Improving Equality of Opportunity
New Evidence and Policy Lessons

Raj Chetty
Harvard University

The opinions expressed in this paper are those of the authors alone and do not necessarily reflect the views of the Internal Revenue Service or the U.S. Treasury Department. This work is a component of a larger project examining the effects of eliminating tax expenditures on the budget deficit and economic activity. Results reported here are contained in the SOI Working Paper “The Economic Impacts of Tax Expenditures: Evidence from Spatial Variation across the U.S.,” approved under IRS contract TIRNO-12-P-00374.
Is America the Land of Opportunity?

- The U.S. is traditionally hailed as the “land of opportunity”
- Growing concern that it does not live up to this reputation
- How can we improve disadvantaged children’s chances of success?
New Evidence

- Our research group is using big data to develop new evidence-based answers to this question
  - Part of a broader project on impacts of tax policy

- Analyze anonymous records on the earnings of 40 million children and their parents
  - Study kids’ chances of moving up in the income distribution
Intergenerational Mobility in the United States

Gap Between Top and Bottom: 34 percentiles

Source: Chetty, Hendren, Kline, Saez 2013
Intergenerational Mobility in the United States vs. Denmark

U.S. Gap = 34 percentiles

Denmark Gap = 18 percentiles
Differences in Social Mobility Within the U.S.

- Discussion has focused on differences across countries
- But social mobility varies substantially across areas even within the U.S.
- Illustrate by comparing two cities with vibrant economies

Salt Lake City, UT

Charlotte, NC
Intergenerational Mobility in Salt Lake City

Salt Lake City $Y_{25} = 46.1 = $29,300
Intergenerational Mobility in Salt Lake City vs. Charlotte

Salt Lake City

\[ Y_{25} = 46.1 = $29,300 \]

Charlotte

\[ Y_{25} = 36.3 = $21,400 \]
The Geography of Intergenerational Mobility in the United States
Average Child Percentile Rank for Parents at 25th Percentile

Note: Lighter Color = More Upward Mobility
The Geography of Upward Mobility in the Midwest
Mean Child Percentile Rank for Parents at 25th Percentile ($Y_{25}$)

Note: Lighter Color = More Absolute Upward Mobility
### Highest Upward Mobility in the 50 Largest Cities

<table>
<thead>
<tr>
<th>Upward Mobility Rank</th>
<th>CZ Name</th>
<th>Absolute Upward Mobility</th>
<th>Odds of Reaching Top Fifth Starting from Bottom Fifth</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Salt Lake City, UT</td>
<td>46.2</td>
<td>11.5</td>
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<tr>
<td>2</td>
<td>Pittsburgh, PA</td>
<td>45.2</td>
<td>10.3</td>
</tr>
<tr>
<td>3</td>
<td>Boston, MA</td>
<td>44.6</td>
<td>9.8</td>
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<tr>
<td>4</td>
<td>San Jose, CA</td>
<td>44.6</td>
<td>11.2</td>
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<tr>
<td>5</td>
<td>San Francisco, CA</td>
<td>44.5</td>
<td>11.2</td>
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<td>6</td>
<td>San Diego, CA</td>
<td>44.3</td>
<td>10.4</td>
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<tr>
<td>7</td>
<td>Manchester, NH</td>
<td>44.2</td>
<td>9.9</td>
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<tr>
<td>8</td>
<td>Minneapolis, MN</td>
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<td>9.0</td>
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<td>Newark, NJ</td>
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<td>9.4</td>
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<tr>
<td>10</td>
<td>New York, NY</td>
<td>43.8</td>
<td>9.7</td>
</tr>
<tr>
<td>Upward Mobility Rank</td>
<td>CZ Name</td>
<td>Absolute Upward Mobility</td>
<td>Odds of Reaching Top Fifth Starting from Bottom Fifth</td>
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<tr>
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</tr>
<tr>
<td>41</td>
<td>Cleveland, OH</td>
<td>38.2</td>
<td>5.2</td>
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<tr>
<td>42</td>
<td>New Orleans, LA</td>
<td>38.2</td>
<td>6.3</td>
</tr>
<tr>
<td>43</td>
<td>Cincinnati, OH</td>
<td>37.9</td>
<td>5.5</td>
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<tr>
<td>44</td>
<td>Columbus, OH</td>
<td>37.7</td>
<td>5.1</td>
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<td>45</td>
<td>Jacksonville, FL</td>
<td>37.5</td>
<td>5.3</td>
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<tr>
<td>46</td>
<td>Detroit, MI</td>
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<td>5.1</td>
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<td>47</td>
<td>Indianapolis, IN</td>
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<td>48</td>
<td>Raleigh, NC</td>
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<td>4.0</td>
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<tr>
<td>50</td>
<td>Charlotte, NC</td>
<td>35.8</td>
<td>4.3</td>
</tr>
</tbody>
</table>
What Drives the Differences in Upward Mobility?

