UNIVERSITÄT KOBLENZ · LANDAU

EBERHARD KARLS UNIVERSITÄT TÜBINGEN

Funding:
STIFTUNG WÜRTH

MEASURING DOMAIN-SPECIFIC COMPETENCES: A SHORT SCALE OF THE TEST OF ECONOMIC COMPETENCE (TEC)

Presenter: Luis Oberrauch
Coauthors: Tim Kaiser, Günther Seeber

MOTIVATION

- Rapidly changing economic environment requires adolescents to be equipped with certain domain-specific competences
- Economic skills, esp. with regard to financial decision-making, have been shown to be a reliable predictor of various financial outcomes
- **However, there is still considerable disagreement among researchers on how to adequately measure these domain-specific capabilities**

THREE MAJOR LIMITATIONS IN THE LITERATURE

i. Most studies rely on short financial literacy scales with 3 or 5 items

   (e.g., Lusardi et al. 2010; Lusardi and Mitchell 2008)

   →Construct/Content validity haven't been established so far

ii. Instruments in the broader economic domain rather rely on factual or textbook knowledge than on competences

   (e.g., Soper and Walstad 1987; Brückner et al. 2015; Happ et al. 2018)

iii. Existing instruments not suitable for the implementation in educational large-scale setting

   (e.g., Brückner et al. 2015 (TUCE); Kaiser et al. 2020 (TEC))

THIS PAPER

Providing a brief 12-item scale to capture economic competences using a representative sample of 12,146 secondary school students from grade 7 to 10 in the German federal state Baden-Wuerttemberg

- Selecting 12 items from the 31-item TEC scale based on
  - psychometric properties,
  - applicability and
  - competence area coverage
- Re-validation of the short scale using modern psychometric procedures

OUTLINE AND PROCEDURES

- Content validity (established in Kaiser et al. 2020)
  - Think-a-loud studies
  - Expert validation
- Construct validity
  - Item characteristics based on Item Response Theory (IRT)
  - Dimensionality (Model fit statistics)
  - Convergent validity (correlations to adjacent scales)
  - Differential Item Functioning (DIF)
- Criterion validity
  - Socio-demographic correlates
  - Correlates with constructs relevant for economic decision-making

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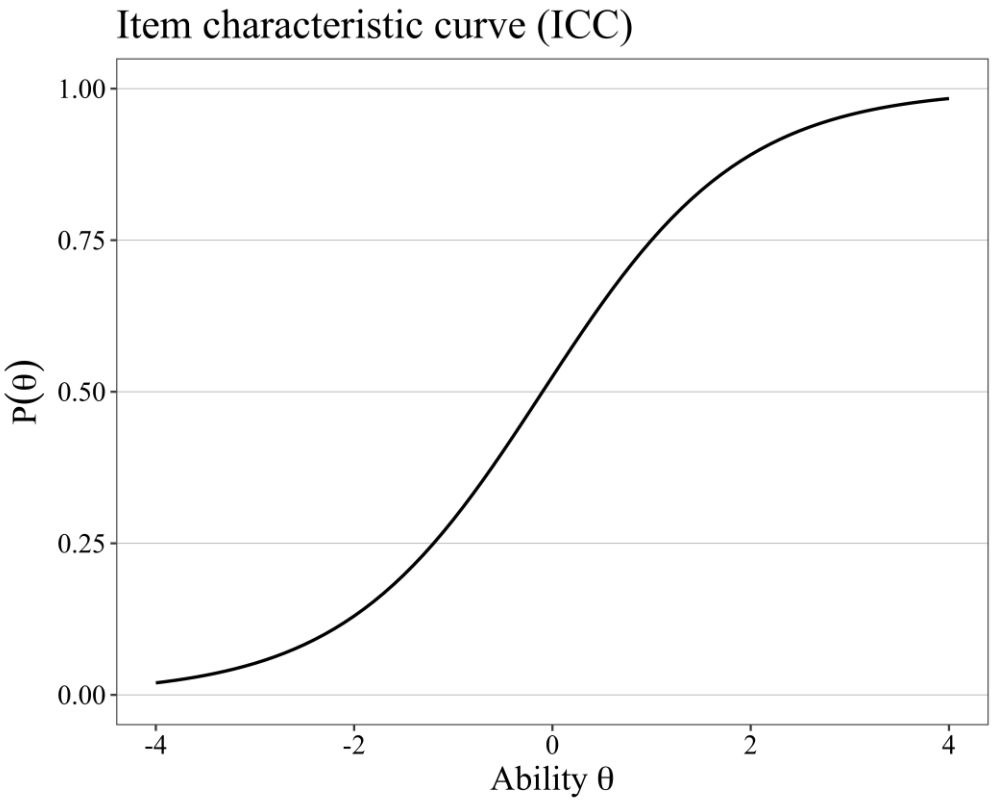
ITEM CHARACTERISTICS BASED ON ITEM RESPONSE THEORY



