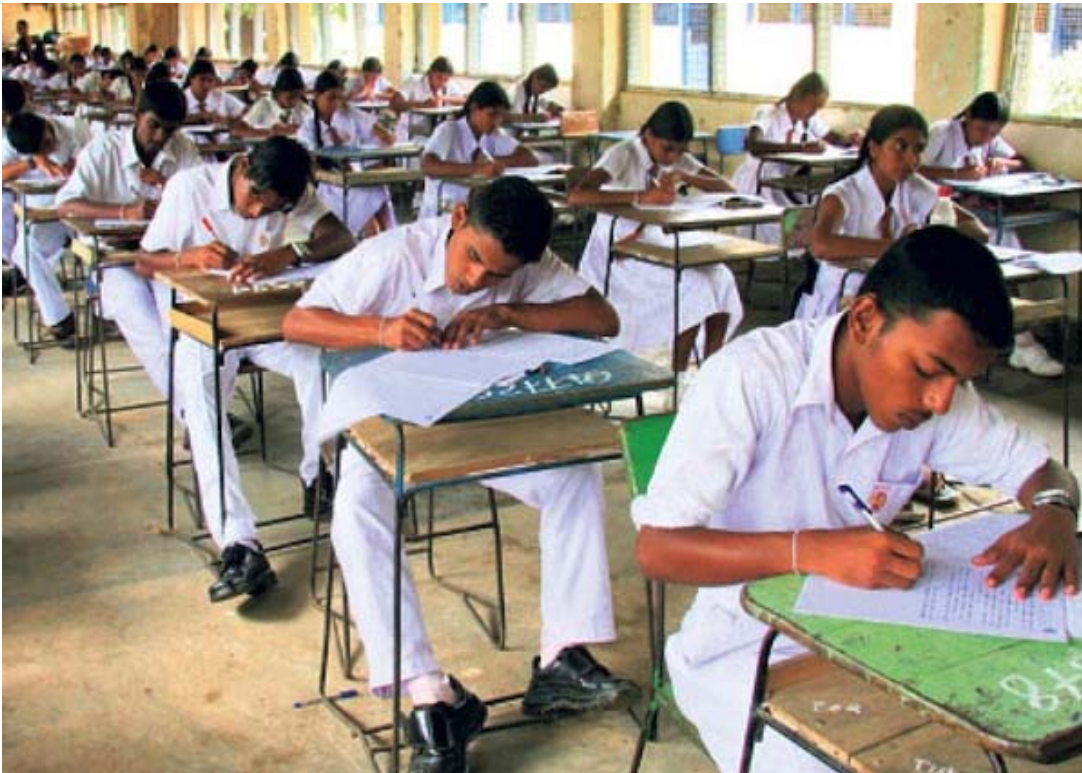


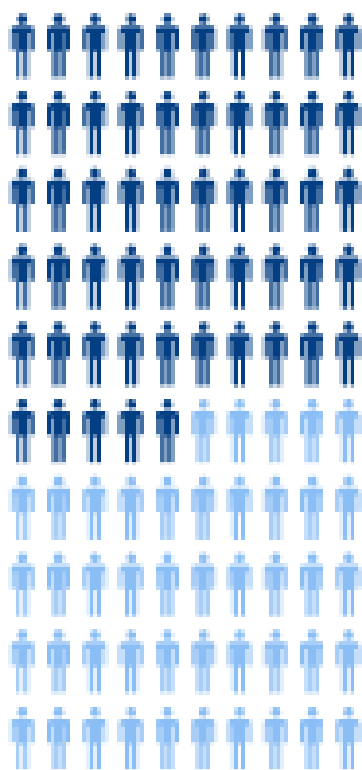
School-Level Bottlenecks in Improving O-Level Performance in Sri Lanka



Ashani Abayasekara
Nisha Arunatilake

10 July 2017

Performance in O-Level Mathematics, 2015



45% failed/conditionally
passed O-Levels

■ Passed (55%) ■ Failed (45%)

Research Questions

How important are school resources in determining O-Level performance?



What types of educational investments matter most?



