Starting Early: Returns on Kindergarten Attendance in Indonesia

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May 02, 2024

Introduction

- ▶ Rapid economic growth in Indonesia:
    - ▶ Averaging 5.26% economic growth from 2000 to 2019

- ▶ Robust post-COVID recovery

- ▶ Growth has been accompanied by significant investments in education:
    - ▶ 200% real increase in education spending from 2002 to 2018

- ▶ Rapid gains in schooling:
    - ▶ Completion of primary school is now near-universal
    - ▶ Gender parity in schooling

Introduction

- Human capital has not kept up with growth:
    - 87th in the world in Human Capital Index

- While schooling has improved, learning has not
    - Boys' test scores worsened in math, and girls' didn't improve (2012-2022)
    - 71st in reading, 70th in math, and 67th in science (out of 81 countries)
    - Students lost 11 months of school due to COVID

Motivation to Study Kindergarten

- ▶ Possible solution to improve human capital: **quality early childhood education**

- ▶ Kindergarten is currently sparse in Indonesia, mostly private

- ▶ Little understanding of the educational effects of kindergarten in Indonesia

Research question:
What are kindergarten's effects on educational outcomes?

Kindergarten's Positive Association with Schooling

Figure 1: Years of Education and Year of Birth, by Kindergarten Attendance
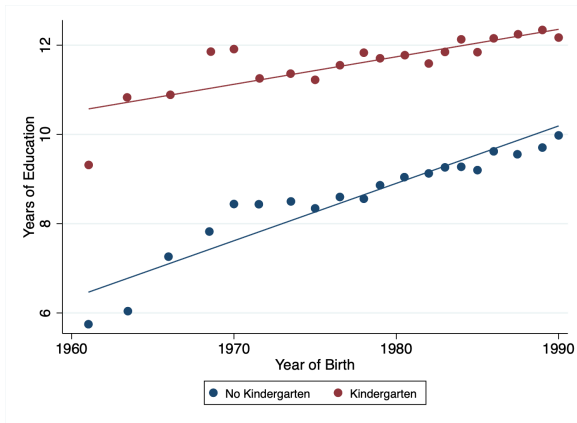
Empirical Findings on Kindergarten's Effects

- **Early childhood interventions are effective**, with considerable heterogeneity (**Garces2000**)

- Effects of programs may **'fade out'** as children age (**Abenavoli2019**)

- Work on preschool in developing countries is limited

- Some evidence positive preschool effects translate to developing countries (**Behrman2013**)

No previous examination of kindergarten's effects over the life-cycle in Indonesia

Data

Indonesian Family Life Survey (IFLS)

- ▶ Multi-wave household and community survey:
    - ▶ **Five waves from 1993 to 2014**
    - ▶ Initial 1993 wave was representative of 83% of the total population

- ▶ Tracks individuals from pre-kindergarten to adulthood

Village Potential Statistics (PODES)

- ▶ Survey of **65,000 villages**

- ▶ Contains critical data IFLS does not:
    - ▶ 1990 and 2000 data on **number of kindergartens and population** in each *kecamatan*, i.e. sub-district

Sample

- All individuals who:
  - Were between 3 and 9 years old in 1997
  - Individually interviewed in both 1997 and 2014

- Main sample: **3,158 individuals**
  - 'Switcher' sample: 221 individuals

- Non-random attrition:
  - Weighting by attrition likelihood does *not* alter results

- Sample approximates educational characteristics of general population

Sample Summary Statistics – Outcome Variables

Table 1: Mean and Standard Deviation of Educational Outcome Variables and Kindergarten Attendance