Item characteristics:

- Difficulty (ICC location)
- Discrimination (ICC slope)
- Guessing (Lower asymptote)
- Fatigue (Upper asymptote)

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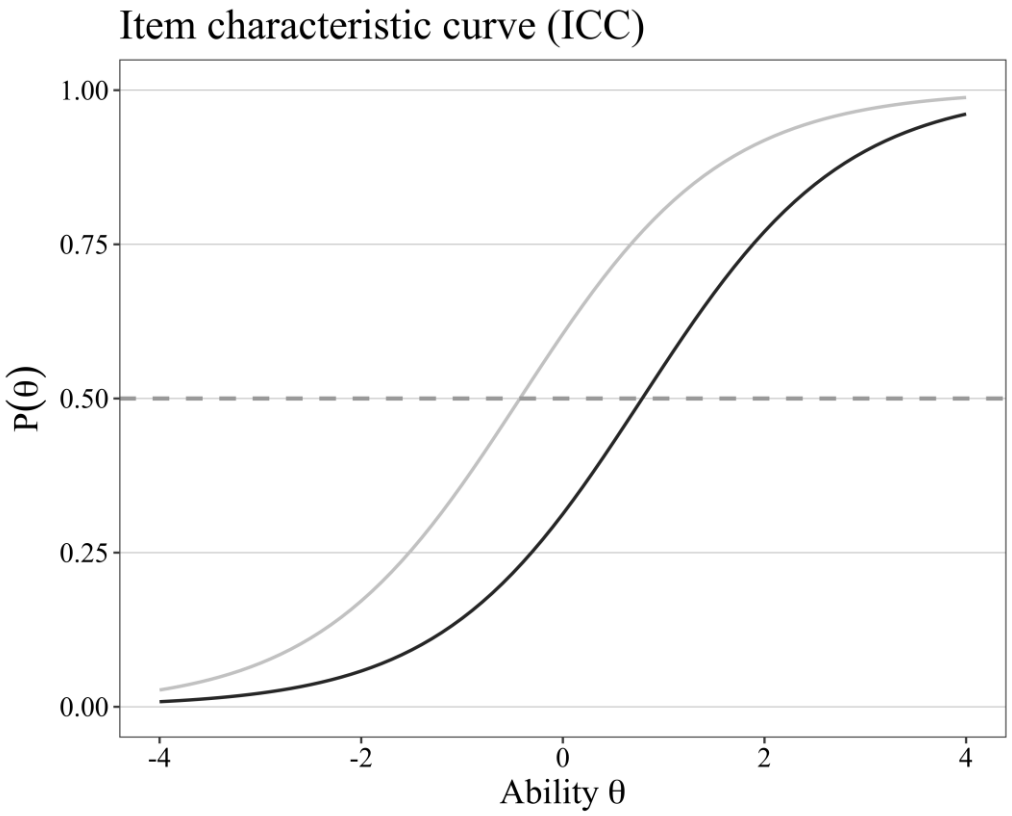

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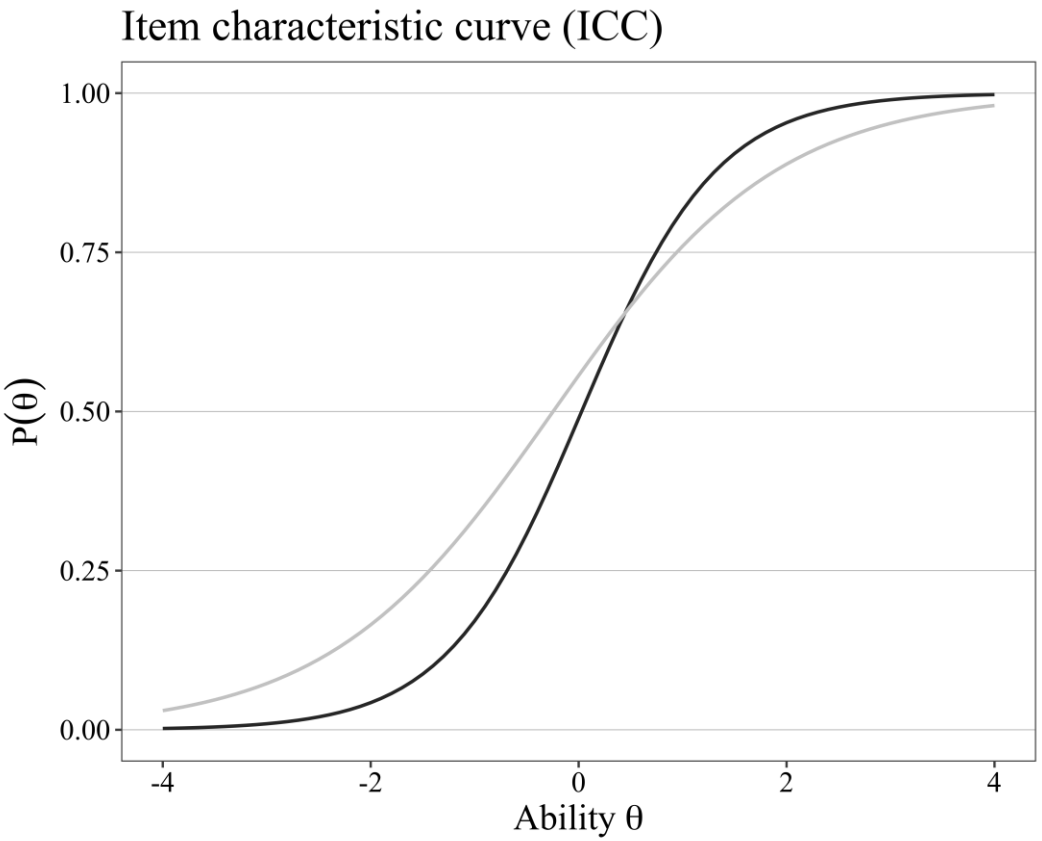

