays patterns of correlations that are virtually identical to those of the Big-Five instruments (BFI), and can stand as a reasonable proxy for BFI (Gosling et al., 2003). TIPI consists of 10 questions measured on a seven-item Likert scale. Sample questions include: I see myself as: (1) Extraverted, enthusiastic, (2) Critical, quarrelsome, (3) Dependable, self-disciplined.

The *risk-taking* responses in the 30-item version of the DOSPERT scale evaluate behavioural intentions – or the likelihood of engaging in risky activities by the respondents – originating from five domains of life (i.e., ethical, financial, health/safety, social and recreational risks). It uses a seven-point rating scale ranging from 1 (Extremely unlikely) to 7 (Extremely likely). The six financial items can be split into three gambling and three investment items for further decomposition of the construct. Sample items include: 'Investing 10% of your annual income in a new business venture' (*Financial-Investing*). Item ratings are added across all items of a given subscale to obtain subscale scores. Higher scores indicate greater proneness to risk-taking in the domain of the subscale.[1]

The cognitive reflection test (CRT 3) proposed by Frederick (2005) is a three-item task that measures the extent to which individuals form their judgments intuitively (operate in System 1), as opposed to through reflection (System 2). CRT 7 is an expanded seven-item task introduced by Toplak et al. (2014) that has been proven to be a more potent predictor of rational thinking than the original CRT 3. CRT in general is designed to measure the tendency to override an intuitive response that is incorrect, and to engage in further reflection that leads to a correct answer (Toplak et al., 2011). Sample questions include, for example:1. A bat and a ball cost $1.10 in total. The bat costs a dollar more than the ball. How much does the ball cost? (impulsive answer: 10 cents, reflective answer: 5 cents)2. If it takes five machines 5 minutes to make five widgets, how long would it take 100 machines to make 100 widgets? (impulsive answer: 100 min, reflective answer: 5 min)

Similar to Mata, Josef and Hertwig (2016) and Wang, Xu, Zhang and Chen (2016), a linear model of regression was used to estimate the influence of cultural, cognitive, personality traits and gender differences on risk-taking behaviour. The model was estimated as

$$Overall\ risk = \beta_1 CountryUSA + \beta_2 GenderM + \beta_3 EXT + \beta_4 AGR + \beta_5 CON$$
$$+ \beta_6 ES + \beta_7 OTE + \beta_8 CRT7 + \beta_0$$

where independent variables (predictors) were concerned: country (*USA*), gender (*M*), personality traits (*EXT, AGR, CON, ES, OTE*) and CRT 7 results.

In order to verify the results, robust regression based on an M-estimator using iteratively reweighted least squares (I.R.W.L.S.) estimation was used.

3. Results

3.1. Descriptive statistics

Table 1 demonstrates the mean scores for Poland and the U.S.A. for the overall risk scale and domain subscales.

The most remarkable result to emerge from the descriptive statistics is that the average score on overall risk among Polish students (M = 3.45; S.D. = 0.60) is higher than the risk disposition of American students (M = 3.18; S.D. = 0.70). Poles score higher than Americans on all risk subscales except for the financial risk on the Investment subscale (PL, M = 2.88; U.S.A., M = 3.31).

Table 1. Mean (M), median (Me) and standard deviation (S.D.) on the overall risk-taking scale and domain subscales for Poland and the U.S.A.

	Poland					U.S.A.				
	M	Me	S.D.	Min.	Max.	M	Me	S.D.	Min.	Max.
E	2.18	2.00	0.84	1.00	5.00	2.17	2.00	0.82	1.00	4.00
H/S	3.64	3.67	0.91	1.83	6.00	2.86	2.83	1.14	1.00	7.00
R	4.05	4.17	1.37	1.00	7.00	3.74	3.67	1.52	1.00	7.00
S	4.96	5.00	0.74	2.50	7.00	4.62	4.67	0.99	1.67	7.00
F	2.43	2.33	0.97	1.00	6.00	2.48	2.33	0.99	1.00	7.00
F/I	2.88	3.00	1.11	1.00	6.67	3.31	3.33	1.37	1.00	7.00
F/G	1.97	1.67	1.18	1.00	5.67	1.65	1.00	1.03	1.00	7.00
Overall	**3.45**	3.50	0.60	1.83	5.30	**3.18**	3.07	0.70	1.60	4.97

Risk-taking scale: E = ethical; F = financial; F/I = financial/Investment; F/G = financial/gambling; where F = F/I + F/G; H/S = health/safety; R = recreational; S = social.
$*p < 0.05$, $**p < 0.01$, $***p < 0.001$.
Source: own study.

