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Salience, Risky Choices and Gender*

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Abstract

Risk theories typically assume individuals make risky choices using probability weights that differ from objective probabilities. Recent theories suggest that probability weights vary depending on which portion of a risky environment is made salient. Using experimental data we show that *salience* affects young men and women differently, even after controlling for cognitive and non-cognitive skills. Men are significantly more likely than women to switch from a certain to a risky choice once the upside of winning is made salient, even though the expected value of the choice remains the same.

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1. Introduction

Social scientists have identified important violations of Expected Utility Theory, the classic theory of choice under risk. While the axioms of Expected Utility Theory have been modified to deal with violations, they have not been altogether convincing. The 'gold standard' of current theories of choice under uncertainty is Kahneman and Tversky's (1979) Prospect Theory. This assumes individuals make risky choices using probability weights that differ from objective probabilities. More recently, Bordalo, Gennaioli, and Shleifer (2011) – BSG hereafter – extend this approach by assuming these probability weights vary depending on which portion of a risky environment is made salient. They are able to show how salience is able to explain many violations of Expected Utility Theory.

The operation of salience – a psychological construct – may vary with observable factors such as gender and IQ. Eckel and Grossman (2002) summarize experimental studies showing that women are, on average, more risk averse than men. Why there are gender differences in risk attitudes has recently begun to be investigated by economists, and the BGS Salience Model provides another possible explanation.[1] Suppose men and women are affected differently by salience but are equally risk averse. If so, men may be *observed* to display less risk aversion depending on what payoff is made salient. This could be particularly relevant to financial markets or high-level occupations where individuals may have to choose between a sure bet and risky lottery.

Other psychological factors such as intelligence (IQ) and personality traits could also play a part in explaining susceptibility to salience; their role in risk attitudes has been investigated by Dohmen et. al. (2010). These we also explore empirically in the current paper, using the simple example from BGS (2011) that highlights the role of salience and how the BGS model and Prospect Theory differ.

[1] In experiments conducted to elicit risk aversion, Dohmen et al. (2010) found that individuals with higher cognitive ability (IQ) were more likely to choose risky outcomes, and Booth and Nolen (2012) found that risk aversion could be modified by group gender composition.

2. Experiment

We conducted an experiment at the University of Essex in October 2011 using 493 first-year students enrolled in introductory economics, either EC111 or EC100, for their degree. In their first class, students answered the following two questions (identical to those in BGS except that our monetary payoffs are in sterling).

Q.1 Below are two choices, Option A and Option B. Consider the two options carefully and decide which one you prefer.

Option A: Get £1 with probability 95% and get £381 with probability 5%

Option B: Get £20 for sure.

Indicate the Option you prefer by putting a tick in the appropriate box.

OPTION **A**	
OPTION **B**	

Q.2 Below are two choices, Option A and Option B. Consider the two options carefully and decide which one you prefer.

Option A: Get £301 with probability 95% and get £681 with probability 5%

Option B: Get £320 for sure.

Indicate the Option you prefer by putting a tick in the appropriate box.

OPTION **A**	
OPTION **B**	

Notice that Q2 simply adds £300 to each payoff in Q1. Within each question, options A and B have the same expected payoff. Also within each question option A has the same relatively small (5%) probability of a high payoff, and high (95%) probability of a £19 loss, relative to the sure outcome.

Of our 493 students, 326 (66%) chose option B in Q1 and 276 (56%) chose option A in Q2. Of the 326 students choosing option B in Q1, 184 (just over 56%) subsequently 'switched' to option A in Q2.[2] These 'switchers' are risk-averse in Q1 and risk-loving in Q2; expected utility theory cannot explain the behaviour of this large group (over 37% of total sample). Furthermore, as shown by BGS, Prospect Theory can only account for the switch from option B in Q1 to option A in Q2 if there is a combination of probability weighting and declining absolute risk aversion in the value function.[3] However, the model of salience developed by BGS *can* explain the switch. In Q1, the bad outcome in option A, £1, feels a lot lower than the sure

[2] These results are consistent with those found by BGS.

