Causal Evidence on the Effectiveness and Efficiency of Church Schools

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Research in progress.

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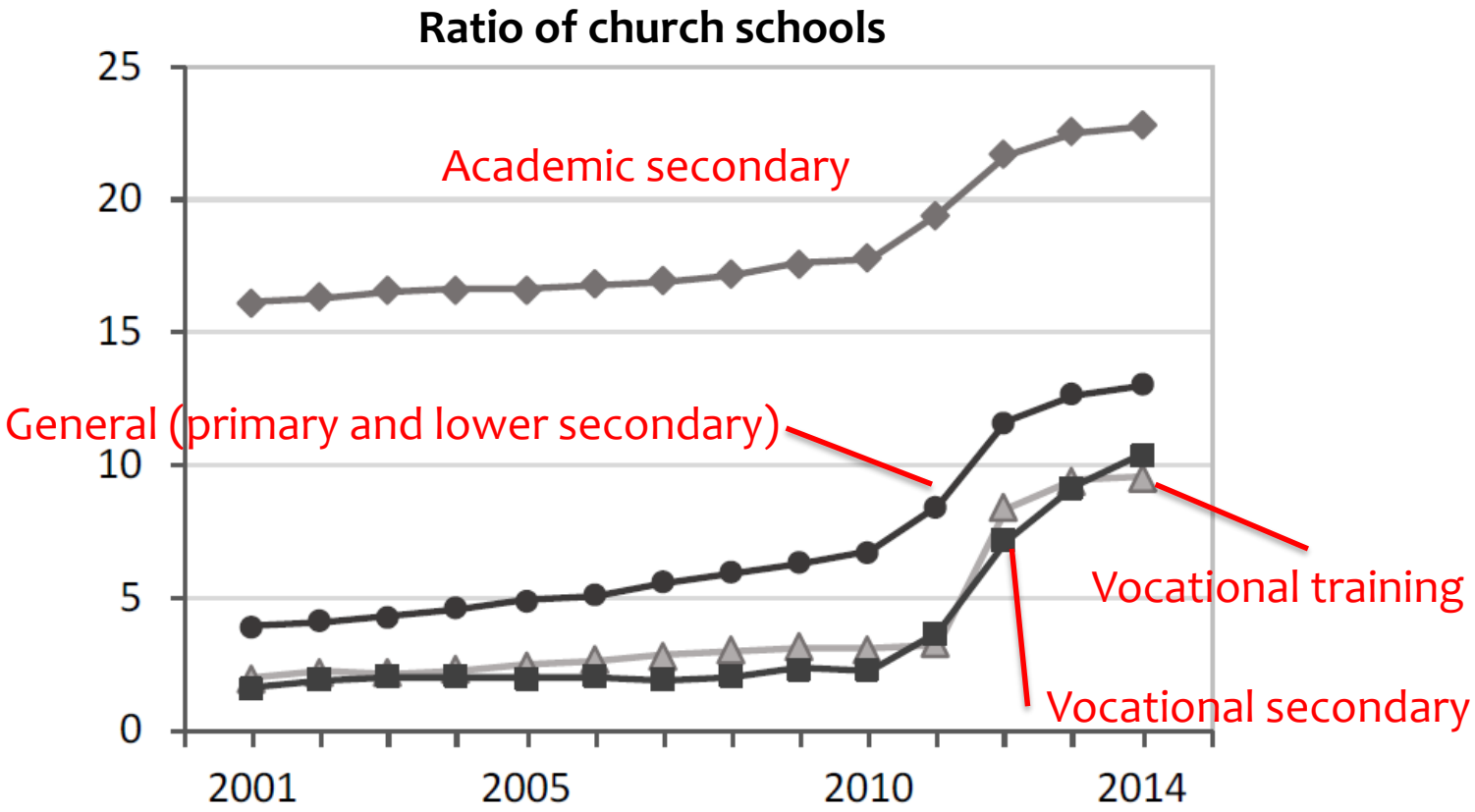
Outline

- One slide of background
- 2 Methods – 2 papers
  - Individual level analysis – with heterogeneous treatment effects (OLS, ITT and IV)
  - School level analysis – with efficiency analysis (DiD)
- Data
- Results
  - IV
  - DiD
- Caveats
- Future steps

Background

In 2010 a minor change in the regulation of taking schools over from local governments resulted in a big change in school ownership.