Table 2. A t-test analysis of Polish and American respondents as for risk and personality traits.

	PL		U.S.A.					
Variable	M	S.D.	M	S.D.	t	df	p	r
E	2.18	0.84	2.17	0.82	0.1	191	0.922	0.01
H/S	3.64	0.91	2.86	1.14	5.23	179.93	0	0.36
R	4.05	1.37	3.74	1.52	1.47	187.63	0.143	0.11
S	4.96	0.74	4.62	0.99	2.68	174.38	0.008	0.2
F/I	2.88	1.11	3.31	1.37	−2.35	180.72	0.020	0.17
F/G	1.97	1.18	1.65	1.03	2.06	188.99	0.041	0.15
Overall	3.45	0.60	3.18	0.70	2.96	184.20	0.003	0.21
EXT	5.01	1.68	3.93	1.34	4.94	184.26	<0.001	0.34
AGR	5.14	1.19	5.08	1.15	0.35	190.99	0.727	0.03
CON	4.92	1.52	5.40	1.28	−2.39	187.63	0.018	0.17
ES	3.60	1.64	4.47	1.38	−3.98	187.06	<0.001	0.28
OTE	4.83	1.09	5.44	1.15	−3.78	189.65	<0.001	0.26

Risk-taking scale: F = financial; F/I = financial/investment; F/G = financial/gambling; EXT = extraversion; AGR = agreeableness; CON = conscientiousness; ES = emotional stability; OTE = openness to experience. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.
Source: own study.

3.2. Cultural, cognitive, personality traits and gender differences in risk-taking

As reported previously, the cushion hypothesis assumes that those who live in collectivist societies can rely on material and financial assistance from the government, family and friends to such an extent that the financial risks associated with investing are significantly reduced (Hsee & Weber, 1999). Alternatively, those living in societies where individuals have less of a 'cushion' to fall back on must bear the burden of the possible loss to a greater extent if a financial decision turns out badly.

Taking into consideration the present sample and the model of Hofstede and Hofstede (2005), Poland is collectivist in nature as opposed to the U.S.A. ($PL_{IDV} = 60$; $USA_{IDV} = 91$), and hence should display lower risk-aversion.

A t-test analysis of Polish and American respondents is presented in order to examine the magnitude and significance of risk and personality traits (Table 2).

These results offer compelling evidence that cross-cultural factors play a statistically significant role in differing the sample of Polish and American students. The most remarkable result to emerge from the data is that Polish students reported

Table 3. Mean scores and independent *t*-test results on the overall risk-taking scale and domain subscales for men and women.

DOSPERT subscale	Women		Men		*t*	*df*	*p*	*r*
	M	S.D.	M	S.D.				
F	2.33	0.89	2.76	1.13	−2.49	80.25	0.015	0.27
F/I	3.02	1.23	3.28	1.34	−1.22	89.3	0.227	0.13
F/G	**1.65**	0.92	**2.24**	1.42	−2.85	70.97	0.006	0.32
Overall	3.27	0.67	3.44	0.63	−1.65	103.08	0.103	0.16

Risk-taking scale: F = financial; F/I = financial/investment; F/G = financial/gambling.
*p < 0.05, **p < 0.01, ***p < 0.001.
Source: own study.

significantly greater willingness to take risks than American students in three domains, including the health/safety, social and gambling (financial)–oriented domains, and in the overall risk-taking scale. American students reported significantly greater proneness to risk-taking than Polish ones only in the investment (financial) risk domain. This is possibly a derivative of a difference in personal wealth between Polish and American students. The higher cost of studying in the U.S.A. (tuition fee) comes from the higher level of wealth, which could impose more risk-taking behaviour in the domain of financial/investment risk among American students. The American capital market has also a longer history and tradition than the Polish one, hence American students are probably more familiar with such topics as investing.

