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Risk aversion, patience and intelligence: evidence based on macro data

Abstract

Using the new macro data on risk aversion and patience by Falk et al. (2018), I show that risk aversion and patience are related to intelligence: high-IQ populations are more patient and more risk averse than low-IQ populations. The correlation between patience and intelligence corroborates previous results based on micro data. Intelligent people tend to be patient because they have long time horizons. The correlation between risk aversion and intelligence supports new micro data studies based on dynamically optimized sequential experimentation (Chapman et al. 2018).

JEL-Codes: D000, D810, D900.

Keywords: risk aversion, patience, intelligence.

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1. Introduction

Psychologists and economists have shown that citizens who perform better on IQ and related cognitive tests are more likely to behave patiently (Shoda et al., 1990; Warner & Pleeter, 2001, Dohmen et al., 2010; Chapman et al. 2018; Falk et al. 2018). Empirical evidence on the nexus between cognitive skills and risk aversion is however mixed (Dohmen et al. 2010 and 2018a, b, Andersson et al. 2016, Chapman et al. 2018).[2] The previous studies used micro data to elaborate on the nexus between risk aversion, patience and cognitive ability.

There were no macro data on risk aversion and patience available for a long time. I now use the new macro data by Falk et al. (2018) to examine the correlation between risk aversion, patience and intelligence at the macro level. Scholars use macro data to examine correlates of nations' intelligence quotients. Potrafke (2012) proposed that there is less corruption in societies with high-IQ populations because more intelligent people have longer time horizons, a common finding in psychology and economics (Shamosh and Gray 2008, Jones and Podemska 2010).[3] Many of the hypotheses examined with macro data are based on results psychologists and economists arrived at by using micro-data.

2. Data

I use the new macro data on risk aversion and patience by Falk et al. (2018). The authors introduced the "Global Preference Survey (GPS), an experimentally validated survey data set of time preference, risk preference, positive and negative reciprocity, altruism, and trust from 80,000 people in 76 countries" (p. 1645). The GPS measures preferences for a

[2] Scholars employ data for populations' risk aversion and risk aversion of participants in lab/student experiments. Participants in lab/student experiments tend to be less risk averse and have higher cognitive ability than the general population (e.g., von Gaudecker et al. 2012, Chapman et al. 2018, Snowberg and Yariv 2018).

[3] Farzanegan (2018) shows that the correlation between IQ and corruption is especially pronounced in countries with a high quality rule of law.

nationally representative sample. It was compiled during the 2012 Gallup World Poll; the median sample size was 1,000 participants per country.

The GPS preference measures are based on survey items that were validated by multiple incentivized choice experiments for each preference. The measures on patience and willingness to take risks are based on a combination of two survey items, a qualitative and a quantitative item. The two items are combined using weights from the experimental validation procedure.

To measure patience, Falk et al. (2018, p. 12 in the online appendix) describe: "1. (Sequence of five interdependent quantitative questions:) Suppose you were given the choice between receiving a payment today or a payment in 12 months. We will now present to you five situations. The payment today is the same in each of these situations. The payment in 12 months is different in every situation. For each of these situations we would like to know which you would choose. Please assume there is no inflation, i.e, future prices are the same as today's prices. Please consider the following: Would you rather receive 100 Euro today or x Euro in 12 months?...2. (Willingness to act:) How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?". The weight of the first question (intertemporal choice sequence using the staircase method) is 0.712, the weight of the second question (self-assessment: willingness to wait) is 0.288.

To measure willingness to take risk, Falk et al. (2018, p. 12 in the online appendix) describe: "1. (Similar to self-assessment:) Please tell me, in general, how willing or unwilling you are to take risks. Please use a scale from 0 to 10, where 0 means "completely unwilling to take risks" and a 10 means you are "very willing to take risks". You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10….2. (Sequence of five interdependent quantitative questions:) Please imagine the following situation. You can choose between a sure payment of a particular amount of money, or a draw, where you would have an equal chance of getting amount x or getting

nothing. We will present to you five different situations. What would you prefer: a draw with a 50 percent chance of receiving amount x, and the same 50 percent chance of receiving nothing, or the amount of y as a sure payment?". The weight of the first question (self-assessment: willingness to take risks) is 0.527, the weight of the second question (lottery choice sequence using the staircase method) is 0.473.

