Journal of Human and Social Sciences

The Impact of Entrepreneurs' Cognitive Biases on Their Risk-Taking Propensity: A Research in the Technology Sector via Pls-Sem Method

Muhammed Yasin SAĞLAM [1]
Yıldız Technical University, Graduate School of Social Science

Yasin ŞEHİTOĞLU[2]
Yıldız Technical University, Department of Business Administration

ABSTRACT

The purpose of this research was to examine the impact of the two main cognitive biases, i.e., jumping to conclusion bias and the belief inflexibility bias, on the entrepreneurs operating in the technology sector in terms of their risk-taking propensities. The participants of this research are 90 entrepreneurs in the technology sector. The PLS-SEM analysis method was used to analyse the data collected within the scope of this research. Based on the prospect theory, this study aimed to test the effects of jumping-to-conclusions bias and belief inflexibility bias on economic, general and career-based risk-taking propensities. It was observed that jumping-to-conclusions bias is associated with all risk-taking propensities, but belief inflexibility bias is only associated with general risk-taking propensity, but not with economic and career risk taking propensities. The findings were discussed within the framework of the literature and suggestions were made for future research.

Key Words: Cognitive Processes, Jumping to Conclusion Bias, Belief Inflexibility Bias, Risk Taking Propensity, Entrepreneurship, Technology Sector, PLS-SEM (Partial Least Squares Based Structural Equation Modelling)

Research Article

Received: 14.09.2021
Revision received: 25.10.2021
Accepted: 27.10.2021
Published online: 30.10.2021

[1] Corresponding author:
saglam.yasin.m@gmail.com
ORCID: 0000-0001-5564-2404
[2] Doç. Dr.
ysehit@yildiz.edu.tr
ORCID: 0000-0003-0074-6446

Introduction

In many economic environments around the world, governments, businesses, and investor networks attach great importance to encouraging entrepreneurs and entrepreneurship, so that new investments can be made with a view to achieving innovation and sustainable competitiveness. As indicated in the report of the Global Entrepreneurship Monitor (GEM), the percentage of new entrepreneurs operating in the technology sector in Turkey on a large or medium scale, rose by 3.46%, from 1.54% in 2016 to 5% in 2018. One of the features that distinguishes Turkish entrepreneurs from those in other GEM countries seems to be the high expectation of growth and job creation (Bosma & Kelley, 2019). In view of that, cognitive processes play a critical role in terms of the perception of risk and its impact on entrepreneurs pertaining to making rational decisions in periods involving critical decision-making processes where ambiguity and excess risk factors are of high priority concern for entrepreneurs. In this context, some experimental studies have shown that cognitive biases can lead to delusions and systematic errors in thinking. Although studies in the literature are generally aimed at investors, the relationship between the cognitive biases such as overconfidence, the illusion of control, the belief in the law of small numbers and planning fallacy, and the concepts such as starting new businesses and seizing opportunities for growth has been examined by keeping the risk perception tool as the main variable when it comes to evaluating the conditions of entrepreneurs (Simon, Houghton and Aquion, 2000; Keh, Der Foo and Lim, 2002).

In this study, we used two different cognitive bias patterns, which can be interpreted as the main cause of such biases, which are relatively less covered in different disciplines in the literature, though frequently used in the literature related to entrepreneurship to date. These two different cognitive biases are Jumping-to-Conclusions (JTC) bias, which describes decision-making based on limited evidence, and Belief-Inflexibility Bias, indicating that individuals shape their reasoning processes as inflexible according to delusions formed under the influence of their beliefs. The aim of this study is to examine the impact of such biases on the risk-taking propensity of entrepreneurs working in the technology sector. We believe that our study will contribute to the relevant literature considering that we have focused on the biases of “jumping to conclusions” and “belief inflexibility”, which we think have been very little addressed in the literature so far, yet are critically important. This paper will also contribute to the sector representatives by providing practical benefits since the number of studies focusing on entrepreneurs in the technology sector in Turkey is relatively few.

Theoretical Background and Hypotheses

Cognitive bias refers to the systematic deviation of individuals from the norms or rationality while making judgments (Buss, 2016). In recent years, biases have been investigated together with various management-related concepts ranging from strategic management to project management, from knowledge management to sustainability (Bishop, 2021; Kim & Daniel, 2020; Pope, 2018; Certo, Busenbark, Woo and Semadeni, 2016; Dal Mas Piccolo and Ruzza, 2016; John, 2016; Kondylis, Mueller, Sheriff and Zhu, 2016; Lau, 2020; Li, Liu and Liu, 2016). Having so far attracted the attention of the sciences of psychiatry and psychology, the JTC bias has been discussed in different studies focusing on the idea that individuals may need less information before making a decision (Dudley, Taylor, Wickham and Hutton, 2016), on the propensity to make hasty decisions while reasoning (Rausch, Eisenacher, Elkin, Englisch, Kayser, Striepens ... & Wagner, 2016), and on the relationship between the JTC bias and negative emotions (Lüdtke, Kriston, Schröder, Lincoln and Moritz., 2017; Prater, Kirytopoulos and Ma, 2017). The consequences of this bias have been addressed in the social sciences as well, though relatively less. According to Kahneman (2011) jumping to conclusions can be productive as long as the results to be reached are likely to be correct, if the costs of the mistakes, which are to be very few in number, are at an acceptable level, and if jumping to conclusions saves the individual a great deal of time and effort. Nevertheless, jumping to conclusions can be dangerous if the individual is unfamiliar with the situation, the risk is high, and there is no time to gather more information (van der Gaag, Schütz, ten Napel, Landa, Delespaul, Bak, 2013).

The second bias discussed in our research, the belief inflexibility, is the case in which individuals mould their reasoning processes under the influence of their beliefs with no room for flexibility (Woodward, Moritz, Cuttler and Whitman, 2006). Jumping to conclusions indicates a bias towards System 1 that denotes fast-thinking, which is the first of the two cognitive process models for thinking, while belief inflexibility, which is characterized as weakness in the flexibility of beliefs, indicates a bias towards System 2 that represents slow-thinking (Ward & Garety, 2019). These two biases are, therefore, the main ones that trigger many others as well as representing two different extremes.