Important in maximizing the efficiency of government budget allocations

Review of Existing Literature

Developed countries

- No strong relationship between school resources and student performance in the US (Hanushek, 1997)
- Strong and positive relationships between teacher qualifications and education outcomes in North Carolina (Clotfelter et al., 2010)
- Negative effects of higher class sizes on student performance in Greece and Iceland (Wößmann & West, 2006)

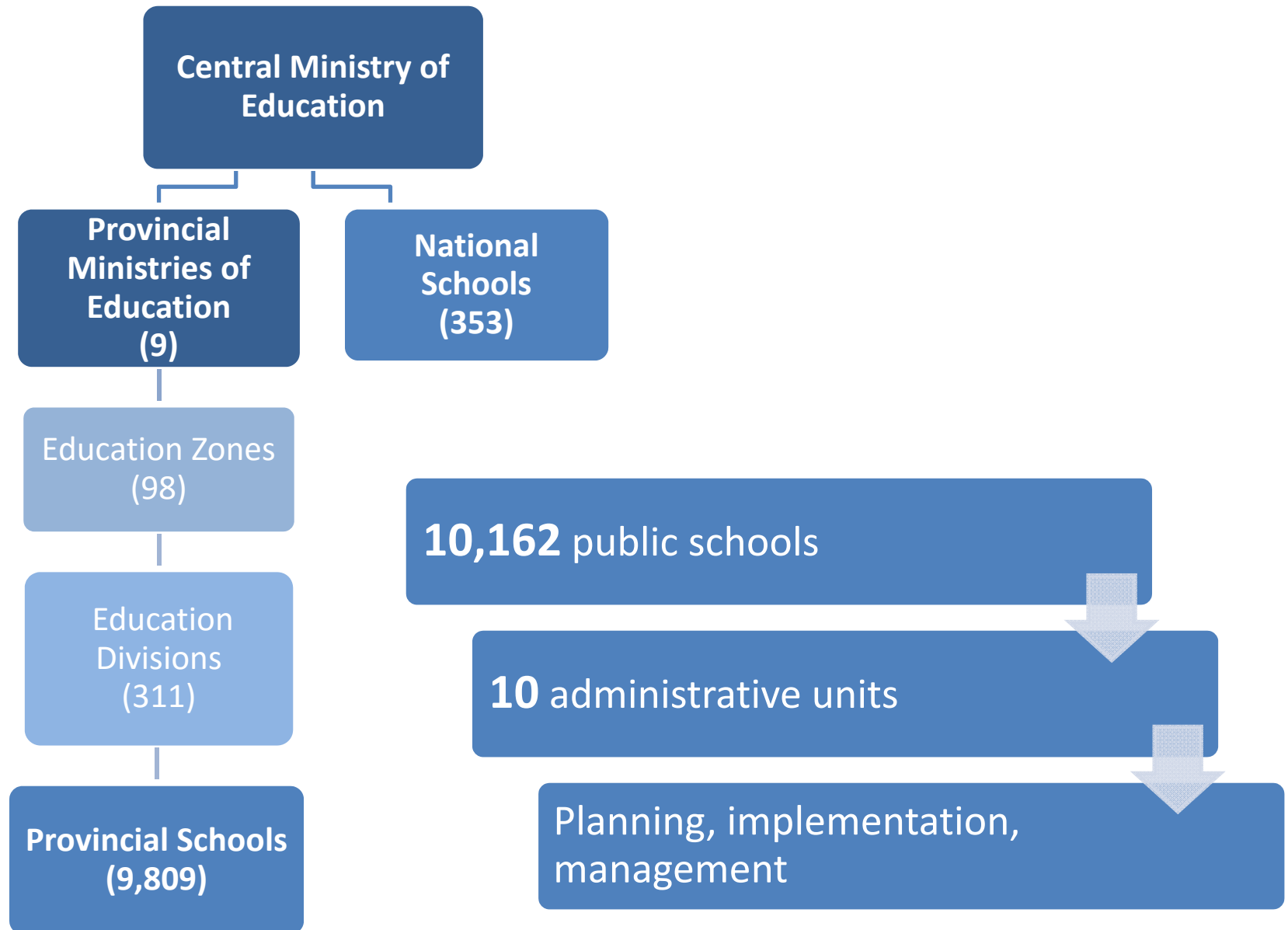
Developing countries

- Statistically insignificant impact of most characteristics on time in school and learning, with the exception of the availability of desks, teacher knowledge of the subjects they teach, and teacher absence (Glewwe et al., 2010)
- Positive influence of teacher credentials in China (Chu et al., 2015)

Sri Lanka

- Survey conducted by NEREC and the University of Colombo among 4th graders
- Principals' and teachers' years of experience, educated parents, better nutrition, high daily attendance, and enrollment in private tutoring classes are important determinants of learning outcomes (Aturupane et al., 2013)

