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Analyzing the Effect of Funding on School Performance in DC Public Schools

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PPOL564: Final Class Status Update. 11.30.2022

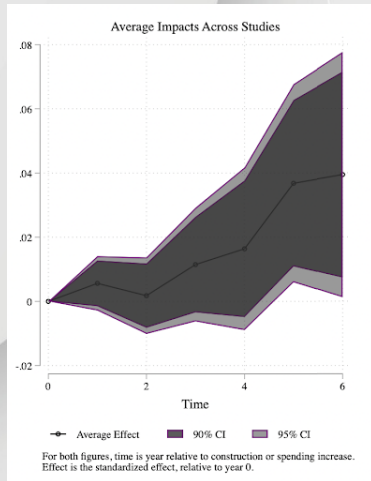Intro
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DC's FY23 Budget

- ▶ DC Council has approved its fiscal year (FY) 2023 "Fair Shot" Budget
- ▶ More than half of DC's public schools had their budgets lowered from FY 2022
- ▶ The budget includes increased funding for "at-risk" students
  - ▶ provides targeted resources to help these students catch up following COVID-19

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Prior Research

Jackson & Mackevicius (2021)

▶ Examined causal effects of public K-12 spending on test scores and educational attainment using various credible studies

▶ Found that, on average, a $1000 increase in per-pupil public school spending (for four years) increases:

    ▶ test scores by 0.044α
    ▶ high-school graduation rate by 2.1 percentage points
    ▶ higher education attainment by 3.9 percentage points

Average Impacts Across Studies

For both figures, time is year relative to construction or spending increase. Effect is the standardized effect, relative to year 0.

Average Effect   90% CI   95% CI

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Prior Research

Lafortune et al. (2018)
- ▶ studied the impact of school finance reforms on achievement in low and high-income school districts
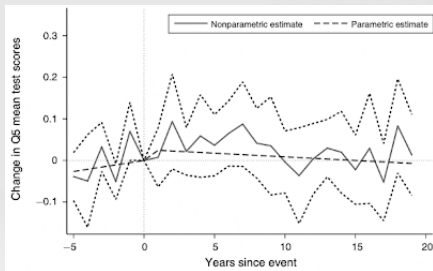

FIGURE 1: ESTIMATES OF EFFECTS OF SCHOOL
FINANCE REFORMS ON MEAN TEST SCORES IN HIGHER
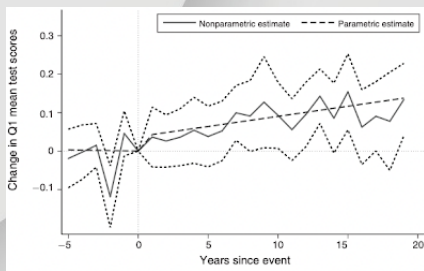INCOME SCHOOL DISTRICTS

FIGURE 2: ESTIMATES OF EFFECTS OF SCHOOL
FINANCE REFORMS ON MEAN TEST SCORES IN LOWER
INCOME SCHOOL DISTRICTS

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Research Questions

▶ Are these findings consistent with DC public schools?
   ▶ Could the FY 23 Budget better student outcomes?
   ▶ Was the emphasis on at-risk/low-income students a smart decision?
▶ Looking at the pre-COVID data from DC public schools,
   ▶ Is the change in expenditures correlated with the change in school performance (STAR scores)?
   ▶ Does a change in expenditures lead to better student outcomes (STAR score) for low-income schools than high-income schools?

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Data Sources

Data Source	Values

Edunomics/NCES Data	▶ includes various financial variables for schools:
	  ▶ State/Federal level funding
	  ▶ per-pupil expenditures
	  ▶ total expenditures, etc.

