

Department of Economics
Working Paper No. 301

Gender differences in risky asset behavior: the importance of self-confidence and financial literacy

Andrej Cupák
Pirmin Fessler
Alyssa Schneebaum

September 2020



Gender differences in risky asset behavior: the importance of self-confidence and financial literacy*

Andrej Cupák ^a, Pirmin Fessler ^b, Alyssa Schneebaum ^c

Abstract

Women are less likely than men to hold risky financial assets, a fact that has often been attributed to differences in risk aversion and, more recently, to differences in financial literacy and investor confidence. This paper studies the role of individuals' confidence in their own financial literacy in explaining the gender gap in investment in risky assets, while controlling for actual financial literacy and a measure of risk aversion. It is the first paper to assess the role of confidence independent of actual financial knowledge for a large set of countries and it is the first to explore the role of confidence by using counterfactual decomposition techniques. Results from our analysis confirm recent findings of modern behavioral finance: confidence is a strong determinant of risky financial behavior and accounts for a large part of the gender gap.

JEL codes: D14; D91; I20; G11; G53

Keywords: self-confidence; financial literacy; financial behavior; gender; decomposition

* For helpful comments we are grateful to Elisabeth Beckmann, Joanne W. Hsu, Carla Rainer, Maria Silgoner, and Martin Šuster. The views and results presented in this paper are those of the authors and do not necessarily represent the official opinions of the National Bank of Slovakia, the Oesterreichische Nationalbank, or the Eurosystem. Any remaining errors and omissions are solely ours.

^a Research Department, National Bank of Slovakia. andrej.cupak@nbs.sk.

^b Foreign Research Division, Oesterreichische Nationalbank. pirmin.fessler@oenb.at.

^c Department of Economics, Vienna University of Economics and Business. alyssa.schneebaum@wu.ac.at.

1. Introduction

The literature on financial asset holdings has established that women are less likely than men to hold risky assets (Jianakoplos and Berasek, 1998; Charness and Gneezy, 2012). Common explanations for this fact have been that women are more risk-averse (Dohman et al., 2011; Halko et al., 2012) and that women have less financial knowledge than men (Dwyer et al., 2002; van Rooij et al., 2011; Hibbert et al., 2013; Bucher-Koenen et al., 2017; Bollen and Posavac, 2018; Cupák et al., 2018; Almenberg and Dreber, 2015). More recent literature additionally considers the role of self-confidence (subjective financial literacy) (Barber and Odean, 2001; Allgood and Walstad, 2006; Bannier and Neubert, 2016; Bannier et al., 2019; Cupák et al., 2020) and financial self-efficacy (e.g. Montford and Foldsmith, 2016) to explain the gender differences in risky asset holdings. These studies show that an important factor in explaining why women are less likely to hold risky financial assets is that they are less confident about their financial skills.

The existing studies on the role of confidence in determining financial investments typically look at just one country at a time (e.g. Germany in Bannier and Neubert, 2016 and the U.S. in Cupák et al., 2020). This is the first paper to study the role of confidence in explaining the gender gap in the holding of risky assets for a large international set of 12 countries plus Hong Kong at once, decomposing the gender gap into several observable characteristics, including consumer confidence and measured financial literacy, while controlling for risk aversion.

2. Data and variables

To explore differences in participation in risky assets, we use recent international harmonized micro-data from the OECD / INFE (International Network on Financial Education) survey.¹ The main goal of the survey is to monitor the financial capabilities of the adult population, with a special focus on financial knowledge, attitudes, and behavior. While the survey collects data in around 30 countries worldwide, not all countries have made their data publicly available for research purposes. Our final sample of countries includes Austria (AT), Brazil (BR), Canada (CA), Croatia (HR), Finland (FI), Germany (DE), Hungary (HU), Hong-Kong, China (HK), Jordan (JO), the Netherlands (NL), Russia (RU), Spain (ES), and United Kingdom (UK).

