



**mea**



# Gender, confidence and financial literacy

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We find a substantial **gender gap** in financial literacy.

Women are significantly more likely to **answer** with „**do not know**“.

This **gap persists** across different **countries, subgroups**, and knowledge **domains**.

see Bucher-Koenen, Lusardi, Alessie, van Rooij (2014) „How financially literate are women? An overview and new insights“, NBER Working Paper, w20793.



# Research Question

What lies behind the **gender gap** in financial literacy?

Why do women answer with „**do not know**“ more frequently?

Is it due to a lack of **knowledge** or lack of **confidence**?



# Survey Experiment



## SAMPLE:

- DNB Household Panel (DHS)
- Online survey representative of Dutch-speaking households
- We include panel members who are household heads and their partners, age 18 and older

## DESIGN:

- 3 classic financial literacy questions asked twice
- First survey (May 2012): Financial literacy questions including a “Do not know/refuse” option
- Second survey (June /July 2012): Same questions without a “Do not know option”, after each question ask for confidence in the answer



Set Up Week 1 (May 2012):

- 1) **Interest:** *Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? More than \$102 / Exactly \$102 / Less than \$102 / Do not know/ Refuse to answer*
- 2) **Inflation:** *Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?  
More than today / Exactly the same / Less than today / Do not know / Refuse to answer*
- 3) **Risk:** *Please tell me whether this statement is true or false. “Buying a single company’s stock usually provides a safer return than a stock mutual fund.” True / False / Do not know / Refuse to answer*



## Set Up Week 2 (June/July 2012):

- Questions without the “Do not know” and “refuse to answer” options (DK)
- After each question – **Confidence:**  
*On a scale from 1 to 7, How confident are you in this answer?*  
*1-not confident at all ... 7- completely confident*