As for personality traits, Poles were generally more extravert, while Americans were more conscientious, more emotionally stable and more open to experience.

Table 3 illustrates mean scores and independent *t*-test results on the overall risk-taking scale and domain subscales for men and women in the general sample. To simplify the results of the study, in the following analysis the author focused only on the overall risk and on the financial risk domain (with decomposition into investment and gambling financial risk).

The evidence we found points to the fact that men are more prone to risk-taking behaviour than women. Results are, however, statistically significant only in the domain of financial/gambling risk.

3.3. Regression analysis of risk-taking propensity

Table 4 displays the multiple linear regression analysis in the general sample containing all participants where dependent variables captured financial and overall risk where independent variables (predictors) were concerned: country (*USA*), gender (*M*), personality traits (*EXT*, *AGR*, *CON*, *ES*, *OTE*) and CRT 7 results.

It is now possible to state that all regression models were statistically significant. An overall risk model regression explained 19% of variance. Statistically significant predictors were: country, extraversion, conscientiousness and CRT 7 results. As confirmed by earlier analyses, American students generally revealed less risk-taking behaviour than Polish students, which confirms Hypothesis 1 on overall risk. Higher extraversion corresponded to higher risk-taking behaviour; higher conscientiousness matched lower risk-taking behaviour. The results in area of personality traits

Table 4. Results of regression of risk-taking propensity.

	Dependent variable			
	F	F/I	F/G	Overall
Country (USA)	−0.15	0.26	−0.55**	−0.27*
Gender (M)	0.54***	0.35	0.73***	0.20
EXT	0.07	0.06	0.08	0.08**
AGR	−0.04	−0.01	−0.07	−0.06
CON	−0.15**	−0.15*	−0.15**	−0.12***
ES	0.05	0.05	0.05	0.01
OTE	0.09	0.08	0.10	0.07
CRT 7	−0.60***	−0.50*	−0.70***	−0.22*
Constant	2.60***	2.97***	2.23***	3.58***
Observations	193	193	193	193
R^2	0.16	0.10	0.20	0.19
Adjusted R^2	0.13	0.06	0.16	0.15
F-statistic ($df = 8$; 184)	4.48***	2.47*	5.69***	5.31***

Note: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
Source: own study.

substantiate the previous findings of Nicholson et al. (2005) that extraversion correlates positively with overall risk propensity. Respondents characterised by higher level of extraversion revealed higher risk-taking disposition. Conscientiousness correlated inversely with overall risk. Overall, the analysis conducted has not shown any correlations between agreeableness, emotional stability or openness to experience and risk. Hypothesis 3 was confirmed in the case of extraversion and conscientiousness. Additionally, higher CRT 7 results corresponded to lower risk-taking behaviour, which appears to contradict Hypothesis 2.

We have also obtained accurate results from the model of financial risk. It explained 16% of variance. Here, statistically significant predictors were: gender, conscientiousness and CRT 7 results. As expected, Hypothesis 4 was also confirmed. Men revealed more risk-taking behaviour in financial risk than women (mainly in the financial/gambling domain). The impact of conscientiousness and CRT 7 results on risk-taking remained the same as in the overall risk model.

In order to analyse better how the cross-cultural differences affect risk-taking behaviour, the author provided additional two models, with Polish and American samples (Table 5).

In general, all regression models were statistically significant. An overall risk model regression run in the Polish subgroup explained 22% of variance, and statistically significant predictors were: conscientiousness, openness to experience and CRT 7 results. An overall risk model regression run in the American subgroup explained 15% of variance, and the only one statistically significant predictor was conscientiousness. Therefore, the common factor that influenced the risk-taking behaviour in both groups was conscientiousness – a personality trait that is independent from the culture or the cultural region. Further analysis showed that people characterised by higher conscientiousness can better control themselves so that they tend to avoid extreme risk behaviour.

