Exploration of Measurement Characteristics of Family Wealth Indicators Over Time (2001 - 2015)

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ABSTRACT

In TIMSS and PIRLS, several indicators were used to assess family wealth and provided in two parts of national and international options. Whereas, international options remain constant for all countries, national ones are quite different. Both parts have changed over time. In present study, all national and international items in fourth grade of Iran were examined for 6 cycles of TIMSS and PIRLS. There were 23 items: calculator, computer, study desk, dictionary, daily newspaper, own book, internet connection, own room, washing machine, dishwasher, (own) mobile, car, video camera, piano, phone, game system, TV, video player, radio, audio-visual player, luxury furniture, musical instrument and pool. Difficulty and discrimination parameters of items were estimated, applying two-parameter item response model, in all cycles of TIMSS and PIRLS. Considering the reverse coding of items, results show that difficulty parameters often have increased towards positive extreme of continuum, means that higher percent of ownership of them from 2001 to 2015. Although, typically the discrimination power of most items remain constant up to 2011, slope coefficients slightly have declined in the last cycle, which means adequacy of items likely have been decrease and alternative items should be considered for next cycles. Changes in ICT-related items are higher than others. Generally, results suggest the items of family wealth should be revised in order to hold their measurement power.

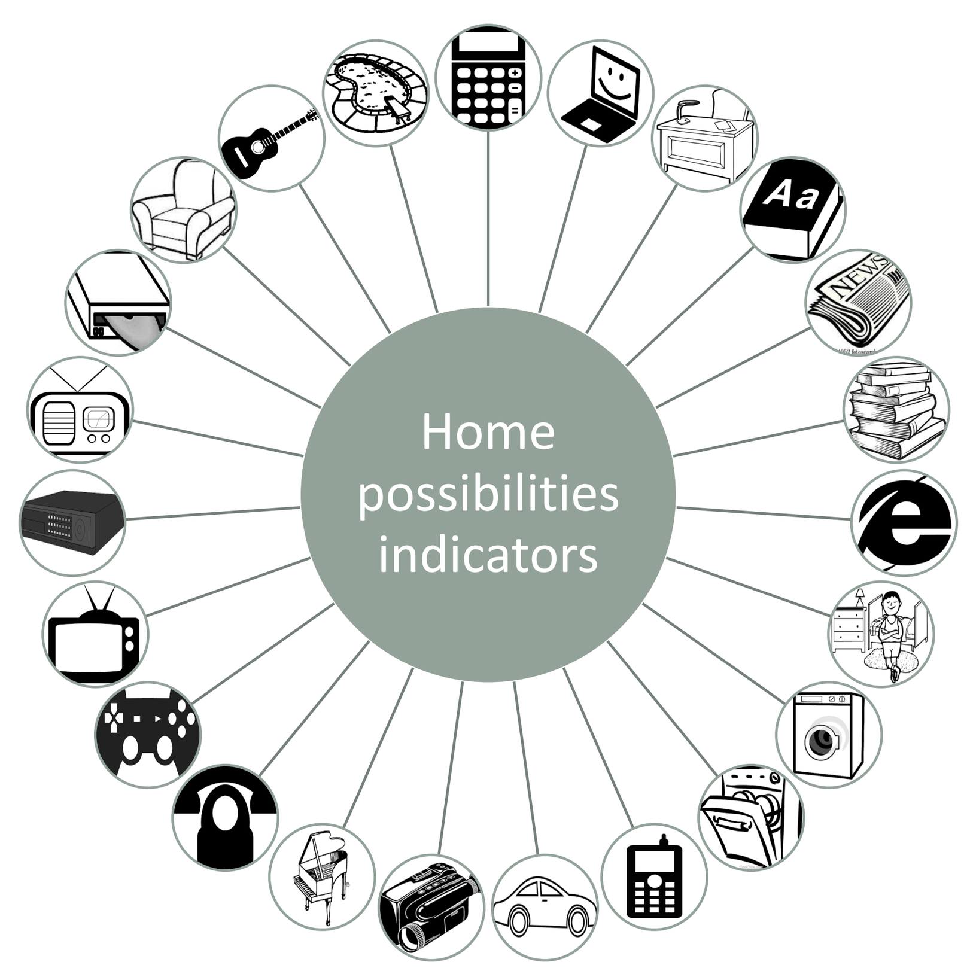
METHODS

Data source:

- Cycles of study: PIRLS 2001, 2006, 2011
  TIMSS 2003, 2007, 2011, 2015
- Country and grade: Fourth grade Iran,
- Instrument: Student background questionnaires,
- Variable: Family wealth indicators (national and international)

Methods:

- Two-parameter model of item response theory (IRT) was applied to estimate difficulty and discrimination parameters of each indicators
- Student total weights were used to estimate parameters accurately, based on complex sampling design of TIMSS and PIRLS.



RESULTS

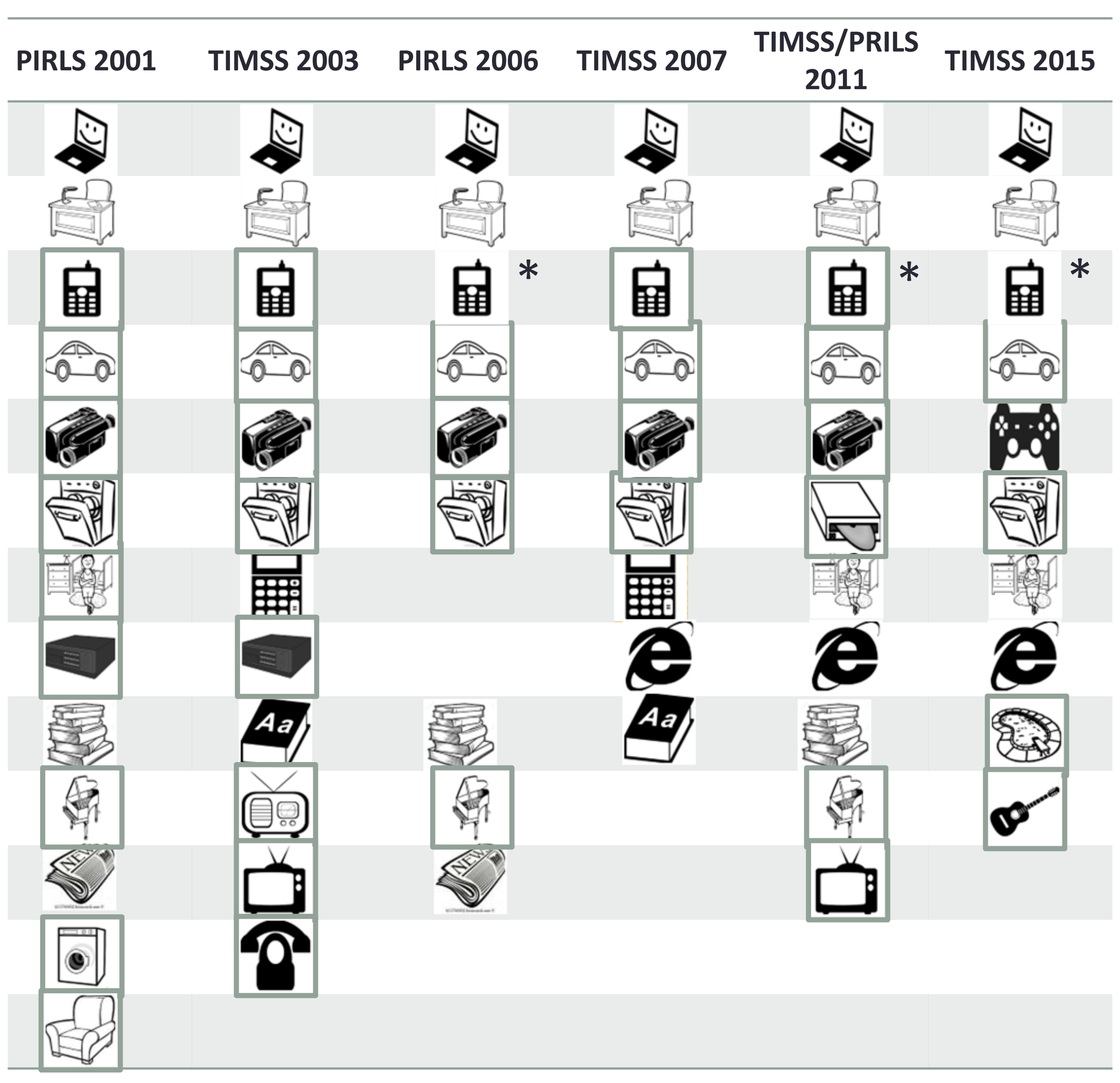
- Mobile: Considering measuring possession of mobile (in general) in 2001, 2003 and 2007 and own mobile in 2006, 2011 and 2015, inconsistent increase in each of two groups can be interpreted.
- Video camera: Slopes were around 1.
- Dish washer: The location parameters were almost similar up to 2007, except 2003.
- Piano: Surprisingly, the location parameters decreased from 2001 to 2011. It seems students could discriminate piano from other similar musical instruments.
- Internet connection: The steepest curve was in 2007 and the slopes decreased over time, but there is the acceptable slope in 2015.