Source: Hermann-Varga 2016

Method 1- individual level analysis

We estimate the following (OLS) equation

- $A_{ist}^{8} = \alpha_t + \alpha_s + \beta T_{ist}^{8} + \sum \pi_j X_{jist} + \delta A_{ist}^{6} + u_{ist}$

Where

- A_{ist}^{8} is test score in grade 8, for *i* individual, *s* school and *t* time.
- α_t and α_s are time and school fixed-effects (8th grade)
- X – individual controls (education of mother/father, books at home, female, SEN student),
- score grade 6 reading and math test score
- A_{ist}^{6}– 6th grade math/reading test score and their square
- u_{ist}– individual errors, clustered on school level
- *T* – „*Treatment*", where T=1 if 8th grade student studied in a school, which was taken over by church in the last 2 years (i.e beginning of 7th or 8th grade). (Note: student could move)

Method 1- individual level analysis

Problem with T in the equation above: students could leave or enter changing schools.

We estimate the following equation to deal with this:

- $A_{ist}^{8} = \alpha_t + \alpha_s + \beta ITT_{ist}^{6} + \sum \pi_j X_{jist} + \delta A_{ist}^{6} + u_{ist}$

Where

- *ITT – intention to treat,* where ITT=1 if 6th grade student studied in a school, which was taken over by church in the next 2 years (i.e beginning of 7th or 8th grade). (Note: students could move)

Using ITT we can estimate an IV model:

- First stage: $T_{ist}^{8} = \alpha_t + \alpha_s + \beta ITT_{ist}^{6} + \sum \pi_j X_{jist} + \delta A_{ist}^{6} + u_{ist}$

- 2SLS: $A_{ist}^{8} = \alpha_t + \alpha_s + \beta \widehat{T_{ist}^{8}} + \sum \pi_j X_{jist} + \delta A_{ist}^{6} + u_{ist}$

Method 1- individual level analysis

Additional tests:

1. T1 and T2 for 7th and 8th grade (treatment intensity)
2. Subsample of low/high educated mothers
3. Sample of small villages
4. 10th grade outcome

Method 2 – school level analysis

We estimate the following (DiD) equation (baseline)

- $A_{st}^{8} = \alpha_t + \alpha_s + \beta C_{st}^{8} + \sum \pi_j X_{jst} + \delta A_{st}^{6} + u_{st}$

Where

- A_{st}^{8} is test score in grade 8, for s school and *t* time.
- α_t and α_s are time and school fixed-effects (8th grade)
- X – school level controls (education of mother/father, books at home, female, SEN student, early tracking student, mover student),
- score grade 6 reading and math test score
- A_{st}^{6}– 6th grade math/reading test score
- u_{st}– errors clustered on school level
- C – „*Church*", where C=1 if 8th grade student studied in a church school

Method 2 – school level analysis

Additional tests:

1. Value added method (individual level VA measures on LHS)
2. Weighted VA
3. Matched samples (NN5 and one-to-one)

Data

- National Assessment of Basic Competencies (NABC)
- 2008-2018
- 8th grade students
- cca 560.000 cases (with available controls)
- cca. 15% movers or around 200 schools

Method 1 – individual level data

Baseline specification – 8th grade math

8th grade	(4)	(5)	(6)	(7)	(8)	(9)
	math	math	math	math	math	math
VARIABLES	OLS	ITT	IV	OLS	ITT	IV
treated	0.0347		0.0595**			
	(0.0269)		(0.0298)			
itt		0.0510**				
		(0.0237)				
treated_1				0.00853		0.0385
				(0.0284)		(0.0320)
treated_2				0.0649*		0.0833**
				(0.0356)		(0.0394)
itt_1					0.0330	
					(0.0259)	
itt_2					0.0720**	
					(0.0325)	
Observations	556,780	556,785	556,017	556,780	556,785	556,017
R-squared	0.534	0.534	0.534	0.534	0.534	0.534
Number of th_az	3,198	3,197	3,190	3,198	3,197	3,190
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Baseline specification – 8th grade read