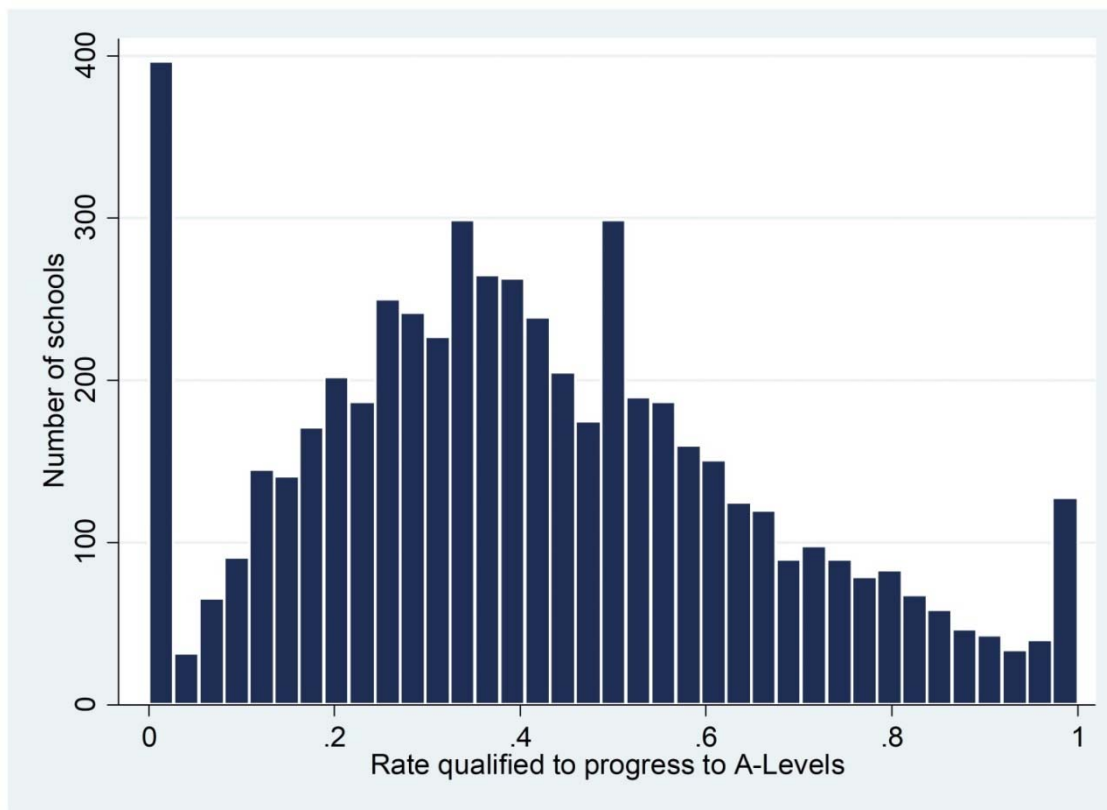
Education Administration Structure



Dependent Variable

Share of students that sit for the O-Levels who qualify to proceed to A-Level classes