¹ Detailed information about the survey and the statistical report can be found at <https://www.oecd.org/finance/oecd-infe-survey-adult-financial-literacy-competencies.htm>.

Following the literature on consumer finance (e.g. Guisso et al., 2002; Campbell, 2006), we model participation in risky assets (ownership of stocks and/or bonds) as a function of basic socio-economic characteristics such as economic resources and employment status, education, age, and marital status. Most importantly, we are able to control for measured financial literacy, risk aversion, and confidence in own financial capabilities. A description of the variables entering our empirical analysis is provided in appendix (Table A1).

Figure 1 shows survey respondents' self-confidence in financial knowledge (vertical axis) and actual measured financial literacy (horizontal axis) by country, where the size of the dots corresponds to the frequency of observations.² While the figure shows a weak positive correlation between self-confidence and financial literacy in all countries, there is wide variation in this relationship across countries. In Canada, Hong Kong, Jordan, and Spain, the correlation in these measures is relatively high (all with a correlation coefficient above 0.3), while in Brazil, Finland, Russia, and the UK, the correlation between confidence and ability is below 0.2.

[insert Figure 1 about here]

Table 1 looks explicitly at the gender gap in these measures, as well as the share of respondents holding risky assets. In all countries, women are less confident in their financial capabilities and have lower financial literacy scores than men; these differences are statistically significant in most countries.

[insert Table 1 about here]

3. Estimation and results

We study differences in participation in risky assets between men (M) and women (W) by a counterfactual decomposition technique for non-linear models proposed by Fairlie (2005),³ which is an extension of the classical Blinder-Oaxaca decomposition to the case of binary outcome variables. The method helps answer the question of how much of the observed gender gap in risky asset holdings is explained by differences in men and women's characteristics (and how much of a difference remains unexplained once these characteristics are taken into

² Note that subjective literacy is asked before the knowledge questions in the OECD/INFE survey.

³ Note that we are not claiming to provide causal effects. The method serves as a useful tool for understanding the complexities in financial decision-making between men and women, because it allows us to filter out differences explainable by observables in a rather flexible way.

account). The gender gap in the probability of participation in risky assets can be decomposed as follows:

$$Pr(Y^M = 1|X^M) - Pr(Y^W = 1|X^W) = \underbrace{\left[\Lambda(X^M \beta^M) - \Lambda(X^W \beta^M) \right]}_{\text{difference in characteristics}} + \underbrace{\left[\Lambda(X^W \beta^M) - \Lambda(X^W \beta^W) \right]}_{\text{difference in parameters}},$$

where X^M and X^W represent row vectors of the control variables for men and women, alongside the vectors of coefficients (β^M and β^W) estimated separately for both groups. Λ is the distribution function of the logistic distribution. In our exercise, we are mostly interested in the contribution of the particular covariates explaining the “difference in characteristics.”

Table 2 shows the results of this decomposition. In most countries, at least half of the raw gap in the holding of shares/bonds can be explained by differences in observable characteristics. While some characteristics can explain some portion of the gap (such as having a financial buffer and employment), in many countries, one’s level of confidence in financial ability is the strongest or second strongest determinant of the gender gap in risky asset holdings. In almost all places, individual confidence is – besides risk attitude itself – the central predictor of the gender difference in risky asset holdings. Finland and Spain are the only countries in which differences in measured financial literacy explain more of the risky asset gap than confidence.

Bannier and Neubert (2016) show for Germany that controlling for measured financial literacy and self-confidence eliminates the significance of gender in predicting the probability of holding risky assets in a linear probability model. We can confirm the same phenomenon, albeit more directly, as we directly estimate the contribution of different observables in explaining the observed gender gap.

[insert Table 2 about here]

4. Conclusions

We employed comparable international microdata to explore the role of measured financial literacy and self-confidence in explaining the gender gap in risky asset holdings. While there has been increased awareness that self-confidence might play a role in these differences and resulting asset return patterns, empirical evidence using comparable microdata across countries is still scarce. This paper confirms the findings of the literature that self-confidence

is a significant factor in explaining the risky asset gender gap. Our results suggest that its role might be much stronger than formerly thought.