Individual data are normalized at the country level with mean zero and standard deviation one. Country averages are then computed based on country weights by Gallup. In the macro-data that I use patience assumes values between -0.61 and 1.07 (mean -0.01, standard deviation 0.37), the willingness to take risks assumes values between -0.79 and 0.97 (mean 0.00, standard deviation 0.30).

I measure intelligence using the IQ data by Lynn and Vanhanen (2012) that are based on a wide variety of journal articles, international cognitive tests, and comprehensive samples assembled by IQ testing companies. These data have been very often used to measure IQ across countries (see, for example, Jones and Potrafke 2014, Jones 2015, Salahodjaev 2015, Rindermann 2018). The IQ data in the sample have values between 61.9 and 105.9.

3. Unconditional correlations

Figures 1 and 2 show the unconditional correlation between IQ and willingness to take risks and patience. The correlation coefficients are -0.39 and 0.55. Countries with high-IQ populations and high patience include Sweden and the Netherlands. Countries with high-IQ populations and low willingness to take risks include Japan and Hungary.

The African IQ scores in the Lynn/Vanhanen database have been criticized of being too low. I have therefore raised the lowest scores to 76 (Wicherts et al. 2010a) and 80 (Wicherts et al. 2010b) for robustness tests. Winsorizing the data at the levels suggested by Wicherts et al. increases the unconditional correlation between IQ and patience (r=0.59 with lowest scores 76 and r=0.61 with lowest scores 80) and somewhat mitigates the unconditional correlation between

IQ and willingness to take risks (r=-0.36 with lowest scores 76 and r=-0.32 with lowest scores 80).

4. Conditional correlations

I examine the correlation between IQ and willingness to take risks and patience conditional on the geographic and cultural correlates that Falk et al. (2018) have proposed.

The base-line econometric model has the following form:

$$\text{Willingness to take risks/Patience}_i = \alpha + \beta\, \text{IQ}_i + \zeta_l\, x_{il} + u_i$$

$$\text{with } i = 1,...,76;\ l=1,...,10. \qquad (1)$$

The subscript i refers to country i. IQ_i denotes the intelligence quotient. α is a constant. Following Falk et al. (2018), I control for geographic conditions, absolute latitude, agricultural suitability, crop suitability, biological conditions, weak future time reference, pronoun drop not allowed, share of Protestants, individualism, and family ties. I estimate the model with ordinary least squares (OLS) and robust standard errors. Table 1 includes descriptive statistics of all variables.

Table 2 shows the base-line results when I use the willingness to take risks as the dependent variable. The IQ variable has a negative sign and is statistically significant at the 1% level in columns (1), (3), (4), (7) to (10), and at the 5% level in columns (5) and (11). The point estimate in column (8) suggests, for example, that the willingness to take risks decreased by around 0.45 standard deviations when the IQ increased by one standard deviation (9.9 points). The conditional correlations corroborate the unconditional correlations shown in Figure 1.

Against the background of the previous evidence, an interesting question is why intelligence is not positively correlated with the willingness to take risks. It is conceivable that the relationship between cognitive ability and risk aversion varies across countries. The data by Falk et al. (2018) report a quite high risk aversion in Africa. Citizens' perceptions of the environment and willingness to take risks in Africa tend to be different than in other continents. Just living in Africa may be considered as a high risk. When I exclude African countries from the sample or include continental dummy variables, the conditional correlation between IQ and willingness to take risks is negative but lacks statistical significance. In any event, my results based on macro data do not suggest that IQ and willingness to take risks are positively correlated. Moreover, one may want to reconsider why previous studies based on micro data have found a positive correlation between cognitive ability and willingness to take risks. Studies based on micro data exploit within country variation. It is possible that results differ when variance across countries (my study) or within countries is exploited (previous studies). The results of Falk et al. (2018) based on micro data suggest that self-reported math skills are positively correlated with willingness to take risks. What is more, Falk et al. (2018) do not use incentivized questions which may also explain differences compared to previous studies. Citizens with low cognitive ability might have issues with incentivized questions and tend to make inconsistent choices (Chapman et al. 2018). Risk aversion may just have been measured with error in previous studies that used micro data.

