Fiction or Fact: Systematic Gender Differences in Financial investments?

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Previous literature

- Women hold less risky portfolios:
  - Interpretation: Women are more risk averse.
  - E.g. Jianakoplos & Bernasek (*EI* 1998), Sundén & Surette (*AER* 1998), Agnew, Balduzzi & Sundén (*AER* 2003), Säve-Söderberg (2005), and Lyons and Yilmazer (2006).

- Women trade less with financial assets:
  - Interpretaion: Men are overconfident.
  - E.g. Barber & Odean (*QJE* 2001), Agnew, Balduzzi & Sundén (*AER* 2003), Niessen and Ruenzi (2006).

In this paper, we…

- ….document that women ***unconditionally*** hold less risky portfolios.

- ….question whether women are more financially risk averse.

2 stylized facts motivate our paper

Differences between labor income and wealth profiles of men and women.

- Could possibly explain some of the observed differences between female and male investors.

Existing studies on gender differences look only at investors who hold financial assets.

- Nonparticipants often excluded from the analysis.
  - 51% of US households nonstockholders.
  - 76% of European households nonstockholders.
  - 75% of Danish adults nonstockholders.

Research questions

- Are women's seemingly lower propensity to invest in risky asset due to differences in background characteristics?

- Taking self-selection into account, do women hold less risky financial wealth portfolios?

Overall results

Using very detailed and comprehensive data, we find:

- ***Unconditionally***, women seem to be more averse against taking on financial risk.

- ***Conditionally***, women and men behave similarly on the bond and stock markets.

Important point in paper

We pay special attention to marital status:

- Previous literature find differences between married and single investors.
  - E.g. Barber & Odean (2001), Sundén & Surette (1998).
- We look specifically at:
  - Single women.
  - Changes in behavior when changing marital status.

Related analysis

- Related to Christiansen, Joensen & Rangvid (*RF* 2008).

- Stock market behavior and education.

- Finding: Economists more likely to hold stocks (than otherwise identical investors).

Outline of talk

- Introduction
- Data
- Financial market participation
- Portfolio riskiness
- Moving together – moving away from one another
- Conclusion

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Data

- Data from Denmark.
- Register-based data set.
- Representative 10% sample of adult Danish population.
- Year-end information 1997-2004.
- Detailed information on background characteristics.
- 3,023,110 observations of individual investor decisions.

Descriptive statistics

- **Unconditionally**, women participate less in the stock market:
  - Men's participation rate: 27%
  - Women's participation rate: 23%

- **Unconditionally**, women hold less risky portfolios:
  - Men's stock/financial wealth ratio: 31%
  - Women's stock/financial wealth ratio: 29%

- **Unconditionally**, women have lower holdings of stocks:
  - Value of men's stock holdings: DKK 32,945
  - Value of women's stock holdings: DKK 27,136