We conclude that while education and financial literacy might be very important factors in lowering the gender gap in investments into risky assets, one crucial additional path to gender equality is addressing the related norms and gender roles in society. These norms underlie differences in self-confidence, which – on top of all other observable characteristics – lead to women’s lower participation in risky asset markets.

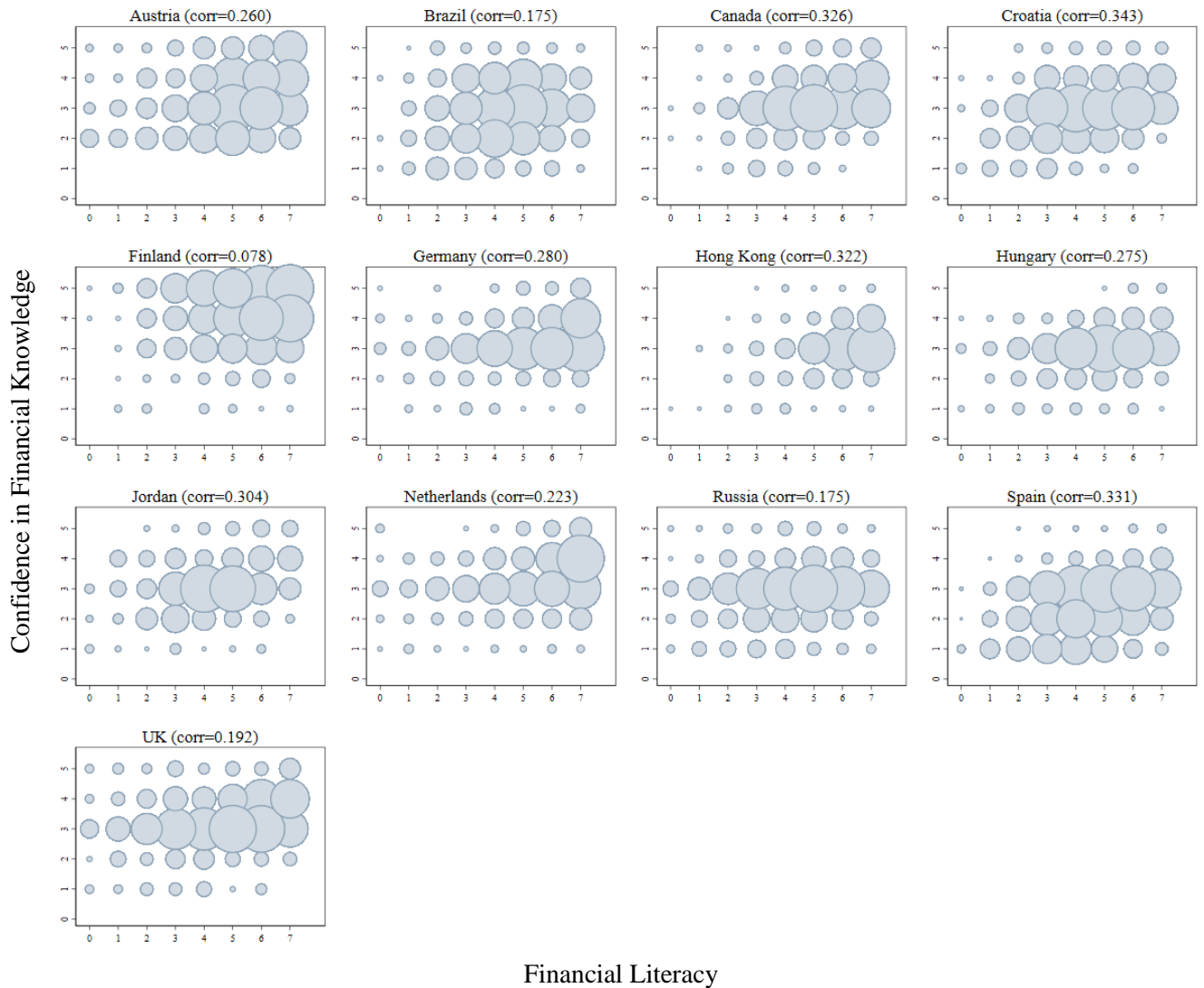
References

- Allgood, S. and Walstad, W. B. (2016). The effects of perceived and actual financial literacy on financial behaviors. *Economic Inquiry*, 54(1): 675–697.
- Almenberg, J. and Dreber, A., (2015). Gender, stock market participation and financial literacy, *Economics Letters*, 137(C): 140–142.
- Bannier, C., Meyll, T., Röder, F., and Walter, A. (2019). The gender gap in ‘bitcoin literacy’. *Journal of Behavioral and Experimental Finance*, 22: 129–134.
- Bannier, C. E. and Neubert, M. (2016). Gender differences in financial risk taking: The role of financial literacy and risk tolerance. *Economics Letters*, 145: 130–135.
- Barber, B. M. and Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *The Quarterly Journal of Economics*, 116(1): 261–292.
- Bollen, N. P. and Posavac, S. (2018). Gender, risk tolerance, and false consensus in asset allocation recommendations. *Journal of Banking & Finance*, 87: 304–317.
- Bucher-Koenen, T., Lusardi, A., Alessie, R., & Van Rooij, M. (2017). How financially literate are women? An overview and new insights. *Journal of Consumer Affairs*, 51(2): 255–283.
- Campbell, J. Y. (2006). Household finance. *The Journal of Finance*, 61(4): 1553–1604.
- Charness, G. and Gneezy, U. (2012). Strong evidence for gender differences in risk taking. *Journal of Economic Behavior & Organization*, 83(1): 50–58.
- Cupák, A., Fessler, P., Schneebaum, A., & Silgoner, M. (2018). Decomposing gender gaps in financial literacy: New international evidence. *Economics Letters*, 168: 102–106.