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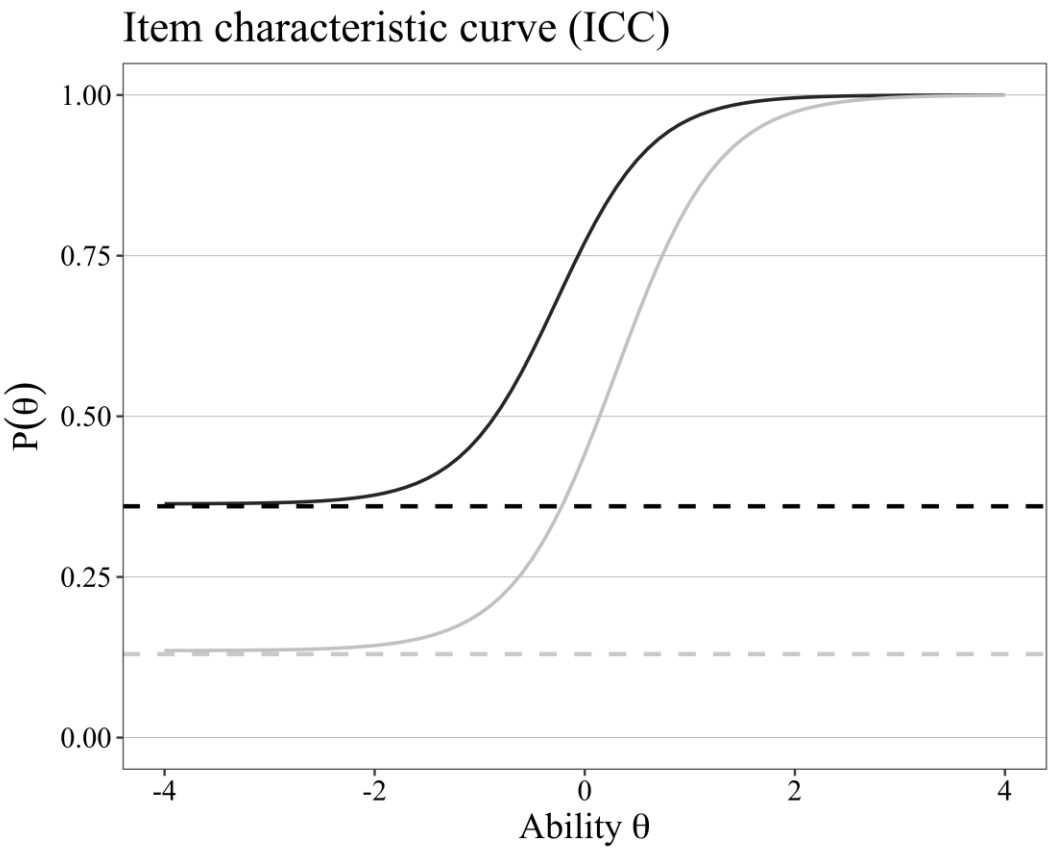

