



PISA Research Conference

Modeling the reciprocal determinism of self-related beliefs and Achievement

Details can be found in:

Williams, T. and Williams, K. (in press) Self-efficacy and performance in mathematics: Reciprocal determinism in 33 nations. *Journal of Educational Psychology*.



Self-regulated Learning

Self-related beliefs

self-efficacy

self-concept

Emotional factors

anxiety

Motivations

interest/enjoyment

instrumental motivation

attitudes to school

sense of belonging

Learning strategies

memorization/rehearsal

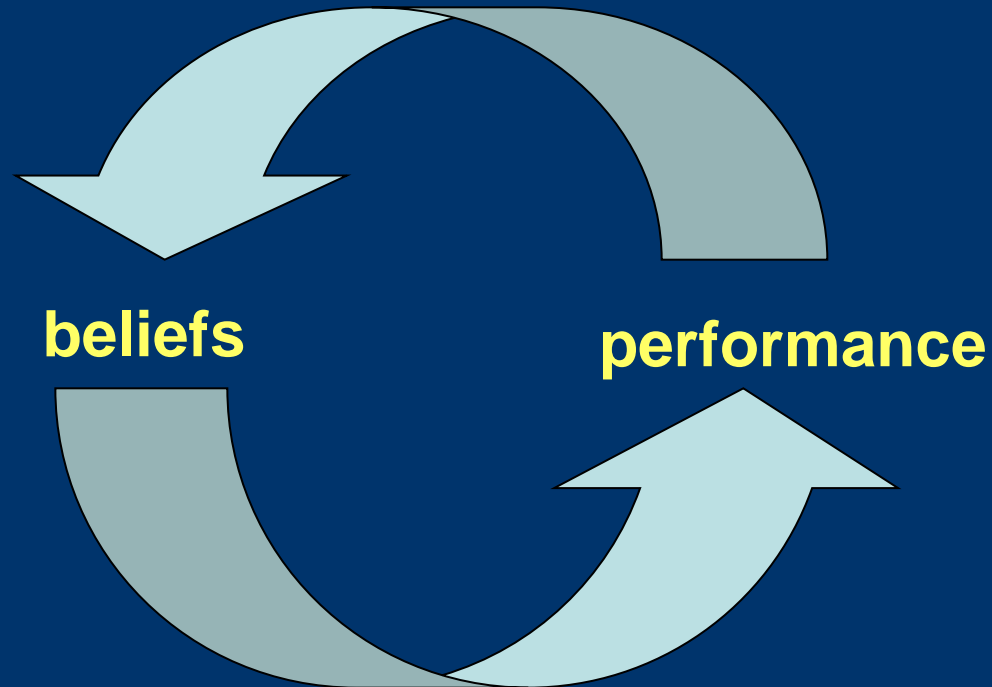
elaboration

control



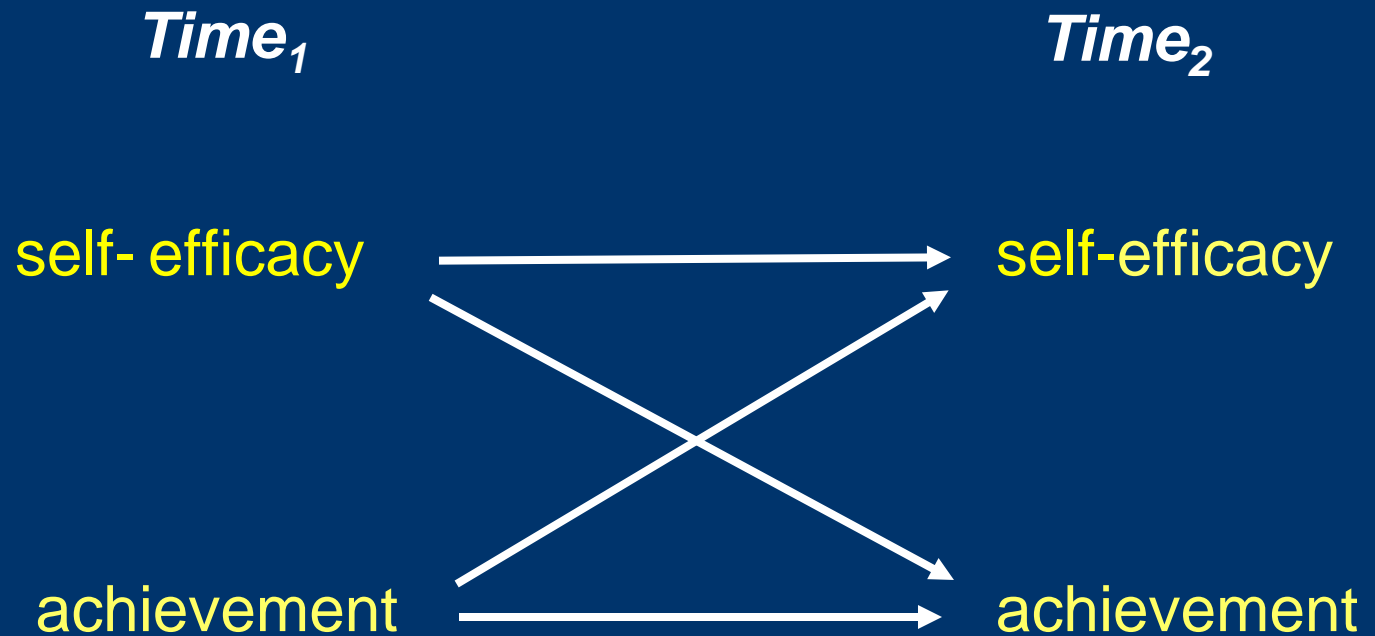
Reciprocal Determinism

reciprocal effects





Modeling Reciprocal Determinism





The Dilemma

- Theory (e.g., Bandura) postulates reciprocal effects; *and*
- PISA acknowledges the likelihood of reciprocal effects; *but*
- modeling reciprocal effects requires repeated measures; *and*
- PISA data are cross-sectional; *so*
- PISA models one-way effects of self-beliefs on performance.

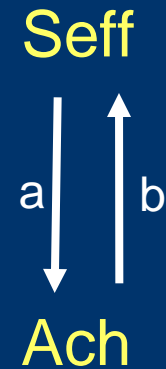
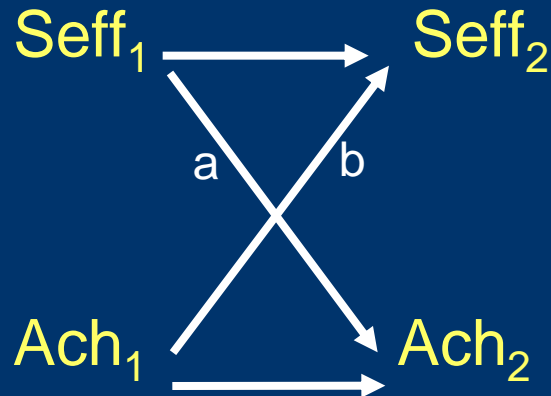