- Cupák, A., Fessler, P., Hsu, J. W., and Paradowski, P. R. (2020). *Confidence, financial literacy and investment in risky assets: Evidence from the Survey of Consumer Finances*. Finance and Economics Discussion Series 2020-004. Washington: Board of Governors of the Federal Reserve System.
- Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., and Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association*, 9(3): 522–550.
- Dwyer, P. D., Gilkeson, J. H., and List, J. A. (2002). Gender differences in revealed risk taking: evidence from mutual fund investors. *Economics Letters*, 76(2): 151–158.
- Fairlie, R. (2005). An Extension of the Blinder Oaxaca Decomposition to Logit and Tobit Models. *Journal of Economic and Social Measurement*, 30(4): 305–316
- Guiso, L., Haliassos, M., & Jappelli, T. (Eds.). (2002). *Household portfolios*. MIT press.

- Halko, M.-L., Kaustia, M., and Alanko, E. (2012). The gender effect in risky asset holdings. *Journal of Economic Behavior & Organization*, 83(1): 66–81.
- Jianakoplos, N. A. and Bernasek, A. (1998). Are women more risk averse? *Economic Inquiry*, 36(4): 620–630.
- Montford, W. and Goldsmith, R. E. (2016). How gender and financial self-efficacy influence investment risk taking. *International Journal of Consumer Studies*, 40(1): 101–106.
- OECD (2016). *OECD/INFE International Survey of Adult Financial Literacy Competencies*. Paris: Organisation for Economic Co-operation and Development.
- van Rooij, M., Lusardi, A. and Alessie, R. (2011). Financial literacy and stock market participation, *Journal of Financial Economics*, 101(2): 449–472,

Figures and Tables

Figure 1: Distributions of confidence in own financial knowledge and measured financial literacy



Note: This graph shows scatter plots of measured financial literacy (0 to 7 score on the x-axis) and confidence in own financial knowledge (0 to 5 score on the y-axis) across countries, where dots are weighted by frequency of observation.

