



# Using Two-Step Least Squares Method to Estimate the Effect of Education Policy on Student Outcomes



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## INTRODUCTION

Implementing policies face a range of challenges including direct and indirect interventions. These challenges have the potential to reduce the impact of the policies implementations.

## OBJECTIVES

- 1) To examine the impact of class size effects on student outcomes while controlling for relevant proxies of other policy attributes listed in the MEB.
- 2) To compare the findings from the proposed method with another standard method.

## LITERATURE REVIEW

Woessmann and West (2006) show that using an instrument of variation in the population, class size does not have a significant impact on student achievement in the US; whereas Cho *et al.* (2012) show that there is a positive and significant impact of smaller class sizes on student achievement in Minnesota by addressing potential bias estimates in the standard model.

## RESULTS

**Table 1** Effect of class size on student attainment

Dependent variable: Test scores in Science	OLS		2SLS	
	(1) Boys	(2) Girls	(3) Boys	(4) Girls
Class size	3.73* (0.73)	2.04* (0.65)	0.61 (0.60)	0.47 (0.47)
First-stage IV estimates (Dependent variable: Class size)				
Eight-grade size			0.01* (0.00)	0.01* (0.00)
School size (enrolment)			0.00* (0.00)	0.00* (0.00)
Observations	2815	2918	2815	2918
P-value of endogeneity test			0.00	0.00
F-statistics of first-stage			278.26*	414.67*
P-value of overidentifying test			0.03	0.311

Notes: Standard errors in parentheses. \*  $p < .01$ .

**Table 2** Effect of class size on student attainment by school location

Dependent variable: Test scores in Science	Urban		Rural	
	(1) Boys	(2) Girls	(3) Boys	(4) Girls
Class size	-4.53* (1.28)	-1.58 (1.20)	2.40* (0.79)	1.11** (0.56)
First-stage IV estimates (Dependent variable: Class size)				
Eight-grade size	0.02* (0.00)	0.02* (0.00)	0.03* (0.00)	0.03* (0.00)
Observations	1114	1095	1701	1823
P-value of endogeneity test	0.00	0.00	0.00	0.00
F-statistics of first-stage	150.48*	152.04*	338.50*	595.22*

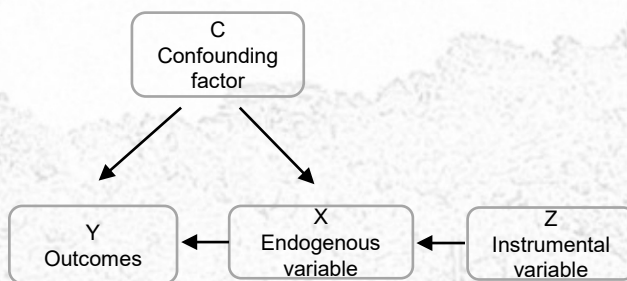
Notes: Standard errors in parentheses. \*\*  $p < .05$ , \*  $p < .01$ .

## DATA

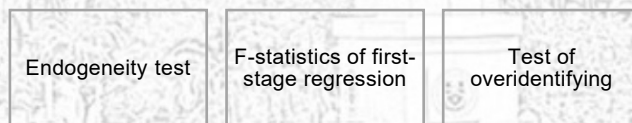
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## METHODS

The two-stage least squares method (2SLS) application can be illustrate as follows:



Post-estimations (Angrist and Pischke, 2009):



## DISCUSSIONS AND CONCLUSION

- ❖ There is some evidence of an endogeneity problem in the OLS estimates.
- ❖ The 2SLS method is superior in estimating the education production model of class size effects.
- ❖ Class size has a positive effect on students' test scores, it is in line with Bietenbeck (2020); Huang and Zhu (2020) and Hattie's (2005), who suggest that this possibly explained by teacher productivity; peer effects; and school efficiency in handling limited resources.
- ❖ Implementing class size reduction program should be emphasized strategically as reduction class size is not cost-effective initiatives.

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