Entrepreneurs often face with the risk-taking propensity, being the dependent variable of the present study. These risks are generally grouped under four main headings: financial risks, career risks, family-related and social risks, and psychological risks (Liles, 1974). Risk-taking propensity is also defined as an individual's propensity towards risk-taking or risk-prevention, and is regarded as an individual characteristic that is likely to change over time as a result of experience (Sitkin & Pablo, 1992; Sitkin & Weingart, 1995).

Upon presenting the definitions of the relevant concepts, this section will focus on developing hypotheses. Broadly speaking, the most important task that an entrepreneur cannot give up is to make a decision (Koçel, 2018). In this sense, entrepreneurs' propensity to take risks is related to risk perception. While estimating the risk involved in the situation, a decision-maker develops certain beliefs about the future consequences of the risk in question (Kahneman, 2011). According to the expectancy theory, perceived risk plays a more active role in directing individuals' behaviour when compared to expected risk (Tversky & Kahneman, 1979). Undoubtedly, the individual biases and emotions of a decision-maker influence the decision-making process. The relationships between misconceptions and risk perception and/or propensity have been addressed in many areas of management science (Pereira, 2021; Li, 2020; Khan, 2017; Zhang & Cueto, 2017; Rossi, 2017; Pappas, 2016).

In this context, we believe that the biases that may be experienced by entrepreneurs during their cognitive processes have a clear impact on their propensity to take risks.

The Relationship between Jumping-to-Conclusions Bias and Risk-Taking Propensity

We are of the view that the JTC bias has an impact on the risk-taking propensity, classified as economic, general, and career-related. Although no other study testing such a hypothesis was found in the literature, some studies were found to have been conducted in relation to Kahneman (2011)'s theory of the relationship between risk perception and/or risk-taking propensity concerning some biases, which can also be seen as sub-dimensions of the JTC bias. It would be appropriate to remind here that there is a negative relationship between risk perception and risk-taking propensity (Sitkin & Weingart, 1995). In this regard, it has been argued that exaggerated emotional consistency is also influential on perceived risk (Florea, 2015), that the framing effect paves the way for making more risky choices, that individuals' risk avoidance propensity disappears or even reverses when they win (Cheung & Mikels, 2011), and that violating the basic ratios causes individuals to perceive risk less than it actually is. However, there are studies showing that overconfidence has no significant impact on risk perception (Simon, et al., 2000; Keh et al., 2002). From this standpoint, the following hypotheses have been proposed.

H1: There is a significant relationship between the jumping-to-conclusions bias and the economic risk-taking propensity of entrepreneurs.

H2: There is a significant relationship between the jumping-to-conclusions bias and the general risk-taking propensity of entrepreneurs.

H3: There is a significant relationship between the jumping-to-conclusions bias and the career risk-taking propensity of entrepreneurs.

The Relationship between Belief-Inflexibility Bias and Risk-Taking Propensity

People with belief inflexibility are characterized by their inclination to disapprove of the evidence, even when presented with available evidence about the situation (Woodward et al., 2006). Contrary to belief inflexibility, belief flexibility is exemplified in the literature as taking a step back, considering the possibility of being mistaken, and taking into account alternative explanations or opinions about a subject (Ward et al., 2018). In addition, the concept of belief flexibility is associated with an analytical and controlled mind management process, as named by Kahneman as System 2 (2011), which is one of the cognitive process models for reasoning. No research has been found in the literature on the relationship between belief inflexibility and risk-taking propensity. However, it is believed that individuals who are strongly attached to their beliefs will end up failing to think rationally on some issues and that their propensity to take risks will be affected by this irrational attitude. From this perspective, the following hypotheses have been developed:

H4: There is a significant relationship between the belief-inflexibility bias and the economic risk-taking propensity of entrepreneurs.

H5: There is a significant relationship between the belief-inflexibility and the general risk-taking propensity of entrepreneurs.

H6: There is a significant relationship between the belief-inflexibility bias and the career risk-taking propensity of entrepreneurs.

Methodology

Model

This study was carried out in line with the survey approach as a quantitative method. The type of research is a cross-sectional correlational design. Studies conducted with correlational surveys generally aim at revealing the relationship between two or more variables (Yin, 2017). The reason for employing a cross-sectional correlational design in terms of survey type was to explain the relationships between the two cognitive biases, namely, jumping to conclusions and belief inflexibility, which can be interpreted as the main causes of cognitive biases, as well as general, economic and career-related risk-taking propensity, with specific reference to the period in which the data were collected.

The PLS-SEM analysis method was used in the present study with Smart PLS 3 (Ringle, Wende and Becker, 2016) software. The reason why the PLS-SEM method was preferred in this study is that it limits the sample size of the population, thereby working on small samples (Hair, Risher, Sarstedt and Ringle, 2019) and is relatively more useful in terms of not requiring a normal distribution.

Sampling and the 10-Times Rule

This study was conducted with 90 entrepreneurs in the technology sector through a questionnaire, as for collecting data, in compliance with convenience sampling. According to Hair, Hult, Ringle and Sarstedt (2017), the minimum sample size in the PLS road model must meet the '10-times rule', indicating that the sample size should be at least 10 times the maximum number of arrows pointing at a latent variable, which was 2 in the model of this study. The number 20, which is 10 times the number of arrows according to the rule, indicates the minimum number of observations for estimating the PLS road model. There are 90 observations in the present study, in which case, the number of samples is sufficient. It would also be helpful to look at the table of sample size suggested by Cohen (1992) for 80% statistical power. As shown in the table, the study has a sample size of 90, a model with a 5% significance level with 2 independent variables, and a recommended sample size of 0.1 for a minimum R2 value. Table 1 presents the recommended sample size for %80 of statistical power in the PLS-SEM model adapted for different significance levels (10%, 5%, and 1%), different number of independent variables or maximum number of arrows indicating a latent variable, and the minimum R^2 values.