Financial risk models run for the Polish and American subgroups generally gave the same results as those obtained from the regression analysis in the general sample containing all participants. The only differences came from personality traits in the

Table 5. Results of regression of risk-taking propensity with PL and U.S.A. samples.

	PL		U.S.A.	
	F	Overall	F	Overall
Gender (M)	0.50*	0.10	0.55*	0.25
EXT	0.11	0.07	0.02	0.08
AGR	0.005	−0.002	−0.11	−0.12
CON	−0.05	−0.11**	−0.33***	−0.14*
ES	0.01	0.01	0.18*	0.05
OTE	0.14	0.12*	0.08	0.04
CRT 7	−0.59**	−0.27*	−0.56*	−0.08
Constant	1.61*	3.17***	3.50***	3.66***
Observations	98	98	95	95
R^2	0.16	0.22	0.28	0.15
Adjusted R^2	0.10	0.16	0.22	0.08
F-statistic ($df = 7$; 185)	2.48*	3.56**	4.80***	2.18*

Note: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
Source: own study.

Table 6. Robust regression based on an M-estimator using iteratively reweighted least squares (I.R.W.L.S.) estimation.

	Dependent variable			
	F	F/I	F/G	Overall
Country (USA)	−0.14	0.24	−0.44**	−0.27*
Gender (M)	0.45**	0.30	0.44**	0.21
EXT	0.03	0.05	0.04	0.08*
AGR	−0.07	−0.03	−0.11*	−0.06
CON	−0.13**	−0.13*	−0.10*	−0.12***
ES	0.04	0.06	0.03	0.01
OTE	0.10	0.09	0.10	0.08
CRT 7	−0.52***	−0.46*	−0.44**	−0.21
Constant	2.75***	2.91***	2.17***	3.58***
Observations	193	193	193	193
R^2	0.15	0.09	0.15	0.19
Adjusted R^2	193	193	193	193

Note: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
Source: own study.

American sample, where conscientiousness matched lower risk-taking behaviour, and higher emotional stability corresponded with higher risk-taking behaviour.

3.4. Robustness check

To show that the results are robust, the author implemented a robust regression based on an M-estimator using I.R.W.L.S. estimation (Table 6).

Regarding the difference between a linear regression model (O.L.S.) and robust regression (I.R.W.L.S.), the latter is a method free from assumptions (such as the shape of the distribution of residues, homogeneity of variances, presence of influential outliers, etc.), which makes robust regression more reliable when these assumptions are not met. In other words, the results of robust regression are more repetitive and give a greater possibility of generalisation. They provide the opportunity to get a deeper, more accurate and more nuanced understanding of data. According to Field and Wilcox (2017), the only known method for judging the extent that conventional

methods yield reasonable results is to determine whether the results are consistent with those based on robust methods.

The robust regression generally confirmed the linear regression results in the domain of financial risk. As for the overall risk model statistically, significant predictors were: country, extraversion and conscientiousness. CRT 7 results turned out not to influence risk-taking behaviour. This could mean that cultural and personality traits remain the most important factors in overall risk-taking behaviour.

4. Conclusions

This article contributes to the still small number of empirical studies that combine behavioural and cross-cultural approaches with the analysis of risk-taking behaviour. The study measured the influence of cultural, personality and cognitive traits on risk-taking propensity. The aim of this study was to show that risk propensity is not a unitary construct, and that multiple behavioural and cultural determinants need to be considered. As Thaler (2016) noted, behavioural theory should not replace the neo-classical paradigm, but ought to be treated more like engineering, a set of practical enhancements that lead to better predictions about behaviour.

The results generally support previous research in the cross-cultural studies of Hsee and Weber (1999), and confirm the cushion hypothesis that less individualistic countries tend to exhibit greater risk propensity. Polish students reported significantly greater proneness to risk-taking than American students in almost all domains of the DOSPERT scale except for the investment (financial) risk domain, which could be due to differences in wealth status and experience with investing on the capital market. Linear and robust regression models confirmed that country was a statistically significant predictor in evaluating risk-taking behaviour.