Source: OECD / INFE database

Table 1: Summary statistics of selected variables by gender

	AT (N=1,326)	BR (N=1,142)	CA (N=713)	HR (N=782)	FI (N=1,097)	DE (N=747)	HK (N=960)	HU (N=692)	JO (N=764)	NL (N=775)	RU (N=862)	ES (N=4,898)	UK (N=650)
Ownership of shares/bonds													
Men	0.149	0.013	0.495	0.145	0.343	0.350	0.565	0.075	0.173	0.163	0.071	0.187	0.423
Women	0.095	0.007	0.412	0.110	0.268	0.260	0.460	0.032	0.096	0.047	0.123	0.157	0.348
Difference	0.054***	0.006	0.083**	0.034	0.076**	0.090**	0.105***	0.043**	0.076***	0.117***	-0.053***	0.031**	0.075*
Self-rated confidence													
Men	3.462	3.050	3.413	3.096	4.084	3.350	3.081	3.035	3.343	3.468	2.936	2.677	3.460
Women	3.375	2.936	3.148	3.014	3.998	3.113	2.920	2.837	2.870	3.169	2.904	2.509	3.101
Difference	0.087	0.114**	0.266***	0.081	0.087	0.237***	0.161***	0.198***	0.473***	0.299***	0.032	0.167***	0.359***
Measured financial literacy													
Men	5.369	4.624	5.718	4.625	5.429	5.762	6.010	5.074	4.842	5.880	4.554	5.125	5.125
Women	5.075	4.420	4.783	4.519	5.051	4.759	5.612	4.879	4.259	4.776	4.429	4.384	4.185
Difference	0.294***	0.203**	0.934***	0.106	0.378***	1.003***	0.398***	0.195	0.583***	1.104***	0.125	0.742***	0.940***
Risk attitude score													
Men	2.408	2.748	3.402	3.082	2.879	2.561	4.153	1.761	3.579	2.576	2.677	2.896	2.671
Women	2.026	2.728	2.783	3.054	2.488	2.119	4.145	1.524	3.229	1.924	2.265	2.746	2.132
Difference	0.381***	0.020	0.619***	0.028	0.391***	0.442***	0.009	0.237***	0.350***	0.653***	0.412***	0.149***	0.540***

Notes: Descriptive statistics are based on samples of non-missing observations. Differences in means between men and women and their statistical significance (Wald test) computed using survey weights. * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: OECD / INFE dataset