Table 1. *Table 1: The Table of Suggested Number of Samples for 80% of Statistical Power in the PLS-SEM Model*

No of Independent Variables (Maximum number of arrows pointing at a structure)	The Level of Statistical Significance											
	10%				5%				1%			
	Minimum R^2				Minimum R^2				Minimum R^2			
	0.10	0.25	0.50	0.75	0.10	0.25	0.50	0.75	0.10	0.25	0.50	0.75
2	72	26	11	7	90	33	14	8	130	47	19	10
3	83	30	13	8	103	37	16	9	145	53	22	12
4	92	34	15	9	113	41	18	11	158	58	24	14
5	99	37	17	10	122	45	20	12	169	62	26	15
6	106	40	18	12	130	48	21	13	179	66	28	16
7	112	42	20	13	137	51	23	14	188	69	30	18
8	118	45	21	14	144	54	24	15	196	73	32	19
9	124	47	22	15	150	56	26	16	204	76	34	20
10	129	49	24	16	156	59	27	18	212	79	35	21

Source: Cohen, 1992, p. 158.

The survey method was used as a data collection tool in this study, in which questionnaires were collected through face-to-face interviews or virtual platforms. Data were collected between March, 2019 and July, 2019. The questionnaire consists of 40 items, 9 of which are demographic, and assessed on a 5-point Likert scale, rated as '1' strongly disagree and '5' strongly agree. The first part of the questionnaire consists of demographic questions such as age, gender, marital status, educational background, as well as general questions to reveal answers regarding the number of years the enterprise has been active, the number of people working in the enterprise, the annual income of the entrepreneur, the annual turnover of the enterprise, and the sector in which it operates.

The first 12 questions in the second part of the questionnaire were designed within the scope of cognitive biases. The questions in the scale were adapted into Turkish from the study of van Der Gaag et al. (2013). Then, the scale was translated using the "translation-retranslation" method by some researchers who are experts in their fields and knowledgeable about the subject. The first 6 items of the scale are associated with the JTC bias, and the other 6 are associated with belief-inflexibility bias. The rest 19 items of the questionnaire belong to the risk-taking propensity scale. The first 9 items are for the general risk-taking dimension, the next 6 items are for the economic risk-taking dimension, and the last 4 are for the career risk taking dimension. The general risk-taking scale was used in the way it was prepared by Timuroğlu & Çakır (2014). In this context, we accessed 115 entrepreneurs and examined the data obtained from the 90 questionnaires that remained after those that could not be used were eliminated. Figure 1 shows the research model created within the framework of all given explanations.

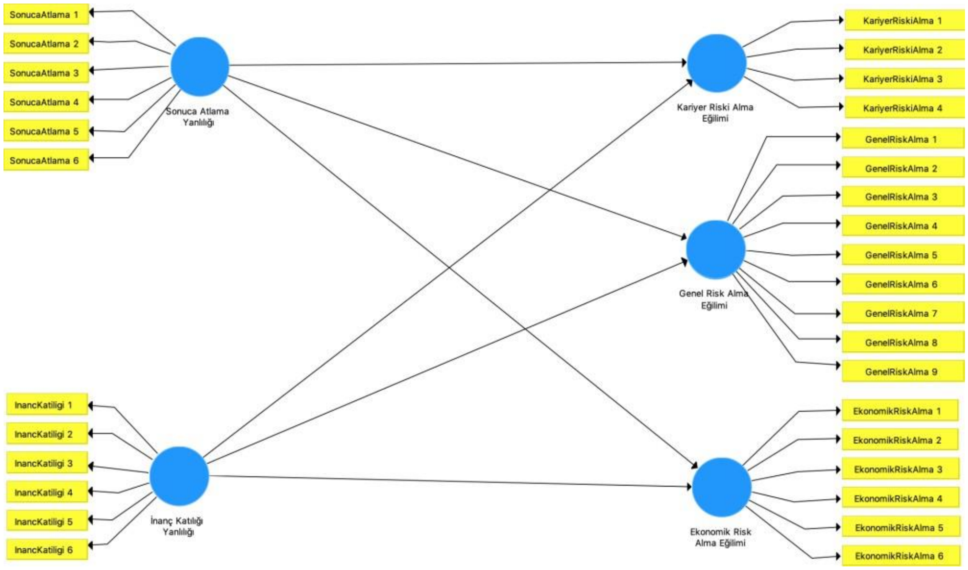

Figure 1: SmartPLS Visual of Research Model

Findings

Table 2 shows the demographic data collected from 90 subjects participating in the study.

Table 2: *Participants' Demographic Data*

Variables	Features	Frequency	Percentage	Variables	Features	Frequency	Percentage
Gender	Female	23	25.56	**Annual income (TL)**	Less than 30.000	13	14.44
	Male	67	74.4		30.000 – 60.000	13	14.44
Age (years)	30 and younger	18	20.0		More than 60.000	64	71.12
	30-39	36	40.0	**Annual Turnover (TL)**	Less than 50.000	4	4.44
	40-49	33	36.6		50.000-250.000	19	21.11

	50-59	3	3.3		250.000-500.000	20	22.22
Educational Background	High school	2	2.22		500.000-1,000.000	18	20.00
	University degree	53	58.89		1,000.000-5,000.000	16	17.78
	Master's degree	29	32.22		More than 5,000.000	13	14.44
	PhD	6	6.67	**No of work years**	0-5 years	45	50.00
Number of employees	0-9	50	55.56		6-10 years	20	22.22
	10-49	23	25.56		11-15 years	17	18.89
	50-249	17	18.89		More than 15 years	8	8.89

As can be seen in Table 2, the participants are predominantly male, university graduates, between the ages of 30-49, have 9 or fewer employees, and have been operating for less than 5 years, with an annual income of 60.000 TL or more. Demographic data appear to be evenly distributed, which is of great importance for the soundness of the research.

Our study was conducted in accordance with the procedure defined by Hair et al. (2017) regarding the evaluation of the results obtained from the PLS-SEM model testing. As the first step, the reliability and validity values of the latent variables (the JTC bias, belief-inflexibility bias, general risk-taking propensity, career risk-taking propensity, and economic risk-taking propensity) within the measurement model are presented in tables. In the second step, the findings about the test results of the designed structural model are reported.