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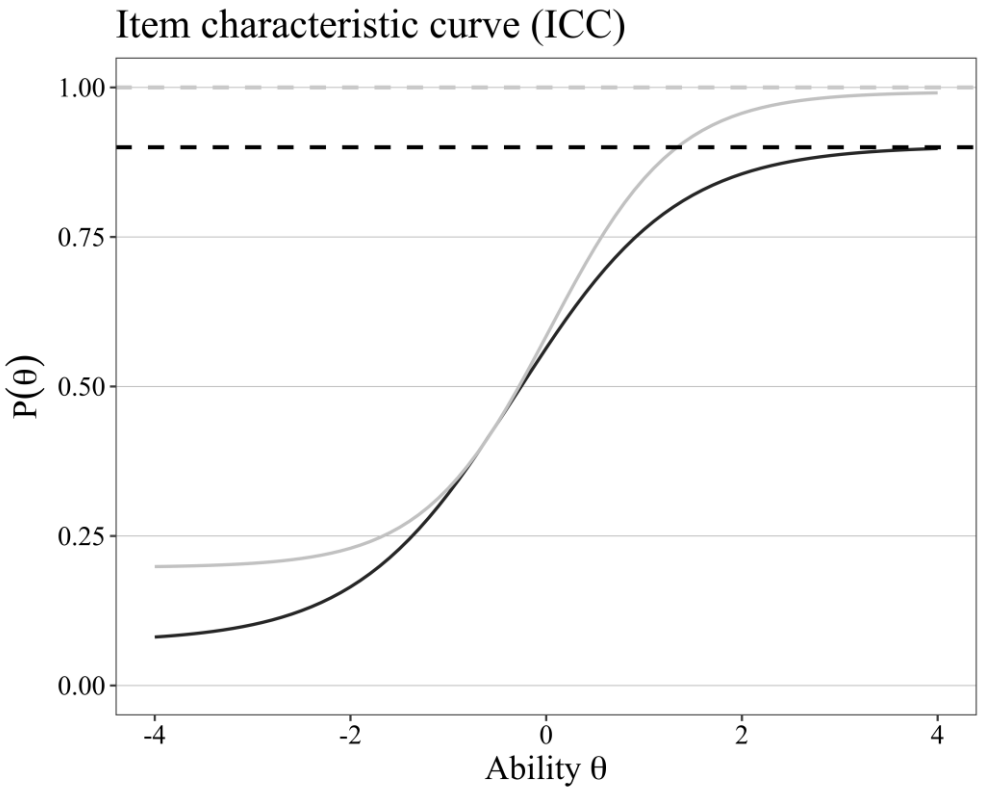

Item characteristics:

- Difficulty (ICC position)
- Discrimination (ICC slope)
- Guessing (Lower asympthote)
- Fatigue (Upper asymptote)

ITEM CHARACTERISTICS BASED ON ITEM RESPONSE THEORY

Four-parameter IRT estimates and model fit statistics

	Parameters and standard errors				
Itemno.	$\hat{\alpha}$ [SE]	$\hat{\sigma}$ [SE]	$\hat{\gamma}$ [SE]	$\hat{\delta}$ [SE]	$S-\chi^2$ (p-val.)
1	3.388 [0.189]	-0.110 [0.022]	0.451 [0.012]	0.982 [0.003]	6.308 (0.504)
2	0.968 [0.022]	-1.733 [0.032]	0.000 [0.019]	0.936 [0.005]	16.124 (0.024)
3	0.902 [0.019]	-1.068 [0.025]	0.000 [0.013]	0.996 [0.005]	12.879 (0.075)
4	1.983 [0.068]	0.272 [0.020]	0.129 [0.009]	1.000 [0.005]	5.573 (0.590)
5	3.435 [0.148]	0.062 [0.015]	0.303 [0.007]	0.934 [0.005]	6.838 (0.446)
6	1.405 [0.032]	-1.004 [0.020]	0.000 [0.012]	0.973 [0.004]	4.278 (0.747)
7	1.367 [0.062]	-0.171 [0.032]	0.142 [0.013]	0.898 [0.009]	6.521 (0.480)
8	1.478 [0.043]	-0.002 [0.020]	0.177 [0.008]	1.000 [0.006]	4.267 (0.749)
9	1.097 [0.049]	0.285 [0.034]	0.156 [0.011]	1.000 [0.011]	10.649 (0.155)
10	1.878 [0.055]	0.589 [0.018]	0.078 [0.005]	0.892 [0.010]	5.994 (0.540)
11	2.164 [0.109]	1.200 [0.027]	0.179 [0.008]	1.000 [0.013]	7.024 (0.426)
12	3.357 [0.236]	1.507 [0.027]	0.240 [0.007]	1.000 [0.009]	15.186 (0.034)