STAR data	▶ Uses these common measures of performance to give schools a rating:
	  ▶ school environment
	  ▶ college/career readiness
	  ▶ diversity data

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Data Sources

"At-Risk" Student in DC

- those who qualify for TANF or SNAP
- homeless during the academic year
- under the care of the Child and Family Services Agency
- high school students who are at least one year older than the expected age for their grade

STAR Framework

The School Transparency and Reporting (STAR) Framework is the accountability framework for public schools in the District of Columbia. It separately measures performance for each student group on every metric and adds them together to calculate the overall STAR Rating.

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Data Sources

	Academic Achievement	Academic Growth	School Environment	English Language Proficiency	Graduation Rate
Elementary/Middle	30pts	40pts	20pts	5pts	N/A
High	40pts	N/A	39pts	5pts	11pts

FIGURE 3: MEASUREMENTS FOR DIFFERENT SCHOOL LEVEL

FIGURE 4: CALCULATING STAR SCORES FOR DIFFERENT STUDENT GROUPS

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Methods: Data Acquisition

▶ NCES: downloading excel dataframes from the National
  Center for Education Statistics (NCES) for 2018-2019 and
  2019-2020

▶ STAR: (DC School Report Card) Downloading excel
  dataframes from the Office of the State Superintendent of
  Education DC government for 2018 and 2019

▶ Diversity: Downloading excel dataframes from the DC
  Policy Center. Mostly focus on Socioeconomic diversity in
  D.C.'s schools for 2018-19.

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Methods: Data Cleaning

▶ NCES
  1. subsetting to columns we need. Split columns into 3 parts: metadata, financial data, and other independent variables.
  2. delete cols have constant value except for state and year
  3. filled value "NBR" to nan in the whole dataset
  4. convert financial data to the numeric type
  5. add difference value and percentage between 2 years of financial values and enrollment number as new columns

▶ STAR
  1. Merge all School Types to "DCPS" and "Charter"
  2. Subsetting relevant columns
  3. add difference value and percentage of STAR score and rating as new columns

▶ Diversity
  1. Set label 1-5 according to schools' risk percentage
  2. Subsetting relevant columns

▶ Join three datasets together by state-assigned School Code

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Describing the analytic sample

- ▶ **Unit of analysis:** Individual public funding school in DC
- ▶ **Time range:** focus on FY 18-19 and FY 19-20
- ▶ **Fields within data:** expenditure per pupil, STAR Scores, Percentage of students at risk ,enrollment size
- ▶ **Universe of "public funding" schools:** 237 unique schools affilated to DCPS or Charter School with valid STAR Score and Edunc data

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Geo Visualization of DC STAR and Expenditure
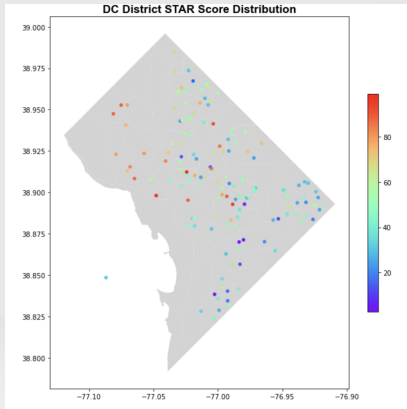
FIGURE 5: DC DISTRICT STAR SCORES DISTRIBUTION
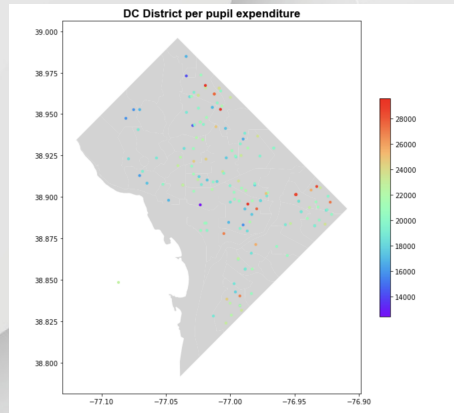
FIGURE 6: DC DISTRICT EXPENDITURE DISTRIBUTION

