‘Many roads lead to Rome’:
Pathways to high national maths performance in PISA

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high national maths performance in PISA

Pathways = combinations of factors

The image generated by ChatGPT with Wang's prompt, 11 November 2024.

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Which combination(s) of factors explain high national maths performance in PISA?

Context

- Learn from others - which country?
- Many factors at students, households, schools, education systems, societies

  (Wang, Perry, Malpique & Ide, 2023)
- Factors interact

  (e.g., Niehues et al., 2020; Wang et al., 2022)
- Country context varies + interaction among factors varies

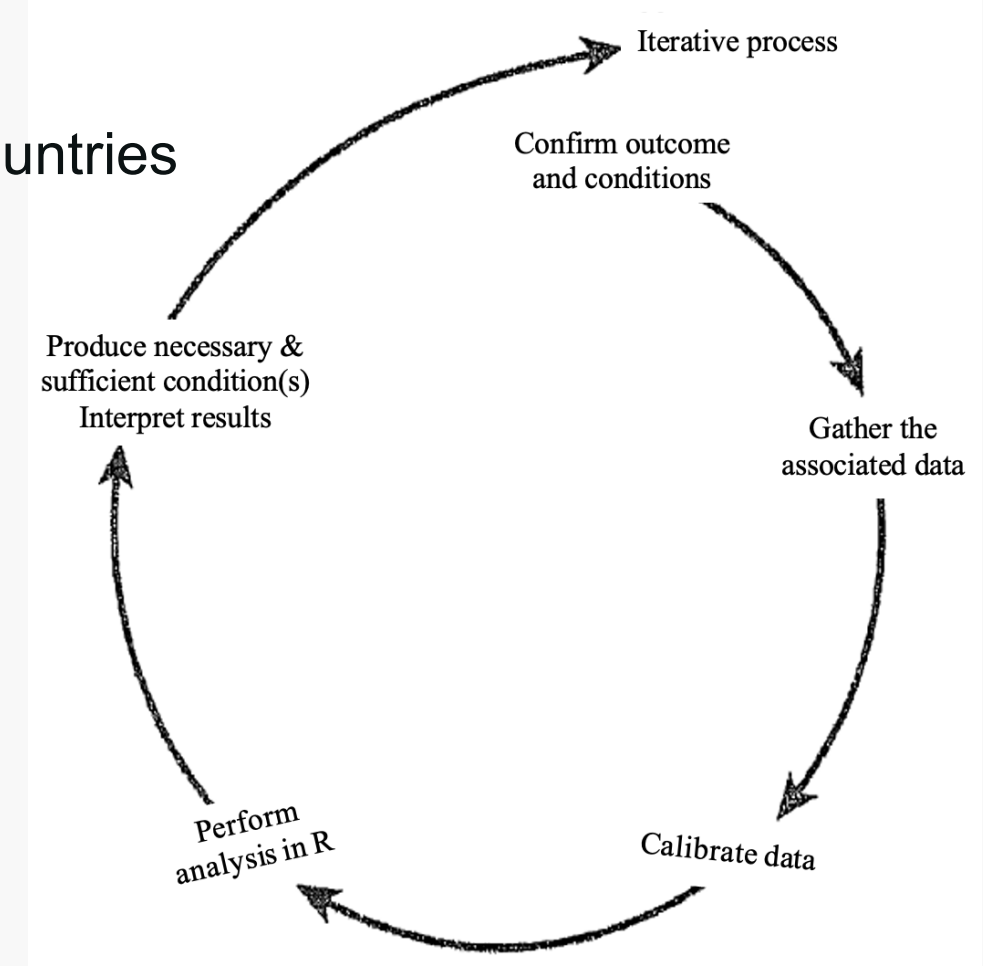
  (e.g., Caro et al., 2016)

The image generated by Copilot with Wang's prompt, 13 November 2024.

Approach

- Outcome of interest: countries' mean score - 49 countries
- Qualitative Comparative Analysis (QCA)
- Individual country as a case
- Combined effect of factors: 13 factors

- Multiple combinations of factors
- Only exist in high-performing countries



(Dusa, 2019; Schneider & Wagemann, 2012)

Findings

- Necessary condition: high human development (except Viet Nam)
- 5 sufficient pathways: explain 17 countries
- Ireland, New Zealand, Slovenia and Viet Nam: not explained
- Pathways only exist in high-performing countries

	Sufficient pathway	Countries
1	FINA_RESO*CONTENT*AVERAGE_SCH*TEACH_DEGREE	KOR; SGP; DEN; POL; FIN; EST; CAN; AUS; GER
2	FINA_RESO*CONTENT*AVERAGE_SCH*LOW_SHORT	KOR; SGP; DEN; POL; FIN; EST; CAN; SUI
3	FINA_RESO*LOW_SHORT*content*average_sch	JPN; MAC; TPE; HKG; AUT
4	EQUAL*low_short*behav	BEL; NED; AUS; GER
5	FINA_RESO*teach_degree*behav	BEL; NED; SUI; AUT

Findings

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Key factors for most countries:
1. human development
2. financial resources for education

	Sufficient pathway	Countries
1	**FINA_RESO**CONTENT*AVERAGE_SCH*TEACH_DEGREE	KOR; SGP; DEN; POL; FIN; EST; CAN; AUS; GER
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Findings

Trivial factors:

1. maths self-efficacy
2. learning time in school
3. percentage of private schooling

Findings

Factors varying across country contexts:

1. maths anxiety
2. students' behaviour
3. maths content exposure
4. teacher shortage
5. maths teacher qualification
6. school SES composition

→ Percentage of students attending socio-economically average schools

	Sufficient pathway	Countries
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Findings

Factors varying across country contexts:

1. maths anxiety
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6. school SES composition

combined

Key factors for most countries:

1. human development
2. financial resources for education

Lessons for PISA participating countries

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- Combinations of factors matter! NOT single factor by itself.
- Country context matters! Factors play out differently - choose which country to learn from.
- In-depth case studies needed

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Thank you

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