Reliability and Validity Analysis of the Measurement Model

The evaluation of reflective measurement models includes composite reliability in order to assess internal consistency, besides indicator reliability, and mean-variance explained (MVE) to assess convergent validity, as well as discriminant validity. The Fornell-Larcker criterion is used to examine the discriminant validity of cross-loadings and especially of the heterotrait-monotrait (HTMT) ratio of correlations (Hair et al., 2017).

Hair et al. (2017) reported that composite reliability values should be higher than 0.70 for internal consistency reliability, though 0.60 - 0.70 can also be accepted in exploratory studies. Cronbach's alpha value is taken as the lower limit of internal consistency reliability, while composite consistency value is taken as its upper limit. The external loads of the indicator should be higher than 0.70 to ensure indicator reliability. Subtraction for indicators with external loads between 0.40 and 0.70 should only be considered for the necessity of exclusion from the model in the event that it causes an increase in composite reliability and the MVE value to go beyond the recommended threshold.

In the first evaluation made according to the indicator loads, the items with indicator loads below the value of 0.4 were completely removed from the measurement model. Some items with indicator load values between 0.4 and 0.7 were also removed from the measurement model, but only after being analyzed in terms of their impact on the internal consistency reliability of the model. In the end, a total of 7 items (Economic 2, General 2, General 3, General 4, General 5, Conclusion 4, Belief 3) were removed from the measurement model. Table 3 presents the indicator load values, composite reliability values, Cronbach's Alpha value, and MVE values obtained through the SmartPLS (Ringle et al. 2016) program.

Table 3: *Validity and Reliability Values of the Research Model*

Latent variables	Indicators	Indicator loadings	Composite reliability	Cronbach's Alpha (a)	MVE
Economic risk-taking propensity	Economic 1	0.754	0.821	0.771	0.527
	Economic 3	0.650			
	Economic 4	0.622			
	Economic 5	0.857			
	Economic 6	0.722			
General risk-taking propensity	General 1	0.563	0.845	0.790	0.542
	General 6	0.627			
	General 7	0.848			
	General 8	0.843			
	General 9	0.755			
Career risk-taking propensity	Career 1	0.760	0.819	0.712	0.533
	Career 2	0.727			
	Career 3	0.834			
	Career 4	0.575			
Jumping-to-conclusions bias	Conclusion 1	0.819	0.848	0.773	0.534
	Conclusion 2	0.877			
	Conclusion 3	0.719			
	Conclusion 5	0.588			
	Conclusion 6	0.608			
	Belief 1	0.879	0.831	0.748	0.501

Belief-inflexibility bias	Belief 2	0.700			
	Belief 4	0.565			
	Belief 5	0.549			
	Belief 6	0.790			

As can be seen in Table 3, five latent variables were identified. The indicator loadings of these variables were found to be in the range between 0.622 and 0.857 for economic risk-taking propensity, between 0.563 and 0.848 for general risk-taking propensity, between 0.575 and 0.834 for career risk-taking propensity, between 0.588 and 0.877 for jumping-to-conclusions bias, and between 0.549 and 0.879 for belief-inflexibility bias. Such values seemed to comply with the specified criteria in terms of individual indicator reliability. Composite reliability values varied between 0.819 and 0.848. They were also highly compatible with the criterion of the necessity of having a composite reliability value of 0.60 and above of any measurement model as stated by Bagozzi & Yi (1988). Given the MVE values, all values seemed to have a value of 0.5 and above, providing convergent validity. Fornell-Larcker values, cross-loadings of items and statistical values in the HTMT table should be checked for the discriminant validity of the measurement model. Table 4 demonstrates the Fornell-Larcker values of these criteria, whereas Table 5 presents the values of cross-loadings and Table 6 the HTMT table.

Table 4: *Fornell-Larcker Values for the Research Model*

	Economic risk-taking propensity	**General risk-taking propensity**	**Career risk-taking propensity**	**Jumping-to-conclusions bias**	**Belief-inflexibility bias**
Economic risk-taking propensity	**0.726**				
General risk-taking propensity	0.322	**0.736**			
Career risk-taking propensity	0.565	0.213	**0.730**		
Jumping-to-conclusions bias	0.654	0.423	0.532	**0.731**	
Belief-inflexibility bias	0.175	0.328	0.000	0.105	**0.708**

The Fornell-Lacker values in Table 4 are those written in bold on the diagonal of the table. The correlation values of the latent variables in the model are those placed below the Fornell-Lacker values, varying between 0.708 and 0.736. The correlation values vary between 0 and 0.654.

That Fornell-Larcker values are higher than the correlation values of the latent variables in the given rows and columns where they coexist is considered appropriate in terms of discriminant validity. The values in Table 4 meet this criterion.

Table 5 shows the cross-loading values obtained in the measurements of the research model.

Table 5: Cross-loading values for the research model

	Economic risk-taking propensity	General risk-taking propensity	Career risk-taking propensity	Jumping-to-conclusions bias	Belief-inflexibility bias
Economic 1	**0.754**	0.377	0.384	0.447	0.409
Economic 3	**0.650**	0.026	0.263	0.463	0.135
Economic 4	**0.622**	0.162	0.300	0.350	-0.032
Economic 5	**0.857**	0.263	0.582	0.583	-0.044
Economic 6	**0.722**	0.309	0.472	0.497	0.141
General 1	0.116	**0.563**	0.094	0.220	0.040
General 6	0.170	**0.627**	0.082	0.228	0.079
General 7	0.295	**0.848**	0.166	0.340	0.370
General 8	0.312	**0.843**	0.282	0.433	0.254
General 9	0.217	**0.755**	0.095	0.280	0.307
Career1	0.437	0.244	**0.760**	0.415	-0.078
Career 2	0.340	0.103	**0.727**	0.296	-0.176
Career 3	0.492	0.145	**0.834**	0.516	0.066
Career 4	0.362	0.116	**0.575**	0.247	0.249
Conclusion 1	0.540	0.441	0.392	**0.819**	0.102
Conclusion 2	0.502	0.354	0.441	**0.877**	-0.004
Conclusion 3	0.351	0.347	0.330	**0.719**	-0.072
Conclusion 5	0.388	0.120	0.383	**0.588**	-0.121
Conclusion 6	0.565	0.234	0.388	**0.608**	0.408
Belief 1	0.139	0.378	0.031	0.131	**0.879**

Belief 2	0.059	0.230	0.031	0.202	**0.700**
Belief 4	-0.026	0.167	-0.160	-0.173	**0.565**
Belief 5	0.200	0.091	-0.079	0.064	**0.549**
Belief 6	0.211	0.193	0.059	0.030	**0.790**

As can be seen in Table 5, when the loading value of the particular variable to which each item is related is higher than the other values in the row in which they are placed, it is considered appropriate in terms of ensuring discriminant validity.