Unconditional stock market participation rates
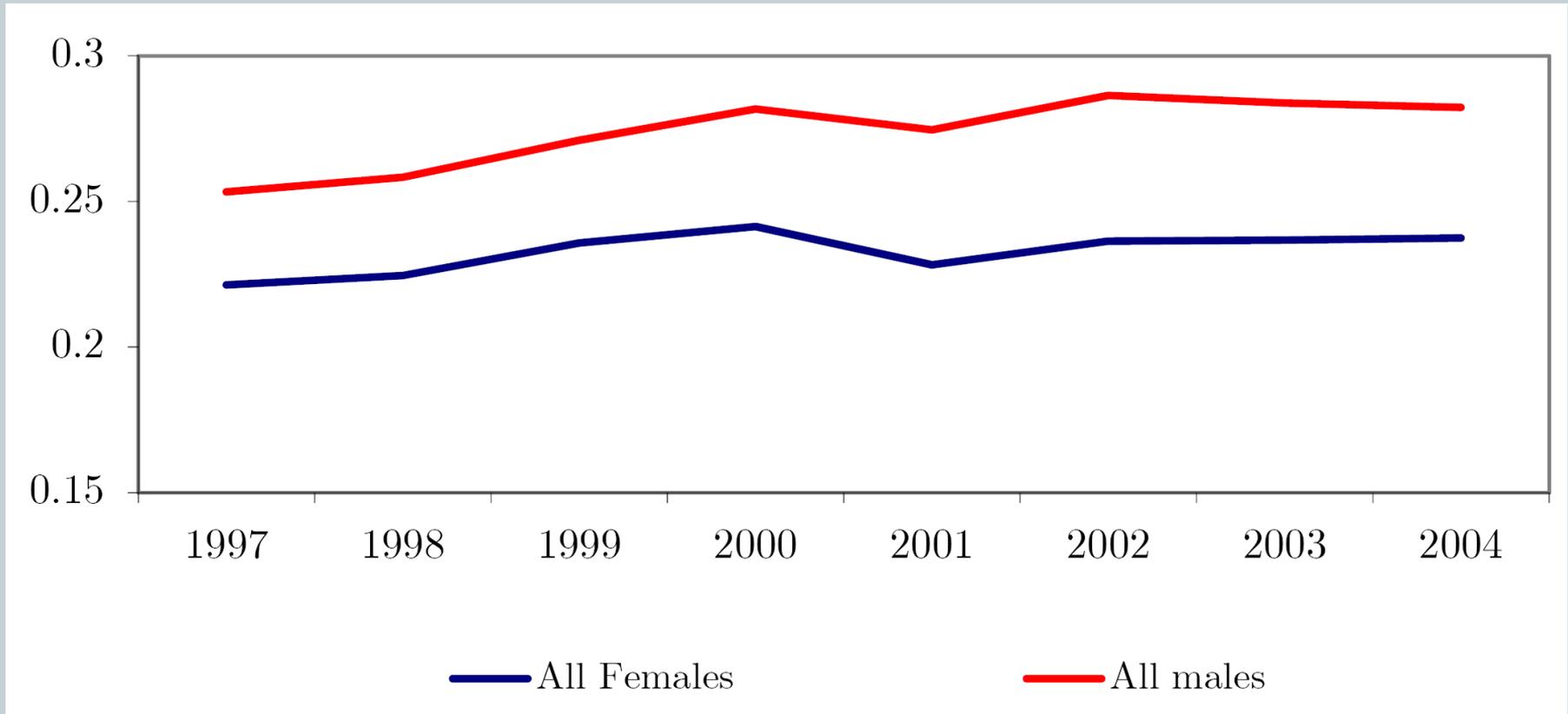
Descriptive statistics

But:

- Women also have lower income and wealth:
  - Men's average annual income: DKK 286,094
  - Women's average annual income: DKK 200,034

- Women's pension contributions are lower:
  - Men's   DKK 19,091
  - Women's: DKK 12,574

- More women live together with a child:
  - Single men: 2%
  - Single women: 11%

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Dependent variable

The **participation** decision:

- Stock market participation indicator.

As stock and bond investments might be related, we also model the bond market behavior:

- Bond market participation indicator.

Participation model

- Bivariate probit model for stock and bond participation:

$$S_{it} = 1 \left[X_{it}\beta_S + \varepsilon_{S_{it}} \geq \right.$$

$$B_{it} = 1 \left[X_{it}\beta_B + \varepsilon_{B_{it}} \geq \right.$$

- Error term vector:
  - Independent over individuals and time.
  - Standard normal distribution with correlation coefficient ρ.
- Marginal effects upon participation probabilities.

Explanatory variables

- Gender
- Marital status
- Interaction (married male)

- Socioeconomic variables:
  - Age, children, length of education, economist.

Explanatory variables

- # Financial variables:
  - Noncapital income, cash holdings, equity in houses, pension contribution, lagged stock and bond participation indicators, lagged stock return.

- # Second-moment variables:
  - Standard deviations: growth in noncapital income, growth in equity in houses.
  - Correlations: (noncapital income, stock return), (noncapital income, bond return), (equity in houses, stock return), (equity in houses, bond return), (equity in houses, noncapital income).

