

Exercise: Estimating the Impact of Class Size on Student Learning Outcomes Using Maimonides' Rule

This empirical exercise explores the relationship between class size and student learning outcomes by utilizing Maimonides' Rule as an instrumental variable. The study leverages a natural experiment arising from the rule that mandates the division of classes into smaller sizes once enrollment exceeds a certain threshold, thus providing a unique opportunity to assess the causal impact of class size on student performance.

Key Variables and Data Overview

- Dependent Variable: Student Learning Outcomes - measured through standardized test scores or academic performance indicators.
- Independent Variable: Class Size - the number of students per class.
- Instrumental Variable: Maimonides' Rule Threshold - utilized to address the endogeneity between class size and student outcomes by exploiting the exogenous variation in class sizes generated by the rule.

Reproduction Tasks

- Reproduce the analysis that demonstrates the relationship between the Maimonides' Rule threshold and actual class sizes within schools.
- Visualize the discontinuity in class sizes at the Maimonides' Rule threshold.

Estimation Tasks

- OLS Estimation: Estimate the impact of class size on student learning outcomes without using the instrumental variable.
- 2SLS Estimation with IV: Apply Maimonides' Rule threshold as an instrumental variable for class size to estimate its causal effect on student learning outcomes.

Empirical Results from the Study

- Ordinary Least Squares (OLS) Regression: Direct estimation of the impact of class size on student outcomes may suffer from endogeneity, leading to biased results.
 - $Student\ Learning\ Outcome = \beta_0 + \beta_1 \times Class\ Size + \varepsilon$
- First-Stage Regression: Demonstrates a significant reduction in class size at the Maimonides' Rule threshold.

- $Class\ Size = \alpha_0 + \alpha_1 \times Maimonides' Rule\ Threshold + u$
- Second-Stage Regression: Provides a causal estimate of the impact of class size on student learning outcomes, revealing the true effect once endogeneity is addressed.
 - $Student\ Learning\ Outcome = \gamma_0 + \gamma_1 \times Predicted\ Class\ size + v$

Unveiling Stories from the Data

- Investigate how the implementation of Maimonides' Rule influences class sizes and, subsequently, student performance.
- Explore the potential mechanisms through which class size affects learning outcomes, considering factors like teacher attention, student engagement, and classroom dynamics.
- Discuss the implications of these findings for educational policy and the optimal allocation of resources in schools.

Interpreting Regression Results

- Reflect on the first-stage regression results indicating the effectiveness of Maimonides' Rule in creating exogenous variation in class sizes.
- Analyze the second-stage regression results to understand the causal impact of reducing class sizes based on the Maimonides' Rule.
- Compare the OLS and 2SLS estimates to discuss the importance of addressing endogeneity in empirical research on education.