8th grade	(4)	(5)	(6)	(7)	(8)	(9)
	read	read	read	read	read	read
VARIABLES	OLS	ITT	IV	OLS	ITT	IV
treated	0.0518**		0.0557**			
	(0.0220)		(0.0239)			
itt		0.0454**				
		(0.0191)				
treated_1				0.0431*		0.0495*
				(0.0256)		(0.0279)
treated_2				0.0618**		0.0626**
				(0.0249)		(0.0271)
itt_1					0.0406*	
					(0.0226)	
itt_2					0.0509**	
					(0.0223)	
Observations	557,033	557,037	556,267	557,033	557,037	556,267
R-squared	0.588	0.588	0.588	0.588	0.588	0.588
Number of th_az	3,198	3,197	3,190	3,198	3,197	3,190
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Other (IV) specifications – 10th grade

10th grade	(6)	(9)	(6)	(9)
	10th math	10th math	10th read	10th read
VARIABLE	IV	IV	IV	IV
treated	0.0249		0.0199	
	(0.0184)		(0.0167)	
treated_1		0.0204		0.0223
		(0.0221)		(0.0196)
treated_2		0.0310		0.0167
		(0.0218)		(0.0207)
Observatio	357,345	357,345	357,526	357,526
R-squared	0.540	0.540	0.576	0.576
Number of	3,115	3,115	3,115	3,115
N_clust	3115	3115	3115	3115

Other (IV) specifications – low ed. mother

	(6)	(9)	(18)	(21)	(30)	(33)	(42)	(45)
	math	math	read	read	10th math	10th math	10th read	10th read
VARIABLE	IV	IV	IV	IV	IV	IV	IV	IV
treated	0.0800**		0.0783**		0.0483*		0.0384	
	(0.0392)		(0.0343)		(0.0268)		(0.0240)	
treated_1		0.0423		0.0748*		0.0392		0.0404
		(0.0454)		(0.0409)		(0.0315)		(0.0273)
treated_2		0.123**		0.0831**		0.0611*		0.0355
		(0.0496)		(0.0405)		(0.0322)		(0.0321)
Observatio	205,729	205,729	205,846	205,846	122,236	122,236	122,294	122,294
R-squared	0.413	0.413	0.510	0.510	0.441	0.441	0.524	0.524
Number of	3,121	3,121	3,122	3,122	3,024	3,024	3,025	3,025
N_clust	3121	3121	3122	3122	3024	3024	3025	3025
Robust standard errors in parentheses								
*** p<0.01, ** p<0.05, * p<0.1								

Other (IV) specifications – villages

	(30)	(33)	(42)	(45)
	math	math	read	read
	g6 scores	g6 scores	g6 scores	g6 scores
VARIABLES	IV	IV	IV	IV
treated	0.0510		0.0776**	
	(0.0465)		(0.0393)	
treated_1		0.0136		0.0793
		(0.0534)		(0.0499)
treated_2		0.0946		0.0738
		(0.0642)		(0.0477)
Observations	151,867	152,023	151,933	152,089
R-squared	0.484	0.484	0.571	0.570
Number of th_az	1,400	1,400	1,400	1,400
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Method 2 - School level data

Baseline specification – 8th grade

	(1) reading_g8	(2) reading_g8	(3) reading_g8	(4) reading_g8	(5) math_g8	(6) math_g8	(7) math_g8	(8) math_g8
Grade 8 school: church	**8.264**	**8.758***	**8.847***	**7.728**	**-1.516**	**1.427**	**1.460**	**2.288**
	(5.280)	**(4.066)**	**(4.078)**	**(8.407)**	**(6.099)**	**(5.153)**	**(5.166)**	**(10.226)**
School and Cohort FE	yes	yes	yes	yes	yes	yes	yes	yes
Controls		yes	yes	yes		yes	yes	yes
Additional controls			yes	yes			yes	yes
School-specific linear trend				1				1
Adj. R-squared	0.706	0.778	0.778	0.785	0.628	0.685	0.685	0.706
N	19467	19458	19458	19458	19466	19457	19457	19457