Recursive & Nonrecursive Models

Recursive model

Nonrecursive model

AT EQUILIBRIUM



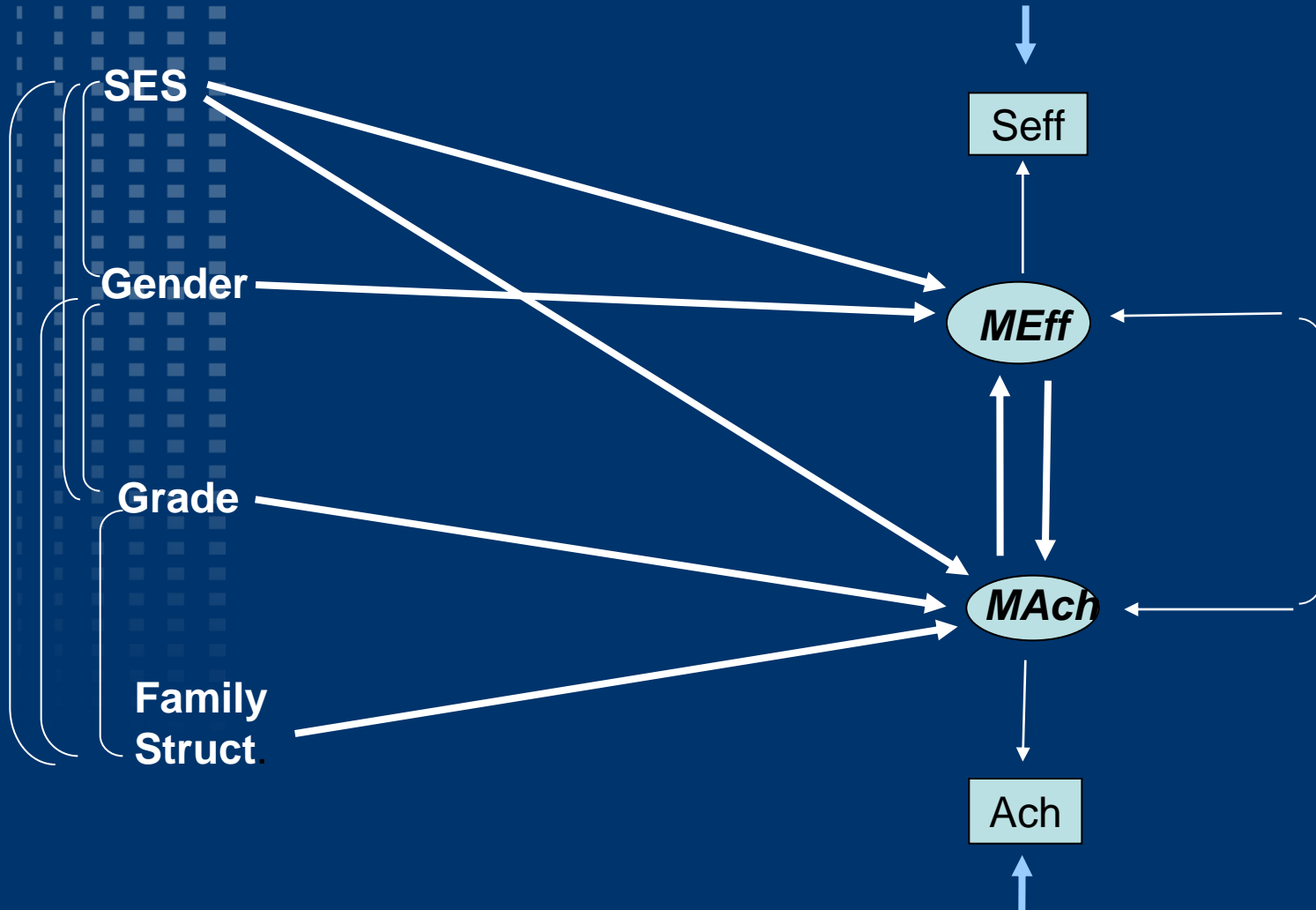


Issues for Nonrecursive Models

- *assume*: system is in equilibrium
- *identification*: under-identified model; fix parameters
- *instrumental variables*: sex, grade, family structure
- *fit of model/data*: over-identified model
- *composite scores*: self-efficacy & achievement



Fixing Parameters





Estimation

- *estimation*: separately for 33 countries
- *plausible values*: estimate model 5 times
- *sampling errors*: estimate model 81 times
- *measure of fit*: design effect adjustment



Model Fit & Reciprocal Effects

	FIT	RD		FIT	RD		FIT	RD
Australia	✓	✓	Hong Kong	✓	✓	New Zealand	✓	✓
Austria	✓	✓	Hungary	✓	✓	Portugal	x	x
Belgium	✓	✓	Indonesia	✓	o	Russian Federation	✓	✓
Brazil	✓	✓	Ireland	x	x	Slovak Republic	✓	s
Canada	✓	✓	Italy	✓	✓	Spain	✓	✓
Czech Republic	✓	s	Latvia	✓	a	Switzerland	✓	✓
Denmark	x	x	Liechtenstein	✓	✓	Thailand	✓	o
Finland	✓	✓	Luxembourg	✓	✓	Tunisia	✓	✓
France	✓	✓	Macao-China	✓	✓	Turkey	✓	✓
Germany	✓	✓	Mexico	x	x	United Kingdom	✓	a
Greece	✓	✓	Netherlands	✓	✓	United States	✓	✓
						Uruguay	✓	✓



Model Fit: Self-efficacy, Self-concept & Engagement