The observed relationship between personality and risk-taking appeared to be in line with Nicholson et al. (2005), at least in the case of two traits of personality. High extraversion (outgoing, sociable persons) seems to supply the motivational force for risk-taking; low conscientiousness (careless, impulsive persons) facilitates crossing cognitive barriers of need for control and taking a risk. For example, a person with higher levels of extraversion may be more assertive and enthusiastic (Costa & MacCrae, 1992), hence they believe themself to have the ability to deal with various project risks.

The relationship between cognitive skills and risk-taking appears to contradict previous findings. Frederick (2005) found a positive relation between cognitive reflection and risk-taking in the gains domain and an inverted relation in the losses domain. In this study, risk propensity is measured in a different way, and it is not possible to distinguish clearly between the gains and losses domains. The analysis suggests that participants scoring highly in cognitive reflection tend to take less risk – especially in the financial domain. Assuming that the CRT is a good predictor of cognitive and rational thinking, then such behaviour is in line with a classical approach in the economy, where rational agents are characterised by general risk-aversion.

The last, but not least, important results brought by this study concern gender differences in attitude to risk. They confirm previous research findings, which suggest

that men are more prone to risk-taking than women. The present study shows, however, that this is true, but only in the case of the gambling/financial domain of risk. The observed results suggest that earlier research may have been sometimes too singular and naive in its treatment of risk propensity, as risk behaviour seems to be highly patterned at the individual difference level. As Nicholson et al. (2005) suggest, some people are likely to be consistent risk-takers, others will be consistently risk-averse, while some could exhibit domain-specific patterns of risky behaviour. The recent study by Markiewicz and Weber (2013), conducted on a sample of 3870 participants, provides evidence that only one domain of risk from the DOSPERT scale – namely, the gambling risk – predicts excessive stock trading.

Any single study, like this one, is subject to a number of limitations. The first one relates to the sample of participants: young students, mostly female, who might show behaviours different from the general population. A neutral sample of chemistry students was chosen since most of the literature says that economics and business students tend to behave differently from their colleagues from other faculties. Economics students tend to behave more selfishly (Carter & Irons, 1991; Gerlach, 2017), lie more (López-Pérez & Spiegelman, 2012) and are generally less trustworthy (Haucap & Müller, 2014) than other students.

Another limitation could be the usage of TIPI – a shortened version of the Big-Five personality dimensions. Compared with standard multi-item measures of the Big-Five (N.E.O. P.I.-R., 240 questions or N.E.O.-F.F.I., 60 questions) (Costa & MacCrae, 1992) , this scale is less reliable and correlates less strongly with other variables. The crucial benefit of TIPI, however, is its shortness, and therefore the minimisation of participants' boredom and frustration about answering the same questions, a fact that might have been important in the case of younger students.

As for the practical implications, the obtained results of the conducted analysis indicate that the lower risk-aversion of Polish students could affect positively the degree of entrepreneurship of new businesses in Poland. What is more, cultural differences in risk proclivity should be considered by foreign direct investors when choosing a country to run a business. According to the World Investment Report (2017), the most collectivist countries, China and developed countries, remain the top prospective investors for foreign direct investment (F.D.I.).

There is no doubt that further development of the study should evolve towards a more diversified sample. Increasing the sample size and expanding it to cover other countries from different cultural regions are vital issues for future research.

Disclosure statement

Note

1. Only risk-taking responses (without the risk-perception and expected benefits) were analysed due to the time constraints of the study.

References

Agnew, S., & Harrison, N. (2017). The role of gender, cognitive attributes and personality on willingness to take risks. *Business and Economic Research*, *7*(1), 1–16. doi:10.5296/ber.v7i1.10371

Barber, B. M., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *The Quarterly Journal of Economics*, *116*(1), 261–292. doi:10.1162/003355301556400

Blais, A. R. (2006). A Domain-Specific Risk-Taking (DOSPERT) scale for adult populations. *Judgment and Decision Making*, *1*(1), 33–47.