Table 2. Discriminant parameters of family wealth indicators

	P 2001	T 2003	P 2006	T 2007	T/P 2011	T 2015
	0.664	0.635	0.998	2.728	1.957	0.413
	0.777	1.093	1.089	0.926	0.732	0.672
	0.782	0.924	0.706	0.738	0.613	0.583
	1.186	1.352	0.718	0.720	0.382	0.590
	0.910	0.853	1.010	0.994	0.724	
	0.768	1.297	0.725	0.604		0.610
	0.857		0.813		0.507	
				4.080	2.347	1.129
			0.856		0.509	0.608
	0.559		0.672		0.569	

BACKGROUND

Table 1. Family wealth indicators used in Iran from 2001 to 2015



Note:

- *National options embedded in color line*
- ** own mobile phone*

RESULTS

Table 2. Location parameters of family wealth indicators

	PIRLS 2001	TIMSS 2003	PIRLS 2006	TIMSS 2007	TIMSS/PRI LS 2011	TIMSS 2015
	-1.397	-1.127	-0.994	-0.610	-0.025	-0.166
	0.047	-0.259	-0.268	-0.165	0.408	0.428
	-0.442	-0.433	-0.702	-0.096	0.304	0.407
	-1.066	-0.965	-2.476	-0.653	-.955	-0.453
	-0.955	-1.043	-0.767	.356	-0.140	
	-1.517	0.281	-1.819	-1.962		-0.734
	-1.847		-2.373		-3.092	
				-0.969	-0.548	-0.141
			-0.249		-0.491	0.637
	1.402		0.986		1.835	

Remarkable Findings:

- Computer: A considerable shrinkage of slope parameter in 2015 mainly was due to discrimination of own from family computer.
- Study desk: Part of inconsistency in difficulty parameter of 2001 was related to different used words.
- Car: Probably the diminution of location coefficient in 2007, was due to use synonyms in translation.

CONCLUSIONS

- Almost the location coefficients for all indicators increased, which means the higher ownership of them from 2001 to 2015.
- Inconsistency of change in location was due to specification of indicators (e. g. family mobile vs. own mobile) or different words used in translation (using synonyms). So more attention should be spent on scale development.
- Discriminant parameters remain almost same for non-ICT related indicators (e.g. piano), and small changes were observed over time, however, a considerable shrinkage were obtained for ICT related indicators (e.g. internet connection), which means there have accessed more in recent cycles.
- Slope parameters of many of indicators decreased in the last cycles of TIMSS. It seems that discrimination power of them have been diminished, therefore, alternative indicators should be considered in next cycles of study.

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