# Survey Experiment

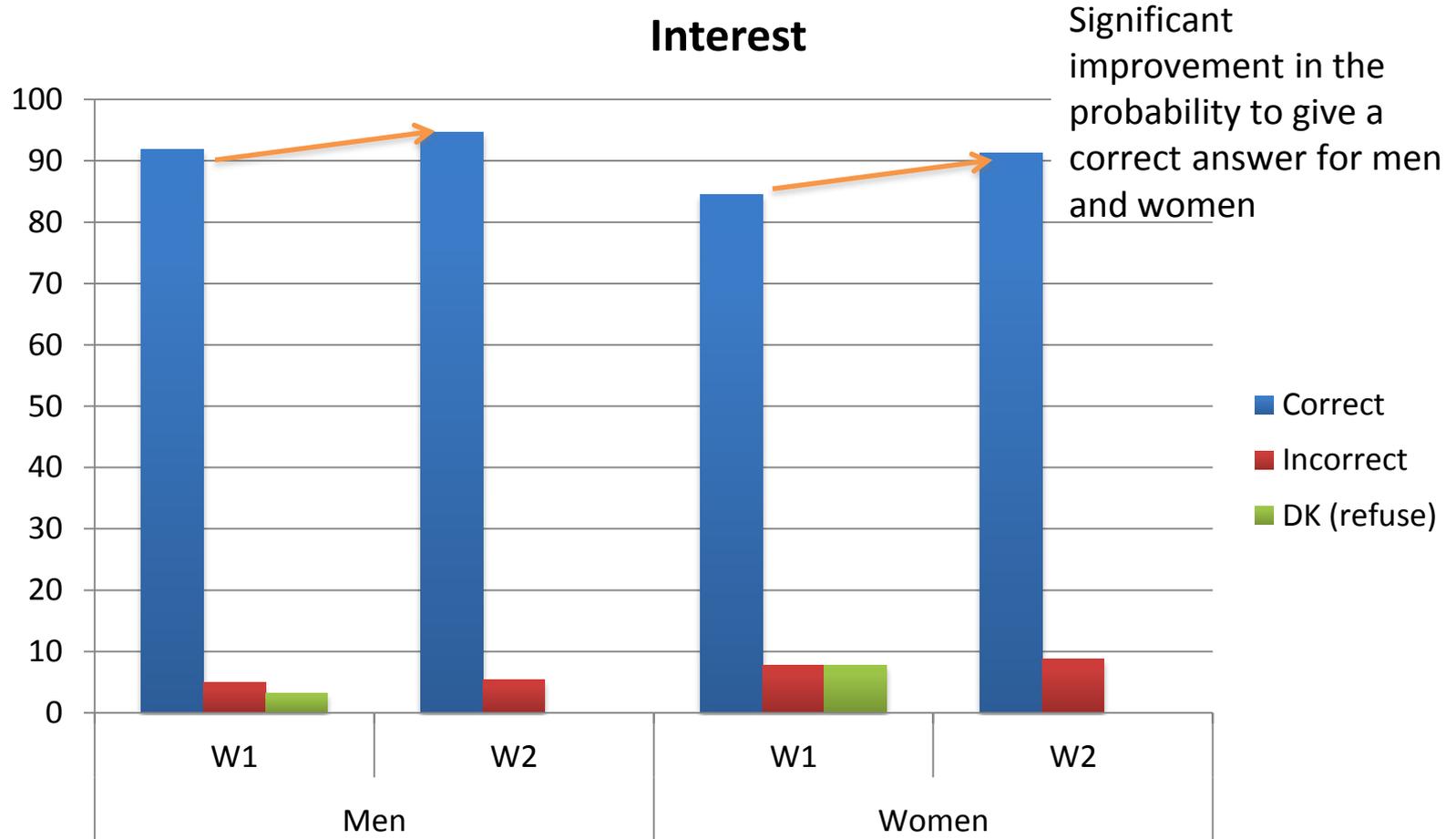
- Sample restrictions:
  - Only households without missing answers in the financial literacy questions in week 1 or 2 (drop N=30, 1.35%)
- Week 1: N= 1,748
- Week 2: N= 1,973 (incl. refresher)
- Sample for the analysis: complete questionnaire in both weeks, N=1,532; 861 (56.2%) are men and 671 (43.8%) are women.
- **Attrition:** no sign. effects of gender or financial literacy on dropping out after week 1
- **Learning:** answers to financial literacy questions in week 2 for refreshers (N=445) do not differ significantly from participants in both weeks.



