Neighborhood Effects and Children’s Outcomes

- Growing body of evidence shows that where children grow up has substantial causal effects on their prospects for upward income mobility


- Natural question: which neighborhoods offer the best opportunities for children?
  - Previous work either focuses on a small set of neighborhoods (e.g., Moving to Opportunity experiment) or broad geographies
We construct publicly available estimates of children’s earnings in adulthood (and other long-term outcomes) by Census tract and subgroup, for the entire U.S.

- Granular definition of neighborhoods: 70,000 Census tracts; 4,200 people per tract

Key difference from prior work on geographic variation: identify roots of outcomes such as poverty and incarceration by tracing them back to where children grew up

- Large literature on place-based policies and local labor markets has documented importance of place for production [e.g., Moretti 2011, Glaeser 2011, Moretti 2013, Kline & Moretti 2014]

- Here we focus on the role of place in the development of human capital and show that patterns differ in important ways
Data Sources and Sample Definitions


- Link children to parents based on dependent claiming on tax returns

- Target sample: Children in 1978-83 birth cohorts who were born in the U.S. or are authorized immigrants who came to the U.S. in childhood

- Analysis sample: 20.5 million children, 96% coverage rate of target sample
Income Definitions

- Parents’ pre-tax household incomes: mean Adjusted Gross Income from 1994-2000, assigning non-filers zeros

- Children’s pre-tax incomes measured in 2014-15 (ages 31-37)
  - Non-filers assigned incomes based on W-2’s (available since 2005)

- To mitigate lifecycle bias, focus on national percentile ranks: rank children relative to others in their birth cohort and parents relative to other parents
Predicted Value at Parents 25th Percentile = 41st Percentile = $31,900
The Opportunity Atlas via Two Applications

1. Observational Variation and Targeting
2. Causal Effects and Neighborhood Choice
The Opportunity Atlas via Two Applications

1. Observational Variation and Targeting

2. Causal Effects and Neighborhood Choice
Observational Variation and Targeting

- Many policies target areas based on characteristics such as the poverty rates
  - Tax policies (e.g., Opportunity zones), local services (e.g., Head Start programs), …

- For such “tagging” applications, observed outcomes are of direct interest in standard optimal tax models [Akerlof 1978, Nichols and Zeckhauser 1982]
  - Isolating causal effects of neighborhoods not necessarily relevant

- Motivated by these applications, begin with a descriptive characterization of how children’s outcomes vary across tracts
The Geography of Upward Mobility in the United States
Average Household Income for Children with Parents Earning $27,000 (25th percentile)

Note: Blue = More Upward Mobility, Red = Less Upward Mobility
Mean Household Income for Children in Los Angeles with Parents Earning $27,000 (25th percentile)
Mean Household Income for Children in Los Angeles with Parents Earning $27,000 (25th percentile)

WATTS:
Mean Household Income = $23,800 ($3,600)
Mean Household Income for **Black** Men in Los Angeles with Parents Earning $27,000 (25th percentile)

**WATTS, Black Men**
Mean Household Income = $7,286 ($2,576)
Mean Household Income for Black Men in Los Angeles with Parents Earning $27,000 (25th percentile)

**WATTS, Black Men**: Mean Household Income = $7,286 ($2,576)

**COMPTON, Black Men**: Mean Household Income = $19,141 ($2,149)
Mean Individual Income for Black Women in Los Angeles with Parents Earning $27,000 (25th percentile)

WATTS, Black Women:
Mean Household Income = $19,489 ($1,985)

COMPTON, Black Women:
Mean Household Income = $21,509 ($1,850)
Incarceration Rates for **Black Men** in Los Angeles with Parents Earning < $2,200 (1st percentile)

**WATTS, Black Men**
Share Incarcerated on April 1, 2010
= 44.1% (9.3%)
Incarceration Rates for **Black Men** in Los Angeles with Parents Earning < $2,200 (1st percentile)

- **WATTS, Black Men**: Share Incarcerated on April 1, 2010 = 44.1% (9.3%)
- **COMPTON, Black Men**: Share Incarcerated on April 1, 2010 = 6.2% (5.0%)
Incarceration Rates for **Hispanic Men** in Los Angeles with Parents Earning < $2,200 (1st percentile)

**WATTS, Hispanic Men**: Share Incarcerated on April 1, 2010 = 4.5% (2.8%)

**COMPTON, Hispanic Men**: Share Incarcerated on April 1, 2010 = 1.4% (0.8%)
Correlations between Tract-Level Covariates and Household Income Rank
Race-Adjusted, Parent Income at 25th Percentile