Table 2: Fairlie decomposition results for ownership of stocks / bonds by gender

	AT	BR	CA	HR	FI	DE	HK	HU	JO	NL	RU	ES	UK
Prob. of owning stocks/bonds (men)	0.149***	0.013***	0.495***	0.145***	0.343***	0.350***	0.565***	0.075***	0.173***	0.163***	0.071***	0.187***	0.423***
Prob. of owning stocks/bonds (women)	0.095***	0.007**	0.412***	0.110***	0.268***	0.260***	0.460***	0.032***	0.096***	0.047***	0.123***	0.157***	0.348***
Raw gap	0.054***	0.006	0.083**	0.034	0.076**	0.090**	0.105***	0.043**	0.076***	0.117***	-0.053***	0.031**	0.075
Explained	0.040***	0.005	0.113***	0.002	0.036*	0.081***	0.069**	0.036***	0.099***	0.090***	-0.009	0.054***	0.068**
Confidence in own fin. knowledge	0.002 (0.002)	-0.000 (0.002)	0.031*** (0.008)	0.005 (0.004)	0.002 (0.004)	0.020** (0.008)	0.015*** (0.005)	0.014** (0.006)	0.017* (0.010)	0.011* (0.006)	-0.001 (0.002)	0.010*** (0.002)	0.006 (0.012)
Measured fin. literacy	0.002 (0.002)	-0.001 (0.002)	0.021 (0.019)	-0.001 (0.002)	0.018* (0.010)	0.011 (0.018)	0.002 (0.008)	-0.001 (0.003)	-0.001 (0.006)	0.015 (0.010)	-0.000 (0.001)	0.027*** (0.004)	0.026 (0.020)
Risk attitude score	0.024*** (0.005)	0.000 (0.001)	0.052*** (0.012)	0.001 (0.002)	0.021*** (0.008)	0.042*** (0.010)	0.001 (0.002)	0.020** (0.008)	-0.001 (0.005)	0.054*** (0.010)	-0.001 (0.004)	0.006*** (0.002)	0.029** (0.012)
Has financial buffer	0.002 (0.003)	0.001 (0.002)	0.007* (0.004)	0.006 (0.004)	0.008* (0.004)	0.008 (0.005)	-0.002 (0.003)	0.013** (0.006)	0.008** (0.004)	0.007** (0.003)	-0.000 (0.001)	0.004*** (0.001)	0.012** (0.006)
Single person household	0.000 (0.001)	0.000 (.)	0.001 (0.003)	-0.001 (0.003)	-0.002 (0.004)	-0.000 (0.002)	-0.003 (0.004)	-0.000 (0.002)	-0.001 (0.003)	0.000 (0.004)	-0.002 (0.003)	0.000 (0.000)	-0.001 (0.003)
Age	0.001 (0.003)	0.000 (0.001)	-0.004 (0.005)	0.002 (0.007)	-0.007 (0.005)	-0.002 (0.005)	-0.001 (0.005)	-0.001 (0.005)	0.020** (0.008)	-0.004 (0.005)	0.011 (0.013)	0.003 (0.003)	-0.001 (0.009)
Employment	0.006 (0.003)	0.002 (.)	0.007 (0.006)	-0.006 (0.010)	-0.003 (0.005)	-0.001 (0.006)	0.052* (0.027)	-0.004 (0.007)	0.056*** (0.015)	0.011* (0.006)	-0.013 (0.014)	0.008* (0.005)	-0.005 (0.009)
Education	0.003* (0.002)	0.003 (0.004)	-0.001 (0.003)	-0.004 (0.005)	-0.002 (0.002)	0.004 (0.006)	0.005 (0.006)	-0.004 (0.009)	0.000 (0.002)	-0.004 (0.004)	-0.003 (0.005)	-0.004* (0.002)	0.002 (0.005)
N (men)	662	595	370	393	511	366	450	337	463	445	424	2,535	331
N (women)	664	547	343	389	586	381	510	355	301	330	438	2,363	319
N (total)	1,326	1,142	713	782	1,097	747	960	692	764	775	862	4,898	650

Note: significance levels are based on 500 bootstrap replicates. Decomposition using survey weights. “Age category 70+”, “Other employment status”, and “No or primary education” are reference categories of the respective dummy variable sets. Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: OECD / INFE dataset

Appendix

Table A1: Description of variables entering empirical analysis

Variable	Description
Risky financial assets	Dummy variable: 1 if an individual holds stocks, shares, or bonds
Confidence in own financial knowledge	Self-rated confidence in own knowledge about financial matters: ranging from 1 “very low” to 5 “very high”
Measured financial literacy	Financial literacy score: ranging from 0 to 7; based on correct answers to 7 financial literacy questions (time value of money, interest paid on loan, interest plus principal, compound interest, risk and return, definition of inflation, diversification), see OECD/INFE (2016) for details
Risk attitude	Willingness to risk some of the own money when saving or making an investment: ranging from 1 “completely disagree” to 5 “completely agree”
Financial buffer	Dummy variable: 1 if an individual has financial buffer covering at least three months in a case that he/she loses job (proxy for wealth)
Single	Dummy variable: 1 if an individual lives alone
Age	Dummy variables set for age categories: age category (18-29) age category (30-49) age category (50-69) age category (70+)
Employment	Dummy variables set for employment status: employed self-employed retired not working / other (student, disabled, house keeper)
Education	Dummy variables set for education categories: no or primary education secondary education tertiary education

Source: own processing based on the OECD/INFE toolkit