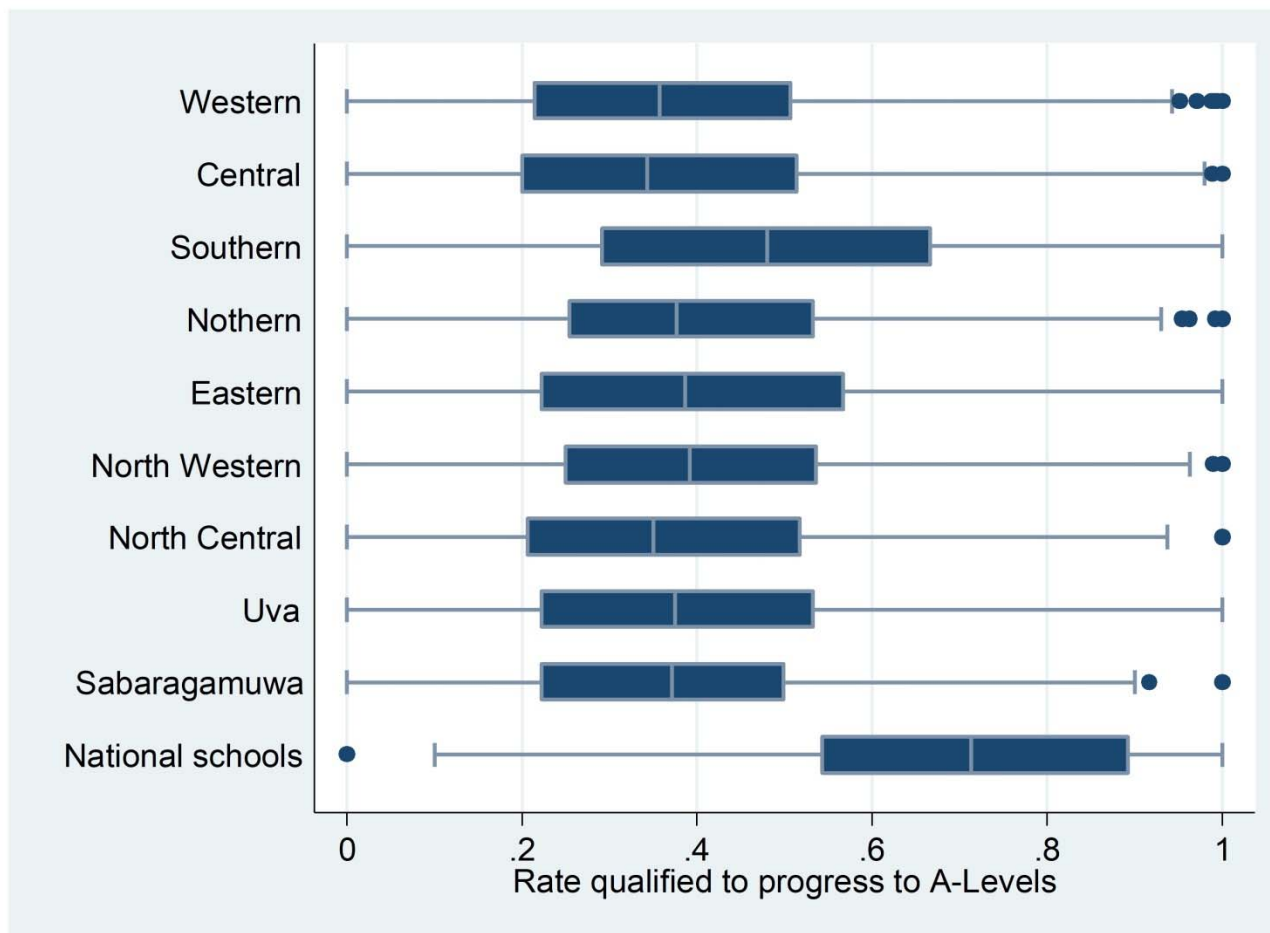
Distribution of Schools by Share of Students Qualifying for A-Levels



Average share:
0.41

Source: School Census 2016

Share of Students Qualifying for A-Levels



Source: Own calculations using 2016 School Census data

Data and Sample

Data

- School-level: 2016 School Census of government schools conducted by the MOE
- Province-level: Department of Census and Statistics

Sample

- **5,688** schools
- Schools with only primary and lower-secondary classes and those with missing values excluded

Independent Variables



Status, type, size, ethnicity



Grade 5 Scholarship holders, school funds

Status

- Highly privileged
- Privileged
- Not privileged
- Underprivileged
- Highly underprivileged

Type

- 1AB
- 1C
- Type 2

Size (No. of students)

- Above 1000
- 200-1000
- Below 200

School funds

- Public funds
- Community funds
- Other funds

Independent Variables cont.



Teacher quality and commitment
(teacher leave)