[3] This is only true if the reference point is the status quo; if the reference point is the sure prospect, then both problems are identical and Prospect Theory cannot account for the switch.

payoff of £20. Since this downside is more salient than winning £381, the subjects focus on it when making their decisions, triggering a risk-averse choice. In Q2, the bad outcome in option A, £301, does not appear nearly as bad compared to the sure payoff of £320. Thus the upside of winning £681 is more salient, and subjects focus on it when making their decisions, triggering a risk-seeking decision.

3. Results

The simple examples in Q1 and Q2 show how risk aversion and salience may be intertwined; people may be observed risk-averse or risk-loving depending on how they respond to salience. For instance, someone choosing option A is less risk-averse than someone choosing option B in either question above. In both cases, our female subjects are more risk averse than males, but the gender gap is larger in Q2, as the second and third rows of Table 1 reveal.

There are four types of individuals defined by the Q1 and Q2 above: (1) *stay with A* – those choosing option A in Q1 and Q2; (2) *stay with B* – those choosing option B in Q1 and Q2; (3) *salience switchers* – those choosing option B in Q1 and A in Q2; (4) *other switchers* – those choosing option A in Q1 and B in Q2. The proportion of *Salience Switchers* is the largest (37%), followed by *Stay with B* (29%), then *Stay with A* (19%), and finally *Other Switchers* (15%). Since Stay with A and Stay with B people have consistent preferences, the model of Salience focuses on the largest group of people that are inconsistent with EUT.

[Insert Table 1 here]

Although our main focus is on gender, we also control for IQ and the Big Five personality traits, since the experimental literature shows that these affect risky preferences.[4] Summary statistics in Table 1 indicate that females are less likely to choose option A (the risky one) than males in each question. However, men are *more likely* to 'switch' (that is, respond to the salient nature of the questions) than women.[5] There are no gender differences in age, course-type (economics or business) and IQ scores. Of the Big Five personality traits, women have significantly higher scores for Extroversion and Neuroticism.

[4] IQ scores were constructed from a 20-minutes test using Raven's matrices. The Big Five personality traits were constructed following Heineck (2007). See Booth, Cardona Sosa and Nolen (2011) for further details..
[5] See row 6 in Table 1; men are more likely to pick option A in Q2 after choosing option B in Q1.

Of the 326 risk-averse students who chose option B in Q1, 56% switched in Q2 to being risk-loving. We define these switchers as '*affected by salience*'. To see if observable characteristics are correlated with being *affected by salience*, we estimate probits on the subsample of 326 individuals. The dependent variable takes the value one if the person switched from being risk-averse to being risk-loving once the payoffs were increased from Q1 to Q2, and zero otherwise. These estimates are presented in the first four columns of Table 2. (The final column reports estimates for the subsample of 167 students who made the reverse switch – from risk-loving in Q1 to risk-averse in Q2.)

[Insert Table 2 here]

Column [1] indicates that gender is strongly correlated with being *affected by salience*; women are 13 percentage points *less* likely to switch than men. This implies that a female is 27% less likely to be affected by salience than a male subject.[6] Column [2] drops gender and adds cognitive ability (proxied by IQ z-score). This has a small positive, though statistically insignificant, effect. Column [3] shows the effect of the 'Big Five' personality traits (proxying non-cognitive skills). None are significant. Moreover, the F-statistic for joint significance is only 0.565, implying that the 'Big Five' have no effect. Since Fehr-Duda et. al. (2006) suggest that stronger female emotionality might explain gender differences in probability weighting, we also tried interacting the 'Big Five' with the female dummy variable. The coefficients are individually and jointly insignificant.[7] Thus our data do not support the hypothesis that differential gender effects with regard to the 'Big Five' explain susceptibility to salience.

Column [4] controls simultaneously for gender, cognitive and non-cognitive skills. Here IQ is marginally significant, the gender coefficient is larger in absolute terms and significant at a higher confidence level, and the Big Five continue to have no effect. The size of the gender coefficient is more than three standard deviations greater than mean IQ score.

Finally, Column [5] reports estimates for the other type of switcher. The subsample is the 167 subjects choosing option A (risky) in Q1. Of these**,** 45% switch to option B (certain) in Q2. The dependent variable now takes the value one if the person switched from being risk-

[6] The estimate of 13 percentage points is calculated holding all other variables at their mean value for the sample. At those values there is a 61% chance that a male is a salience switcher and a 48% chance that a female is a salience switcher. That means a male is 27% more likely than a female to respond to salience.
[7] Resulta available from authors on request.

loving in Q1 to risk-averse in Q2, and zero otherwise. None of the observables have a significant correlation with who is likely to be that type of switcher.