The results in Table 3 show that patience was positively correlated with IQ. The IQ variable has a positive sign and is statistically significant at the 1% level in columns (1) to (9), at the 5% level in column (10) and at the 10% level in column (11). In column (7), for example, increasing IQ by one standard deviation (9.9 points) was associated with an increase in patience by around 0.51 standard deviations. This result corroborates the unconditional correlation shown in Figure 2. The correlation between intelligence and patience also tends

to be stronger than the correlation between patience and other correlates such as geographic and biological conditions that have been examined already by Falk et al. (2018).

Winsorizing the data at the levels suggested by Wicherts et al. (2010a, b) somewhat increases the point estimates of the IQ variable when I use patience as the dependent variable and somewhat decreases the point estimates of the IQ variable when I use willingness to take risks as the dependent variable.

For robustness tests, I have also used the IQ data by Lynn and Meisenberg (2010) which is available for 60 countries of my sample. Inferences do not change: the correlation coefficients between IQ and willingness to take risks and patience are -0.60 and 0.46. The coefficient estimates of IQ are all statistically significant when I include the controls proposed by Falk et al. (2018).

5. Conclusion

Based on the new data on risk aversion and patience by Falk et al. (2018), my results suggest that countries with high IQ populations are more risk averse and more patient than countries with low IQ populations. The positive correlation between patience and IQ corroborates the empirical evidence based on micro data. High IQ populations tend to be more patient because intelligent people have longer time horizons.

Micro data evidence portraying the correlation between cognitive ability and risk aversion is mixed. The positive correlation between risk aversion and IQ supports recent micro data evidence based on dynamically optimized sequential experimentation (Chapman et al. 2018). Future research should examine the correlation between risk aversion and cognitive ability in more detail.