# Results

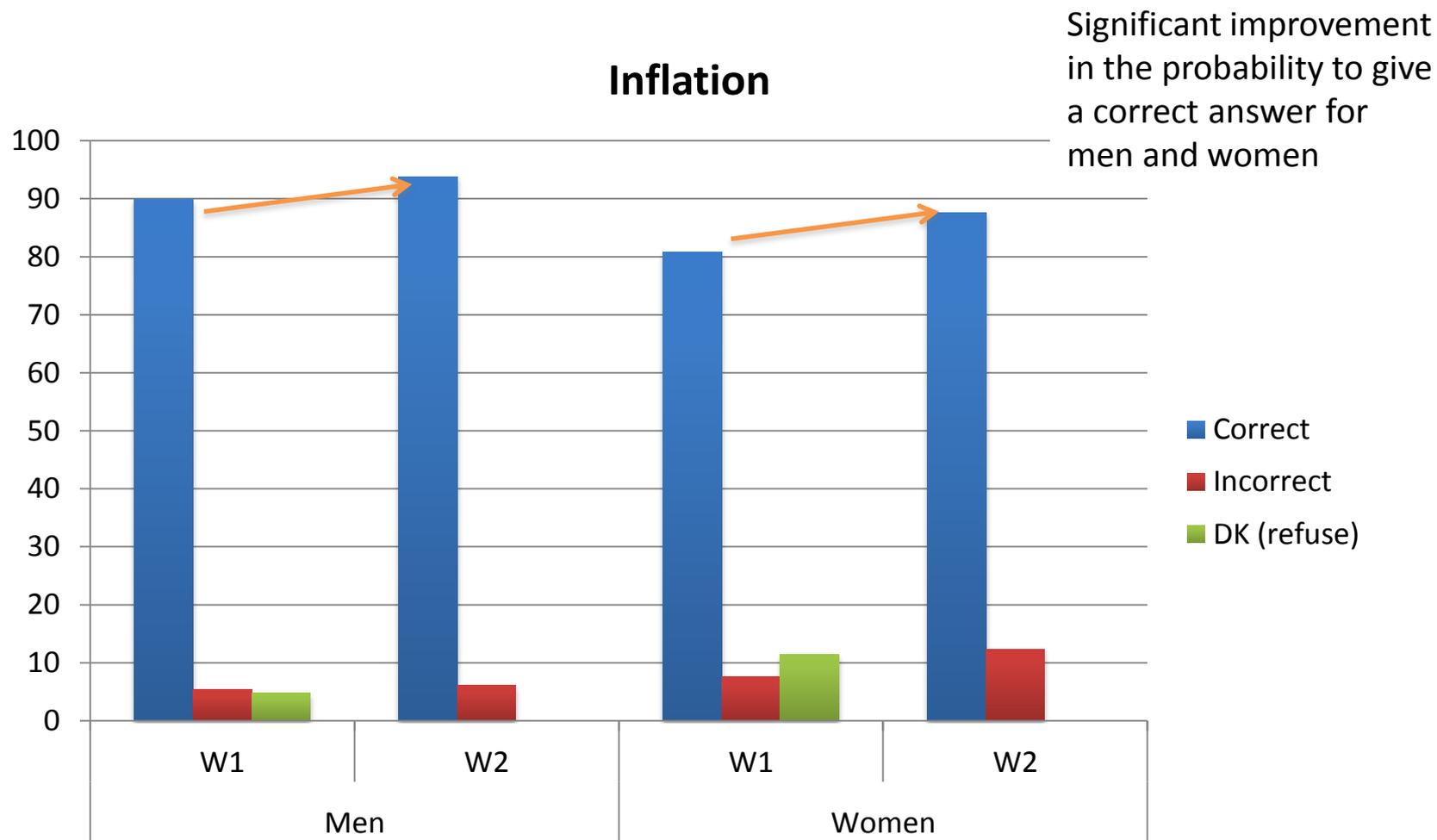


## Answers Week 1 and Week 2



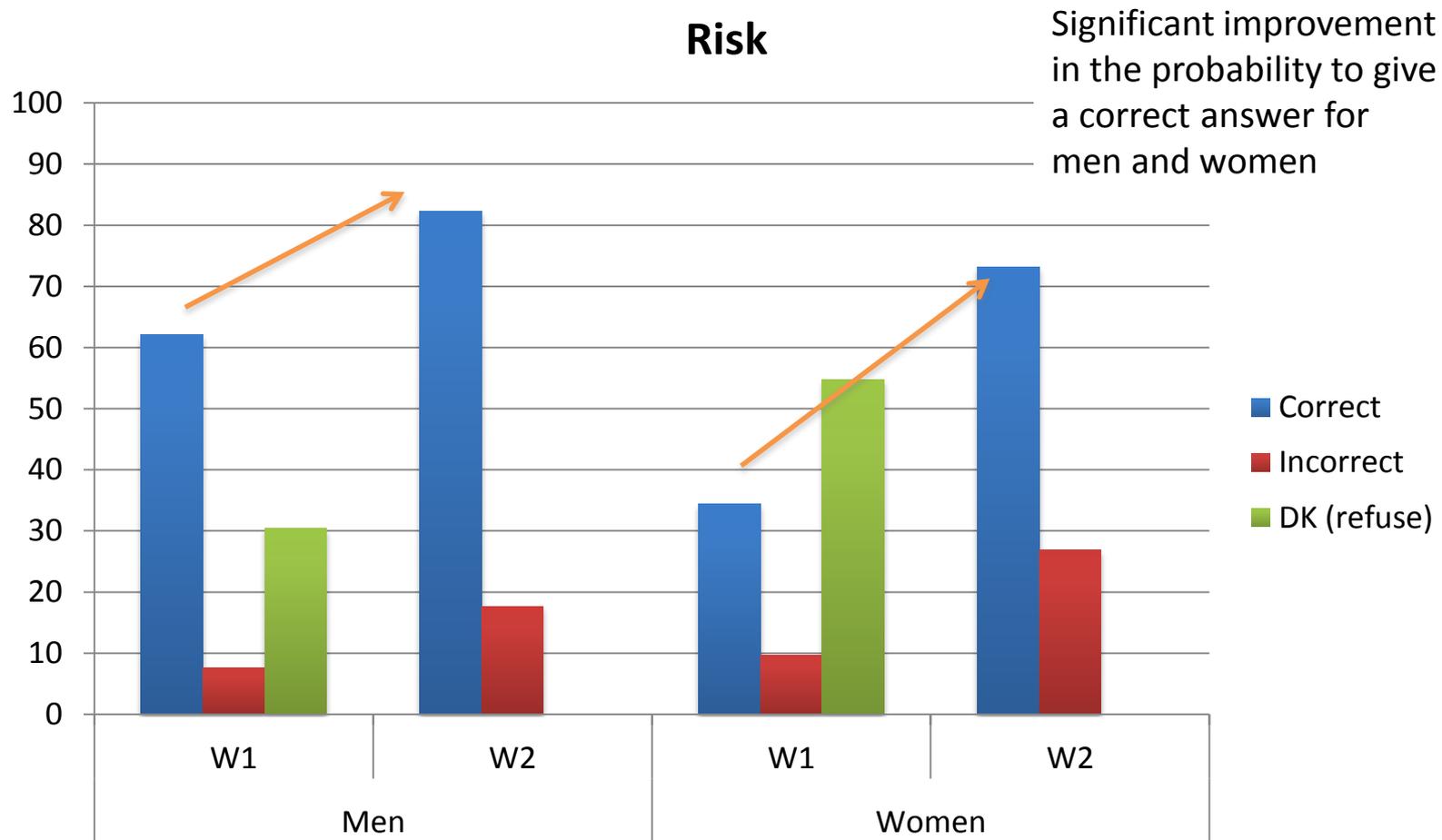


## Answers Week 1 and Week 2





## Answers Week 1 and Week 2





## Consistent and inconsistent answering across waves

### A. Interest:

		Men			Women		
	<b>incorrect</b>	<b>correct</b>	<b>don't know</b>	<b>incorrect</b>	<b>correct</b>	<b>don't know</b>	
<i>Survey May</i>							
<i>Survey July</i>							