4. Conclusion

In summary, our results clearly show that the probability of being affected by salience is greater for men than for women. Risk theories typically assume individuals make risky choices using probability weights that differ from objective probabilities. Recent theories suggest that probability weights vary depending on which portion of a risky environment is made salient. Using experimental data we show that *salience* affects young men and women differently, even after controlling for cognitive skills and personality-type. Men are significantly more likely than women to switch from a certain to a risky choice once the upside of winning is made salient, even though the expected value of the choice remains the same. Quite why this might occur remains a topic for future research.

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Table 2: Correlations on who responds more ot Salience

	Dependent Variable (=1) if picked different option choice in Q2 compared to Q1				
VARIABLES	[1]	[2]	[3]	[4]	[5]
Female (=1)	-0.132**			-0.157***	0.128
	[0.057]			[0.059]	[0.089]
Z-Score for Student's IQ		0.044		0.054*	-0.056
		[0.028]		[0.029]	[0.040]
Big Five Personality Score: Agreeableness			-0.007	-0.009	0.026
			[0.013]	[0.013]	[0.016]
Big Five Personality Score: Conscientiousness			0.005	0.000	0.012
			[0.011]	[0.011]	[0.014]
Big Five Personality Score: Extraversion			0.012	0.014	-0.006
			[0.012]	[0.012]	[0.017]
Big Five Personality Score: Neuroticism			0.003	0.012	-0.015
			[0.011]	[0.012]	[0.015]
Big Five Personality Score: Openness			-0.015	-0.017*	-0.008
			[0.009]	[0.009]	[0.012]
Student in EC111 (=1)	-0.060	-0.066	-0.056	-0.059	-0.024
	[0.056]	[0.056]	[0.056]	[0.057]	[0.083]
18 Years Old (=1)	0.139**	0.133*	0.124*	0.126*	-0.106
	[0.068]	[0.068]	[0.070]	[0.071]	[0.098]
19 Years Old (=1)	0.150**	0.136**	0.145**	0.151**	-0.034
	[0.066]	[0.067]	[0.067]	[0.068]	[0.094]
Sample of Students who, in Q1, Picked Option	B	B	B	B	A
Observations	326	326	326	326	167
P-Value for joint Significance of Big Five			0.565	0.339	0.494

Marginal effects calculated at the mean for the sample are reported. Robust standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 1: Summary Statistics

VARIABLES	Male	Female	Difference
Student in EC111 (=1)	0.458	0.437	-0.022
	[0.499]	[0.497]	[0.047]
Choose Option A in Question 1	0.369	0.287	-0.081*
	[0.483]	[0.454]	[0.043]
Choose Option A in Question 2	0.606	0.481	-0.125***
	[0.490]	[0.501]	[0.046]
Salience Switcher (=1)	0.388	0.348	-0.04
	[0.027]	[0.045]	[0.045]
Other Switcher (=1)	0.151	0.155	0.004
	[0.020]	[0.034]	[0.034]
Picked A in Q2 if Choose Option B in Q1	0.614	0.488	-.126**
	[0.488]	[0.502]	[0.056]
Age	19.192	19.122	-0.071
	[1.383]	[1.508]	[0.137]
Raw score IQ test	11.814	11.663	-0.151
	[3.159]	[3.140]	[0.294]
Z-Score for Student's IQ	0.032	-0.016	-0.048
	[0.996]	[0.990]	[0.093]
Big Five Personality Score: Agreeableness	12.596	12.519	-0.077
	[2.635]	[2.585]	[0.243]
Big Five Personality Score: Conscientiousness	13.481	13.155	-0.326
	[2.930]	[3.195]	[0.290]
Big Five Personality Score: Extraversion	13.173	13.608	0.435*
	[2.781]	[2.611]	[0.250]
Big Five Personality Score: Neuroticism	11.651	12.602	0.952***
	[2.616]	[3.181]	[0.279]
Big Five Personality Score: Openness	14.471	14.061	-0.41
	[3.645]	[3.629]	[0.340]