Discrimination

ITEM CHARACTERISTICS BASED ON ITEM RESPONSE THEORY

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Difficulty

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Guessing

ITEM CHARACTERISTICS BASED ON ITEM RESPONSE THEORY

Four-parameter IRT estimates and model fit statistics

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Fatigue

ITEM CHARACTERISTICS BASED ON ITEM RESPONSE THEORY

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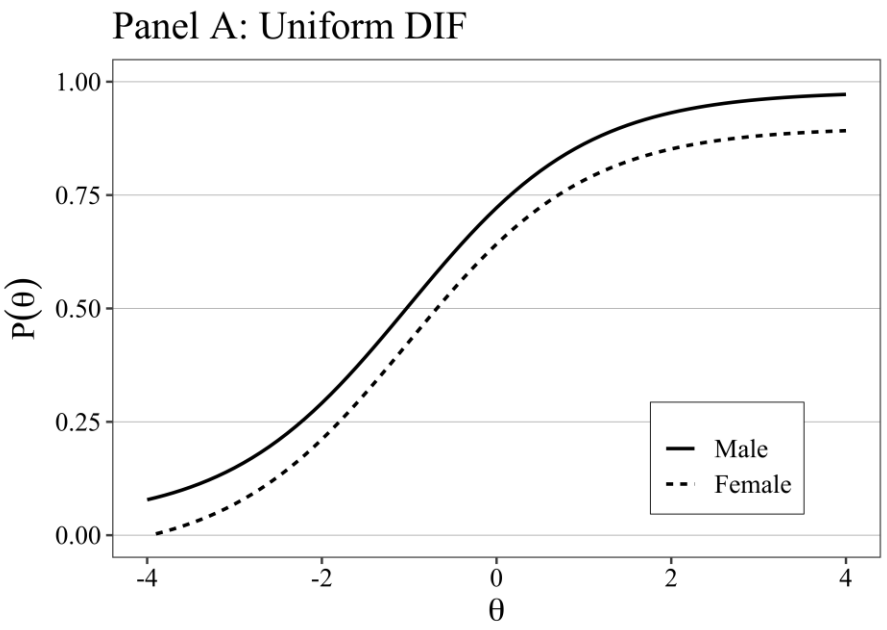
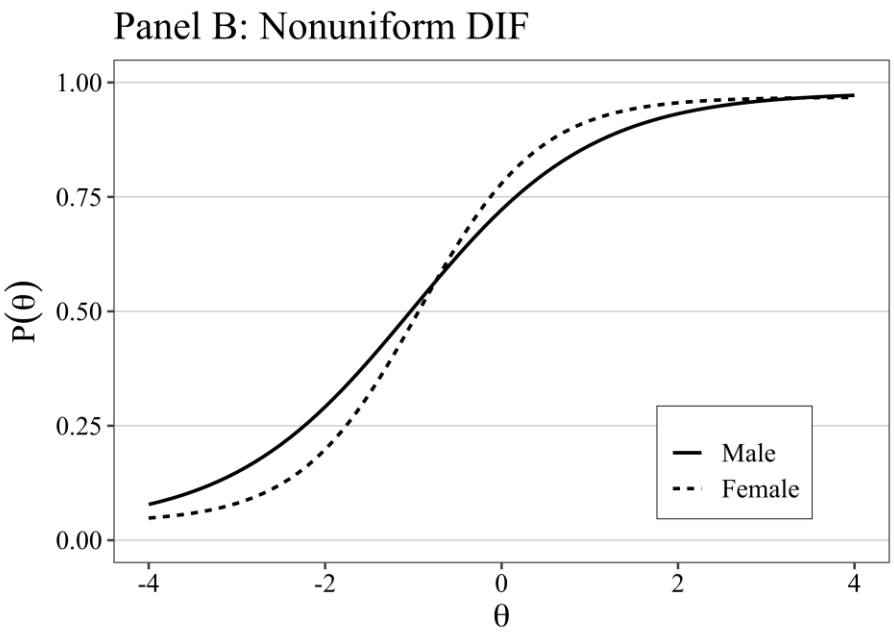
Dimensionality

DIFFERENTIAL ITEM FUNCTIONING





Classification of DIF-effects using the well-established ETS-scheme:

A: Negigible DIF

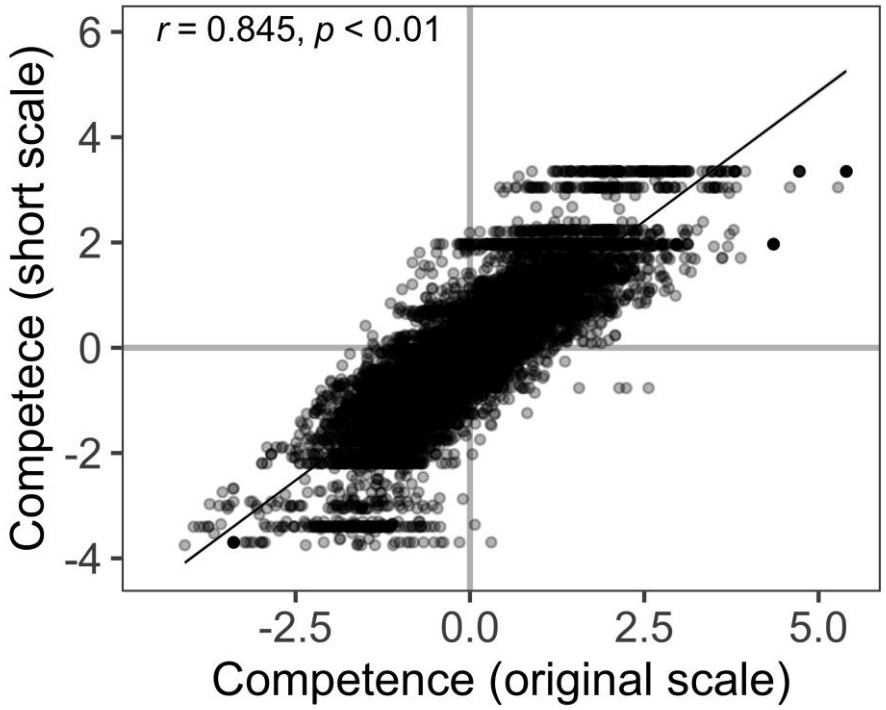
B: Moderate DIF

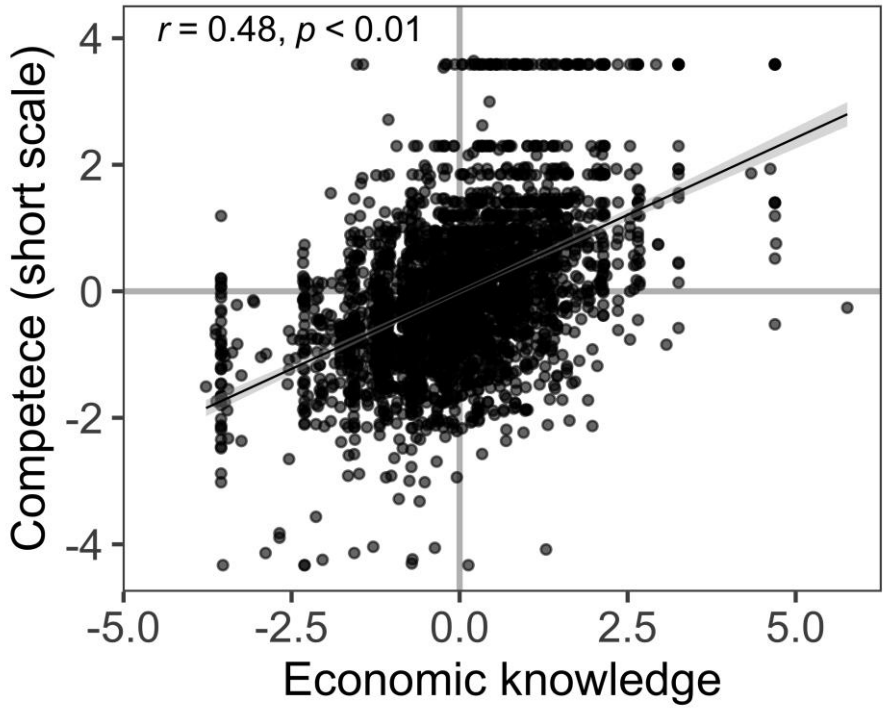
C: Severe DIF

DIFFERENTIAL ITEM FUNCTIONING (UNIFORM)

	Gender *(Focal group: Female)*		Books at home *(Focal group: <26 books at home)*		Native language *(Focal group: Non-natives)*	
Itemno.	*Δ-DIF* [*MHχ2*]	ETS	*Δ-DIF* [*MHχ2*]	ETS	*Δ-DIF* [*MHχ2*]	ETS
1	-1.160 [0.494]	B	-0.415 [0.176]	A	-0.608 [0.259]	A
2	0.488 [-0.208]	A	0.605 [-0.258]	A	0.242 [-0.103]	A
3	0.637 [-0.271]	A	0.452 [-0.192]	A	0.326 [-0.138]	A
4	0.380 [-0.162]	A	-0.666 [0.284]	A	-0.378 [0.161]	A
5	0.092 [-0.039]	A	-0.106 [0.045]	A	-0.054 [0.023]	A
6	1.248 [-0.531]	B	0.144 [-0.061]	A	-0.205 [0.087]	A
7	-0.333 [0.142]	A	0.066 [-0.028]	A	0.089 [-0.038]	A
8	0.261 [-0.111]	A	-0.132 [0.056]	A	0.159 [-0.068]	A
9	-0.030 [0.013]	A	0.208 [-0.089]	A	-0.172 [0.073]	A
10	-0.434 [0.185]	A	-0.054 [0.023]	A	0.128 [-0.054]	A
11	-0.167 [0.071]	A	-0.631 [0.269]	A	-0.270 [0.115]	A
12	-0.983 [0.418]	A	0.528 [-0.225]	A	0.743 [-0.316]	A