Table 6 shows the heterotrait-monotrait (HTMT) ratio of latent variable correlations in the research model.

Table 6: *The table of HTMT ratios for the research model*

	Economic risk-taking propensity	**General risk-taking propensity**	**Career risk-taking propensity**	**Jumping-to-conclusions bias**	**Belief-inflexibility bias**
Economic risk-taking propensity					
General risk-taking propensity	0.412				
Career risk-taking propensity	0.740	0.317			
Jumping-to-conclusions bias	0.831	0.529	0.679		
Belief-inflexibility bias	0.315	0.380	0.325	0.357	

As a main criterion, the HTMT is used to evaluate the discriminant validity in the PLS-SEM. It is necessary that the values in the HTMT statistics not contain the value 1 for all structure combinations. The HTMT ratio values in Table 6 demonstrate that discriminant validity is warranted.

Goodness of Fit Criteria in Evaluating the Model

The SRMR, NFI and GFI criteria were checked for the fit assessment of the model. In connection to that, the VIF (variance inflation factor) values were also provided. On the whole, the Standardized Root Mean Square Residual (SRMR) model is required to take a value less than 0.10 so that the model can be regarded to have acceptable fit. The Normed Fit Index (NFI) is required to take values between 0 and 1. The NFI value close to 1 indicates that the model has a good fit (Yılmaz & Kinaş, 2020. 447). We found the SRMR value for the model as 0.092 and NFI value as 0.499. Another index- the Goodness of Fit Index (GFI)- provides a standard measure for determining the performance of both the measurement model and the structural model, and for the estimated performance of the whole model. The GFI values range from 0 to

1. The degrees of fit for the GFI are as follows: GFI< 0.10 (poor), GFI< 0.25 (fair), 0.25<GFI 0.36 (excellent). The GFI is calculated by taking the sum of the square root of the product of the mean of the MVE and R2 values obtained for the latent variables. GoF =√ Average R2 × Average (MVE) (Yılmaz & Kinaş, 2020, 446). The mean R2 value was found 0.329, the mean of MVE value 0.534, and the GFI 0.419, results showing that the model has a very good fit. As a final step, the model should be evaluated to explore whether there are multiple interrelationships between latent variables. To do this, the VIF values are examined. That the VIF value is less than 5 indicates that there is no collinearity between the variables (Yılmaz & Kinaş, 2020, 447). The VIF values in our study were found as 1.696 - 1.721 - 1,376, respectively. In that case, all VIF values were less than 5 with no interrelationship problem between latent variables.

Testing the Structural Model

At the stage of testing the structural model upon testing the measurement model, we also examined its overall explanatory power, the amount of variance explained by the independent variables, as well as the size and strength of each of the hypotheses in a particular structural model path. The R2 value used in the regression analysis was again used in order to determine the explanatory power of the model. Given what was explored, jumping-to-conclusions and belief-inflexibility biases appeared to account for the change in the economic risk-taking propensity (R2 = 0.440), as well as in the general risk-taking propensity (R2 = 0.261), and in the career risk-taking propensity (R2 = 0.286).

As can be seen in Figure 2, the measurement model of the research was tested through the SmartPLS (Ringle et al., 2016) software, in addition to obtaining a structural model in which the relationships developed. After that, a resampling was carried out in such a way based on creating a random sample set of 5000 (recommended sampling number) from among the real sample on the research model. Then, Bootstrapping analysis was performed.

Here we checked whether the t-test scores obtained from the Path Coefficient values were statistically significant according to the 5% margin of error threshold.

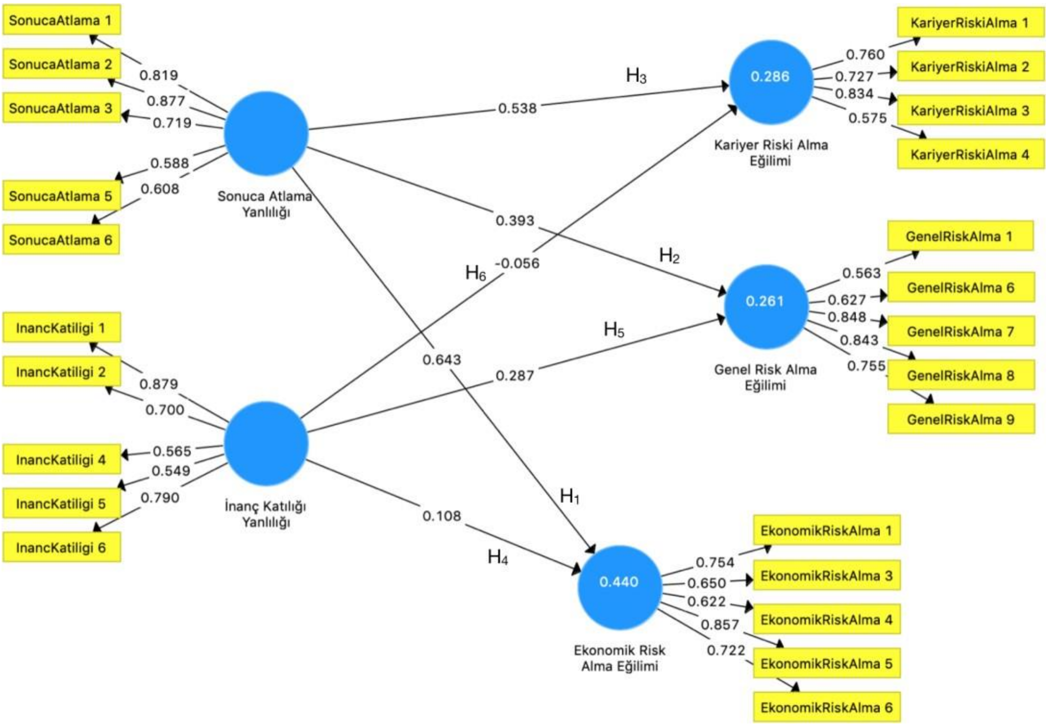

Figure 2: *The SmartPLS Structural Model Output for the Research Model*

Table 7 presents the t-statistics for the path coefficients reached in line with the hypotheses developed and provided in the second part of the study.