	Full Sample	Urban		Rural	
		Kinder	No Kinder	Kinder	No Kinder
Kindergarten attendance	0.39	1.00	0.00	1.00	0.00
	(0.49)	(0.00)	(0.00)	(0.00)	(0.00)
Years of education	10.97	12.79	10.79	11.92	9.74
	(3.45)	(2.53)	(3.04)	(2.82)	(3.73)
Completed elementary	0.95	0.99	0.96	0.99	0.90
	(0.22)	(0.08)	(0.20)	(0.11)	(0.30)
Completed junior high	0.81	0.95	0.82	0.92	0.69
	(0.39)	(0.21)	(0.39)	(0.27)	(0.46)
Completed senior high	0.62	0.85	0.61	0.72	0.46
	(0.49)	(0.36)	(0.49)	(0.45)	(0.50)
Cognitive score, ln (2000)	-0.46	-0.33	-0.44	-0.41	-0.55
	(0.38)	(0.28)	(0.35)	(0.34)	(0.43)
Cognitive score, ln (2007)	-0.43	-0.28	-0.41	-0.37	-0.54
	(0.38)	(0.26)	(0.33)	(0.35)	(0.43)
Cognitive score, ln (2014)	-0.56	-0.42	-0.55	-0.47	-0.66
	(0.41)	(0.34)	(0.35)	(0.37)	(0.45)
Number of Observations	3158	700	571	533	1350

Note: Figures in parentheses are standard deviations of each variable.

Sample Summary Statistics – Covariates

Table 2: Mean and Standard Deviation of Key Household Characteristics

	Full Sample	Urban		Rural	
		Kinder	No Kinder	Kinder	No Kinder
Mom's yrs of education	5.73	8.68	5.28	6.79	3.98
	(3.97)	(3.75)	(3.32)	(3.92)	(3.28)
HH head's yrs of education	6.06	8.73	6.04	6.48	4.53
	(4.26)	(4.15)	(3.83)	(4.37)	(3.69)
HH per-capita expenditure (1997)	12.13	12.42	12.11	12.29	11.94
	(0.69)	(0.74)	(0.65)	(0.71)	(0.62)
HH per-capita expenditure (2000)	12.14	12.47	12.08	12.24	11.96
	(0.65)	(0.66)	(0.62)	(0.62)	(0.59)
HH per-capita expenditure (2007)	12.93	13.27	12.92	12.94	12.76
	(0.69)	(0.68)	(0.62)	(0.70)	(0.66)
Number of children in HH	2.60	2.20	2.77	2.34	2.83
	(1.21)	(0.91)	(1.22)	(1.03)	(1.33)
Number of Observations	3158	700	571	533	1350

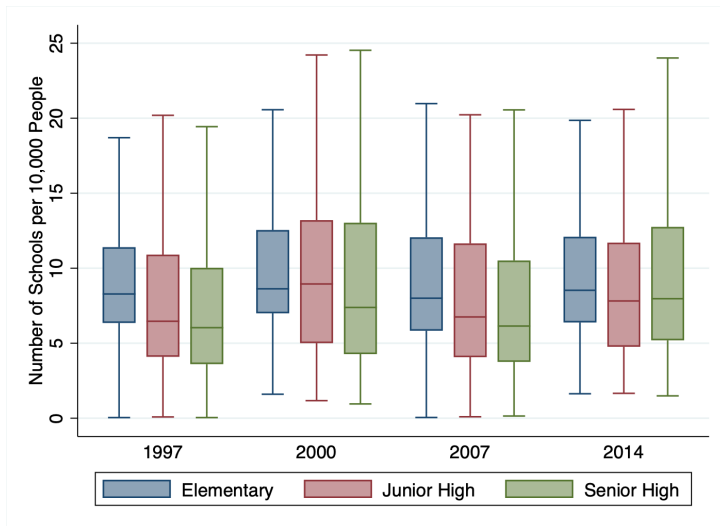Note: Figures in parentheses are standard deviations of each variable.