Participation results

Explanatory Variable	Stocks			Bonds		
Constant	-4.776	(0.105)	*	-5.501	(0.114)	*
Married	-0.095	(0.013)	*	-0.255	(0.014)	*
Male	-0.018	(0.015)		-0.202	(0.016)	*
Married Male	0.075	(0.017)	*	0.185	(0.019)	*
Age	0.007	(0.000)	*	0.016	(0.000)	*
Children	-0.039	(0.007)	*	-0.066	(0.009)	*
Length of Education	0.010	(0.001)	*	0.027	(0.001)	*
Economist	0.283	(0.019)	*	0.199	(0.020)	*
Log Noncapital Income	0.097	(0.009)	*	-0.009	(0.009)	
Lagged Stock Participation	2.330	(0.007)	*	0.208	(0.008)	*
Lagged Bond Participation	-0.013	(0.010)		2.115	(0.009)	*
Lagged Stock Return	-0.428	(0.021)	*	1.015	(0.024)	*
Cash Holdings	0.122	(0.003)	*	0.108	(0.003)	*
Equity in Houses	0.055	(0.004)	*	0.113	(0.004)	*
Pension Contribution	0.013	(0.003)	*	0.023	(0.003)	*
St.Dev.(Growth Noncapital Income)	0.000	(0.000)		0.000	(0.000)	
Correlation (Noncapital Income; Stock Return)	-0.007	(0.009)		0.009	(0.010)	
Correlation (Noncapital Income; Bond Return)	-0.026	(0.010)	*	-0.006	(0.012)	
St.Dev. (Growth Equity in Houses)	0.000	(0.000)		0.000	(0.000)	
Correlation (Equity in Houses; Stock Return)	0.045	(0.009)	*	0.004	(0.010)	
Correlation (Equity in Houses; Bond Return)	0.033	(0.009)	*	-0.009	(0.010)	
Correlation (Equity in Houses; Noncapital Income)	-0.002	(0.008)		0.019	(0.009)	*
Correlation coefficient			0.301 (0.005)*			

Stock market participation results

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Pension Contribution	0.013	(0.003)	*

Participation results

- Men do not have a stronger tendency to hold stocks.

- Negative effect from being married.

- Only married men have higher probability of holding stocks than single women.

- Overall, females are not less likely to hold stocks.

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Heckman (1979) Selection Model

- We want to evaluate what investors hold more risky portfolios.
  - Riskiness defined as stocks/assets.

- But we can also see the riskiness measure for those investors who actually do hold stocks.

- Use Heckman's (1979) model.

Heckman (1979) Selection Model

- Regression model:

$$\frac{S_{it}^*}{A_{it}} = X'_{it}\,\beta_{SA} + \varepsilon_{SA_{it}}$$

- Selection/participation equation:

$$\frac{S_{it}^*}{A_{it}} \text{ only observed if } S_{it}^* = X_{it}\beta_S + \varepsilon_{S_{it}} > 0$$

- Heckman's point: If $\rho = corr(\varepsilon_{SA_{it}}, \varepsilon_{S_{it}}) \neq 0,$ an OLS estimation of the share-equation would produce biased estimates.

- Exclusion restriction: Lagged stock market participation indicator, like in Vissing-Jørgensen (*NBER* Annual 2004).
  - Lagged stock market participation affects current stock market participation, but only affects the share of wealth invested in stocks through its effect on current participation.

Measure of wealth is important

We use two measures of wealth:

- Financial wealth: Stock + bonds + cash.
- Total wealth: Financial wealth + equity in house.

- Using **Financial** wealth, women hold less risky portfolios.
- Using **Total** wealth, women do not hold less risky portfolios.

$\Rightarrow$ Comprehensive data important!
  - But many studies do not have access to both financial wealth and the value of housing.