Table 7: *The t-statistics for the path coefficients of the research model*

	Std. β	Sample mean	Standard deviation	T statistics	p value
Jumping-to-conclusions bias -> Economic risk-taking propensity	0.643	0.651	0.060	10.643	0.000
Jumping-to-conclusions bias -> General risk-taking propensity	0.393	0.406	0.110	3,572	0.000
Jumping-to-conclusions bias -> Career risk-taking propensity	0.538	0.546	0.069	7,824	0.000
Belief-inflexibility bias -> Economic risk-taking propensity	0.108	0.125	0.116	0.926	0.354
Belief-inflexibility bias -> General risk-taking propensity	0.287	0.300	0.107	2,675	0.007
Belief-inflexibility bias -> Career risk-taking propensity	-0.056	-0.046	0.183	0.307	0.758

The t-statistics was used for testing the statistical significance of the paths/relationships in the research model. The highly significant path between the JTC bias and economic risk-taking propensity ($t=10.643$; $p < 0.01$) appeared to support the H1 hypothesis. Likewise, the H2 hypothesis was supported since the path between the JTC bias and general risk-taking propensity ($t=3.572$; $p < 0.01$) was significant. Furthermore, since the path between the the JTC bias and the career risk-taking propensity (t=7,824; $p < 0.01$) was significant, the H3 hypothesis was also supported.

On the other hand, the H4 hypothesis was not supported since the path between the belief-inflexibility bias and the economic risk-taking propensity ($t=0.926$; $p=0.354$) was statistically insignificant. However, the H5 hypothesis was supported, since the path between the belief-inflexibility bias and the general risk-taking propensity ($t=2.675$; $p < 0.01$) was significant, whereas the H6 hypothesis was not supported, since the path between the belief-inflexibility bias and the career risk-taking bias ($t=0.307$; $p = 0.758$) was insignificant. Table 8 presents the overall view of the results of the hypotheses as a summary.

Table 8: *Results of the hypotheses*

Hypothesis	Independent variable	Dependent variable	Result	Conclusion
H_1	Jumping-to-conclusions bias	Economic risk-taking propensity	$t=10.643$; $p<0.01$	Supported
H_2	Jumping-to-conclusions bias	General risk-taking propensity	$t=3.572$; $p<0.01$	Supported
H_3	Jumping-to-conclusions bias	Career risk-taking propensity	$t=7.824$; $p<0.01$	Supported
H_4	Belief-inflexibility bias	Economic risk-taking propensity	$t=0.926$; $p=0.354$	Not supported
H_5	Belief-inflexibility bias	General risk-taking propensity	$t=2.675$; $p<0.01$	Supported

H_6	Belief-inflexibility bias	Career risk-taking propensity	t=0.307; p=0.758	Not supported

Result and Discussion

This study investigated the relationship between entrepreneurs' risk-taking propensity and the two cognitive biases that we considered as the main biases, namely jumping-to-conclusions bias (JTC) and belief-inflexibility bias, which are used in a limited number of studies in different disciplines in the literature, though not used in the literature of management. We employed the PLS-SEM (Partial Least Squares Based Structural Equation Modelling) analysis method.

Considering our sample, we believe that this research contributes to the literature in relation to Kerr, Kerr & Xu's (2018) proposal indicating that more studies are needed to be conducted on narrowly defined populations to better understand the degree of risk-taking propensity of entrepreneurs. Despite the availability of academic research in the literature targeting the investors in general, our literature review have also revealed that some other studies targeted entrepreneurs with the aim of exploring the relationships between cognitive biases such as overconfidence, illusion of control, belief in the law of small numbers, as well as planning illusions, and some concepts such as starting a new business, seizing opportunities, and growing by keeping the risk perception tool as the variable (Simon, et al. 2000; Keh et al. 2002). In this respect, this paper's uniqueness lies in the variables examined, the model tested, and the results obtained.

As regards the hypotheses, it turned out that those tested in the research had not been discussed in the literature before. However, there are some studies related to risk, albeit limited, about exaggerated emotional coherence (aka, halo effect), overconfidence, belief and confirmation propensity, framing effect, and baseline rate bias, which can also be expressed as sub-dimensions of the JTC bias (Kahneman, 2011).

A study by Florea (2015) revealed that exaggerated emotional coherence (halo/moon effect) from among cognitive biases has a considerable impact on the risk perceived by a consumer (functional risk, financial risk, social risk, physical risk, psychological risk, and time risk).

In another relevant study by Simon, et al. (2000), the authors examined overconfidence and risk perception in relation to the decision to start a venture, as a result of which they revealed that overconfidence did not reduce the risk perception. Similarly, Keh et al. (2002) examined the relationship between entrepreneurs' overconfidence and risk perception in relation to how they evaluate opportunities. The authors concluded that overconfidence showed no statistically significant impact on risk perception.

The first stage of another two-stage study explained that reliance on emotions is associated with risk seeking, but the goals of regulating emotions mitigate these effects, while the second stage indicated that the framing effect in case of loss is also associated with risk seeking, but that effect in case of gain is not related to risk aversion (Cheung & Mikels, 2011).