Breuer, W., & Quinten, B. (2009). *Cultural finance*. SSRN eLibrary. Retrieved from http://dx.doi.org/10.2139/ssrn.1282068 (20 July 2018).

Campitelli, G., & Labollita, M. (2010). Correlations of cognitive reflection with judgments and choices. *Judgment and Decision Making*, *5*(3), 182–191.

Carter, J. R., & Irons, M. D. (1991). Are economists different, and if so, why? *Journal of Economic Perspectives*, *5*(2), 171–177. doi:10.1257/jep.5.2.171

Costa, P. T., & MacCrae, R. R. (1992). *Revised NEO personality inventory (NEO PI-R) and NEO five-factor inventory (NEO FFI): Professional manual*. Lutz, FL: Psychological Assessment Resources.

Czerwonka, M., Staniszewska, A., & Kompa, K. (2018). Cognitive reflection test in predicting rational behavior in the dictator game. In K. Nermend & M. Łatuszyńska (Eds.), *Problems, methods and tools in experimental and behavioral economics. CMEE 2017*. Springer Proceedings in Business and Economics. Cham, Switzerland: Springer.

Duttle, K., & Inukai, K. (2015). Complexity aversion: Influences of cognitive abilities, culture and system of thought. *Economic Bulletin*, *35*(2), 846–855.

Dwyer, P. D., Gilkeson, J. H., & List, J. A. (2002). Gender differences in revealed risk taking: Evidence from mutual fund investors. *Economics Letters*, *76*(2), 151–158. doi:10.1016/S0165-1765(02)00045-9

Evans, J. (2008). Dual processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, *59*(1), 255–278. doi:10.1146/annurev.psych.59.103006.093629

Faccio, M., Marchica, M. T., & Mura, R. (2016). CEO gender, corporate risk-taking, and the efficiency of capital allocation. *Journal of Corporate Finance*, *39*, 193–209. doi:10.1016/j.jcorpfin.2016.02.008

Fan, J. X., & Xiao, J. J. (2006). Cross-cultural differences in risk tolerance: A comparison between Chinese and Americans. *Journal of Personal Finance*, *5*(3), 54–75.

Field, A. P., & Wilcox, R. R. (2017). Robust statistical methods: A primer for clinical psychology and experimental psychopathology researchers. *Behaviour Research and Therapy*, *98*, 19–38. doi:10.1016/j.brat.2017.05.013

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economics Perspectives*, *19*(4), 25–42. doi:10.1257/089533005775196732

Frijns, B., Gilbert, A., Lehnert, T., & Tourani-Rad, A. (2013). Uncertainty avoidance, risk tolerance and corporate takeover decisions. *Journal of Banking and Finance*, *37*(7), 2457–2471. doi:10.1016/j.jbankfin.2013.02.010

Gerlach, P. (2017). The games economists play: Why economics students behave more selfishly than other students. *PloS One*, *12*(9), e0183814. doi:10.1371/journal.pone.0183814

Gilliam, J., Chatterjee, S., & Zhu, D. (2010). Determinants of risk tolerance in the baby boomer cohort. *Journal of Business & Economics Research*, *8*(5), 79–87.

Gosling, S. D., Rentfrow, P. J., & Swann Jr, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in personality*, *37*(6), 504–528. doi: 10.1016/S0092-6566(03)00046-1

Guiso, L., Sapienza, P., & Zingales, L. (2006). Does culture affect economic outcomes? *Journal of Economic Perspectives*, *20*(2), 23–48. doi:10.1257/jep.20.2.23

Haucap, J., & Müller, A. (2014). Why are economists so different? Nature, nurture and gender effects in a simple trust game. Annual Conference 2014 (Hamburg): Evidence-based Economic Policy 100554, Verein für Socialpolitik, German Economic Association.

Hofstede, G., & Hofstede, G. J. (2005). *Cultures and organizations: Software of the mind* (revised and expanded 2nd ed.). New York, NY: McGraw-Hill.

