Understanding the Old and New School Finance Literature

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Funding per Pupil has increased substantially: $1,636 in 1940 to $15,051 in 2018

Source: Digest of Education of Statistics (2020 edition): Table 235.10
Federal funds are smallest share of school district revenues

Source: Digest of Education of Statistics (2020 edition): Table 235.10
Trends over time suggest test scores have been increasing for 9- and 13-year-old students, but appear to be stagnant for 17-year-old students.

What does this mean for education investment?

• On the one hand, increased funding improves outcomes for 9 and 13-year-old students

• But...there appears to be no substantial growth among 17-year-old students

• Question arises: Does money matter for education outcomes?

Source: Urban Institute
Stagnant growth among 17-year-old students perhaps due to falling dropout rate over time (C. Kirabo Jackson)

Source: C. Kirabo Jackson (2017). Twitter: https://twitter.com/KiraboJackson/status/896207189379096577
Indeed, dropout rates have been declining over time.
The Production Function

Output = \( f \) (Input 1, Input 2, \ldots, Input N)

Process that converts raw inputs into outputs
Education Production Function

\[ \text{Output} = f(\text{Input 1}, \text{Input 2}, \ldots, \text{Input } N) \]

Q1: What is the output in the education production function?

Q2: What are the inputs?
How do schools choose the input levels?

• Schools are constrained:

\[ R = p_T \times T + p_C \times C \]

- Schools have a budget constraint
- Simplistic example: Revenues are a function of the teacher wages, price of computers, and the quantities of teachers and computers

- Which variables do schools typically have control over?
Economic question: How should schools choose the input levels?

→ Through cost minimization

• **Objective:**
  ▪ School leaders must decide how to combine various inputs to produce educational outcomes at the lowest cost

• **Intuition:** If spending another dollar on teachers leads to larger gains in student achievement, while spending another dollar on computers leads to only modest gains, what should the school leader do?

Answer: Invest more in teachers!
Conceptualizing How Money Matters

In addition to teachers, what about other school staff?

- **Academic Staff**
  - Teachers
  - Library specialists
  - Instructional coordinators

- **Administrative Staff**
  - Principals
  - VPs and Aps
  - Secretaries
  - Other clerical support staff

- **Basic Services**
  - Food Service
  - Custodial / maintenance
  - Security

- **Health Services Staff**
  - School counselors
  - Nurses
  - Psychologists
  - Speech therapists

- **School Aides**
  - ESL/bilingual
  - Special education
  - Library
  - Title I
  - Other classroom aide

Based on NCES Schools and Staffing Survey
Do other staff matter?

- Teachers
- Principals
- Student Achievement
- Other staff
Example Conceptual Framework: Maintenance Staff & Achievement

- Maintenance and Operations Staff
- School Safety
- Learning Environment
- Attendance
- Productive Classroom Instruction
- Student Achievement
Old Literature: No consistent evidence between resources and student outcomes

Table 3
Percentage Distribution of Estimated Effect of Key Resources on Student Performance, Based on 376 Production Function Estimates

<table>
<thead>
<tr>
<th>Resources</th>
<th>Number of estimates</th>
<th>Statistically significant (%)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td>Statistically insignificant (%)</td>
</tr>
<tr>
<td>Real classroom resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher-pupil ratio</td>
<td>276</td>
<td>14</td>
<td>14</td>
<td>72</td>
</tr>
<tr>
<td>Teacher education</td>
<td>170</td>
<td>9</td>
<td>5</td>
<td>86</td>
</tr>
<tr>
<td>Teacher experience</td>
<td>206</td>
<td>29</td>
<td>5</td>
<td>66</td>
</tr>
<tr>
<td>Financial aggregates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher salary</td>
<td>118</td>
<td>20</td>
<td>7</td>
<td>73</td>
</tr>
<tr>
<td>Expenditure per pupil</td>
<td>163</td>
<td>27</td>
<td>7</td>
<td>66</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilities</td>
<td>91</td>
<td>9</td>
<td>5</td>
<td>86</td>
</tr>
<tr>
<td>Administration</td>
<td>75</td>
<td>12</td>
<td>5</td>
<td>83</td>
</tr>
<tr>
<td>Teacher test scores</td>
<td>41</td>
<td>37</td>
<td>10</td>
<td>53</td>
</tr>
</tbody>
</table>