Scaling with **Financial** wealth

Explanatory Variable	Stocks/Financial Assets		
Constant	-1.966	(0.055)	*
Married	0.163	(0.010)	*
Male	0.108	(0.011)	*
Married Male	-0.187	(0.013)	*
Age	-0.199	(0.011)	*
Children	0.099	(0.006)	*
Length of Education	0.199	(0.010)	*
Economist	0.110	(0.012)	*
Log Noncapital Income (*100,000)	0.117	(0.000)	
Lagged Stock Return	-0.138	(0.003)	*
Cash Holdings (*100,000)	-0.036	(0.000)	*
Equity in Houses (*100,000)	0.103	(0.000)	*
Pension Contribution (*100,000)	-0.033	(0.000)	

Scaling with **Total** wealth

Explanatory Variable	Stocks/Total Assets		
Constant	-5.051	(0.066)	*
Married	-0.225	(0.012)	*
Male	-0.172	(0.013)	*
Married Male	-0.167	(0.016)	*
Age	0.091	(0.013)	*
Children	-0.338	(0.007)	*
Length of Education	0.428	(0.012)	*
Economist	0.242	(0.014)	*
Log Noncapital Income (*100,000)	0.012	(0.013)	
Lagged Stock Return	-0.133	(0.004)	*
Cash Holdings (*100,000)	0.005	(0.000)	*
Equity in Houses (*100,000)	-0.001	(0.009)	
Pension Contribution (*100,000)	-0.134	(0.100)	

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Moving in or out

- What happens to
  - Stock market participation probability.
  - Portfolio riskiness (stocks to total/wealth).

  when an investor changes marital status?
  - Single => cohabiting/married?
  - Single <= cohabiting/married?

Difference-in-difference estimator

Compares

- Change in participation rates for investors moving in (or out) to

- Change in participate rates for investors who stay single (or stay living together).

Expectations

If men are more risk taking and "influence" women when living together, then we should expect:

- More risky behaviour of women after moving together.

- Less risky behaviour of women after moving apart.

(Strength of our data that we can see when couple more together and apart).

Moving in: Participation

Unconditional Dif-in-Dif:

- Women's participation rate: +3.89%**
  - T-stat: 12.41
- Men's participation rate: +1.95%**
  - T-stat: 6.86.

Conditional Dif-in-Dif:

- Women's participation rate: +1.73%
  - T-stat: 1.93.
- Men's participation rate: +0.13%
  - T-stat: 0.17.

Moving in: Riskiness (Total assets scaling)

Unconditional Dif-in-Dif:

- Women's risky share: -2.16%[**]
  - T-stat: -5.01
- Men's risky share :   -5.50%[**]
  - T-stat: -13.43.

Conditional Dif-in-Dif:

- Women's risky share :   -1.35%
  - T-stat: -1.82.
- Men's participation rate: +0.19%
  - T-stat: 0.28.

Conclusion on Moving in

- Big changes unconditionally.

- Small (participation rate) or insignificant (riskiness) changes conditionally.

Moving out: Participation

Unconditional Dif-in-Dif:

- Women's participation rate: +3.53%**
  - T-stat: 12.58.
- Men's participation rate: -0.63%
  - T-stat: -1.76.

Conditional Dif-in-Dif:

- Women's participation rate: -1.37%*
  - T-stat: -2.21.
- Men's participation rate: +0.88%
  - T-stat: 1.13.

Moving out: Riskiness (Total assets scaling)

Unconditional Dif-in-Dif:

- Women's participation rate: -4.41%**
  - T-stat: 12.86.
- Men's participation rate: 1.88%**
  - T-stat: 6.66.

Conditional Dif-in-Dif:

- Women's participation rate: 1.15%*
  - T-stat: 2.57.
- Men's participation rate: 2.06%**
  - T-stat: 3.95.

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Conclusion

- We have investigated female investor behavior on financial markets
  - Stock and bond market participation.
  - Portfolio riskiness.

- Unconditional differences between male and female investors tend to disappear once we account for financial and socioeconomic background factors

- When moving in: Not much happens.
- When moving out: Both men and women invest more risky......

So, bottom line

The right question is not so much:

- "Why do women hold fewer stocks?"

The right question is more:

- "Why do women earn so little, keep the child, take shorter educations, live in smaller houses, etc.?"