Hsee, C. K., & Weber, E. U. (1999). Cross-national differences in risk preference and lay predictions. *Journal of Behavioral Decision Making*, 12(2), 165–179. doi:10.1002/(SICI)1099-0771(199906)12:2<165::AID-BDM316>3.0.CO;2-N

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. The *Journal of Economic Perspectives*, 5(1), 193–206. doi:10.1257/jep.5.1.193

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica: Journal of the Econometric Society*, 47(2), 263–291. doi:10.2307/1914185

López-Pérez, R., & Spiegelman, E. (2012). *Do economists lie more?* (Working Papers in Economic Analysis).

Markiewicz, Ł., & Weber, E. U. (2013). DOSPERT's gambling risk-taking propensity scale predicts excessive stock trading. *Journal of Behavioral Finance*, 14(1), 65–78. doi:10.1080/15427560.2013.762000

Mata, R., Josef, A. K., & Hertwig, R. (2016). Propensity for risk taking across the life span and around the globe. *Psychological Science*, 27(2), 231–243. doi:10.1177/0956797615617811

Mayfield, C., Perdue, G., & Wooten, K. (2008). Investment management and personality type. *Financial Services Review*, 17(3), 219–236.

Nicholson, N., Soane, E., Fenton-O'Creevy, M., & Willman, P. (2005). Personality and domain-specific risk taking. *Journal of Risk Research*, 8(2), 157–176. doi:10.1080/1366987032000123856

Oechssler, J., Roider, A., & Schmitz, P. W. (2009). Cognitive abilities and behavioral biases. *Journal of Economic Behaviour & Organisation*, 72(1), 147–152. doi:10.1016/j.jebo.2009.04.018

Rabin, M. (2000). Risk aversion and expected-utility theory: A calibration theorem. *Econometrica*, 68(5), 1281–1292. doi:10.1111/1468-0262.00158

Siegel, J. I., Licht, A. N., & Schwartz, S. H. (2011). Egalitarianism and international investment. *Journal of Financial Economics*, 102(3), 621–642. doi:10.1016/j.jfineco.2011.05.010

Thaler, R. H. (2016). Behavioral economics: Past, present, and future. *American Economic Review*, 106(7), 1577–1600. doi:10.1257/aer.106.7.1577

Thoma, V., White, E., Panigrahi, A., Strowger, V., & Anderson, I. (2015). Good thinking or gut feeling? Cognitive reflection and intuition in traders, bankers and financial non-experts. *PloS One*, 10(4), e0123202. doi:10.1371/journal.pone.0123202

Toplak, M. E., West, R. F., & Stanovich, K. E. (2011). The cognitive reflection test as a predictor of performance on heuristics-and-biases tasks. *Memory & Cognition*, 39(7), 1275–1289. doi:10.3758/s13421-011-0104-1

Toplak, M. E., West, R. F., & Stanovich, K. E. (2014). Assessing miserly information processing: An expansion of the cognitive reflection test. *Thinking and Reasoning*, 20(2), 147–168. doi:10.1080/13546783.2013.844729

Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of Business*, 59, 251–278.

Wang, C. M., Xu, B. B., Zhang, S. J., & Chen, Y. Q. (2016). Influence of personality and risk propensity on risk perception of Chinese construction project managers. *International Journal of Project Management*, 34(7), 1294–1304. doi:10.1016/j.ijproman.2016.07.004

World Investment Report. (2017). http://unctad.org/en/PublicationsLibrary/wir2017_en.pdf?lien_externe_oui=Continue (accessed 13 July 2018).