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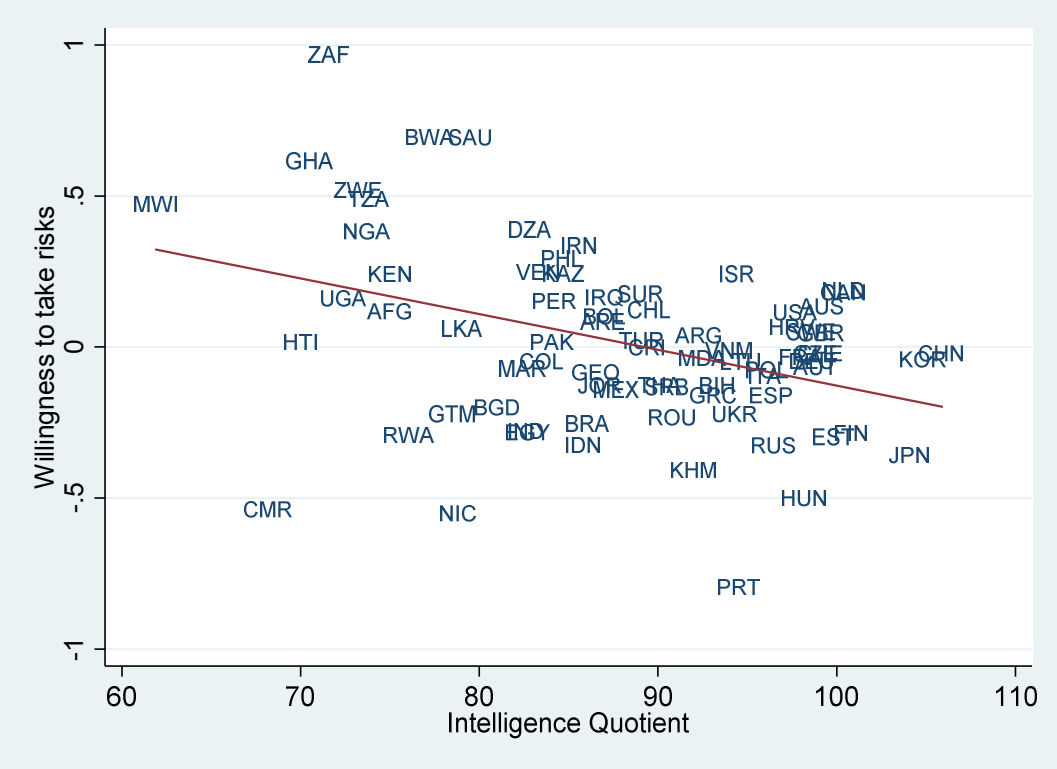
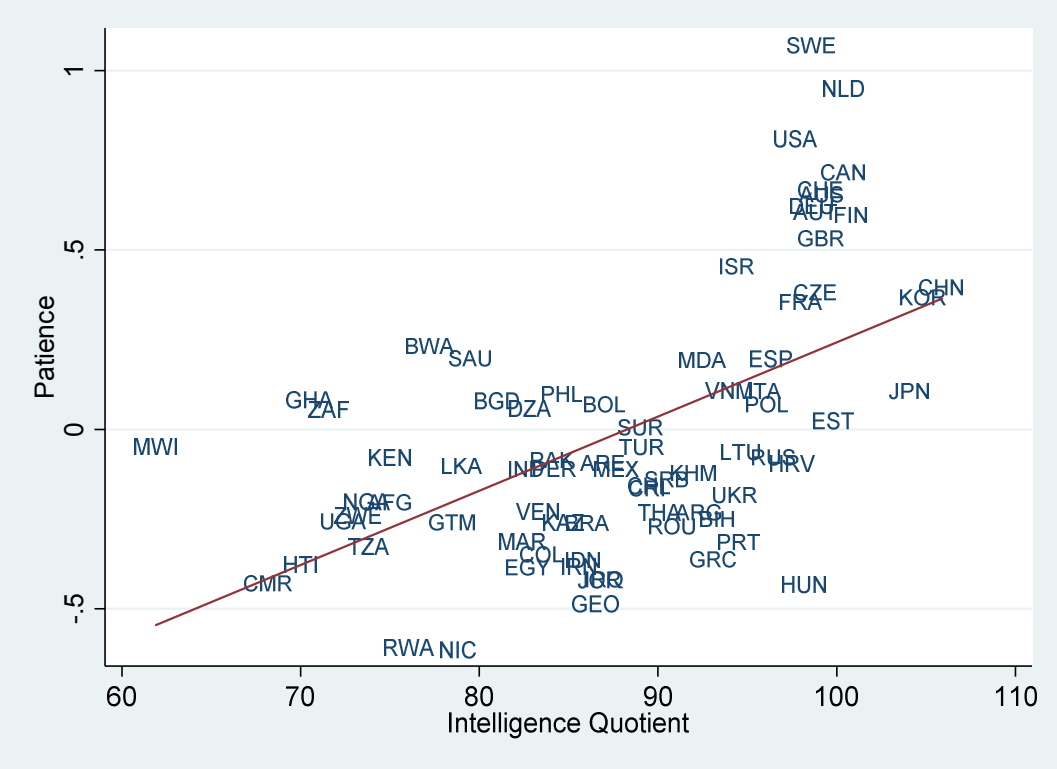
Figure 1. Correlation between willingness to take risks and Intelligence Quotient. Coefficient of correlation: r=-0.39. 76 countries.



Sources: Falk et al. (2018) and Lynn and Vanhanen (2012)

Figure 2. Correlation between patience and Intelligence Quotient. Coefficient of correlation: r=0.55. 76 countries.



Sources: Falk et al. (2018) and Lynn and Vanhanen (2012)

Table 1: Descriptive statistics and data sources.