Source: Hanushek (1997a) (revised, see text and footnote 14).
Old Literature: No consistent evidence between teacher characteristics and student test score gains

Table 5

Percentage Distribution of Other Estimated Influences on Student Performance, Based on Value-added Models of Individual Student Performance

<table>
<thead>
<tr>
<th>Resources</th>
<th>Number of estimates</th>
<th>Statistically significant (%)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td>Statistically insignificant (%)</td>
</tr>
<tr>
<td>a. All estimates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher-pupil ratio</td>
<td>79</td>
<td>11</td>
<td>9</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Teacher education</td>
<td>41</td>
<td>0</td>
<td>10</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Teacher experience</td>
<td>62</td>
<td>37</td>
<td>2</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>b. Estimates within a single state</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher-pupil ratio</td>
<td>24</td>
<td>4</td>
<td>17</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>Teacher education</td>
<td>34</td>
<td>0</td>
<td>9</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Teacher experience</td>
<td>37</td>
<td>41</td>
<td>3</td>
<td>56</td>
<td></td>
</tr>
</tbody>
</table>

New Literature: Key results from studies that leverage shocks from school finance reforms

- **Economic mobility**: A $4,500 reduction in gap in per pupil revenues between high- and low-income districts leads to a 5 percentile increase in intergenerational mobility of children whose parents are the bottom on the income distribution (Biasi, 2021)

- **Across studies**: “On average, a $1000 increase in per-pupil public school spending (for four years) increases test scores by 0.044 standard deviations, high-school graduation by 2.1 percentage points, and college-going by 3.9 percentage points.” (Jackson & Mackevicius, 2021)
New Literature Summary: money matters, but still much to learn

National Studies Summary:

• Spending increased and was redistributive (Candelaria & Shores, 2019; Sims, 2011)

• Money matters, especially among students in lower-income districts (Candelaria & Shores, 2019; Lafortune, Rothstein, & Schanzenbach, 2018; Jackson, Johnson, & Persico, 2016)

State-Specific Studies Summary: Mixed results

• Moderate spending increase, no evidence of academic improvement
  B. Kentucky 1990 Education Reform Act (Clark, 2003)
  C. Maryland 2002 Bridge to Excellence in Public Schools Act (Chung, 2015)

• Spending increases plus academic improvements
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What are the mechanisms? What explains the heterogeneity?
And now the big question...

• How should school leaders “productively” spend funds?
Need to ask the right questions…

<table>
<thead>
<tr>
<th>BROAD Question</th>
<th>NARROW QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Diagnosing the problem</strong></td>
<td>Is the problem worse when ______ (or for ______)?</td>
</tr>
<tr>
<td><strong>2. Assessing the implementation of the strategy</strong></td>
<td>What is the strategy supposed to look like in best practice (the faithful-implementation scenario), and what would (or does) it look like in our setting? What are all the resources this strategy requires (e.g., space, scheduling, training, materials, budget, communications)? What can we monitor to see if we are on track?</td>
</tr>
<tr>
<td><strong>3. Evaluating the impact of the strategy</strong></td>
<td>How might (or did) the strategy change outcomes for us?</td>
</tr>
</tbody>
</table>

How can school leaders learn more about what works?

https://ies.ed.gov/ncee/wwc/

https://www.campbellcollaboration.org/
Additional Slides
Randomized Controlled Trials (RCTs): Overview

Intervention (Treatment) Group

Non-Intervention (Control) Group
People have unobservable characteristics

Intervention (Treatment) Group

Non-Intervention (Control) Group
If people self-select into "treatment," we get biased results

![Diagram showing selection into groups]

- **Intervention (Treatment) Group**
  - A
  - A
  - A
  - A

- **Non-Intervention (Control) Group**
  - B
  - B
  - B
  - B

- **Failure to Randomize**
Randomization balances individuals on observable and unobservable characteristics.