Zheng, X., El Ghoul, S., Guedhami, O., & Kwok, C. C. Y. (2012). National culture and corporate debt maturity. *Journal of Banking and Finance*, 36(2), 468–488. doi:10.1016/j.jbankfin.2011.08.004

Zingales, L. (2015). The "cultural revolution" in finance. *Journal of Financial Economics*, 117(1), 1–4. doi:10.1016/j.jfineco.2015.05.006

Appendix 1

CRT 7

1. A bat and a ball cost $1.10 in total. The bat costs a dollar more than the ball. How much does the ball cost? _____ cents
2. If it takes five machines 5 minutes to make five widgets, how long would it take 100 machines to make 100 widgets? _____ minutes
3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? _____ days
4. If John can drink one barrel of water in 6 days, and Mary can drink one barrel of water in 12 days, how long would it take them to drink one barrel of water together? _____ days
5. Jerry received both the 15th highest and the 15th lowest mark in the class. How many students are in the class? ___students
6. A man buys a pig for $60, sells it for $70, buys it back for $80, and sells it finally for $90. How much has he made? ___dollars
7. Simon decided to invest $8000 in the stock market one day early in 2008. Six months after he invested, on 17 July, the stocks he had purchased were down 50%. Fortunately for Simon, from 17 July to 17 October, the stocks he had purchased went up 75%. At this point, Simon: has broken even in the stock market; (2) is ahead of where he began; (3) has lost money

Domain-specific risk-taking (adult) scale – Risk-taking

For each of the following statements, please indicate the likelihood that you would engage in the described activity or behaviour if you were to find yourself in that situation. Provide a rating from *Extremely unlikely* to *Extremely likely*, using the following scale:

1	2	3	4	5	6	7
Extremely unlikely	Moderately unlikely	Somewhat unlikely	Not sure	Somewhat likely	Moderately likely	Likely

1. Admitting that your tastes are different from those of a friend. (S)
2. Going camping in the wilderness. (R)
3. Betting a day's income at the horse races. (F/G)
4. Investing 10% of your annual income in a moderate growth diversified fund. (F/I)
5. Drinking heavily at a social function. (H/S)
6. Taking some questionable deductions on your income tax return. (E)
7. Disagreeing with an authority figure on a major issue. (S)
8. Betting a day's income at a high-stakes poker game. (F/G)
9. Having an affair with a married man/woman. (E)
10. Passing off somebody else's work as your own. (E)
11. Going down a ski run that is beyond your ability. (R)
12. Investing 5% of your annual income in a very speculative stock. (F/I)
13. Going whitewater rafting at high water in the spring. (R)
14. Betting a day's income on the outcome of a sporting event (F/G)
15. Engaging in unprotected sex. (H/S)
16. Revealing a friend's secret to someone else. (E)
17. Driving a car without wearing a seat belt. (H/S)
18. Investing 10% of your annual income in a new business venture. (F/I)
19. Taking a skydiving class. (R)
20. Riding a motorcycle without a helmet. (H/S)
21. Choosing a career that you truly enjoy over a more secure one. (S)

22. Speaking your mind about an unpopular issue in a meeting at work. (S)
23. Sunbathing without sunscreen. (H/S)
24. Bungee jumping off a tall bridge. (R)
25. Piloting a small plane. (R)
26. Walking home alone at night in an unsafe area of town. (H/S)
27. Moving to a city far away from your extended family. (S)
28. Starting a new career in your mid-thirties. (S)
29. Leaving your young children alone at home while running an errand. (E)
30. Not returning a wallet you found that contains $200. (E)

Note. E = Ethical, F = Financial, F/I = Financial/Investment, F/G = Financial/ Gambling, H/S = Health/Safety, R = Recreational, and S = Social.

Ten-item personality inventory (TIPI)

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

1 = Disagree strongly, 2 = Disagree moderately, 3 = Disagree a little, 4 = Neither agree nor disagree, 5 = Agree a little, 6 = Agree moderately, 7 = Agree stronglyI see myself as:

1. _____ Extraverted, enthusiastic.
2. _____ Critical, quarrelsome.
3. _____ Dependable, self-disciplined.
4. _____ Anxious, easily upset.
5. _____ Open to new experiences, complex.
6. _____ Reserved, quiet.
7. _____ Sympathetic, warm.
8. _____ Disorganised, careless.
9. _____ Calm, emotionally stable.
10. _____ Conventional, uncreative.

Sex: male/female
Age: … …