FIRE: THE FIRST-YEAR INNOVATION & RESEARCH EXPERIENCE
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Why Do Some US States Offer More Computer Science Courses Than Others? A Mixed-Methods Analysis of Access Gaps

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INTRODUCTION

Access to computer science (CS) in U.S. high schools is not equal across states (Ottenbreit-Leftwich et al., 2022). Given the relevance of CS in the workforce, understanding what factors drive access disparities can inform policy and education planning. Using the Diffusion of Innovations Theory as a framework, the goal of this research is to investigate the correlation between the number of high schools offering computer science and a range of factors, such as state government policies, median household income, funding per student per year, and geographic disparities in access to CS courses for each US state. The research question driving our work is: **how does the number of high schools offering computer science vary across different states in the United States, and what factors may contribute to this variation**?

METHODS

Quantitative Analysis:

- Multiple linear regression to explore the relationship of each quantitative factor to CS access
- Variables:
  - % of high schools offering CS
    - From Code.org State of CS Education 2024
  - Policy Strength score (0 - 10)
    - From Code.org State of CS Education 2024
    - Based on a 10-point rubric
      - Policies include state plans, standards, funding, certifications, state CS positions, and high school requirements
  - Median Household income (US Census, 2024)
  - Education Funding per student (EducationData.org)
  - Geographic Disadvantage Index
    - A custom 0 – 1 scale based on rurality/access barriers (Warner et al., 2021)

Qualitative Analysis:

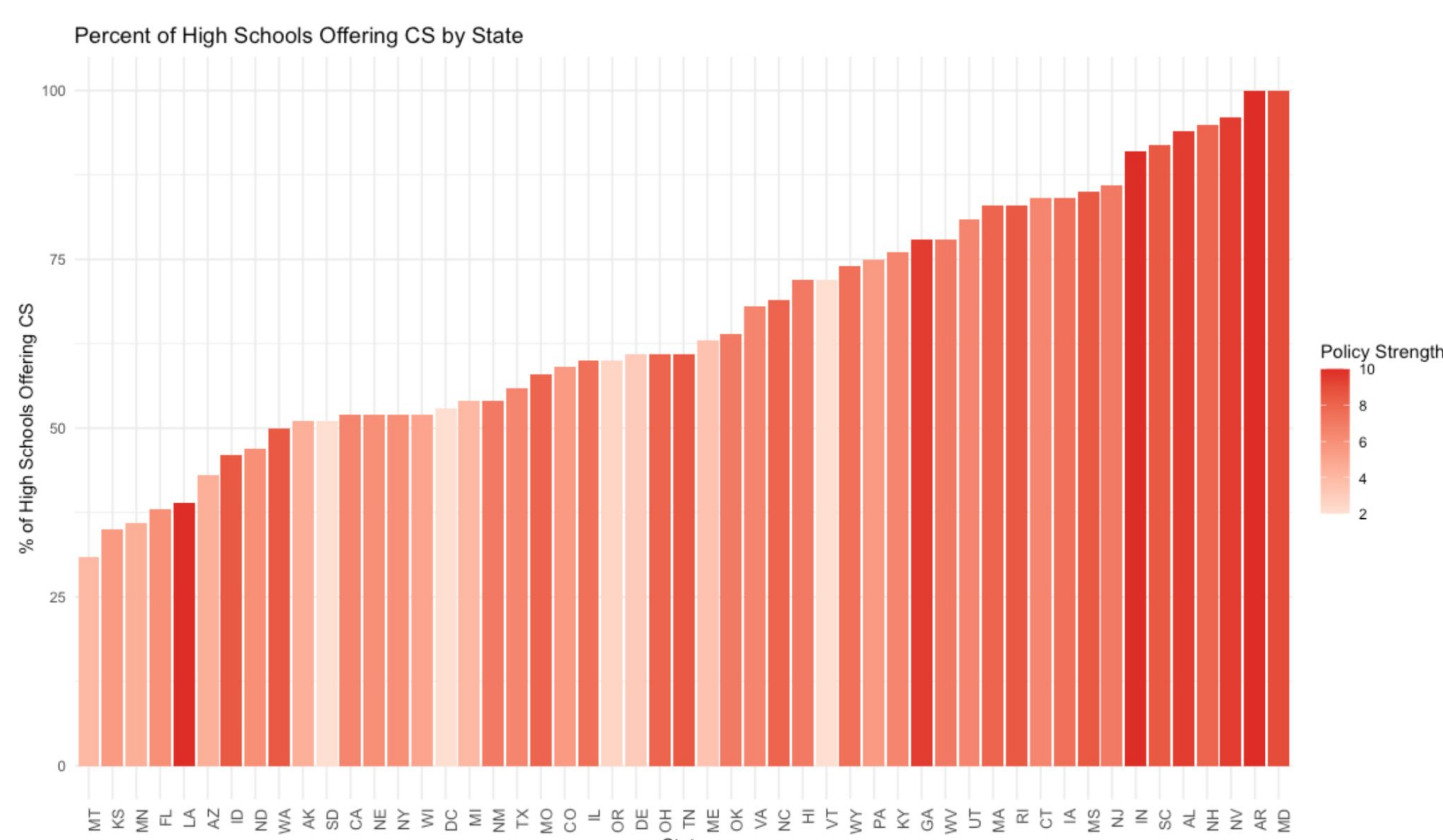
- Comparative thematic analysis of policy implementation case studies (ex: Code.org and Fordham Institute) in high and low-access states (top and bottom 25% in course offerings) to identify disconnects between paper policy and access in practice

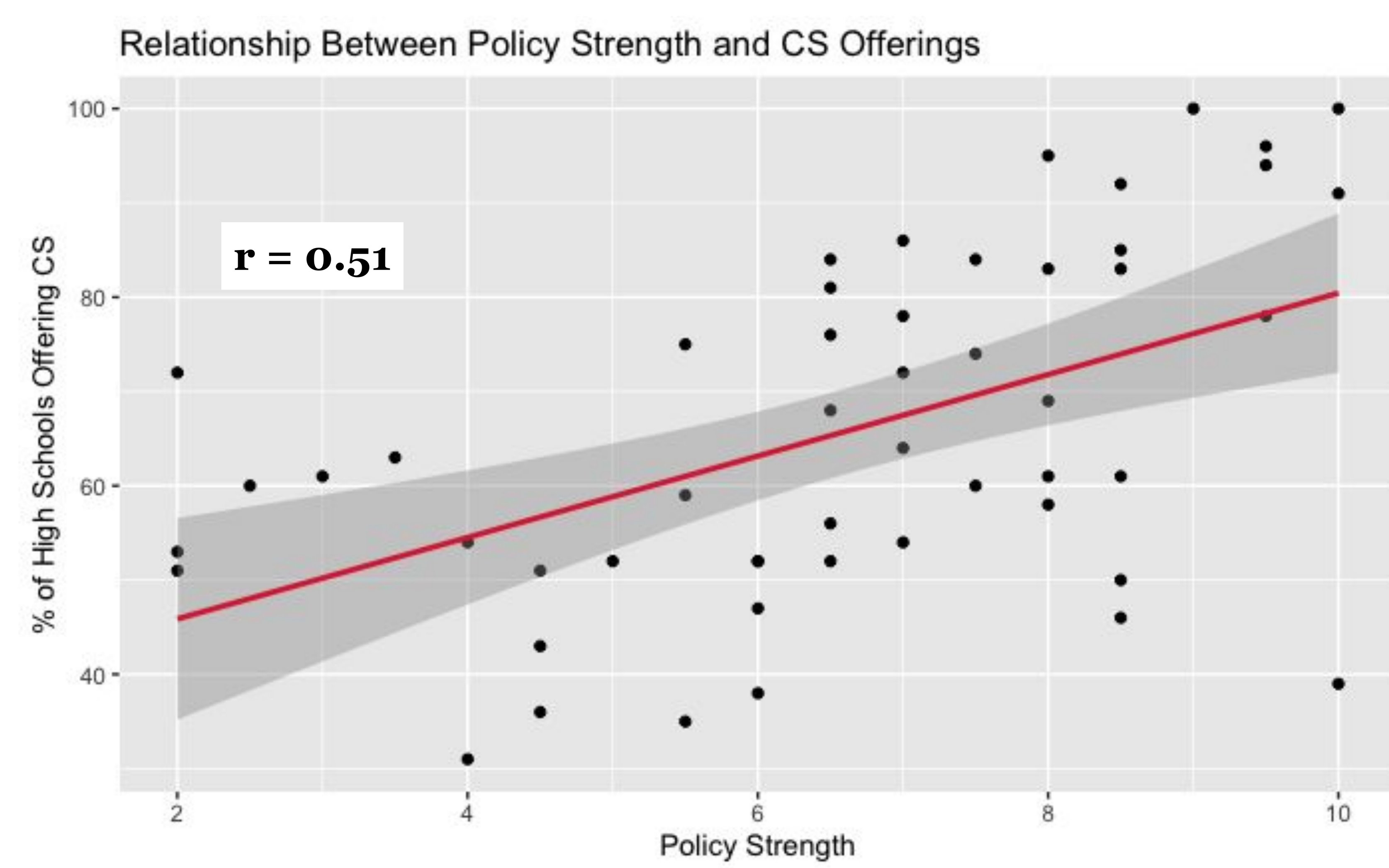
References QR Code:

RESULTS

Predictor	Estimate	SE	p-value
Intercept	20.40	14.78	0.174
Policy	**4.80**	**1.08**	**< 0.001**
Household income	0.00010	0.00011	0.348
Funding per Student	0.00070	0.00059	0.245
Geographic Disparity Index (DI)	−7.95	10.38	0.447

$$\hat{Y} = 4.80\ X_{Policy} + 0.00010\ X_{Income} + 0.00070\ X_{Funding} - 7.95\ X_{DI} + \varepsilon$$





Qualitative Insights

State	Policy Score	% HS with CS	Insights
Arkansas (AR)	10	100%	Passed all 10 CS policies and required all HS to offer CS. Strong state laws + curriculum + funding = universal access (Code.org, K12Dive).
Alabama (AL)	10	94%	Near-universal access due to required CS in all schools, teacher grants, and tracking mechanisms. From 85% to 95% in just one year (AlabamaAchieves.org).
Louisiana (LA)	10	35%	Passed all 10 policies, but most recently and not yet effective. Teacher shortages and unclear credit rules hinder rollout (Code.org, LA DOE).
New Hampshire (NH)	7.5	95%	Does not have all policies, but still experienced high access through strong district leadership and teacher professional development networks (Fordham Institute).
Kansas (KS)	5.5	36%	Requires CS by name, but rural schools opt out. Weak enforcement, poor teacher pipeline, and low funding explain the shortfall (Code.org).

DISCUSSION

Policy paves the way, but implementation (funding, enforcement, teacher pipeline) is what brings success.

Stronger CS policy scores predict access, but not always.	Regression shows a steep positive trend, yet some states fall away from the line.
Quality of implementation matters.	States that pair mandates with funding, teacher training, and monitoring of progress (e.g., AR, AL) translate policy into nearly universal coverage.
Policy alone cannot lift access.	Louisiana's 10/10 Code.org rating with ~35 % CS access illustrates how slow roll-out and teacher shortages may cut down on effective laws.
Local control can overcome average policy.	New Hampshire's 95% access with a mid-range policy rating shows how district uptake and PD networks can bridge gaps.
Funding per student was not as strongly associated with CS access.	How funding is spent may be more important than total funding amount.
Wealth alone doesn't guarantee access to CS education.	Median household income did not significantly predict CS course access.