The H1 was designed to examine the relationship between the JTC bias and economic risk-taking propensity, indicating the presence of a positive and significant relationship between them in such a way that supported the H1 hypothesis. From this standpoint, we examined the impact of the JTC bias on the propensity of entrepreneurs in the technology sector when it comes to take financially risky decisions. It could be assumed that they are inclined to take economic risks, considering the fact that they are prone to making investment decisions without having sufficient knowledge, but just by being influenced by their environment, or by acting in accordance with biases. Similarly, the relationship between the JTC bias and general risk-taking propensity was also examined, supporting the H2. The general evaluation of the risk-taking propensity of the entrepreneurs in the sector revealed that they are influenced by the JTC bias, and are inclined to take risks by making conclusions about situations based on their character traits, an outcome indicating that the H3 was supported, considering the relationship between entrepreneurs' JTC bias and their career risk-taking propensity The entrepreneurs turned out to be active in changing jobs easily, paying more attention to the future than the past, not hesitating to risk their current career, and seeing risk-taking as part of their career. The sub-dimensions of the JTC bias as pointed out by Kahneman (2011) (with the exception of some studies on overconfidence) were found to be associated with risk. In this regard, it could be expected that the first 3 hypotheses of this study contain significant results in line with the literature.

In this study, the relationship between belief-inflexibility bias and economic risk-taking propensity revealed no statistical significance between the two, indicating that the H4 was not supported. Likewise, no significant relationship was found between the belief-inflexibility bias and the career risk-taking propensity; accordingly, the H6 was not supported either. Yet, no study exists in the literature to shed light on this situation. However, the predisposition of the entrepreneurs in the sector to trust the correctness of their goals and decisions without the need for alternative ideas, opinions, and knowledge may arise from the nature of the sector, leading to resistance against any kind of obstacles to be encountered in jobs that carry economic and career risks. We believe that the general risk-taking propensity, to which the belief-inflexibility bias is significantly related, is effective on the perceptions of the entrepreneurs who are of the opinion that events can be explained in one way, who do not need additional information or different opinions while making decisions, and who avoid contemplating on knowledge contrary to their beliefs. Moreover, the relationship between the belief-inflexibility bias and the general risk-taking propensity in the H5 indicated a positive and significant relationship between them, being a result supporting the H5. No study has been found in the literature regarding the relationship between the belief-inflexibility bias and the risk-taking propensity. As a result of the hypotheses, based on the evaluation of the risk in general, it could be concluded that the belief-inflexibility bias proved influential on the risk-taking propensity, albeit partially. However, when the risk is considered specifically, there is no relationship between them.

Today, it is clear that data collection is a burdensome task via such data collection techniques as surveys. We believe that the procedural structure and functioning of the PLS-SEM method used in this study will set an example for both future research and researchers experiencing the aforementioned difficulties.

As a result of all these analyses and related findings, considering the impacts regarding the JTC bias, we are of the opinion that it may arise as a noteworthy factor that provides an advantage to entrepreneurs in cases where the probability of making the right conclusions is high depending on the situation, the number of errors is low, the costs are at an acceptable level, and whenever it saves time and effort. However, in cases where the risk of encountering unfamiliar situations is high and where an entrepreneur has no time to gather more information, intuitive errors are considered highly likely, thus making it dangerous to jump to conclusions. In such cases, it can be assumed that making decisions on the basis of a rational and analytical thinking process may be helpful for an entrepreneur.

The prominent limitation of this study was that the scales had been developed in disciplines other than the field of entrepreneurship. Although scientific procedures were followed while using them, our first recommendation for future research is to pay attention to such limitation. We also recommend that qualitative research be conducted with entrepreneurs and a scale be developed based on this, considering the biases which are fed by the main two-biases that stands out in the current study, and which have been conceptualized or newly discovered so far.

It is further recommended that future research be conducted with entrepreneurs operating in different sectors, and cognitive biases mentioned in the study be discussed in more detail. Since this study involved the entrepreneurs in the technology sector only, it is considered necessary to conduct further studies on entrepreneurs and enterprises in different sectors in both Turkey and various countries so that the generalizability of the findings can be achieved in order to make contributions including cognitive processes about entrepreneurship.

References

Bishop, S. (2021). Influencer Management Tools: Algorithmic Cultures, Brand Safety, and Bias. Social Media+ Society, 7(1), 1-13.

Bosma, N. & Kelley, D. (2019). *Global entrepreneurship monitor 2018/2019 Global Report*. Global Entrepreneurship Research Association (GERA). https://www.c4e.org.cy/reports/2019/Global_GEM_Report_2018_2019.pdf

Buss, D. (2016). *The handbook of evolutionary psychology*. 5th Edition, John Wiley & Sons.

Certo, S. T., Busenbark, J. R., Woo, H. S., & Semadeni, M. (2016). Sample selection bias and Heckman models in strategic management research. Strategic Management Journal, 37(13), 2639-2657.

Cheung, E. & Mikels, J. A. (2011). I'm feeling lucky: The relationship between affect and risk-seeking in the framing effect. *Emotion*, *11*(4), 852– 859.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155-159.

Dal Mas, F., Piccolo, D., & Ruzza, D. (2020). Overcoming cognitive bias through intellectual capital management: The case of pediatric medicine. In Intellectual Capital in the Digital Economy (pp. 123-133). Routledge.

Dudley, R., Taylor, P., Wickham, S., & Hutton, P. (2016). Psychosis, delusions and the "jumping to conclusions" reasoning bias: a systematic review and meta-analysis. Schizophrenia bulletin, 42(3), 652-665.

Florea, D. L. (2015). A theory of consumer's perceived risk under the halo effect. *Management & Marketing Journal*, *13*(1), 205-215.

Hair Jr, J. F., Hult, G. T. M., Ringle, C. & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)*. 2nd ed. Thousand Oaks: Sage publications.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2-24.

John Bernardin, H., Thomason, S., Ronald Buckley, M., & Kane, J. S. (2016). Rater rating-level bias and accuracy in performance appraisals: The impact of rater personality, performance management competence, and rater accountability. Human Resource Management, 55(2), 321-340.

Kahneman, D. (2011). *Thinking, fast and slow*. Macmillan.