Instruments

Figure 2: Kindergartens per 10,000 People / Kecamatan, 1990 and 2000
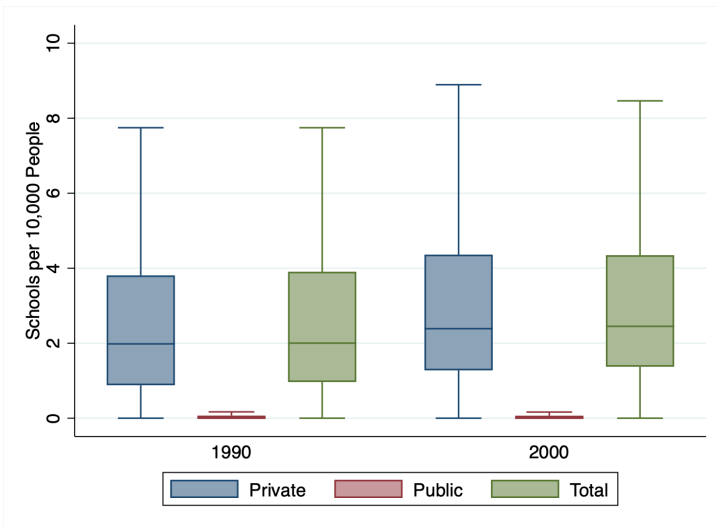
Schools Over Time

Figure 3: Schools per 10,000 People / Kabupaten, Selected Years

Mother Fixed-Effects

- OLS model: omitted variable bias
  - Unobservable household characteristics affect educational outcomes

- Fixed-effects: *all* mother characteristics are controlled for

$$Y_{if} = \beta_0 + \beta_1 \text{KINDER}_{if} + \beta_2 \mathbf{K}_{if} + \mu_f + \epsilon_{if} \tag{1}$$

- Individual i and family f
- Y is outcome variable
- KINDER is whether a child attended kindergarten
- μ_f is the mother fixed-effects
- $\mathbf{K}$ is a vector of individual characteristics

Instrumental Variable (IV) Estimation

- ▶ IV is one way to overcome endogeneity of kindergarten attendance

  Main equation:

  $$Y_i = \alpha_0 + \rho \text{KIN}\hat{\text{D}}\text{ER}_i + \gamma_0 \mathbf{K}_{if} + \beta_0 \mathbf{C}_f + \epsilon_{0i} \qquad (2)$$

  First stage:

  $$\text{KINDER}_i = \alpha_1 + \phi Z_f + \gamma_1 \mathbf{K}_{if} + \beta_1 \mathbf{C}_f + \epsilon_{1i} \qquad (3)$$

- ▶ Z is the instrument
- ▶ **C** is a vector of household and community characteristics

  Instruments:

1. kindergartens per 10,000 people / kecamatan in 1990
2. kindergartens per 10,000 people / kecamatan in 2000

Instrument Validity and Strength

Instruments have to be (1) strong and (2) valid:

(1) **Strength**:
- ▶ Strongly correlated with kindergarten attendance
- ▶ Statistically significant in first-stage regression

(2) **Validity**:
- ▶ Exogenous to educational outcomes when kindergarten is controlled for
- ▶ Over-identifying test

Results

Educational outcomes of interest:

- ▶ Years of Education Completed

- ▶ School Completion

- ▶ School Attendance and Stay-On Decision

- ▶ Cognitive Test Scores

Years of Education Completed

Table 3: Kindergarten's Effects on Completed Years of Education

	(1)	(2)	(3)
Kindergarten	0.74***	-0.06	1.70***
	(0.13)	(0.44)	(0.64)
Mom's yrs of education	0.16***		0.13***
	(0.02)		(0.02)
HH per-capita expenditure (1997)	0.14		0.11
	(0.09)		(0.09)
HH per-capita expenditure (2000)	0.36***		0.32***
	(0.10)		(0.11)
HH per-capita expenditure (2007)	1.14***		1.12***
	(0.09)		(0.09)
Model	OLS	FE	IV
Adjusted R-squared	0.38	0.07	0.37
Number of observations	3154	221	3154

Heteroskedastic-robust standard errors are reported in parentheses.