incorrect	23.26	3.54	29.63	28.3	4.95	30.77	
correct	76.74	96.46	70.37	71.7	95.05	69.23	
Total	100	100	100	100	100	100	

### B. Inflation:

incorrect	41.3	2.72	33.33	30.77	7.02	38.46
correct	58.7	97.28	66.67	69.23	92.98	61.54
Total	100	100	100	100	100	100

### C. Risk Diversification:

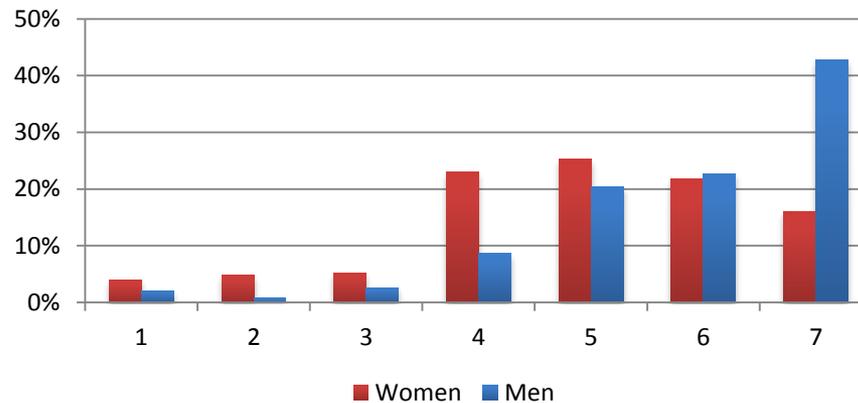
incorrect	38.46	10.32	27.38	47.69	12.55	32.27
correct	61.54	89.68	72.62	52.31	87.45	67.73
Total	100	100	100	100	100	100