Keh, H. T., Der Foo, M, & Lim, B. C. (2002). Opportunity evaluation under risky conditions: The cognitive processes of entrepreneurs. *Entrepreneurship Theory and Practice*, *272*, 125-148.

Kerr, S. P., Kerr, W. R. & Xu, T. (2018). Personality traits of entrepreneurs: A review of recent literature. *Foundations and Trends in Entrepreneurship, 14*(3), 279-356.

Khan, A. R., Azeem, M., & Sarwar, S. (2017). Impact of Overconfidence and Loss Aversion Biases on Investment Decision: Moderating Role of Risk Perception. International Journal of Transformation in Accounting, Auditing & Taxation [ISSN: 2581-7590 (online)], 1(1).

Kim, M., & Daniel, J. L. (2020). Common source bias, key informants, and survey-administrative linked data for nonprofit management research. Public Performance & Management Review, 43(1), 232-256.

Koçel, T. (2018). *İşletme Yöneticiliği*, 17. Basım. İstanbul: Beta Yayınları.

Kondylis, F., Mueller, V., Sheriff, G., & Zhu, S. (2016). Do female instructors reduce gender bias in diffusion of sustainable land management techniques? Experimental evidence from Mozambique. World Development, 78, 436-449.

Lau, C. K. (2020). Measurement uncertainty and management bias in accounting estimates: the perspective of key audit matters reported by Chinese firms' auditors. Asian Review of Accounting, 29(1), 79-95.

Li, J., Liu, M., & Liu, X. (2016). Why do employees resist knowledge management systems? An empirical study from the status quo bias and inertia perspectives. Computers in Human Behavior, 65, 189-200.

Li, Z., Sha, Y., Song, X., Yang, K., ZHao, K., Jiang, Z., & Zhang, Q. (2020). Impact of risk perception on customer purchase behavior: a meta-analysis. Journal of Business & Industrial Marketing.

Liles, P. R. (1974). Who are entrepreneurs. *MSU Business Topics, 22*(1), 5-14.

Lüdtke, T., Kriston, L., Schröder, J., Lincoln, T. M., & Moritz, S. (2017). Negative affect and a fluctuating jumping to conclusions bias predict subsequent paranoia in daily life: an online experience sampling study. Journal of Behavior Therapy and Experimental Psychiatry, 56, 106-112.

Pappas, N. (2016). Marketing strategies, perceived risks, and consumer trust in online buying behaviour. Journal of retailing and consumer services, 29, 92-103.

Pereira, M. B., de Freitas, R. S. G., Stedefeldt, E., & da Cunha, D. T. (2021). Conflicts, informality and risk perception about foodborne diseases in small family and non-family run restaurants. Journal of Foodservice Business Research, 1-27.

Pope, D. G., Price, J., & Wolfers, J. (2018). Awareness reduces racial bias. Management Science, 64(11), 4988-4995.

Prater, J., Kirytopoulos, K., & Ma, T. (2017). Optimism bias within the project management context: A systematic quantitative literature review. International Journal of Managing Projects in Business.

Rausch, F., Eisenacher, S., Elkin, H., Englisch, S., Kayser, S., Striepens, N., ... & Wagner, M. (2016). Evaluation of the 'Jumping to conclusions' bias in different subgroups of the at-risk mental state: from cognitive basic symptoms to UHR criteria. Psychological Medicine, 46(10), 2071-2081.

Ringle, C. M., Wende, S., & Becker, J.-M. (2016). *SmartPLS 3*. Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

Rossi, M. D. S. C., Stedefeldt, E., da Cunha, D. T., & de Rosso, V. V. (2017). Food safety knowledge, optimistic bias and risk perception among food handlers in institutional food services. Food Control, 73, 681-688.

Simon, M., Houghton, S. M. & Aquino, K. (2000). Cognitive biases, risk perception, and venture formation: How individuals decide to start companies. *Journal of Business Venturing, 152*, 113-134.

Sitkin, S. B. & Pablo, A. L. (1992). Reconceptualizing the determinants of risk behavior. *Academy of Management Review, 17*(1), 9-38.

Sitkin, S. B. & Weingart, L. R. (1995). Determinants of risky decision-making behavior: A test of the mediating role of risk perceptions and propensity. *Academy of Management Journal, 38*(6), 1573-1592.

Timuroğlu, M. K. & Çakır, S. (2014). Girişimcilerin yeni bir girişim yapma niyetlerinin risk alma eğilimi ile ilişkisi. *Afyon Kocatepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 16*(2), 119-136.

Tversky, A. & Kahneman, D. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*(2), 263-291.

van der Gaag, M., Schütz, C., ten Napel, A., Landa, Y., Delespaul, P., Bak, M. & et al. (2013). Development of the Davos assessment of cognitive biases scale (DACOBS). *Schizophrenia Research, 144*(1-3), 63-71.

Ward, T. & Garety, P. A. (2019). Fast and slow thinking in distressing delusions: A review of the literature and implications for targeted therapy. *Schizophrenia Research. 203*, 80-87.

Ward, T., Peters, E., Jackson, M., Day, F. & Garety, P. A. (2018). Data-gathering, belief flexibility, and reasoning across the psychosis continuum. *Schizophrenia Bulletin, 44*(1), 126-136.

Woodward, T. S., Moritz, S., Cuttler, C. & Whitman, J. C. (2006). The contribution of a cognitive bias against disconfirmatory evidence (BADE) to delusions in schizophrenia. *Journal of Clinical and Experimental Neuropsychology, 28*(4), 605-617.

Yılmaz, V., & Kinaş, Y. (2020). Kısmi En Küçük Kareler Yapısal Eşitlik Modellemesiyle Bir Elektrik Dağıtım Şirketinin Hizmet Kalitesinin Araştırılması. *Eskişehir Osmangazi Üniversitesi İktisadi ve İdari Bilimler Dergisi, 15*(2), 437-456.

Yin, R. K. (2017). *Case study research and applications: Design and methods*. Los Angeles: Sage Publications.

Zhang, S. X., & Cueto, J. (2017). The study of bias in entrepreneurship. Entrepreneurship theory and Practice, 41(3), 419-454.