Principal quality



Poverty headcount ratio,
urbanization rate, unemployment
rate

Teacher Quality

In-field

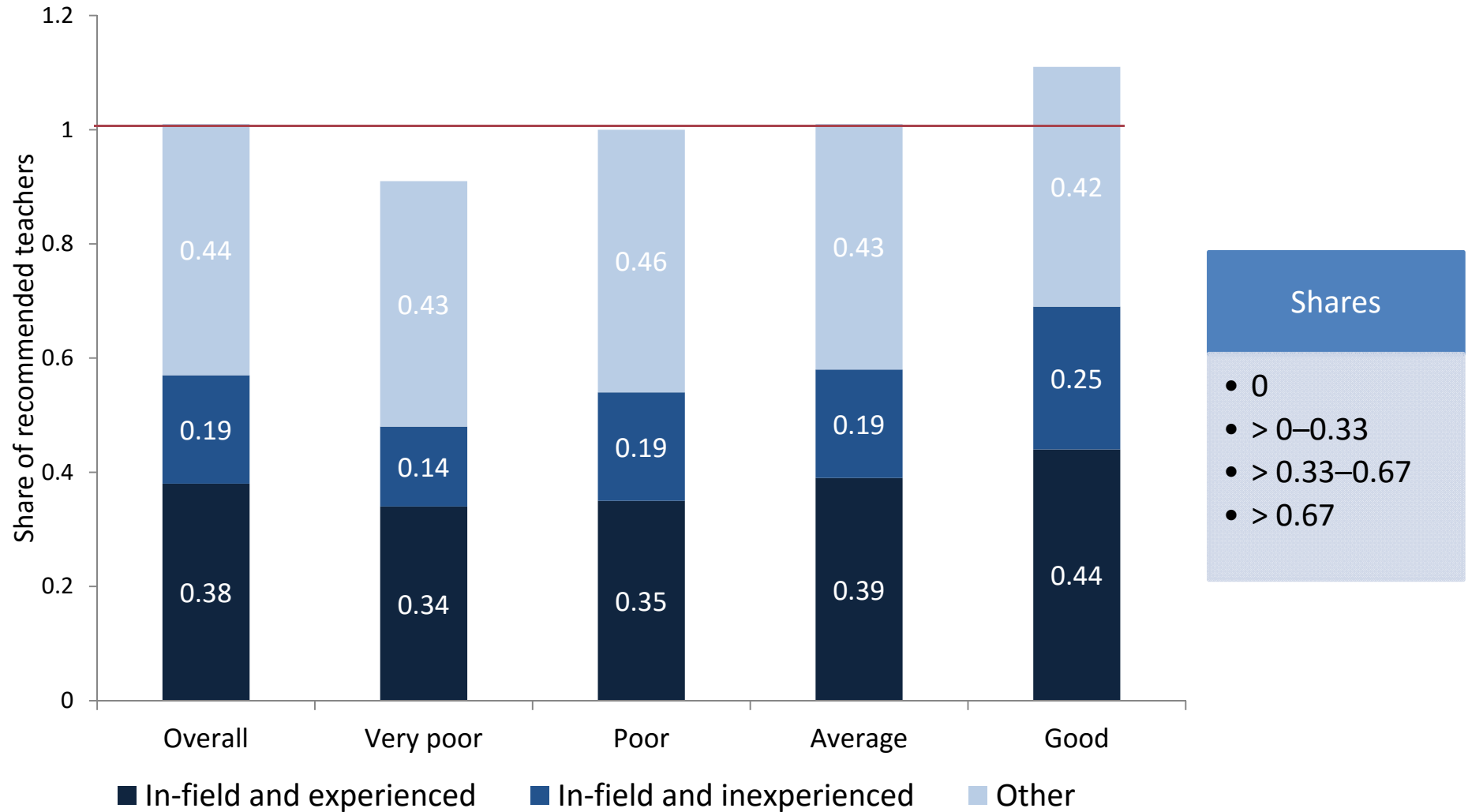
- Holds a degree or has special training in a given subject
- Good subject knowledge in the subject they teach

Experienced

- Belongs to Class 2-Grade II or above in Sri Lanka's Teacher Service
- At least 3 years of experience in addition to pedagogical training

- 3 variables: in-field and experienced, in-field and inexperienced, other
- Shares out of *recommended* number of teachers

Available Mathematics Teachers as a Share of Recommended



Source: Own calculations based on 2016 School Census [data](#)

Principal Quality

Criteria

- Educational/ professional qualifications
- Experience in administration and teaching
- Problem-solving, logical thinking, communication skills

Service Grades

- SL Education Administration Service (SLEAS)
- SL Principals Service (SLPS)
- SL Teachers Service ([SLTS](#))

Methods

OLS

- Standard OLS for a cross-section of schools in 2016

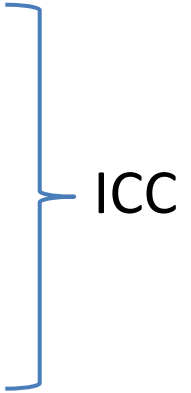
**Hierarchical
Linear
Modelling**

- To account for hierarchical levels of grouped data
- Observations often structured at student, classroom, school, district, province levels

Ordered
Logit

- To allow for multiple ordered response categories and 0–1 range of dependent variable

Hierarchical Linear Modelling (HLM)