CONVERGENT VALIDITY





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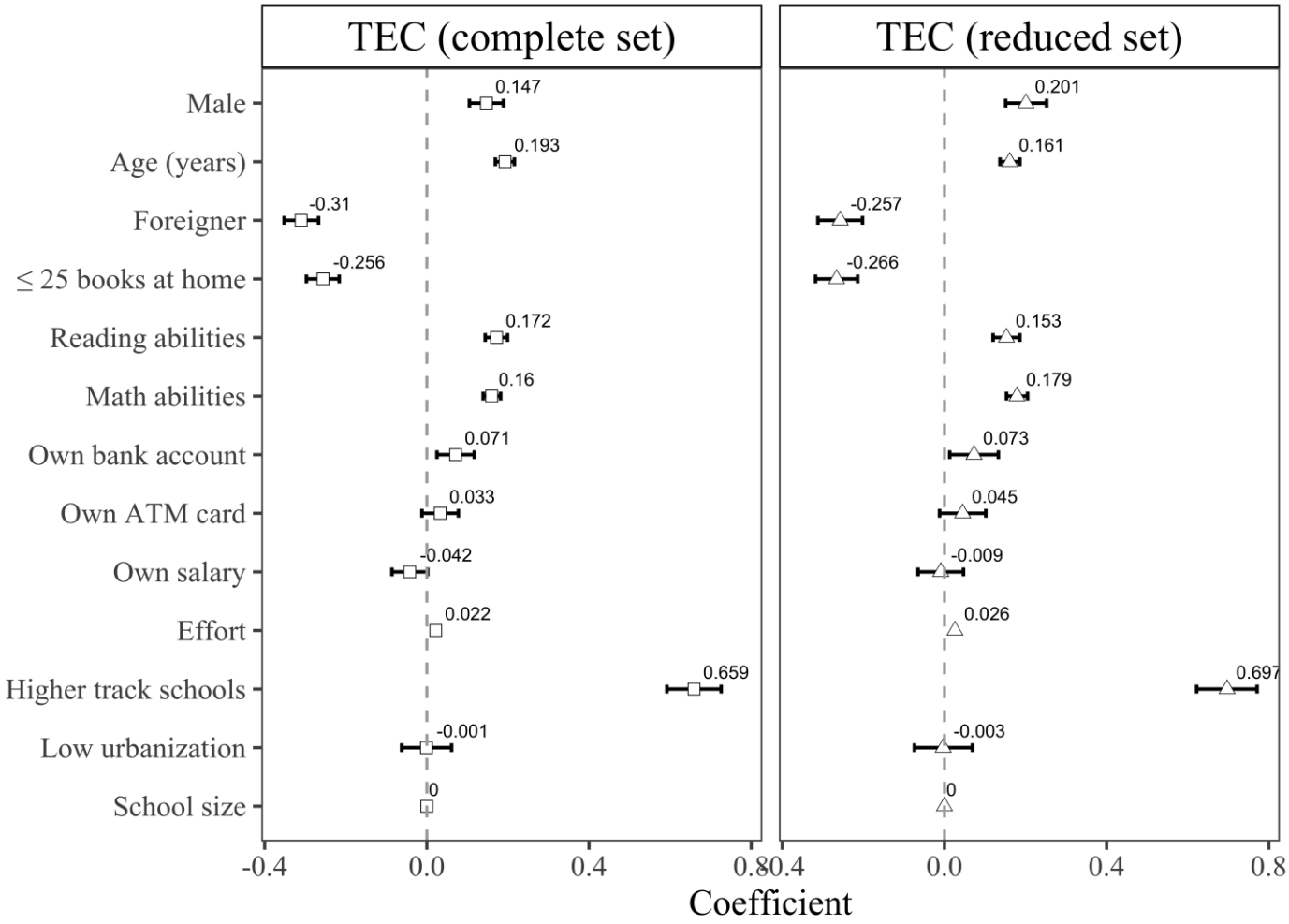
CRITERION VALIDITY: SOCIO-DEMOGRAPHIC CORRELATES



CRITERION VALIDITY: CORRELATES WITH CONSTRUCTS RELEVANT FOR ECONOMIC DECISION-MAKING

Constructs:

- Economic interest (Walstad/Soper 1983; Oberrauch/Seeber 2021)
- Financial planning (Yamauchi/Templer 1982)
- Attitudes towards money (Yamauchi/Templer 1982)
- Financial autonomy (Noom et al. 2001; Kaiser/Oberrauch 2021)
- Impulse purchasing
- Any Savings