	N	Mean	Std. Dev.	Min	Max	Source
Willingness to take risks	76	0.01	0.30	-0.79	0.97	Falk et al. (2018)
Patience	76	-0.00	0.37	-0.61	1.07	Falk et al. (2018)
Intelligence Quotient	76	88.12	9.90	61.90	105.90	Lynn and Vanhanen (2012)
Intelligence Quotient with min 76 in Africa	76	88.70	8.88	70	105.90	Lynn and Vanhanen (2012) and own calculation
Intelligence Quotient with min 80 in Africa	76	89.26	8.15	70	105.90	Lynn and Vanhanen (2012) and own calculation
Intelligence Quotient (version from 2010)	60	89.82	10.45	60	106	Lynn and Meisenberg (2010)
Geographic conditions (O-H)	51	0.35	1.07	-1.27	1.78	Falk et al. (2018)
Absolute latitude	76	30.81	16.86	0.33	60.13	Falk et al. (2018)
Agricultural suitability (aa)	74	1424.61	366.12	472.46	2157.41	Falk et al. (2018)
Agricultural suitability (aa)	74	3312.07	960.27	425.94	5575.43	Falk et al. (2018)
Biological conditions (O-H)	51	0.28	1.02	-0.82	1.39	Falk et al. (2018)
Weak future time reference	76	0.79	0.39	0	1	Falk et al. (2018)
Pronoun drop not allowed	76	0.25	0.38	0	1	Falk et al. (2018)
Share Protestants	76	0.11	0.16	0	0.85	Falk et al. (2018)
Individualism	62	41.21	22.60	6	91	Falk et al. (2018)
Family ties	49	-0.00	0.36	-1	0.51	Falk et al. (2018)

Table 2: Regression Results. Dependent variable: Willingness to take risks.
OLS with robust standard errors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Intelligence Quotient	-0.0118***	-0.0107	-0.0160***	-0.0115***	-0.0112**	-0.00829*	-0.0115***	-0.0137***	-0.0119***	-0.0216***	-0.0185**
	(2.96)	(1.65)	(2.91)	(2.82)	(2.62)	(1.82)	(2.89)	(3.18)	(2.97)	(4.60)	(2.69)
Geographic conditions (O-H)		-0.0170									
		(0.35)									
Absolute latitude			0.00339								
			(1.31)								
Agricultural suitability (aa)				-0.0000903							
				(1.03)							
Agricultural suitability (aa)					-0.0000223						
					(0.65)						
Biological conditions (O-H)						-0.0589*					
						(1.69)					
Weak future time reference							0.0372				
							(0.55)				
Pronoun drop not allowed								0.169**			
								(2.20)			
Share Protestants									0.218		
									(1.17)		
Individualism										0.00448**	
										(2.43)	
Family ties											-0.0505
											(0.41)
Constant	1.053***	0.936	1.317***	1.153***	1.069***	0.736*	0.995***	1.182***	1.041***	1.771***	1.679**
	(2.86)	(1.62)	(2.96)	(3.04)	(2.87)	(1.76)	(2.68)	(3.03)	(2.85)	(4.76)	(2.66)
Observations	76	51	76	74	74	51	76	76	76	62	49
R-squared	0.150	0.166	0.167	0.162	0.155	0.186	0.152	0.190	0.163	0.370	0.297

Notes: t statistics in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Regression Results. Dependent variable: Patience.
OLS with robust standard errors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Intelligence Quotient	0.0207***	0.0167***	0.0160***	0.0210***	0.0214***	0.0189***	0.0189***	0.0157***	0.0201***	0.0104**	0.0136*
	(5.24)	(3.30)	(3.49)	(5.17)	(4.95)	(4.04)	(4.87)	(4.27)	(6.01)	(2.55)	(1.98)
Geographic conditions (O-H)		0.0404									
		(0.76)									
Absolute latitude			0.00381								
			(1.46)								
Agricultural suitability (aa)				-0.0000768							
				(0.69)							
Agricultural suitability (aa)					-0.0000219						
					(0.52)						
Biological conditions (O-H)						0.0100					
						(0.20)					
Weak future time reference							-0.198**				
							(2.00)				
Pronoun drop not allowed								0.437***			
								(4.07)			
Share Protestants									0.983***		
									(4.43)		
Individualism										0.00844***	
										(4.29)	
Family ties											-0.339*
											(1.96)
Constant	-1.827***	-1.475***	-1.531***	-1.743***	-1.812***	-1.656***	-1.517***	-1.495***	-1.883***	-1.235***	-1.201*
	(5.37)	(3.38)	(4.20)	(4.91)	(5.26)	(4.10)	(4.27)	(4.68)	(6.34)	(3.64)	(1.99)
Observations	76	51	76	74	74	51	76	76	76	62	49
R-squared	0.307	0.313	0.321	0.315	0.312	0.307	0.349	0.488	0.491	0.472	0.376

Notes: t statistics in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%