- To account for potential correlation of performance rates within different levels
 - Two levels: **school level** (level 1) and **MOE level** (level 2)
 - Test scores at a given level can be correlated:
 - **School level**: access to same school resources and teachers/teaching methods
 - **MOE level**: administrative capacity of each ministry, provincial characteristics
 - **Intra-class correlation (ICC)**: proportion of variance in the dependent variable explained by grouping structure of the hierarchical model
- 

Advantages of HLM

Higher Precision

- Failure to account for ICC can deliver biased standard errors and confidence intervals

Higher Efficiency

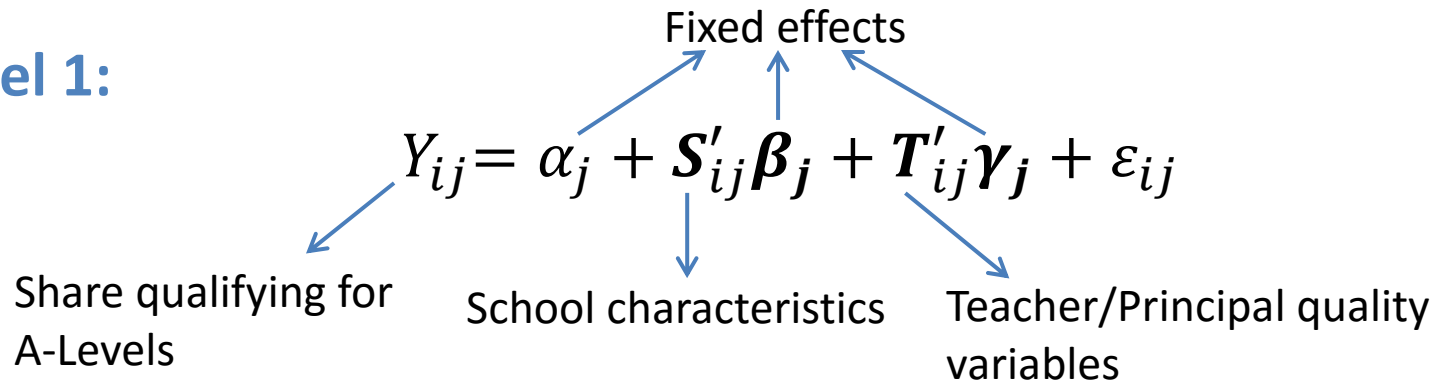
- More efficient at accounting for variance among variables at different levels compared to OLS

Less restrictive

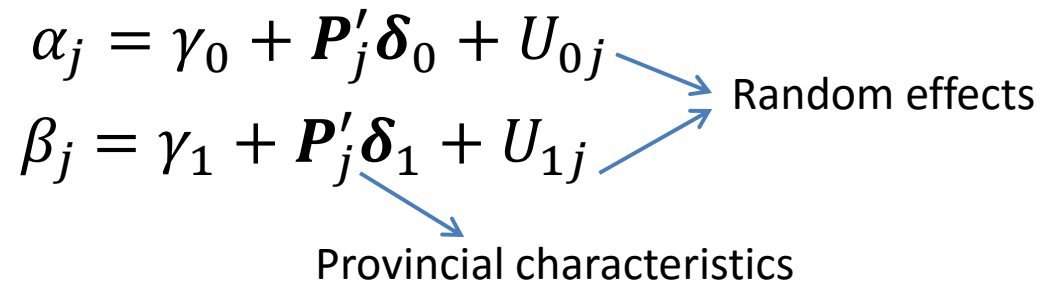
- Fewer number of assumptions compared to other statistical models

HLM cont.

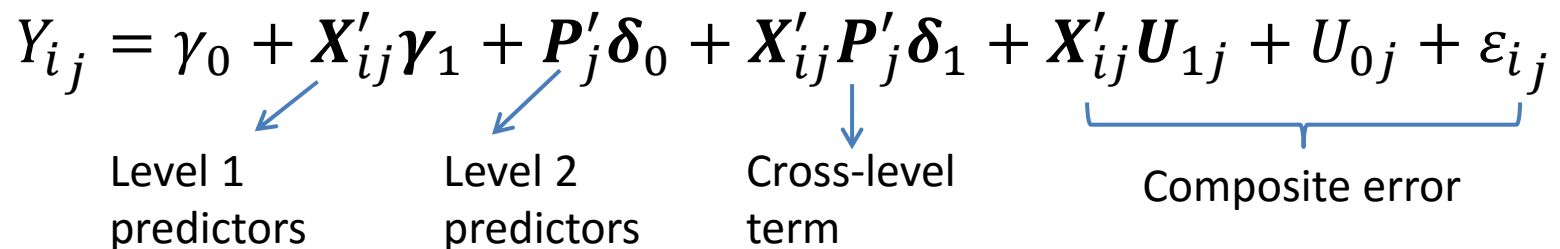
Level 1:



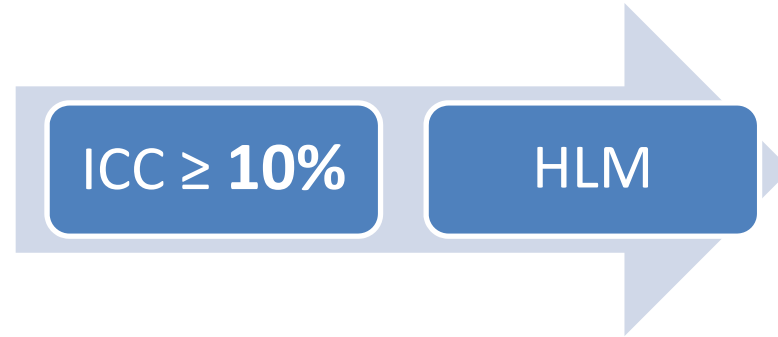
Level 2:



Combined (Mixed) model:



Intra-Class Correlation



“Null”/ “unconditional” multilevel model:

$$Y_{ij} = \underbrace{\gamma_0}_{\text{Mean intercept}} + \underbrace{U_{0j}}_{\text{Residuals}} + \varepsilon_{ij}$$

$$\text{Var}(\varepsilon_{ij}) = \sigma_{\varepsilon}^2$$

$$\text{Var}(U_{0j}) = \sigma_u^2$$

$$\text{ICC} = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_{\varepsilon}^2}$$