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$

School Completion

Table 4: Kindergarten's Effects on Elementary/Junior/Senior High Completion

	Elementary		Junior High		Senior High	
	OLS	IV	OLS	IV	OLS	IV
Kindergarten	0.01*	0.10**	0.07***	0.28***	0.10***	0.12
	(0.01)	(0.04)	(0.02)	(0.08)	(0.02)	(0.10)
Mom's yrs of education	0.00	-0.00	0.01***	0.00	0.02***	0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
HH per-capita expenditure (1997)	-0.00	-0.00	0.00	-0.01	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
HH per-capita expenditure (2000)	0.01	0.00	0.02	0.01	0.04**	0.04**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
HH per-capita expenditure (2007)	0.04***	0.04***	0.08***	0.08***	0.12***	0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Model	OLS	IV	OLS	IV	OLS	IV
Adjusted R-squared	0.08	0.05	0.18	0.14	0.26	0.26
Number of observations	3154	3154	3154	3154	3154	3154

Heteroskedastic-robust standard errors are reported in parentheses.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

School Attendance

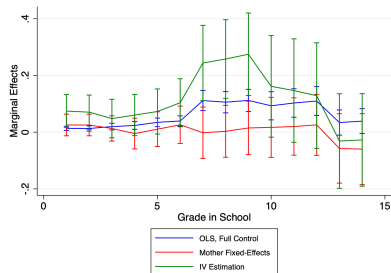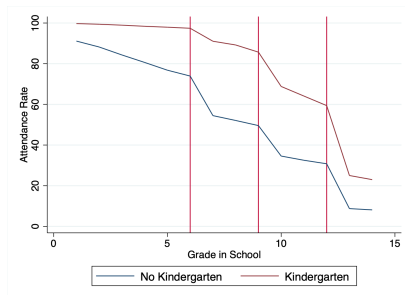Figure 4: Marginal Effects of Kindergarten on Attendance, by Grade

Stay-On

Table 5: Kindergarten's Effects on Stay-On, for Selected Grades

	6th Grade		9th Grade		12th Grade	
Kindergarten	0.05***	0.16**	0.04**	-0.01	0.05*	-0.03
	(0.01)	(0.06)	(0.02)	(0.09)	(0.03)	(0.12)
Mom's yrs of education	0.01***	0.00	0.01***	0.02***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
HH per-capita expenditure (1997)	-0.00	-0.01	0.02*	0.03**	0.02	0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
HH per-capita expenditure (2000)	0.01	0.00	0.03**	0.03**	0.06***	0.06***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
HH per-capita expenditure (2007)	0.04***	0.04***	0.06***	0.07***	0.15***	0.15***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Model	OLS	IV	OLS	IV	OLS	IV
Adjusted R-squared	0.13	0.11	0.15	0.15	0.25	0.24
Number of observations	2987	2987	2564	2564	1950	1950

Heteroskedastic-robust standard errors are reported in parentheses.

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$

Cognitive Test Scores

Table 6: Kindergarten's Effects on Cognitive Test Scores, Standardized by Age

	2000		2007		2014	
Kindergarten	0.06***	-0.12	0.05**	-0.03	0.02	-0.05
	(0.02)	(0.11)	(0.02)	(0.11)	(0.02)	(0.11)
Mom's yrs of education	0.01**	0.01***	0.01***	0.01**	0.02***	0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
HH per-capita expenditure (1997)	0.00	0.01	0.01	0.01	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
HH per-capita expenditure (2000)	0.01	0.01	0.01	0.01	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
HH per-capita expenditure (2007)	0.04***	0.05***	0.04***	0.04***	0.05***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Model	OLS	IV	OLS	IV	OLS	IV
Adjusted R-squared	0.20	0.17	0.15	0.15	0.14	0.14
Number of observations	2117	2117	2117	2117	2117	2117

Heteroskedastic-robust standard errors are reported in parentheses.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

Interpretation of Results

▶ Kindergarten has a positive association with schooling, mixed results for cognitive performance

▶ Results suggest 'fade-out' in effect:
  ▶ For attendance and stay-on: kindergarten's effect peaked in junior high school

▶ IV found stronger coefficients for schooling than OLS

▶ Opposite was true for cognitive performance

Conclusion and Future Work

- ▶ Divergence between schooling and learning
  - ▶ Mirrors broader concerns about Indonesia's education system

- ▶ Could this be related to quality of kindergarten? Cost of private kindergarten?

- ▶ Motivate closer look at kindergarten before public expansion is pursued:
  - ▶ Kindergarten's relationship with earnings
  - ▶ Role of quality in Indonesian education system
  - ▶ Effect of informal playgroups vs. formal kindergarten

Acknowledgements

I want to thank: