Not Playing Favorites:
An Experiment on Parental Preferences for Educational Investment

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April, 2019

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Motivation

- Parental investments have profound impacts on their children’s outcomes (e.g., Cunha and Heckman, 2007; Cunha et al., 2006)

- What are parents’ preferences for allocating resources among their children? (e.g., educational investment)
  - Maximize returns to investments, potentially leading to inequality across siblings?
  - Averse to cross-sibling inequality?
    - Equality in outcomes – the amounts their children ultimately earn?
    - Equality in inputs – such as expenditure in tutoring or textbooks?

- Understanding these preferences can help governments design better policies; e.g., conditional cash transfer programs
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It is challenging to identify parents’ preferences

Difficult to:

1. Know full (perceived) production function and generate clean behavioral predictions
   - ex. if parents invest more in high-ability child, is that pure returns-maximization, returns-max. balanced with inequality aversion, or something else?

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• Parents put some weight on maximizing returns
  • But we reject the null that they care only about returns maximization

• Deviate from returns maximization primarily because of a strong preference for equality in inputs

• Forgo 40-50% of their potential experimental earnings
  • Average estimated WTP to equalize inputs >15% of annual average educational spending
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Preview of findings

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Conceptual framework
Parent utility function and predictions for behavior

\[
\max_{x_1, x_2} U(x_1, x_2 | a_1, a_2) = \lambda u \left( R(x_1 | a_1) + R(x_2 | a_2) \right)
\]

Total household earnings

\[-\alpha f \left( |R(x_1 | a_1) - R(x_2 | a_2)| \right)\]

Absolute earnings gap

\[-\beta g \left( |x_1 - x_2| \right)\]

Abs. inputs gap

with: \( x_i \) inputs; \( a_i \) endowments; \( R(x_i | a_i) \) earnings; \( x_1 + x_2 \leq y_e \)

1. Returns maximization (\( \lambda > 0 \))
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1. Returns maximization \((\lambda > 0)\)
   - \(a_i, x_i\) complements \(\left( \frac{\partial^2 R_i}{\partial x_i \partial a_i} > 0 \right) \rightarrow \) parents reinforce \(\left( \frac{\partial x_i^*}{\partial a_i} > 0 \right)\)
   - \(a_i, x_i\) substitutes \(\left( \frac{\partial^2 R_i}{\partial x_i \partial a_i} < 0 \right) \rightarrow \) parents compensate \(\left( \frac{\partial x_i^*}{\partial a_i} < 0 \right)\)
Parent utility function and predictions for behavior

\[
\max_{x_1, x_2} U(x_1, x_2 | a_1, a_2) = \lambda u \left( R(x_1 | a_1) + R(x_2 | a_2) \right) - \alpha f \left( |R(x_1 | a_1) - R(x_2 | a_2)| \right) - \beta g \left( |x_1 - x_2| \right)
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1. Returns maximization (\( \lambda > 0 \))

2. Inequality aversion over outcomes (\( \alpha > 0 \))
   - Parents compensate regardless of complementarity (\( \frac{\partial x_i^*}{\partial a_i} < 0 \))
Parent utility function and predictions for behavior

\[
\begin{align*}
\max_{x_1, x_2} U(x_1, x_2 | a_1, a_2) &= \lambda u \left( R(x_1 | a_1) + R(x_2 | a_2) \right) \\
&= \text{Total household earnings} \\
&- \alpha f \left( |R(x_1 | a_1) - R(x_2 | a_2)| \right) \\
&= \text{Absolute earnings gap} \\
&- \beta g \left( |x_1 - x_2| \right) \\
&= \text{Abs. inputs gap}
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with: \(x_i\) inputs; \(a_i\) endowments; \(R(x_i | a_i)\) earnings; \(x_1 + x_2 \leq y_e\)

1. Returns maximization (\(\lambda > 0\))
2. Inequality aversion over outcomes (\(\alpha > 0\))
3. Inequality aversion over inputs (\(\beta > 0\))
   - Parents equalize inputs regardless of complementarity
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Total household earnings

Absolute earnings gap

Abs. inputs gap

Relative inputs

with: \( x_i \) inputs; \( a_i \) endowments; \( R(x_i | a_i) \) earnings; \( x_1 + x_2 \leq y_e \)

4. Child-specific preferences (\( \gamma \neq 0 \))
   - Parents give more to the preferred child
   - Discuss in paper but skip today; allow for in estimation
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Identifying the utility function

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Total household earnings

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Relative inputs

• Our goal: Identify average preference weights \( \lambda, \alpha, \beta \)
  • To do so, our experiment varies the \( R(\cdot) \) functions
  • Ideally, shock long-run earnings; difficult so shock short-run instead
Experimental design
Experimental design overview

- Sample 300 parents with $\geq 2$ kids enrolled in grades 5-7
- Tell parents 2 of their kids will be taking a test and receiving monetary earnings (outcomes) based on their test scores
- Give parent an input: 10 lottery tickets for tutoring
  - Winning ticket (1 per HH) receives 1 hr of tutoring focused on tested material
  - Clean prediction: Unless parents care about equality, should give all tickets to 1 child
- Parent allocates inputs (tickets) between her kids
  - Repeats 5 times under 5 scenarios for the payment function mapping test scores to payments ($R(x_i)$ functions)
  - One scenario randomly selected for each household → incentive-compatible to answer truthfully for each
  - Within-subject identification ("strategy method")
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Experimental process
Experimental process

Elicit parents’ beliefs

- Parents answered the following questions for their 2 children:
  - What math score do you think [CHILD] will get without tutoring?
  - How much do you think [CHILD’s] score would increase because of tutoring?
Experimental process

- Surveyors explain experimental design:
  - Walk parents through two practice (hypothetical) scenarios that used different payment function than real experiment.
  - Practice scenarios explained in the same way as the real experimental scenarios.

- Surveyors conduct placebo lottery
  - Ask parents to allocate 10 lottery tickets between a 50MWK and 100 MWK prize.
Experimental process

For each of the 5 payment function scenarios:

- Surveyor explain payment function.
- Surveyor walk parents through visual aids.
  - Tell parents what allocation would maximize expected returns, minimize expected outcomes or inputs inequality
- Parents allocate 10 lottery tickets between their 2 children.
Experimental process

- Elicit parents’ beliefs
- Explain design
- Parents allocate tickets
- Lottery for tutoring

- 1 scenario selected and tickets assigned based on parent’s allocation for that scenario.
- Parents randomly select a ticket
Experimental process

- Elicit parents’ beliefs
- Explain design
- Parents allocate tickets
- Lottery for tutoring
- Winner receives tutoring

- The “winning” child receives 1 hour of tutoring.
• All children take a math test.

• Surveyors delivered cash payments to children based on their test scores and the payment function in the chosen scenario.

• Note: Use of cash biases us towards the null of the “standard model” (returns-maximization) → conservative for estimating inequality aversion.
Results: Qualitative exploration of parents’ preferences
In the placebo lottery, parents maximized returns...
...but with educational investments, inconsistent with pure returns-maximization, parents often choose “split” allocations

Raw choice data, pooled across scenarios

![Bar chart showing ticket distribution to Child L]
Now use cross-scenario variation to shed qualitative light on preferences

Do parents’ preferences (on average) place positive weight on:

1. Returns maximization ($\lambda$)?
2. Inequality aversion (IA) over outcomes ($\alpha$)?
3. Inequality aversion (IA) over inputs ($\beta$)?
Do parents respond to financial returns to tutoring?

### Scenarios

<table>
<thead>
<tr>
<th></th>
<th>1. Base Case</th>
<th>2. Higher Returns to Child H</th>
</tr>
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</table>

#### Payment functions

<table>
<thead>
<tr>
<th></th>
<th>Child L</th>
<th>Child H</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10S_L$</td>
<td>$10S_L$</td>
<td>$100S_H$</td>
</tr>
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#### Predictions

**Returns Max.**
- If $R_L < R_H$ (66%): H
- If $R_L = R_H$ (19%): ?
- If $R_L > R_H$ (14%): L

**IA over Outcomes**
- If $R_L \leq R_H$ (86%): L
- If $R_L > R_H$ (14%): ?

**IA over Inputs**
- Equal

#### Mean perceived earnings return to tutoring

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<tr>
<th></th>
<th>Child L</th>
<th>Child H</th>
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<tbody>
<tr>
<td></td>
<td>113</td>
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#### Mean perceived earnings without tutoring

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<th>Child L</th>
<th>Child H</th>
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<tbody>
<tr>
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<td>90</td>
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$S_i$: Child $i$’s score (relative to test score threshold). $R_i$: Child $i$’s test score gains to tutoring. 1,456-113 MWK = 1 daily wage or 2.2 USD. 10 MWK = 0.014 USD. 100 MWK = 0.14 USD = 7% of daily wage.
Returns Maximization

Implication: Parents place (moderate) weight on returns maximization

Limiting to people with different RM predictions

Individual-level changes
Returns Maximization

IA Outcomes

Implication: Parents place (moderate) weight on returns maximization.

Limiting to people with different RM predictions
Individual-level changes
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IA Outcomes

Implication: Parents place (moderate) weight on returns maximization

- Limiting to people with different RM predictions
- Individual-level changes
Does returns maximization or inequality aversion over outcomes dominate?

### Scenarios

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\(S_i\): Child \(i\)'s score (relative to test score threshold). \(R_i\): Child \(i\)'s test score gains to tutoring.

Returns Max. predictions for Scenario 3 hold for 96% of people.

**Expected Earnings: Scenario 2 vs. Scenario 3**

**Graph**
Returns maximization dominates inequality aversion over outcomes on average.
IA over Outcomes  Returns Maximization

Returns Maximization dominates inequality aversion over outcomes on average.

Individual-level changes
IA over Outcomes  Returns Maximization

Returns Maximization dominates inequality aversion over outcomes on average
Are parents averse to inequality in outcomes?

### Scenarios

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<tr>
<th></th>
<th>1. Base Case</th>
<th>4. Lump Sum to Child L</th>
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<tbody>
<tr>
<td><strong>Payment functions</strong></td>
<td></td>
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</tr>
<tr>
<td>Child L</td>
<td>$0 + 10S_L$</td>
<td>$1000 + 10S_L$</td>
</tr>
<tr>
<td>Child H</td>
<td>$0 + 10S_H$</td>
<td>$0 + 10S_H$</td>
</tr>
<tr>
<td><strong>Predictions</strong></td>
<td></td>
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<tr>
<td>Returns Max.</td>
<td>If $R_L &lt; R_H$ (66%): H</td>
<td>If $R_L &lt; R_H$ (66%): H</td>
</tr>
<tr>
<td></td>
<td>If $R_L = R_H$ (19%): ?</td>
<td>If $R_L = R_H$ (19%): ?</td>
</tr>
<tr>
<td></td>
<td>If $R_L &gt; R_H$ (14%): L</td>
<td>If $R_L &gt; R_H$ (14%): L</td>
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<tr>
<td><strong>IA over Outcomes</strong></td>
<td>If $R_L &lt; R_H$ (66%): L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If $R_L = R_H$ (19%): L</td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>If $R_L &gt; R_H$ (14%): ?</td>
<td></td>
</tr>
<tr>
<td><strong>IA over Inputs</strong></td>
<td>Equal</td>
<td>Equal</td>
</tr>
</tbody>
</table>

$S_i$: Child $i$’s score (relative to test score threshold). $R_i$: Child $i$’s test score gains to tutoring.

Returns Max. for Scenario 4 hold for 95% of people.
Implication: No evidence of inequality aversion over outcomes

Scenario 3 vs 5

Individual-level Changes

Limiting to people with different IAO predictions
IA over Outcomes

Implication: No evidence of inequality aversion over outcomes

Scenario 3 vs 5

Individual-level Changes

Limiting to people with different IAO predictions
Implication: No evidence of inequality aversion over outcomes

- Scenario 3 vs 5
- Individual-level Changes
- Limiting to people with different IAO predictions
Do parents' preferences (on average) place positive weight on:

1. Returns maximization ($\lambda$)? Yes
2. Inequality aversion over outcomes ($\alpha$)? No
   - Is that due to *ex post* equalizing? Possibly, but we get similar evidence from another experiment where parents could not *ex post* equalize, so likely not.
3. Inequality aversion over inputs ($\beta$)?
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Results so far

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3. Inequality aversion over inputs ($\beta$)?
Testing for inequality aversion in inputs

Identified less from cross-scenario variation since prediction does not change across scenarios

Tests:

1. Are there “split” allocations? Yes (57% of choices)
   - Evidence of inequality aversion over either inputs or outcomes → suggests inputs since none over outcomes

2. Does the distribution have a peak at 50%?
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2. Does the distribution have a peak at 50%?
Equal allocation is the modal choice

- Substantial equalizing in all scenarios

<table>
<thead>
<tr>
<th>Percentage</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tickets to Child L</td>
<td>Mean</td>
<td>95% CI</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>18.75%</td>
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</tbody>
</table>

**Hypotheses**

- $H_0: 0=5$ with $p\text{-value}<0.00$
- $H_0: 10=5$ with $p\text{-value}<0.00$
- $H_0: 10=0$ with $p\text{-value}=0.05$
Equal allocation is the modal choice

![Graph]

- Substantial equalizing in all scenarios
Are there other reasons that parents equally split besides an aversion to inequality in inputs?

1. Were parents indifferent between their children?
   - Unlikely: Knife’s edge explanation, and many parents equalized in multiple scenarios even when the returns change.

2. Did parents not understand how to maximize?
   - Unlikely: we told them how to, and more-educated parents equalize more.

3. Were parents uncertain about which child to choose?
   - Unlikely: Heterogeneity analysis and direct survey evidence refute this.

4. Are they simply balancing inequality aversion in outcomes against returns-maximization?
   - No: equalize as much when inequality aversion in outcomes and returns maximization have the same vs. diff predictions.
Results so far

Do parents’ preferences (on average) place positive weight on:

1. Returns maximization ($\lambda$)? Yes
2. Inequality aversion over outcomes ($\alpha$)? No
3. Inequality aversion over inputs ($\beta$)? Yes

Next: Explore parents’ preferences more quantitatively

1. How much less do parents earn (according to their beliefs) than if they maximized returns?
   - Parents earn roughly 40% less than if they maximized returns
2. What are their average preference weights? How much are they willing to pay to equalize inputs?
Do parents’ preferences (on average) place positive weight on:

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2. What are their average preference weights? How much are they willing to pay to equalize inputs?
Mixed logit regression model: Parent $i$ has the following utility in scenario $j$ from choosing ticket allocation $k$ (e.g., 10/0, 5/5):

$$u_{ijk} = \lambda_i \text{TotalPay}_{ijk} - \alpha_i \text{OutcomeInequality}_{ijk} - \beta_i \text{InputInequality}_{ijk} + \gamma_i \text{InputsToChildLvsH}_{ijk} + \varepsilon_{ijk}$$

- $\lambda_i, \alpha_i, \beta_i, \gamma_i$: normally distributed with SD’s and correlations estimated through estimation
- $\varepsilon_{ijk}$: type I extreme value, independent across $i$, $j$, and $k$
Mixed logit estimates of parental preference parameters

<table>
<thead>
<tr>
<th></th>
<th>(1) Mixed Logit ( \beta ) / SE</th>
<th>(2) Mixed Logit ( \beta ) / SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household earnings ('00)</td>
<td>0.2471*** (0.0557)</td>
<td>0.2297*** (0.0454)</td>
</tr>
<tr>
<td>Gap between children’s earnings ('00)</td>
<td>0.0347 (0.0353)</td>
<td>0.0108 (0.0292)</td>
</tr>
<tr>
<td>Absolute difference in inputs</td>
<td>-0.3645*** (0.0613)</td>
<td></td>
</tr>
<tr>
<td>Inputs not equally split (0/1)</td>
<td></td>
<td>-2.9763*** (0.2921)</td>
</tr>
<tr>
<td>Tickets to child L</td>
<td>-0.0831 (0.0643)</td>
<td>-0.1398** (0.0684)</td>
</tr>
<tr>
<td>WTP for 1 unit lower input inequality (MWK100)</td>
<td>1.48 (0.0643)</td>
<td></td>
</tr>
<tr>
<td>WTP for equal inputs (MWK100)</td>
<td>12.96 (0.0684)</td>
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<tr>
<td>Observations</td>
<td>15,895</td>
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</tr>
</tbody>
</table>

- High weight on equalizing inputs: Mean WTP 1,296 MWK CF results
- 2.1 USD; 92% of daily wage; 16% annual per-child educ. exp.
- Estimated WTP for equal inputs also correlates with more equal allocations of expenditures and parental time
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### CF results

- 2.1 USD; 92% of daily wage; 16% annual per-child educ. exp.
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- Estimated WTP for equal inputs also correlates with more equal allocations of expenditures and parental time
Conclusion

We perform the first experiment to estimate parents’ preferences for investing in their children

- Parents put some weight on maximizing returns
- But they don’t only care about maximizing returns
- Deviate from returns maximization primarily because of a strong preference for equality in inputs
- High average WTP to equalize inputs (>15% of annual average educational spending)
Thank you!
Results: Quantifying parents’ preferences
Conclusion
A substantial share of parents choose exactly-equal inputs in each scenario.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Mean</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case</td>
<td>36.84%</td>
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<tr>
<td>Higher Returns to Child H</td>
<td>30.31%</td>
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<tr>
<td>Higher Returns to Child L</td>
<td>41.28%</td>
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<tr>
<td>Lump Sum to Child L</td>
<td>32.62%</td>
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<tr>
<td>Higher Returns to Child L &amp; Lump Sum to Child H</td>
<td>32.52%</td>
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Parents forgo substantial expected earnings

Forgone earnings

<table>
<thead>
<tr>
<th>Scenario</th>
<th>% of Potential Earnings</th>
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<tr>
<td>(1) Base Case</td>
<td>33.32%</td>
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<tr>
<td>(2) Higher Returns to Child H</td>
<td>37.79%</td>
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<tr>
<td>(3) Higher Returns to Child L</td>
<td>44.95%</td>
</tr>
<tr>
<td>(4) Lump Sum to Child L</td>
<td>34.01%</td>
</tr>
<tr>
<td>(5) Higher Returns to Child L &amp; Lump Sum</td>
<td>48.41%</td>
</tr>
</tbody>
</table>

In MWK

Back
Further exploration

- A different experiment where parents can’t ex post equalize
- Other Reasons for Equalizing Inputs
- Mixed Logit, with OLS and IV
Why use lottery tickets as input?

Absent inequality aversion, expected utility is linear in probability, and hence lottery tickets

Linearity advantageous:

1. Clean predictions: Parents who do not care about equality should allocate all tickets to the child they’d prefer to receive tutoring → Only split if indifferent
   - Unlike other settings, concave returns to tutoring or risk aversion (i.e., concave utility in money) do not cause splitting

2. Clean measurement: Only need to elicit beliefs about returns to tutoring for each child
Dizon-Ross (2018)

- RCT in Malawi that delivered information to randomly selected parents with children in primary school about children’s academic performance
- Measured effects of information on parents’ investments and decisions
- To measure changes in level of investment across children:
  - Conducted a lottery, in which prize is 4 years of secondary school fees for one child in every 100 households
  - Parents given 9 tickets to allocate between children
    - Secondary school very expensive and most parents can’t afford → Can’t ex post equalize outcomes.
A similar setting where parents could not ex post equalize outcomes.

_Dizon-Ross (2018)_

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  - Conducted a lottery, in which prize is 4 years of secondary school fees for one child in every 100 households
  - Parents given 9 tickets to allocate between children
  - Secondary school very expensive and most parents can’t afford → Can’t _ex post_ equalize outcomes.
1. Returns maximization
   - All tickets to child with higher perceived secondary school return (normally: high performer)
2. Inequality aversion over outcomes
   - More (or all) tickets to perceived lower performing child
3. Inequality aversion over inputs
   - Split tickets as evenly as possible (4/5)
Parents equalize inputs (not outcomes) even when cannot ex-post equalize outcomes

Control group data

Absolute Gap in Tickets Between Children

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Absolute Gap</th>
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<tbody>
<tr>
<td>74.55%</td>
<td>1</td>
</tr>
<tr>
<td>10.57%</td>
<td>3</td>
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<tr>
<td>2.74%</td>
<td>5</td>
</tr>
<tr>
<td>0.34%</td>
<td>7</td>
</tr>
<tr>
<td>11.79%</td>
<td>9</td>
</tr>
</tbody>
</table>
Parents equalize inputs (not outcomes) even when cannot ex-post equalize outcomes

Control group data

Tickets to (Perceived) Lower-Performing Child
Parents forgo substantial expected earnings

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Mean (MWK)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Base Case</td>
<td>26.89</td>
<td></td>
</tr>
<tr>
<td>(2) Higher Returns to Child H</td>
<td>510.08</td>
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</tr>
<tr>
<td>(3) Higher Returns to Child L</td>
<td>433.52</td>
<td></td>
</tr>
<tr>
<td>(4) Lump Sum to Child L</td>
<td>28.02</td>
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</tr>
<tr>
<td>(5) Higher Returns to Child L &amp; Lump Sum to Child H</td>
<td>466.81</td>
<td></td>
</tr>
</tbody>
</table>

In MWK:

500 MWK: 0.81 USD; 35% of daily wage; 6% annual per-child educ. exp.
2. Structural preference estimation (Preliminary): Identification

**Mixed logit regression model:** Parent $i$ utility in scenario $j$ from ticket allocation $k$:

$$u_{ijk} = \lambda_i TotalPay_{ijk} - \alpha_i OutcomeInequality_{ijk} - \beta_i InputInequality_{ijk} + \gamma_i InputsToChildLvsH_{ijk} + \varepsilon_{ijk}$$

- $TotalPay_{ijk}$ and $OutcomeInequality_{ijk}$ vary for two reasons:
  1. Cross-scenario variation in payment fx’s (exogenous)
  2. Parent beliefs about returns to tutoring (endogenous)

- To address, also implement control function approach (Petrin and Todd 2010):
  1. Calculate OLS residuals from regressing $OutcomeInequality_{ijk}$ and $TotalPay_{ijk}$ on:
     - Instruments (scenario $\times$ ticket allocation dummies, $\tau_{jk}$)
     - The other regressors from equation (1)
  2. Include residuals $\hat{\eta}_{ijk}$, $\hat{\mu}_{ijk}$ as control function in second stage estimation.

$\rho_i, \tau_i$ normally distributed
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$$ + \gamma_i \text{InputsToChildLvsH}_{ijk} + \varepsilon_{ijk} $$

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$$u_{ijk} = \lambda_i \text{TotalPay}_{ijk} - \alpha_i \text{OutcomeInequality}_{ijk} - \beta_i \text{InputInequality}_{ijk}$$

$$+ \gamma_i \text{InputsToChildLvsH}_{ijk} + \rho_i \hat{\eta}_{ijk} + \tau_i \hat{\mu}_{ijk} + \varepsilon_{ijk}$$

- **TotalPay$_{ijk}$** and **OutcomeInequality$_{ijk}$** vary for two reasons:
  1. Cross-scenario variation in payment fx’s (exogenous)
  2. Parent beliefs about returns to tutoring (endogenous)

- To address, also implement control function approach (Petrin and Todd 2010):
  1. Calculate OLS residuals from regressing **OutcomeInequality$_{ijk}$** and **TotalPay$_{ijk}$** on:
     - Instruments (scenario $\times$ ticket allocation dummies, $\tau_{jk}$)
     - The other regressors from equation (1)
  2. Include residuals $\hat{\eta}_{ijk}$, $\hat{\mu}_{ijk}$ as control function in second stage estimation.

  - $\rho_i, \tau_i$ normally distributed
2. Structural preference estimation (Preliminary): Identification

Mixed logit regression model: Parent $i$ utility in scenario $j$ from ticket allocation $k$:

$$ u_{ijk} = \lambda_i \text{TotalPay}_{ijk} - \alpha_i \text{OutcomeInequality}_{ijk} - \beta_i \text{InputInequality}_{ijk} $$

$$ + \gamma_i \text{InputsToChildLvsH}_{ijk} + \rho_i \hat{\eta}_{ijk} + \tau_i \hat{\mu}_{ijk} + \epsilon'_{ijk} $$

- $\text{TotalPay}_{ijk}$ and $\text{OutcomeInequality}_{ijk}$ vary for two reasons:
  1. Cross-scenario variation in payment fx’s (exogenous)
  2. Parent beliefs about returns to tutoring (endogenous)

- To address, also implement control function approach (Petrin and Todd 2010):
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     - The other regressors from equation (1)
  2. Include residuals $\hat{\eta}_{ijk}$, $\hat{\mu}_{ijk}$ as control function in second stage estimation.
    - $\rho_i$, $\tau_i$ normally distributed
Mixed logit estimates of parental preference parameters

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mixed Logit</td>
<td>Mixed Logit</td>
<td>Mixed Logit with CF</td>
</tr>
<tr>
<td></td>
<td>$\beta$ / SE</td>
<td>$\beta$ / SE</td>
<td>$\beta$ / SE</td>
</tr>
<tr>
<td>Household earnings ('00)</td>
<td>0.2471*** (0.0557)</td>
<td>0.2297*** (0.0454)</td>
<td>0.1885*** (0.0554)</td>
</tr>
<tr>
<td>Gap between children's earnings ('00)</td>
<td>0.0347 (0.0353)</td>
<td>0.0108 (0.0292)</td>
<td>0.0160 (0.0292)</td>
</tr>
<tr>
<td>Absolute difference in inputs</td>
<td>-0.3645*** (0.0613)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inputs not equally split (0/1)</td>
<td></td>
<td>-2.9763*** (0.2921)</td>
<td>-3.1775*** (0.3281)</td>
</tr>
<tr>
<td>Tickets to child L</td>
<td>-0.0831 (0.0643)</td>
<td>-0.1398** (0.0684)</td>
<td>-0.2115*** (0.0723)</td>
</tr>
<tr>
<td>WTP for 1 unit lower input inequality (MWK100)</td>
<td>1.48</td>
<td>12.96</td>
<td>16.86</td>
</tr>
<tr>
<td>WTP for equal inputs (MWK100)</td>
<td>15,895</td>
<td>15,895</td>
<td>15,895</td>
</tr>
<tr>
<td>Observations</td>
<td>15,895</td>
<td>15,895</td>
<td>15,895</td>
</tr>
</tbody>
</table>
WTP for equal inputs correlates with other behaviors

<table>
<thead>
<tr>
<th></th>
<th>Above-med. absolute gap in exp.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>$\beta$ / SE</td>
<td>$\beta$ / SE</td>
</tr>
<tr>
<td>WTP to decrease absolute gap in inputs (MWK 100's)</td>
<td>-0.012** (0.006)</td>
<td></td>
</tr>
<tr>
<td>WTP to equally split inputs (MWK 100's)</td>
<td>-0.003 (0.002)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.519*** (0.031)</td>
<td>0.545*** (0.040)</td>
</tr>
<tr>
<td>Observations</td>
<td>288</td>
<td>288</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.013</td>
<td>0.009</td>
</tr>
</tbody>
</table>

Note: Above-med. absolute gap in expenditures is a dummy for whether the absolute value of the between-child gap in shares of total human capital expenditures is above-median.
WTP for equal inputs correlates with other behaviors

<table>
<thead>
<tr>
<th>WTP to decrease absolute gap in inputs (MWK 100's)</th>
<th>Mother’s time not equally split (0/1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>( \beta / SE )</td>
</tr>
<tr>
<td>WTP to decrease absolute gap in inputs (MWK 100's)</td>
<td>-0.012**</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
</tr>
<tr>
<td>WTP to equally split inputs (MWK 100's)</td>
<td>-0.005**</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.410***</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
</tr>
<tr>
<td>Dep. var mean</td>
<td>0.39</td>
</tr>
<tr>
<td>Observations</td>
<td>251</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.015</td>
</tr>
<tr>
<td>Observations</td>
<td>251</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.019</td>
</tr>
</tbody>
</table>
1. Reduced-form approach

1. The “cost” of equalizing inputs (forgone household earnings) varies across scenarios
2. We use this cross-scenario variation to trace out how parents trade off household earnings vs. inputs inequality
3. Steep slope of equalizing on cost implies lower value of equality (when cost increases, stop doing it)
4. Flat slope implies higher value of equality, i.e., that (some) parents equalize even when high cost to doing so
1. Reduced-form approach

\[ \text{Equalized}_{ij} = d_0 + d_1 \ast \text{Foregone}_{ij} + \tau_i + \varepsilon_{ij}, \]

- \( \text{Equalized}_{ij} \): Dummy for respondent \( i \) equalizing inputs in scenario \( j \)
- \( \text{Foregone}_{ij} \): Difference between HH earnings from the returns-maximizing choice vs. the input-equalizing choice.
- \( \text{Foregone}_{ij} \) varies for two reasons:
  1. Cross-scenario variation in functions mapping scores to payments (exogenous)
  2. Parent beliefs about their children’s returns to tutoring (endogenous)
- IV strategy: Instrument for \( \text{Foregone}_{ij} \) with scenario dummies
1. Reduced-form approach

<table>
<thead>
<tr>
<th>Foregone Earnings from Splitting ('00)</th>
<th>OLS ( \beta / SE )</th>
<th>IV ( \beta / SE )</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>-0.006** (0.003)</td>
<td>-0.010*** (0.003)</td>
</tr>
<tr>
<td>(2)</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Observations</th>
<th>1445</th>
<th>1445</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R^2 )</td>
<td>0.664</td>
<td>0.664</td>
</tr>
</tbody>
</table>

- IV: Additional MWK 1000 (1.38 USD or 12% annual per-child educ. exp.) in cost of equalizing decreases equalizing by 10pp
- Relatively flat → Some parents have substantial willingness to pay for equal inputs
### 1. Reduced-form approach

<table>
<thead>
<tr>
<th></th>
<th>(1) OLS</th>
<th>(2) IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foregone Earnings from Splitting ('00)</strong></td>
<td>-0.006** (0.003)</td>
<td>-0.010*** (0.003)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>1445</td>
<td>1445</td>
</tr>
<tr>
<td><strong>$R^2$</strong></td>
<td>0.664</td>
<td>0.664</td>
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</tbody>
</table>

- **IV**: Additional MWK 1000 (1.38 USD or 12% annual per-child educ. exp.) in cost of equalizing decreases equalizing by 10pp
- Relatively flat → Some parents have substantial willingness to pay for equal inputs
1. Reduced-form approach

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<tr>
<th></th>
<th>(1) OLS</th>
<th>(2) IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>β / SE</strong></td>
<td><strong>β / SE</strong></td>
<td></td>
</tr>
<tr>
<td>Foregone Earnings from Splitting ('00)</td>
<td>-0.006** (0.003)</td>
<td>-0.010*** (0.003)</td>
</tr>
<tr>
<td>Observations</td>
<td>1445</td>
<td>1445</td>
</tr>
<tr>
<td>$R^2$</td>
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- IV: Additional MWK 1000 (1.38 USD or 12% annual per-child educ. exp.) in cost of equalizing decreases equalizing by 10pp
- Relatively flat → Some parents have substantial willingness to pay for equal inputs
1. Reduced-form approach

Fraction of equalizers by bin of foregone earnings

![Graph showing fraction of equalizers by bin of foregone earnings.](image-url)
Parents have a high WTP for equal inputs

Mixed logit estimates of willingness to pay for different ticket allocations
<table>
<thead>
<tr>
<th></th>
<th>Father’s time not equally split (0/1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>$\beta$ / SE</td>
</tr>
<tr>
<td>WTP to decrease absolute gap in inputs (MWK 100’s)</td>
<td>-0.014** (0.007)</td>
</tr>
<tr>
<td>WTP to equally split inputs (MWK 100’s)</td>
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</tr>
<tr>
<td>Constant</td>
<td>0.409*** (0.040)</td>
</tr>
<tr>
<td>Observations</td>
<td>175</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.022</td>
</tr>
</tbody>
</table>
WTP for equal inputs correlates with other behaviors

<table>
<thead>
<tr>
<th></th>
<th>Mother’s time not equally split (0/1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>$\beta$ / SE</td>
</tr>
<tr>
<td><strong>WTP to decrease absolute gap in inputs (MWK 100’s)</strong></td>
<td>-0.012**</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
</tr>
<tr>
<td><strong>WTP to equally split inputs (MWK 100’s)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>0.410***</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
</tr>
<tr>
<td><strong>Dep. var mean</strong></td>
<td>0.39</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>251</td>
</tr>
<tr>
<td><strong>$R^2$</strong></td>
<td>0.015</td>
</tr>
</tbody>
</table>

Conclusion
Standard returns-maximizing utility as function of tickets

\[ U(x_L, x_H) = \frac{x_L}{10} Eu(R_L^T + R_H) + \frac{x_H}{10} Eu(R_L + R_H^T) \]  \hspace{1cm} (2)

with:

- \( R_i \) expected earnings without tutoring
- \( R_i^T \) expected earnings with tutoring
- \( Eu(\cdot) \) taken over the risk in parents’ beliefs about their children’s scores with and without tutoring.

Note: linear in \( x_L \) and \( x_H \)
Utility function with uncertainty

\[
\max_{x_1, x_2} U(x_1, x_2 | a_1, a_2) = \lambda \mathbb{E}[R(x_1 | a_1) + R(x_2 | a_2)]
\]

- Total household earnings

\[
- \alpha \mathbb{E}[R(x_1 | a_1) - R(x_2 | a_2)]
\]

- Absolute earnings gap

\[
- \beta \mathbb{E}[x_1 - x_2]
\]

- Absolute inputs gap

\[
+ \gamma \mathbb{E}[x_1 - x_2]
\]

- Relative inputs
Parents' Preferences: Scenario 3 vs. Scenario 5

### Scenarios

<table>
<thead>
<tr>
<th>3. Higher Returns to Child L</th>
<th>5. Higher Returns to L &amp; Lump Sum to H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Payment functions</strong></td>
<td></td>
</tr>
<tr>
<td>Child L</td>
<td>$0 + 100S_L$</td>
</tr>
<tr>
<td>Child H</td>
<td>$0 + 10S_H$</td>
</tr>
<tr>
<td></td>
<td>$0 + 100S_L$</td>
</tr>
<tr>
<td></td>
<td>$6000 + 10S_H$</td>
</tr>
<tr>
<td><strong>Predictions</strong></td>
<td></td>
</tr>
<tr>
<td>Returns Max.</td>
<td>L</td>
</tr>
<tr>
<td>IA over Outcomes</td>
<td>H</td>
</tr>
<tr>
<td>IA over Inputs</td>
<td>Equal</td>
</tr>
<tr>
<td></td>
<td>Equal</td>
</tr>
</tbody>
</table>

$R_i$: Child $i$’s test score gains to tutoring.

RM predictions for Scenario 5 hold for 95% of people. IAO predictions for Scenario 5 hold for 96% of people.
IA over Outcomes and Returns Maximization

- Percent of Allocations
- Tickets to Child L
- Higher returns to L
- Higher returns to L/ Lump sum to H

Back
IA over Outcomes and Returns Maximization

- Percent of Allocations
- Tickets to Child L
- Higher returns to L
- Higher returns to L/ Lump sum to H
Ticket allocations, by scenario

(a) Scenario 1 (Base Case)

(b) Scenario 2 (Lump Sum to Child L)

(c) Scenario 3 (Higher Returns to Child H)

(d) Scenario 4 (Higher Returns to Child L & Lump Sum to Child H)

(e) Scenario 5 (Higher Returns to Child L)
Ticket allocations, by whether inequality aversion in outcomes (IAO) and returns maximization (RM) have the same or opposite predictions: People with $R_L < R_H$ only

Scenarios where IAO and RM have opposite predictions

Scenarios where IAO and RM have the same prediction

cards 3-5 only
Ticket allocations, by whether inequality aversion in outcomes (IAO) and returns maximization (RM) have the same or opposite predictions: Cards 3-5 only

Scenarios where IAO and RM have opposite predictions

Scenarios where IAO and RM have the same prediction
# Summary of Outcomes

<table>
<thead>
<tr>
<th>Total Households</th>
<th>289</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Received Tutoring</strong></td>
<td><strong>% received tutoring</strong></td>
</tr>
<tr>
<td>Child L</td>
<td>0.43</td>
</tr>
<tr>
<td>Child H</td>
<td>0.57</td>
</tr>
<tr>
<td><strong>Math test score</strong></td>
<td><strong>Mean (out of 100)</strong></td>
</tr>
<tr>
<td>Child L</td>
<td>41.92</td>
</tr>
<tr>
<td>Child H</td>
<td>44.14</td>
</tr>
<tr>
<td><strong>Weighted average returns to tutoring</strong></td>
<td><strong>13.08</strong></td>
</tr>
</tbody>
</table>
Individual parent-level changes: S2 to S3

Parent-level Changes From Higher returns to H to Higher returns to L

- Away from Lower-Performing Child
- No Change
- Towards Lower-Performing Child

<table>
<thead>
<tr>
<th>Percent of Parents</th>
<th>Away from Lower-Performing Child</th>
<th>No Change</th>
<th>Towards Lower-Performing Child</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td></td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Individual parent-level changes: S1 to S4

Parent-level Changes From Base case to Lump sum to L

- Away from Lower-Performing Child
- No Change
- Towards Lower-Performing Child

Percent of Parents

- 0.2
- 0.4
- 0.6
Individual parent-level changes: S1 to S2

Parent-level Changes From Base case to Higher returns to H

- Away from Lower-Performing Child: 0.2
- No Change: 0.6
- Towards Lower-Performing Child: 0.4

Percent of Parents
### Stability of Preferences Across Scenarios:

<table>
<thead>
<tr>
<th>Preference</th>
<th>Percentage of Parents</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAI all scenarios</td>
<td>0.19</td>
</tr>
<tr>
<td>RM all scenarios</td>
<td>0.06</td>
</tr>
<tr>
<td>IAO all scenarios</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Total Households:** 289

**Notes:** This table presents the proportion of parents who only preferred to equalize inputs, maximize returns, or equalize outcomes for all scenarios.
IA over Outcomes

Percent of Allocations

Tickets to Child L

Base case

Lump sum to L
Here's your first card. With this card, both children get 10 MWK for every point scored over 40 on the test. So, if Child A gets 50 points and Child B gets 70 points, with this card, Child A would get a reward worth (50-40) points X 10 MWK per point = 100 MWK, and Child B would get a reward worth (70-40) points X 10 MWK per point = 300 MWK. So, the expected reward for each child depends on the score they receive, but with this card, both children get 10 MWK for each point scored.

<table>
<thead>
<tr>
<th></th>
<th>Beliefs w/o T</th>
<th>Beliefs w T</th>
<th>Scenario</th>
<th>Payoff w/o T</th>
<th>Payoff w T</th>
<th># Tickets o/f 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child A</td>
<td>50</td>
<td>60</td>
<td>10*(TS-40)</td>
<td>100</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Child B</td>
<td>70</td>
<td>80</td>
<td>10*(TS-40)</td>
<td>300</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

Without tutoring, you expected Child A to score 50 on the test; if they do in fact score 50, then Child A would get a prize worth 10*(50-40) = 100 MWK. With tutoring, you expected Child A to get a score of 60. If she did score 60, he/she will receive a prize worth 10*(60-40) = 200 MWK. So, then the more tickets you give to Child A, the higher chance you move them from a prize worth 100 MWK to a prize worth 200 MWK.

Similarly, without tutoring, you expected Child B to score 70 on the test, which means that Child B would get a prize worth 10*(70-40) = 300 MWK. With tutoring, you expected Child B to get a score of 80. With this reward card, he/she will receive 10*(80-40) = MWK 400. So, then the more tickets you give to Child B, the higher chance you move them from a prize worth MWK 300 to a prize worth MWK 400.
<table>
<thead>
<tr>
<th>Tickets to Child A</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child A's Expected Reward</td>
<td>100</td>
<td>110</td>
<td>120</td>
<td>130</td>
<td>140</td>
<td>150</td>
<td>160</td>
<td>170</td>
<td>180</td>
<td>190</td>
<td>200</td>
</tr>
<tr>
<td>Child B's Expected Reward</td>
<td>400</td>
<td>390</td>
<td>380</td>
<td>370</td>
<td>360</td>
<td>350</td>
<td>340</td>
<td>330</td>
<td>320</td>
<td>310</td>
<td>300</td>
</tr>
<tr>
<td>Tickets to Child B</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Tickets to Child A</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
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<td>---</td>
<td>---</td>
<td>----</td>
</tr>
<tr>
<td>Child A's Expected Reward</td>
<td>100</td>
<td>110</td>
<td>120</td>
<td>130</td>
<td>140</td>
<td>150</td>
<td>160</td>
<td>170</td>
<td>180</td>
<td>190</td>
<td>200</td>
</tr>
<tr>
<td>Child B's Expected Reward</td>
<td>400</td>
<td>390</td>
<td>380</td>
<td>370</td>
<td>360</td>
<td>350</td>
<td>340</td>
<td>330</td>
<td>320</td>
<td>310</td>
<td>300</td>
</tr>
<tr>
<td>Tickets to Child B</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
The use of cash as a reward

- Any reward could be seen as biasing us in one direction or the other.
- Cash is potentially transferable within the household, which biases us:
  - Towards returns-maximization
  - Away from inequality aversion over outcomes
- Experiment thus lower bound on level of inequality aversion: biased towards the null of the “standard model”
- Other option (non-fungible consumption): utility could be highly concave, biasing us towards inequality aversion
Heterogeneity in allocations for Scenarios 2-5, by whether parents allocated more tickets to Child H in Scenario 1

Scenario 2 (Higher Returns to Child H)

Scenario 3 (Higher Returns to Child L)

Scenario 4 (Lump Sum to Child L)

Scenario 5 (Lump Sum to Child L)
Heterogeneity in allocations for Scenarios 2-5, by whether parents allocated more tickets to Child L in Scenario 1.

Scenario 2 (Higher Returns to Child H)

Scenario 3 (Higher Returns to Child L)

Scenario 4 (Lump Sum to Child H)

Scenario 5 (Lump Sum to Child L)
Do ticket allocations differ when returns-maximization and inequality aversion of outcomes have the same prediction?

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Returns Maximization</th>
<th>Inequality Aversion of Outcomes</th>
<th>Inequality Aversion of Inputs</th>
</tr>
</thead>
</table>
| 1. Base Case<br>
L = 0 + 10(Score\_L - Threshold)<br>H = 0 + 10(Score\_H - Threshold)<br>(If R\_L < R\_H) (66% of sample)<br>(If R\_L < R\_H) | H<br>L | Equal |
| 2. Higher Returns to Child H<br>
L = 0 + 10(Score - Threshold)<br>H = 0 + 100(Score - Threshold) | H<br>L | Equal |
| 3. Higher Returns to Child L<br>
L = 0 + 100(Score - Threshold)<br>H = 0 + 10(Score - Threshold) | L<br>H | Equal |
| 4. Lump Sum to Child L<br>
L = 1000 + 10(Score\_L - Threshold)<br>H = 0 + 10(Score\_H - Threshold)<br>(If R\_L < R\_H) (66% of sample) | H<br>H | Equal |
| 5. Higher Returns to L & Lump Sum to H<br>
L = 0 + 100(Score\_L - Threshold)<br>H = 6000 + 10(Score\_H - Threshold) | L<br>L | Equal |

RM and IAO have same predictions. RM and IAO have different predictions

$R_i$: Child $i$’s test score gains to tutoring. Threshold: Child L’s score, rounded down.
Ticket allocations, by whether inequality aversion in outcomes and returns maximization have the same predictions

Limiting to people with $R_L < R_H$
Data suggest many parents may have a preference for one child or the other

- Those who allocated more to one child in “base case” continue to do so throughout

- Can we predict these preferences?
  - No significant child-level predictors (e.g., no gender bias)
  - One parent-level predictor: Less-educated parents more likely to prefer high-performing child
Child-specific preferences?

• Data suggest many parents may have a preference for one child or the other
  • Those who allocated more to one child in “base case” continue to do so throughout

Can we predict these preferences?
  • No significant child-level predictors (e.g., no gender bias)
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Child-specific preferences?

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  - One parent-level predictor: Less-educated parents more likely to prefer high-performing child
Ticket allocations, by whether inequality aversion in outcomes and returns maximization have the same predictions.

Limiting to Scenarios 2, 3, and 5:

- Opposite predictions (Scenarios 2 and 3): 35.99%
- Same predictions (Scenario 5): 32.53%
## Average perceived scores and returns to tutoring

<table>
<thead>
<tr>
<th></th>
<th>Average Perceived:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score_i^{NoTut} - Threshold</td>
<td>Test score gains from tutoring (&quot;R_i&quot;)</td>
</tr>
<tr>
<td>Child L</td>
<td>8.96</td>
</tr>
<tr>
<td>Child H</td>
<td>23.68</td>
</tr>
</tbody>
</table>
2. High Returns to H vs. 3. High Returns to L

<table>
<thead>
<tr>
<th>Scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Higher Returns to H</td>
</tr>
<tr>
<td>3. Higher Returns to L</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Payment functions</th>
<th>2. Higher Returns to H</th>
<th>3. Higher Returns to L</th>
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<tbody>
<tr>
<td>Child L</td>
<td>$10S_L$</td>
<td>$100S_L$</td>
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<td>Child H</td>
<td>$100S_H$</td>
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<table>
<thead>
<tr>
<th>Predictions</th>
<th>2. Higher Returns to H</th>
<th>3. Higher Returns to L</th>
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<tbody>
<tr>
<td>Returns Max.</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>IA over Outcomes</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>IA over Inputs</td>
<td>Equal</td>
<td>Equal</td>
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</table>

<table>
<thead>
<tr>
<th>Mean perceived earnings return to tutoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child L</td>
</tr>
<tr>
<td>113</td>
</tr>
<tr>
<td>1,129</td>
</tr>
<tr>
<td>Child H</td>
</tr>
<tr>
<td>1456</td>
</tr>
<tr>
<td>146</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean perceived earnings without tutoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child L</td>
</tr>
<tr>
<td>90</td>
</tr>
<tr>
<td>896</td>
</tr>
<tr>
<td>Child H</td>
</tr>
<tr>
<td>2,368</td>
</tr>
<tr>
<td>237</td>
</tr>
</tbody>
</table>

$R_i$: Child $i$’s test score gains to tutoring.

$1,129 - 146 \equiv 983 \equiv 0.7$ daily wage $\equiv 1.38$ USD
1. Base Case vs. 4. Lump Sum to L

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>1. Base Case</th>
<th>4. Lump Sum to Child L</th>
</tr>
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<tbody>
<tr>
<td><strong>Payment functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child L</td>
<td>$0 + 10S_L$</td>
<td>$1000 + 10S_L$</td>
</tr>
<tr>
<td>Child H</td>
<td>$0 + 10S_H$</td>
<td>$0 + 10S_H$</td>
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<tr>
<td><strong>Predictions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Returns Max.</td>
<td>If $R_L &lt; R_H$ (66%): H</td>
<td>If $R_L &lt; R_H$ (66%): H</td>
</tr>
<tr>
<td></td>
<td>If $R_L = R_H$ (19%): ?</td>
<td>If $R_L = R_H$ (19%): ?</td>
</tr>
<tr>
<td></td>
<td>If $R_L &gt; R_H$ (14%): L</td>
<td>If $R_L &gt; R_H$ (14%): L</td>
</tr>
<tr>
<td>IA over Outcomes</td>
<td>If $R_L &lt; R_H$ (66%): L</td>
<td>If $R_L &gt; R_H$ (14%): ?</td>
</tr>
<tr>
<td></td>
<td>If $R_L = R_H$ (19%): L</td>
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</tr>
<tr>
<td></td>
<td>If $R_L &gt; R_H$ (14%): ?</td>
<td></td>
</tr>
<tr>
<td>IA over Inputs</td>
<td>Equal</td>
<td>Equal</td>
</tr>
</tbody>
</table>

**Mean perceived earnings return to tutoring**

| Child L | 113 | 113 |
| Child H | 146 | 146 |

**Mean perceived earnings without tutoring**

| Child L | 90  | 1,090 |
| Child H | 237 | 237   |

$R_i$: Child $i$’s test score gains to tutoring.

$146-113 \equiv 33 \equiv 0.02$ daily wage $\equiv 0.05$ USD
3. High Returns to L vs. 5. High Returns to L/Lump Sum to H

Scenarios

<table>
<thead>
<tr>
<th>3. Higher Returns to Child L</th>
<th>5. Higher Returns to L &amp; Lump Sum to H</th>
</tr>
</thead>
</table>

**Payment functions**

<table>
<thead>
<tr>
<th>Child L</th>
<th>0 + 100$S_L$</th>
<th>0 + 100$S_L$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child H</td>
<td>0 + 10$S_H$</td>
<td>6000 + 10$S_H$</td>
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</table>

**Predictions**

<table>
<thead>
<tr>
<th>Returns Max.</th>
<th>L</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA over Outcomes</td>
<td>H</td>
<td>L</td>
</tr>
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<td>Equal</td>
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</tbody>
</table>

**Mean perceived earnings return to tutoring**

<table>
<thead>
<tr>
<th>Child L</th>
<th>1,129</th>
</tr>
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<tbody>
<tr>
<td>Child H</td>
<td>146</td>
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**Mean perceived earnings without tutoring**

<table>
<thead>
<tr>
<th>Child L</th>
<th>896</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child H</td>
<td>237</td>
</tr>
</tbody>
</table>

$R_i$: Child $i$’s test score gains to tutoring.  
1,129 - 146 ≡ 983 ≡ 0.7 daily wage ≡ 1.38 USD
Scenario 1 (Base Case)

Scenario 2 (Higher Returns to Child H)
Scenario 2 (Higher Returns to Child H)

Scenario 3 (Higher Returns to Child L)
Scenario 1 *(Base Case)*

Scenario 4 *(Lump Sum to Child L)*
Scenario 3 (Higher Returns to Child L)

Scenario 5 (Higher Returns to Child L
Lump Sum to Child H)
### Mixed Logit Estimates of Parental Preference Parameters

<table>
<thead>
<tr>
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<th>(1) Mixed Logit</th>
<th>(2) Mixed Logit</th>
<th>(3) OLS</th>
<th>(4) IV</th>
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</thead>
<tbody>
<tr>
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<td>$\beta$ / SE</td>
<td>$\beta$ / SE</td>
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<tr>
<td>Household earnings ('00)</td>
<td>0.2471***</td>
<td>0.2297***</td>
<td>0.0046***</td>
<td>0.0050***</td>
</tr>
<tr>
<td></td>
<td>(0.0557)</td>
<td>(0.0454)</td>
<td>(0.0009)</td>
<td>(0.0010)</td>
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<tr>
<td>Gap between children's earnings ('00)</td>
<td>0.0347</td>
<td>0.0108</td>
<td>0.0006</td>
<td>0.0011*</td>
</tr>
<tr>
<td></td>
<td>(0.0353)</td>
<td>(0.0292)</td>
<td>(0.0006)</td>
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<tr>
<td>Absolute difference in inputs</td>
<td>-0.3645***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0613)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inputs not equally split (0/1)</td>
<td></td>
<td>-2.9763***</td>
<td>-0.3027***</td>
<td>-0.3027***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.2921)</td>
<td>(0.0267)</td>
<td>(0.0254)</td>
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<tr>
<td>Tickets to child L</td>
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<td>-0.1398**</td>
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</tr>
<tr>
<td>WTP for 1 unit lower input inequality (MWK100)</td>
<td>1.48</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>15,895</td>
<td>15,895</td>
<td>15,895</td>
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</tr>
</tbody>
</table>

- High weight on equalizing inputs: Mean WTP 1,296 MWK
- 2.1 USD; 92% of daily wage; 16% annual per-child educ. exp.
Mixed logit estimates of parental preference parameters

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- **High weight on equalizing inputs:** Mean WTP 1,296 MWK
- 2.1 USD; 92% of daily wage; 16% annual per-child educ. exp.
### Payment functions by scenario

#### Scenarios

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<th></th>
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<tbody>
<tr>
<td>L</td>
<td>$10S_L$</td>
<td>$10S_L$</td>
<td>$100S_L$</td>
<td>$1000 + 10S_L$</td>
<td>$100S_L$</td>
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<tr>
<td>H</td>
<td>$10S_H$</td>
<td>$100S_H$</td>
<td>$10S_H$</td>
<td>$10S_H$</td>
<td>$6000 + 10S_H$</td>
</tr>
</tbody>
</table>

10 MWK = 0.014 USD

100 MWK = 0.14 USD = 7% of daily wage.

Note: $S_L \equiv \text{Score}_L$ - Threshold. $S_H \equiv \text{Score}_H$ - Threshold.
Parents allocate tickets under 5 payment function scenarios

Payment function for child $i$ ($i \in \{L, H\}$) from household $k$ in scenario $j$:

$$\text{Payment}_{ijk} = a_{ij} + b_{ij}(\text{Score}_{ik} - \text{Threshold}_k)$$

$$\equiv a_{ij} + b_{ij}\bar{S}_{ik}$$

$\text{Threshold}_k$: Perceived $\text{Score}_{Lk}$ without tutoring, rounded down to nearest 10

**Predictions** (all based on perceived test scores; suppress $k$ going forward):

1. Returns maximization
   - All to child with higher payment return to tutoring
   - Child $i$’s payment return to tutoring $= b_{ij}(S^{Tut}_i - S^{NoTut}_i) \equiv b_{ij}R_i \Rightarrow$ Only $b_{ij}$ matters

2. Inequality aversion of outcomes
   - (Normally) more to child with lower $\text{Payment}_{i}^{NoTut} \Rightarrow$ Both $a_{ij}$ and $b_{ij}$ matter

3. Inequality aversion of inputs
   - Split regardless $\Rightarrow$ Neither $a_{ij}$ or $b_{ij}$ matters
Parents allocate tickets under 5 payment function scenarios

Payment function for child \( i \) \((i \in \{L, H\})\) from household \( k \) in scenario \( j \):

\[
Payment_{ijk} = a_{ij} + b_{ij}(Score_{ik} - Threshold_k) \equiv a_{ij} + b_{ij}S_{ik}
\]

\(Threshold_k\): Perceived \(Score_{Lk}\) without tutoring, rounded down to nearest 10

**Predictions** (all based on *perceived* test scores; suppress \( k \) going forward):

1. Returns maximization
   - All to child with higher payment return to tutoring
   - Child \( i \)'s payment return to tutoring = \( b_{ij}(S_i^{Tut} - S_i^{NoTut}) \equiv b_{ij}R_i \Rightarrow \) Only \( b_{ij} \) matters
2. Inequality aversion of outcomes
   - (Normally) more to child with lower \( Payment_i^{NoTut} \Rightarrow \) Both \( a_{ij} \) and \( b_{ij} \) matter
3. Inequality aversion of inputs
   - Split regardless \( \Rightarrow \) Neither \( a_{ij} \) or \( b_{ij} \) matters