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Expenditure vs Star Score Visual
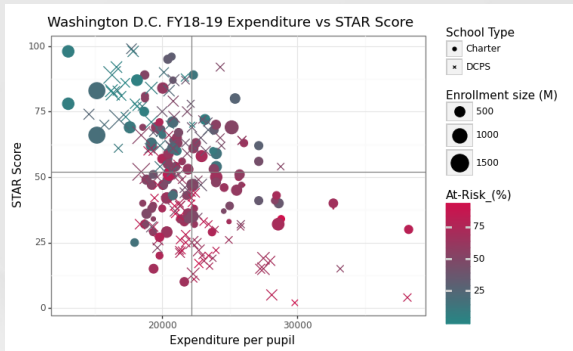
▶ schools
designated as low
risk tend to have
lower per pupil
expenditures and
higher STAR
scores and vice
versa

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Change in per-pupil expenditure and STAR score

the increase precentage of STAR_Score_inc and per-pupil expenditure

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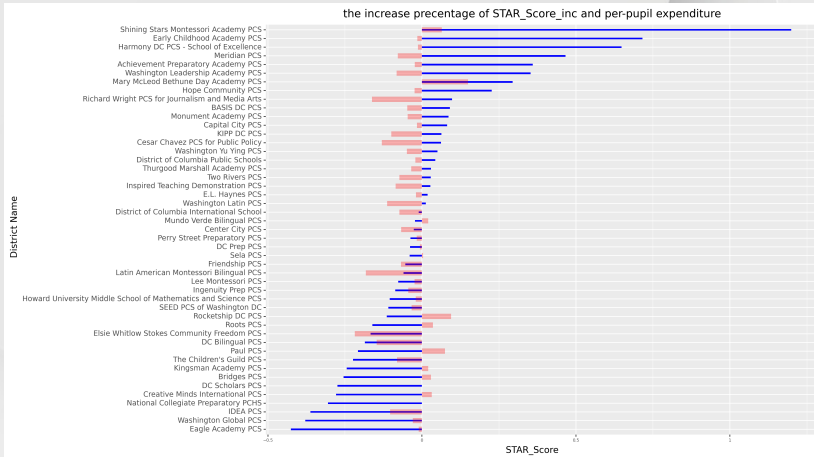
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Regression results

```
                        OLS Regression Results
==============================================================================
Dep. Variable:         STAR_Score_inc   R-squared:                      0.002
Model:                            OLS   Adj. R-squared:                -0.009
Method:                 Least Squares   F-statistic:                   0.1590
Date:                Tue, 29 Nov 2022   Prob (F-statistic):             0.853
Time:                        21:11:51   Log-Likelihood:               -205.54
No. Observations:                 190   AIC:                            417.1
Df Residuals:                     187   BIC:                            426.8
Df Model:                           2
Covariance Type:            nonrobust
==============================================================================
                         coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
Intercept             -0.1583      0.080     -1.968      0.050      -0.317       0.000
pp_total_raw_DC_inc -1.314e-05   3.37e-05     -0.390      0.697   -7.96e-05    5.33e-05
risk                   0.0387      0.105      0.367      0.714      -0.169       0.246
==============================================================================
Omnibus:                        2.790   Durbin-Watson:                  1.951
Prob(Omnibus):                  0.248   Jarque-Bera (JB):               2.435
Skew:                           0.190   Prob(JB):                       0.296
Kurtosis:                       3.405   Cond. No.                    4.14e+03
==============================================================================
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Results

- ▶ Found that there is not a significant correlation between school spending and STAR scores for both income groups between the two school years
    1. Similarly, there is not correlation between decreased funding and decreased STAR score
- ▶ There appears to be more prevalent factors affecting student performance (STAR score) than simply per-pupil expenditure
- ▶ Long-standing equity issue and new policy challenges for effective and flexible funding

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What Next

▶ Evaluating a larger time frame, to see if there is a significant relationship between our variables over a 5/10 year period

▶ Could the FY23 budget actually have an impact just in the long run?