	SEff	Eng	SCA		SEff	Eng	SCA		SEff	Eng	SCA
Australia	✓	x	x	Hong Kong	✓		x	New Zealand	✓	x	x
Austria	✓	✓	x	Hungary	✓	✓	✓	Portugal	x	✓	x
Belgium	✓	✓	✓	Indonesia	✓		x	Russian Federation	✓	✓	x
Brazil	✓	✓	✓	Ireland	x	✓	x	Slovak Republic	✓		x
Canada	✓	✓	x	Italy	✓	✓	x	Spain	✓	✓	✓
Czech Republic	✓	✓	x	Latvia	✓	✓	x	Switzerland	✓	✓	x
Denmark	x	✓	x	Liechtenstein	✓	✓	✓	Thailand	✓		x
Finland	✓	✓	x	Luxembourg	✓	✓	x	Tunisia	✓		x
France	✓	x	✓	Macao-China	✓		✓	Turkey	✓		✓
Germany	✓	x	x	Mexico	x	✓	✓	United Kingdom	✓	✓	x
Greece	✓	✓	✓	Netherlands	✓		x	United States	✓	✓	✓
								Uruguay	✓		x



Reciprocal Determinism: Self-efficacy, Self-concept & Engagement

	SEff	Eng	SCA		SEff	Eng	SCA		SEff	Eng	SCA
Australia	✓	x	x	Hong Kong	✓		x	New Zealand	✓	x	x
Austria	✓	a	x	Hungary	✓	a	✓	Portugal	x	✓	x
Belgium	✓	✓	✓	Indonesia	o		x	Russian Federation	✓	a	x
Brazil	✓	a	✓	Ireland	x	✓	x	Slovak Republic	s		x
Canada	✓	✓	x	Italy	✓	✓	x	Spain	✓	✓	✓
Czech Republic	s	a	x	Latvia	a	✓	x	Switzerland	✓	✓	x
Denmark	x	a	x	Liechtenstein	✓	a	s	Thailand	o		x
Finland	✓	✓	x	Luxembourg	✓	✓	x	Tunisia	✓		x
France	✓	x	✓	Macao-China	✓		✓	Turkey	✓		s
Germany	✓	x	x	Mexico	x	a	s	United Kingdom	a	✓	x
Greece	✓	a	✓	Netherlands	✓		x	United States	✓	✓	s
								Uruguay	✓		x