CRITERION VALIDITY: CORRELATES TO CONSTRUCTS RELEVANT FOR ECONOMIC DECISION-MAKING

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Correlations with competence scores relying on the 12-item short scale (*N=1,287*)							
(1) Economic competence	---						
(2) Economic interest	0.15***	---					
(3) Financial planning	0.07**	0.27***	---				
(4) Attitude towards money	-0.01	0.19***	0.12***	---			
(5) Financial autonomy	0.16***	0.20***	0.23***	0.08**	---		
(6) Impulse purchases	-0.17***	-0.10***	-0.42***	0.09**	-0.21***	---	
(7) Any savings	0.25***	0.09**	0.15***	0.00	0.17***	-0.08**	---
Panel B: Correlations with competence scores relying on the 31-item original scale (*N=1,286*)							
(1) Economic competence	---						
(2) Economic interest	0.19***	---					
(3) Financial planning	0.09***	0.27***	---				
(4) Attitude towards money	-0.02	0.19***	0.12***	---			
(5) Financial autonomy	0.19***	0.20***	0.23***	0.08**	---		
(6) Impulse purchases	-0.20***	-0.10***	-0.42***	0.09**	-0.21***	---	
(7) Any savings	0.26***	0.09**	0.15***	0.00	0.17***	-0.08**	---

TO SUM UP

Provision of an efficiant short scale to capture domain-specific competences:

The scale

- adresses a wide range of ability levels
- discriminates fairly good between low- and high-achieving respondents
- is fair with respect to key socio-demographic characteristics
- is strongly associated with adjacent scales
- shows correlates that mirror estimates documented in the relevant literature

ITEMS: EXAMPLE (1/2)

Ms. Müller runs a dental surgery and makes €200 per hour.
Today she is considering closing the surgery one hour earlier in order to mow the lawn at home. However, she could also hire a gardener for €50.

Which statement is correct?

a) *She should mow the lawn herself in order to save the expense of the gardener.*
b) *She should mow the lawn herself because she could do just as quickly.*
c) *She should hire the gardener in order not to lose her income.**
d) *It makes no difference because both cases involve one hour's work.*

ITEMS: EXAMPLE (2/2)

There is a regular flea market at school before the summer holiday.
Emma in Class 8A owns the newest version of a popular video game she received from her aunt in Germany and which will only be released in the U.S. next year.
She is considering selling it at the flea market.

Which statement is correct?

*a) She would receive a comparatively high amount for the game this year**
b) She would receive a comparatively low amount for the game this year
c) She would receive as much this year as she would receive next year
d) She would not be able to sell the game this year
e) She would not be able sell the game next year

THANK YOU

APPENDIX

DIFFERENTIAL ITEM FUNCTIONING (NONUNIFORM)

	Gender *(Focal group: Female)*		Books at home *(Focal group: < 26 books at home)*		Native language *(Focal group: Non-natives)*	
Itemno.	*pseudo* R^2	Cat	*pseudo* R^2	Cat	*pseudo* R^2	Cat
1	0.004	A	0.002	A	0.001	A
2	0.000	A	0.000	A	0.000	A
3	0.000	A	0.000	A	0.000	A
4	0.000	A	0.001	A	0.001	A
5	0.000	A	0.000	A	0.000	A
6	0.000	A	0.000	A	0.000	A
7	0.000	A	0.002	A	0.001	A
8	0.000	A	0.000	A	0.000	A
9	0.001	A	0.000	A	0.004	A
10	0.000	A	0.000	A	0.000	A
11	0.002	A	0.009	A	0.002	A
12	0.001	A	0.000	A	0.003	A

MODEL FIT STATISTICS

	1-PL		2-PL		3-PL		4-PL	
Itemno.	$S-\chi^2$	p-val.	$S-\chi^2$	p-val.	$S-\chi^2$	p-val.	$S-\chi^2$	p-val.
1	39.167	0.000	16.280	0.061	10.900	0.207	6.308	0.504
2	67.419	0.000	35.543	0.000	20.356	0.009	16.124	0.024
3	23.878	0,008	18.320	0.032	13.557	0.094	12.879	0.075
4	70.039	0.000	15.733	0.073	5.616	0.690	5.573	0.590
5	26.669	0.003	7.496	0,586	6.926	0.545	6.838	0.446
6	12.006	0.285	11.262	0,258	6.680	0.572	4.278	0.747
7	31.745	0.000	9.761	0.370	6.004	0.647	6.521	0.480
8	9.025	0.530	4.617	0.866	4.753	0.784	4.267	0.749
9	15.763	0.107	10.224	0.333	10.636	0.223	10.649	0.155
10	21.464	0.018	12.487	0.187	8.454	0.390	5.994	0.540
11	44.313	0.000	38.902	0.000	7.699	0.463	7.024	0.426
12	152.926	0.000	34.656	0.000	13.445	0.097	15.186	0.034

TEST INFORMATION FUNCTION