Dependent variable: Grade 8 test score

+ p < .10, * p < .05, ** p < .01

Robust standard errors clustered at the school level

Controls: grade 6 reading and math test score, education of mother/father, books at home, female, SEN student, early tracking student, changed school between grade 6 and 8

Additonal controls: N of teachers at the school site per student, ln(N of students in the cohort, grade 8), Roma students

VA specification – 8th grade

	(1) reading8	(2) reading8	(3) math8	(4) math8
Church school	**9.327****	**11.843**+**	**5.102**	**9.534**
	(3.272)	**(6.887)**	**(4.464)**	**(8.915)**
School and cohort FE	1	1	1	1
School-specific linear trend		1		1
Adj. R-squared	0.135	0.147	0.125	0.166
N	19467	19467	19466	19466

Not weighted
Dependent variable: School VA
+ p < .10, * p < .05, ** p < .01
Robust standard errors clustered at the school level

VA specification (weighted) – 8th grade

	(1) reading8	(2) reading8	(3) math8	(4) math8
Church school	**8.916****	**14.544***	**5.451**	**12.574**
	(3.055)	**(6.617)**	**(4.141)**	**(8.246)**
School and cohort FE	1	1	1	1
School-specific linear trend		1		1
Adj. R-squared	0.138	0.151	0.128	0.171
N	19467	19467	19466	19466

Weighted with SE
Dependent variable: School VA
+ p < .10, * p < .05, ** p < .01
Robust standard errors clustered at the school level

NN 5 specification – 8th grade

	(1) reading_g8	(2) reading_g8	(3) reading_g8	(4) reading_g8	(5) math_g8	(6) math_g8	(7) math_g8	(8) math_g8
Grade 8 school: church	**6.118 (5.327)**	**4.982 (4.214)**	**4.876 (4.210)**	**7.202 (8.666)**	**1.244 (6.660)**	**2.496 (5.652)**	**2.171 (5.645)**	**2.264 (10.672)**
School and Cohort FE	yes	yes	yes	yes	yes	yes	yes	yes
Controls		yes	yes	yes		yes	yes	yes
Additional controls			yes	yes			yes	yes
School-specific linear trend				1				1
Adj. R-squared	0.590	0.696	0.696	0.698	0.500	0.592	0.592	0.614
N	4722	4722	4722	4722	4721	4721	4721	4721

Dependent variable: Grade 8 test score

+ p < .10, * p < .05, ** p < .01

Robust standard errors clustered at the school level

Controls: grade 6 reading and math test score, education of mother/father, books at home, female, SEN student, early tracking student, changed school between grade 6 and 8

Additonal controls: N of teachers at the school site per student, ln(N of students in the cohort, grade 8), Roma students

VA NN5 specification (weighted)

	(1) reading8	(2) reading8	(3) math8	(4) math8
Church school	**5.942+**	**12.623+**	**5.902**	**11.888**
	(3.267)	**(6.902)**	**(4.641)**	**(8.855)**
School and cohort FE	1	1	1	1
School-specific linear trend		1		1
Adj. R-squared	0.081	0.078	0.061	0.097
N	4722	4722	4721	4721

Weighted with SE
Dependent variable: School VA
+ p < .10, * p < .05, ** p < .01
Robust standard errors clustered at the school level

Conclusion

- Church schools seems to be a bit more effective.
- Maybe due to the larger effect on students of low ed. mothers.
- Question: is there an efficiency effect?
- Can we differentiate it by parental background?

Thank you for your attention

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2011	2012	2013	2014	2015	Freq.	Percent.	Cum.
P	P	P	P	P	2,030	83.03	83.03
C	C	C	C	C	210	8.59	91.62
P	C	C	C	C	34	1.39	93.01
P	P	C	C	C	80	3.27	96.28
P	P	P	C	C	20	0.82	97.1
P	P	P	P	C	2	0.08	97.18
		other			69	2.82	100
		Total			2,445	100	