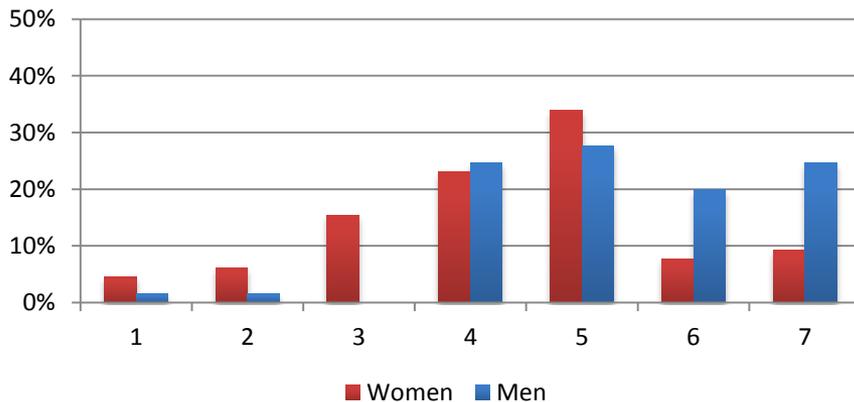
# Descriptives

What about confidence conditional on being correct, incorrect, do not know? e.g. Risk Q

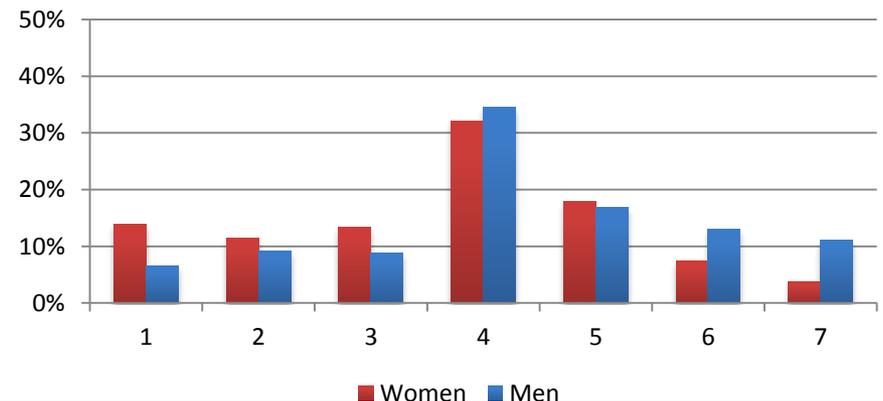
**Confidence cond. Correct**



**Confidence cond. Incorrect**



**Confidence cond. Do not know**





# A small ,model' of measuring financial literacy



## Stylized facts that are the basis of our model for measuring financial literacy

1. Answering behavior changes when deleting the DK option.
2. Respondents who gave a DK answer in May are correct with a high likelihood in July.
3. Fraction of correct answers increases also due to gambling.
4. DK responses in May are correlated with confidence July.



## A model of true financial literacy and confidence

$\tilde{y}_{ik} = 1$  if respondent  $i$  'knows' the correct answer to question  $k$  ("true knowledge"),

$\tilde{y}_{ik} = 0$  otherwise;

$sure_{ik} = 1$  if respondent  $i$  is sure about his/her answer on question  $k$  ;

$sure_{ik} = 0.5$  some intuition but not completely sure;

$sure_{ik} = 0$  totally not sure ('random guessers').



## Assumption 1

Suppose we make the reasonable assumption that if people know the answer they do not randomly guess:<sup>10</sup>

$$P(\tilde{y}_{ik} = 1, sure_{ik} = 0) = 0 \quad (1)$$



## Assumption 2

1.  $\tilde{y}_{ik} = 0, \text{sure}_{ik} = 1 \Rightarrow y_{ik}^j = 0, y_{ik}^m = 0, dk_{ik}^m = 0$
2.  $\tilde{y}_{ik} = 1, \text{sure}_{ik} = 1 \Rightarrow y_{ik}^j = 1, y_{ik}^m = 1, dk_{ik}^m = 0$
3.  $\tilde{y}_{ik} = 1, \text{sure}_{ik} = 0.5 \Rightarrow \begin{cases} \text{a) } y_{ik}^j = 1, y_{ik}^m = 1, dk_{ik}^m = 0 \\ \text{b) } y_{ik}^j = 1, y_{ik}^m = 0, dk_{ik}^m = 1 \end{cases}$
4.  $\tilde{y}_{ik} = 0, \text{sure}_{ik} = 0.5 \Rightarrow \begin{cases} \text{a) } y_{ik}^j = 0, y_{ik}^m = 0, dk_{ik}^m = 0 \\ \text{b) } y_{ik}^j = 0, y_{ik}^m = 0, dk_{ik}^m = 1 \end{cases}$
5.  $\tilde{y}_{ik} = 0, \text{sure}_{ik} = 0 \Rightarrow \begin{cases} \text{a) } y_{ik}^j = 1, y_{ik}^m = 1, dk_{ik}^m = 0 \\ \text{b) } y_{ik}^j = 1, y_{ik}^m = 0, dk_{ik}^m = 0 \\ \text{c) } y_{ik}^j = 1, y_{ik}^m = 0, dk_{ik}^m = 1 \\ \text{d) } y_{ik}^j = 0, y_{ik}^m = 1, dk_{ik}^m = 0 \\ \text{e) } y_{ik}^j = 0, y_{ik}^m = 0, dk_{ik}^m = 0 \\ \text{f) } y_{ik}^j = 0, y_{ik}^m = 0, dk_{ik}^m = 1 \end{cases}$



## A model of true financial literacy and confidence

$$\begin{aligned} P(\tilde{y}_{ik} = 1) &= P(\tilde{y}_{ik} = 1, \text{sure}_{ik} = 1) + P(\tilde{y}_{ik} = 1, \text{sure}_{ik} = 0.5) = \\ &P(y_{ik}^j = 1, y_{ik}^m = 1) + P(y_{ik}^j = 1, y_{ik}^m = 0, dk_{ik}^m = 1) - \\ &P(y_{ik}^j = 1, y_{ik}^m = 1, dk_{ik}^m = 0, \text{sure}_{ik} = 0) - \\ &P(y_{ik}^j = 1, y_{ik}^m = 0, dk_{ik}^m = 1, \text{sure}_{ik} = 0) \end{aligned} \quad (2)$$



## Identification of confidence

1.  $sure_{ik} = 1$  if the following criteria are jointly met
  - (a)  $dk_{ik}^m = 0$  (a 'fully confident' person does not use the plow knowledge)
  - (b)  $y_{ik}^j = y_{ik}^m$  (one should answer consistently over time. Notice that we need the May and July data to check this requirement)
  - (c)  $confidence_{ik}^j = 6, 7$  <sup>11</sup>
2.  $sure_{ik} = 0.5$  if
  - (a)  $((dk_{ik}^m = 0, y_{ik}^j = y_{ik}^m) \text{ and } confidence_{ik}^j = 3, 4, 5)$  OR
  - (b)  $(dk_{ik}^m = 1 \text{ and } confidence_{ik}^j \geq 3)$
3.  $sure_{ik} = 0$  otherwise