- Number of Jobs Within 5 Miles
- High-Paying Jobs Within 5 Miles
- Job Growth 2004-2013

Magnitude of Race-Controlled Signal Correlation

Positive

Negative

0  0.2  0.4  0.6  0.8
Spatial Decay of Correlation with Tract-Level Poverty Rate
Mean Child Household Income Rank (Parents p=25), White Children

Coefficient at 0: -0.314 (0.007)
Sum of Coefficients 1-10: -0.129 (0.009)

Regression Coefficient

Neighbor Number
(Median Distance in Miles)
Spatial Decay of Correlation with Tract-Level Poverty Rate
Mean Child Household Income Rank (Parents p=25), White Children

Poverty rates in neighboring tracts have little predictive power conditional on poverty rate in own tract

Coefficient at 0: -0.314 (0.007)
Sum of Coefficients 1-10: -0.129 (0.009)
Spatial Decay of Correlation with Block-Level Poverty Rate
Mean Child Household Income Rank (Parents p=25), White Children

Coefficient at 0: -0.057 (0.001)
Sum of Coefficients 1-40: -0.224 (0.014)
Correlations between Tract-Level Covariates and Household Income Rank  
Race-Adjusted, Parent Income at 25th Percentile

- Number of Jobs Within 5 Miles
- High-Paying Jobs Within 5 Miles
- Job Growth 2004-2013
- 2000 Employment Rate
- Share Above Poverty Line
- Mean Household Income
- Mean 3rd Grade Math Score
- Share College Grad.
- Share Single Parent Households
- Census Return Rate

Magnitude of Race-Controlled Signal Correlation

Positive  Negative

0  0.2  0.4  0.6  0.8
Correlations between Tract-Level Covariates and Household Income Rank
Race-Adjusted, Parent Income at 25th Percentile

- Number of Jobs Within 5 Miles
- High-Paying Jobs Within 5 Miles
- Job Growth 2004-2013
- 2000 Employment Rate
- Share Above Poverty Line
- Mean Household Income
- Mean 3rd Grade Math Score
- Share College Grad.
- Share Single Parent Households
- Census Return Rate
- Share Black
- Share Hispanic

Positive
Negative

Magnitude of Race-Controlled Signal Correlation
Correlations between Tract-Level Covariates and Household Income Rank
Race-Adjusted, Parent Income at 25th Percentile

R-Squared of All Covars. = 0.504
Do Cities Offer Greater Opportunities for Upward Mobility?
Average Income for White Children with Parents Earning $25,000 in North Carolina

* < 29.5 ($20k)
* 44.6 ($36k)
* > 64.3 ($63k)
Do Cities Offer Greater Opportunities for Upward Mobility?
Average Income for White Children with Parents Earning $25,000 in Iowa
Are Historical Measures of Social Mobility Still Relevant Today?

- Tract-level estimates of children’s appear to provide new information that could be helpful in identifying areas where opportunity is most lacking
  
  - But are they still relevant today? Yes, on average, for two reasons:

1. Correlation of mean outcomes across tracts within CZs is high across cohorts
   
   - 90% signal correlation between 1980 cohort and 1990 cohort outcomes across tract (excluding cohort-specific shocks, which are not predictable)

2. Historical outcomes are **better** predictors than other observables
The Opportunity Atlas via Two Applications

1. Observational Variation and Targeting

2. Causal Effects and Neighborhood Choice
Neighborhood Choice and Causal Effects of Place

- Where should a family seeking to improve their children’s outcomes live?

- Answer matters both to individual families and potentially for policy design
  - Ex: Many affordable housing programs (e.g., Housing Choice Vouchers) have explicit goal of helping low-income families access “higher opportunity” areas

- For these questions, critical to understand whether observational variation is driven by causal effects of place or selection
Identifying Causal Effects of Place

- Identify causal effects using two research designs:

  1. **Moving-to-Opportunity (MTO) Experiment**: Compare observational predictions to treatment effects of MTO experiment on children's earnings

  2. **Movers Quasi-Experiment**: Analyze outcomes of children who move at different ages across all tracts
Earnings of Young Children in MTO Experiment vs. Observational Predictions from Opportunity Atlas

Chetty, Hendren, and Katz (2016, Online Appendix Table 7, Panel B)
Earnings of Young Children in MTO Experiment vs. Observational Predictions from Opportunity Atlas

- Correlation: 0.60
- Slope: 0.71

Mean Indiv. Earnings in MTO (with site FE)

- $5,000
- $8,000
- $11,000

Mean Indiv. Earnings for Children with Parents at p=10 in Opportunity Atlas (with site FE)

- $7,000
- $9,000
- $11,000
- $13,000

- = Control
- = Section 8
- = Experimental

Chetty, Hendren, and Katz (2016, Online Appendix Table 7, Panel B)
MTO experiment shows that observational estimates predict causal effects of moving in a small set of neighborhoods

Now extend this approach to all areas using a quasi-experimental design in observational data, following Chetty and Hendren (2018)
Childhood Exposure Effects on Household Income Rank at Age 24

Ident. Assumption: Selection effect constant across ages
→ Shape before age 23 reflects causal effects of exposure

Slope (Age<=23): -0.025 (0.002)
Slope (Age>23): -0.008 (0.005)

δ = 0.346
Use two approaches to evaluate validity of key assumption, following Chetty and Hendren (2018):

1. Sibling comparisons to control for family fixed effects

2. Outcome-based placebo tests exploiting heterogeneity in place effects by gender, quantile, and outcome
   - Ex: moving to a place where boys have high earnings → son improves in proportion to exposure but daughter does not
Moving at birth from tract at 25th percentile of distribution of upward mobility to a tract at 75th percentile within county → $200K gain in lifetime earnings

Feasibility of such moves relies on being able to find affordable housing in high-opportunity neighborhoods

How does the housing market price the amenity of better outcomes for children?
Children’s Mean Income Ranks in Adulthood vs. Median Rents in Chicago, by Tract

Children with Parents at 25th Percentile

- **Hyde Park**
- **Northbrook**

National Signal Corr (within CZ): 0.439
Children’s Mean Income Ranks in Adulthood vs. Median Rents in Chicago, by Tract

Children with Parents at 25th Percentile

National Signal Corr (within CZ): 0.439

Mean Child Household Income Rank
Given Parents at 25th Percentile

Median Two-Bedroom Rent in 1990 (2015 $)

Opportunity
Bargains?
The Price of Opportunity

- What explains the existence of areas that offer good outcomes for children but have low rents in spatial equilibrium?
  - One explanation: these areas have other disamenities, e.g. longer commutes
  - Alternative explanation: lack of information or barriers such as discrimination [DeLuca et al 2016, Christensen and Timmins 2018]
  - Key Question: if we relax the barriers families face to moving to higher opportunity neighborhoods, will they choose to move there?
Randomized trial to help families with vouchers move to “opportunity bargain” areas using three approaches:

- Information + financial assistance
- Landlord recruitment
- Brokerage services

Bergman, Chetty, DeLuca, Hendren, Katz, Palmer (in progress)
Supplementary Results
Reliability of Tract-Level Estimates

- Each tract typically contains about 300 children in the cohorts we examine.
- Some of the variation across tracts therefore reflects sampling error rather than signal.
- Assess relative importance of signal vs. noise by examining reliability of the estimates.
- As a benchmark to gauge significance of differences in maps that follow:
  - Average standard errors on mean ranks are typically 2 percentiles (~$2K) in pooled data and 3-4 percentiles in subgroups ($3K-$4K).
  - Average standard errors for incarceration rates are 3-4 pp.
Standard Deviation and Reliability of Tract-Level Mean Income Rank Estimates
For Children With Parents at 25th Percentile

Total SD = 6.51 ($7,024)
Noise SD = 1.97
Reliability $\rho = \frac{\text{Sig. Var.}}{\text{Tot. Var.}} = 90.8\%$
Signal SD = 6.20
Standard Deviation and Reliability of Tract-Level Mean Income Rank Estimates
For Children With Parents at 25th Percentile

- All Races: $\rho = 90.8\%$
- White: $\rho = 78.0\%$
- Black: $\rho = 69.0\%$
- Hispanic: $\rho = 62.5\%$
Incarceration Rates vs. Parent Household Income Rank
By Race

- White
- Black
- Hispanic

Pct. of Men Incarcerated on April 1, 2010 (Ages 27-32)

Parent Household Income Rank

0 20 40 60 80 100

Pct. of Men Incarcerated on April 1, 2010 (Ages 27-32)
School Catchment Zones in Mecklenburg County:
Boundaries vs. Assignment of Tracts to Catchment Zones

- High School Catchment Boundary
- Tract Boundary
Correlations between Tract-Level Covariates and Household Income Rank
Race-Adjusted, Parent Income at 75th Percentile

R-Squared of All Covars. = 0.417
Upward Mobility for **Whites** vs. Job Growth in the 50 Largest Commuting Zones

![Graph showing the correlation between upward mobility for Whites and job growth in the 50 largest commuting zones. The correlation (across all CZs) is 0.02.]

Children's Mean Household Inc. Rank Given Parents at 25th Pctile

Job Growth Rate from 1990 to 2010 (%)
Upward Mobility vs. Job Growth in the 30 Largest MSAs

Correlation (across all MSAs): -0.07
Predicted Impacts of Moving to “Opportunity Bargain” Areas in CZ
Restricting to Tracts with Minority Share Above 20%

Mean Indiv. Earnings in MTO (with site FE)

- $5,000
- $8,000
- $11,000
- $14,000

Mean Indiv. Earnings for Children with Parents at p=10 in Opportunity Atlas (with site FE)

- $7,000
- $10,000
- $13,000
- $16,000
- $19,000

= Control
= Section 8
= Experimental: Poverty Rate-Based Targeting
= Opp. Bargain: Outcome-Based Targeting

Baltimore Boston Chicago LA NY
Percentile Difference Between Opportunity Atlas Measures of Mean Child Income in Adulthood And Area Deprivation Index Measure of Neighborhood Quality

Note: Blue = areas where Opportunity Atlas ranking is higher than Area Deprivation Index (Singh 2003); red is the converse
### Childhood Exposure Effects on Household Income Rank at Age 24
Regression Estimates Based on One-Time Movers Across Tracts

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Good and Bad Moves</th>
<th>Large Moves</th>
<th>Observed Components of Opportunity</th>
<th>Unobserved Components of Opportunity</th>
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<tbody>
<tr>
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<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
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<td>Age &lt;= 23</td>
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</tr>
<tr>
<td>Age &lt;= 23, Bad Moves</td>
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<td>-0.027</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(0.002)</td>
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<td>2,692,000</td>
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<td>2,692,000</td>
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</table>

Note: Standard errors in parentheses
Predictive Power of Outcomes in Own Tract vs. Neighboring Tract

Average Childhood Exposure Effect

Predictive Power of Poverty Rates in Actual Destination vs. Neighboring Tracts
<table>
<thead>
<tr>
<th>Outcome:</th>
<th>Income Rank at 24</th>
<th>Married at 30</th>
<th>Teen Birth</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Mean Income Rank at 24</td>
<td>-0.032 (0.003)</td>
<td>0.002 (0.007)</td>
<td>-0.003 (0.003)</td>
</tr>
<tr>
<td>Frac. Married at 30</td>
<td>-0.003 (0.001)</td>
<td>-0.029 (0.002)</td>
<td>0.004 (0.001)</td>
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<tr>
<td>Teenage Birth Rate</td>
<td>-0.005 (0.002)</td>
<td>-0.010 (0.004)</td>
<td>-0.026 (0.002)</td>
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<tr>
<td>Num. of Obs.</td>
<td>1,068,000</td>
<td>776,000</td>
<td>1,347,000</td>
</tr>
</tbody>
</table>

Note: Each column shows the coefficients from a single regression. Standard errors in parentheses.
Estimating Mean Outcomes by Tract

- Goal: estimate children’s expected outcomes given their parent’s income percentile $p$, race $r$, and gender $g$, conditional on growing up from birth in tract $c$.

- Challenge: Not enough data to estimate these means non-parametrically for each group.
In each tract $c$, for each race $r$ and gender $g$, regress children’s outcomes on a smooth function of parent rank:

$$y_{icprg} = \alpha_{crg} + \beta_{crg} \times f_{rg}(p_{icrg}) + \varepsilon_{icprg}$$

Function $f_{rg}$ estimated non-parametrically in national data, by race and gender.
Mean Child Household Income Rank vs. Parent Household Income Rank

- Children's Mean Hhold. Inc. Rank (Ages 31-37)
- Parent Household Income Rank

Income Ranks: ($22K), ($43K), ($69K), ($105K), ($1.5M)
Incarceration Rates vs. Parent Household Income Rank

Black Men

Pct. of Men Incarcerated on April 1, 2010 (Ages 27-32)

Parent Household Income Rank:
- ($22K)
- ($43K)
- ($69K)
- ($105K)
- ($1.5M)
Estimating Mean Outcomes by Tract

- In each tract $c$, for each race $r$ and gender $g$, regress children’s outcomes on a smooth function of parent rank:

$$y_{icprg} = \alpha_{crg} + \beta_{crg} \times f_{rg}(p_{icrg}) + \epsilon_{icprg}$$

- Function $f_{rg}$ estimated non-parametrically in national data, by race and gender

  - Key assumption: shape of conditional expectation of outcome given parental income at national level is preserved in each tract, up to an affine transformation

  - We validate this assumption by testing effects of including higher-order terms and using non-parametric estimates at broader geographies
In each tract $c$, for each race $r$ and gender $g$, regress children’s outcomes on a smooth function of parent rank:

$$y_{icprg} = \alpha_{crg} + \beta_{crg} \times f_{rg}(p_{icrg}) + \varepsilon_{icprg}$$

Function $f_{rg}$ estimated non-parametrically in national data, by race and gender

In practice, many children move across tracts in childhood

- Weight children in each tract-level regression by fraction of childhood (up to age 23) spent in that tract
Estimating Mean Outcomes by Tract

- Focus on predicted values at selected parental income percentiles, especially $p=25$ (low income)
  - Extrapolate to all percentiles even in areas with predominantly low- or high-income populations

- Translate mean rank outcomes back to dollar values based on income distribution of children in their mid-30s (in 2015) for ease of interpretation
Correlations between Tract-Level Covariates and Household Income Rank
Race-Adjusted, Parent Income at 25th Percentile

- Number of Jobs Within 5 Miles
- High-Paying Jobs Within 5 Miles
- Job Growth 2004-2013
- 2000 Employment Rate
- Share Above Poverty Line
- Mean Household Income
- Mean 3rd Grade Math Score
- Share College Grad.
- Share Single Parent Households
- Census Return Rate

Magnitude of Race-Controlled Signal Correlation

Positive  Negative
Correlations between Tract-Level Covariates and Household Income Rank
Race-Adjusted, Parent Income at 25th Percentile

Number of Jobs Within 5 Miles
High-Paying Jobs Within 5 Miles
Job Growth 2004-2013
2000 Employment Rate
Share Above Poverty Line
Mean Household Income
Mean 3rd Grade Math Score
Share College Grad.
Share Single Parent Households
Census Return Rate
Share Black
Share Hispanic

Magnitude of Race-Controlled Signal Correlation

Positive
Negative
Correlations between Tract-Level Covariates and Household Income Rank
Race-Adjusted, Parent Income at 25th Percentile

- Number of Jobs Within 5 Miles
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- 2000 Employment Rate
- Share Above Poverty Line
- Mean Household Income
- Mean 3rd Grade Math Score
- Share College Grad.
- Share Single Parent Households
- Census Return Rate
- Share Black
- Share Hispanic

R-Squared of All Covars. = 0.504
In each tract $c$, for each race $r$ and gender $g$, regress children’s outcomes on a smooth function of parent rank:

$$y_{icprg} = \alpha_{crg} + \beta_{crg} \times f_{rg}(p_{icrg}) + \epsilon_{icprg}$$

Function $f_{rg}$ estimated non-parametrically in national data, by race and gender.

Finally, account for the fact that many children move across tracts in childhood.

- Weight children in each tract-level regression by fraction of childhood (up to age 23) spent in that tract.
Targeting Place-Based Policies

Three general results on targeting:

1. Children’s outcomes vary widely across nearby tracts → location where children grow up is a useful tag for policy interventions.

2. Substantial heterogeneity within areas across subgroups and outcomes conditioned on parent income → neighborhoods not well described by a single-factor model.

3. Outcome-based measures contain new information relative to traditional measures used to target policies, such as poverty rates or job growth.
To begin, consider families who move when child is exactly 5 years old.

Regress child’s income rank in adulthood \( y_i \) on mean rank of children with same parental income level in destination:

\[
y_i = \alpha_{qo} + b_m \bar{y}_{pd} + \eta_i
\]

Include parent decile (\( q \)) by origin (\( o \)) fixed effects to identify \( b_m \) purely from differences in destinations.
Movers’ Income Ranks vs. Mean Ranks of Children in Destination
For Children Who Move at Age 5

Predicted Diff. in Child Rank Based on Permanent Residents in Dest. vs. Orig.
Coefficient on Observational Outcome in Destination

Childhood Exposure Effects on Household Income Rank at Age 24

Age of Child When Parents Move
Childhood Exposure Effects on Household Income Rank at Age 24

Selection Effect
Childhood Exposure Effects on Household Income Rank at Age 24

**Ident. Assumption:** Selection effect constant across ages

→ Shape before age 23 reflects causal effects of exposure

**Selection Effect**

\[ \delta = 0.346 \]

**Slope (Age>23):** -0.008 (0.005)