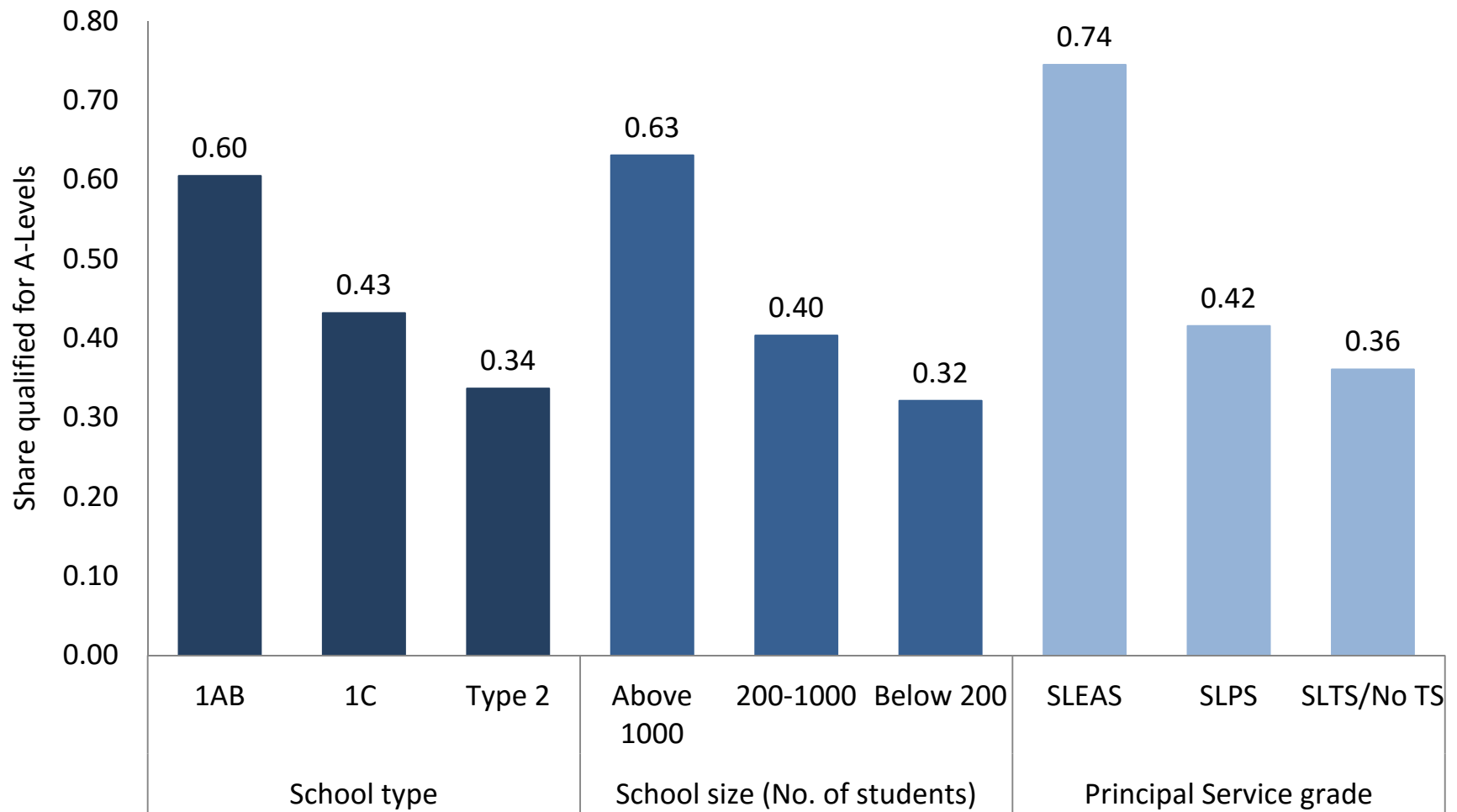
Results

- An ICC of **0.14 – 14%** of the total variation in test scores is due to the province-wise location of each school
- Largely consistent results across the 3 models
- Correlation in outcomes within provinces not overly significant so as to invalidate the results of OLS and ORL
- Modest, but many significant school-level impacts

HLM Estimates

Variables	Overall	National	Provincial
	(1)	(2)	(3)
Highly underprivileged	-0.04**	-0.28***	-0.01
1C	-0.06***	-0.11***	-0.05***
Type 2	-0.12***	-0.14	-0.12***
200-1000	-0.10***	-0.09***	-0.09***
Below 200	-0.14***	-0.43***	-0.14***
Scholarship holders	0.37***	0.35***	0.34***
External funds	0.03**	0.04	0.04***
In-field/exp math teachers	0.02***	0.04	0.03***
In-field/exp 1st language teachers	0.01**	-0.02	0.02***
Leave	-0.38***	-0.55*	-0.38***
SLPS	-0.09***	-0.03*	-0.11***
SLTS/Non-Teacher Service	-0.10***	-0.02	-0.12***
Observations	5,688	346	5,342

O-Level Performance by School Type, Size, and Principal Service Grade



Source: Own calculations using 2016 School Census data

Policy Implications

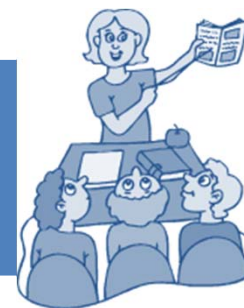
Pay special attention to improving performance standards in small, 1C, and Type 2 schools



- Inferior performance in these schools holds even after controlling for the share of scholarship holders – poorer results not only due to differences in ability
- Require special attention if overall O-Level performance is to be improved nationally

Policy Implications cont.

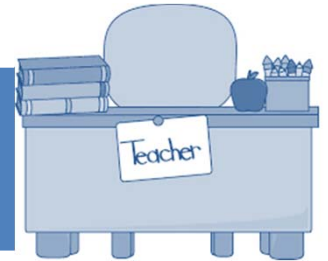
Develop policies to ensure schools attract and cultivate high quality teachers



- Measures to reduce the numbers of unqualified and inexperienced teachers, and raise the shares of in-field and experienced teachers
- Expand the share of qualified and experienced teachers to at least **80%** from the current **40%**
- Systematic training and recruitment of teachers into Teacher Service

Policy Implications cont.

Teacher leave management



- Teachers are on leave for an average of **15%** of total working school days
- Put in place incentive schemes to reduce leave
- Introduce measures to provide substitute teachers in the absence of regulars

Policy Implications cont.

Address principal quality concerns



- **27%** of schools are managed by principals belonging to low ranking grades – which increases to **46%** in *very poor* performing schools
- Enhance the quality of principals' training programs
- Ensure recruitment is carried out in a systematic, merit-based manner

Thank you!

nisha@ips.lk
ashani@ips.lk



Institute of Policy Studies of Sri Lanka
100/2 Independence Avenue,
Colombo 7, Sri Lanka
T: +94 11 2143100

www.ips.lk

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