## Variable definition

Given the ‘observed’ value for  $sure_{ik}$  we also ‘observe’  $\tilde{y}_{ik}$  which is defined as follows (in stata language):

$$\tilde{y}_{ik} = (y_{ik}^j == 1) * ((y_{ik}^m == 1 \& sure_{ik} \geq 0.5) + (dk_{ik}^m == 1 \& sure_{ik} == 0.5)) \quad (7)$$

Alternatively, we may proxy true knowledge  $\tilde{y}_{ik}^j$  using July information only:

$$\tilde{y}_{ik}^j = (y_{ik}^j == 1 \& sure_{ik}^j \geq 0.5) \quad (8)$$

Below, we will compare the measures of true knowledge and the May and July answers to learn about the best way to measure financial knowledge.



## Alternative Financial Literacy Measures (N=1,532)

	<b>May</b>	<b>July</b>	<b>May-July</b>	<b>Corr. July</b>
<b>Panel A: 3 Questions</b>				
Interest	88.58%	93.15%	86.23%	90.60%
Inflation	85.77%	90.99%	83.29%	86.81%
Risk	49.87%	78.26%	65.99%	70.43%
<b>Panel B: Number correct</b>				
0	4.90%	0.59%	3.98%	2.94%
1	11.49%	4.83%	10.90%	7.38%
2	38.12%	26.17%	30.74%	28.59%
3	45.50%	68.41%	54.37%	61.10%



## The gender gap in financial literacy using 4 financial literacy measures (OLS)

	May	July	May-July	Corr. July
A. Only gender	-0.441***	-0.189***	-0.323***	-0.299***
	(0.0386)	(0.0291)	(0.0393)	(0.0363)
B. With controls for age, income, education, marital status	-0.359***	-0.146***	-0.245***	-0.234***
	(0.0393)	(0.0301)	(0.0404)	(0.0372)



## Does it matter for stock market participation?

	No controls	May	July	May-July	corr. July
Financial Literacy		0.0901***	0.0549***	0.0665***	0.0632***
		(0.0105)	(0.00970)	(0.0102)	(0.00977)
Gender	-0.136***	-0.0461***	-0.0715***	-0.0647***	-0.0653***
	(0.0207)	(0.0212)	(0.0213)	(0.0214)	(0.0214)
Controls+	no	yes	yes	yes	yes
N	1532	1532	1532	1532	1532
R2	0.023	0.147	0.126	0.132	0.130

+controls for age, income, education, marital status



Instrument: Economics in high school  
(3 groups: no education, some education, DK)

	May	July	May-July	Corr. July
Financial Literacy	0.192***	0.222***	0.196***	0.192***
	(0.0671)	(0.0842)	(0.0714)	(0.0699)
Gender	-0.00335	-0.0310	-0.0259	-0.0256
	(0.0369)	(0.0308)	(0.0321)	(0.0314)
First stage F-stats	14.19	9.189	11.78	11.99



# How to measure financial literacy?

- Ask the same questions twice with and without DK, exploit cross-question consistency and confidence
- Only use questions without DK + confidence measure (gives similar results)



# 5. Conclusion

## Summary

- Gender gap in financial literacy decreases but does not disappear when deleting the “Do not know option”.
- Gender gap is both: a gap in knowledge and a gap in confidence.
- Deleting DK option introduces measurement error due to guessing.
- Important from a policy perspective for the design of financial education programs.



# 5. Conclusion

## Work in progress

- Check robustness by changing the threshold on the confidence measure
- Use other financial outcomes (retirement planning)
- Latent class measurement model for financial literacy



**Thank you!**



## Measuring confidence using only the July information

1.  $sure_{ik}^j = 1$  if  $confidence_{ik}^j = 6, 7$
2.  $sure_{ik}^j = 0.5$  if  $confidence_{ik}^j = 3, 4, 5$
3.  $sure_{ik}^j = 0$  if  $confidence_{ik}^j = 1, 2$