- First clues: spatial variation in inequality emerges at very early ages
  - Well before children start working

- Points to factors that generate differences in outcomes at early ages
  - For example: schools or family characteristics
College Attendance Gradients by Area
Difference in Childrens’ College Attendance Rates for Low vs. High Income Parents

Note: Lighter Color = Less Disparity in College Attendance Rates
Teenage Birth Gradients by Area
Difference in Children’s’ Teenage Birth Rates for Low vs. High Income Parents

Note: Lighter Color = Less Disparity in Teenage Birth Rates
What Drives the Differences in Upward Mobility?

- Further evidence comes from movers

- Children whose parents move to cities with high rates of upward mobility do significantly better
  - Gains are larger if parents move when child is young
  - Neighborhoods have a “dosage” effect on child’s outcomes that starts at early ages
Effect of Moving to a Neighborhood with Higher Upward Mobility on Child’s Percentile Rank by Child’s Age at Move
What Drives the Differences in Upward Mobility?

- Moving families is not a scalable policy solution

- Need to change characteristics of cities with low rates of upward mobility

- What are the characteristics that predict upward mobility?
Race and Upward Income Mobility

- Start by exploring racial differences

- Most obvious pattern from map: areas with a large African-American population have less upward mobility
Absolute Upward Mobility vs. Fraction Black in Area

Upward Mobility ($Y_{25}$) vs. Fraction Black in Commuting Zone (log scale)

$\rho = -0.654 \pm 0.079$
Race and Upward Income Mobility

- But *white* Americans also have lower rates of upward mobility in areas with a large African-American share.

- Stronger correlate is racial and income *segregation*
  
  - Segregation affects both low-income blacks and whites.
Racial Segregation in Atlanta
Whites (blue), Blacks (green), Asians (red), Hispanics (Orange)

Source: Cable (2013) based on Census 2010 data
Racial Segregation in Sacramento
Whites (blue), Blacks (green), Asians (red), Hispanics (Orange)

Source: Cable (2013) based on Census 2010 data
Upward Mobility vs. Racial Segregation

Correlation = -0.58
Theil Index of Income Segregation across Census Tracts in 1990 (log scale)

\[ \rho = -0.394 \pm 0.065 \]
Upward Mobility vs. Commuting Time to Work

Upward Mobility ($Y_{25}$)

% With Travel Time to Work < 15 mins

\( \rho = 0.603 \) (0.125)
Factor 2: Income Inequality

Salt Lake City
Size of Middle Class 55%

Atlanta
Size of Middle Class 44%

Odds of reaching top fifth starting from bottom fifth: 3 times larger in Salt Lake City than Atlanta
Upward Mobility vs. Inequality in CZ
The “Great Gatsby” Curve Within the U.S.

\[ \rho = -0.562 \pm 0.096 \]
Upward Mobility vs. Top 1% Income Share in CZ

ρ = -0.069
(0.063)
Factor 3: Social Capital

Pittsburgh
Share religious 65%

Orlando
Share religious 38%

Odds of reaching top fifth starting from bottom fifth: 3 times larger in Pittsburgh than Orlando
Absolute Upward Mobility vs. Social Capital Index

Upward Mobility ($Y_{25}$) vs. Social Capital Index ($\rho = 0.639$ (0.090))
Factor 4: Family Structure

San Francisco
Share Single Parents 19%

New Orleans
Share Single Parents 31%

Odds of reaching top fifth starting from bottom fifth:
2 times larger in San Francisco than New Orleans
Upward Mobility and Fraction Families with Married Parents in CZ

Upward Mobility ($Y_{25}$) % of Children with Married Parents in Area

$$\rho = 0.748$$

$$0.065$$
Upward Mobility and Fraction Families with Married Parents in CZ
Children of Married Parents Only

Upward Mobility ($Y_{25}$)

% of Children with Married Parents in Area

$\rho = 0.687$

(0.084)
Factor 5: School Quality

Boston
Grade 3-8 Tests
Highly Proficient 65.5%

Detroit
Grade 3-8 Tests
Highly Proficient 52.1%

Odds of reaching top fifth starting from bottom fifth: 2 times larger in Boston than Detroit
Absolute Upward Mobility vs. School Quality

Upward Mobility ($Y_{25}$) vs. Mean School Percentile Rank (Based on Grade 3-8 Reading and Math)

\[ \rho = 0.571 \pm 0.083 \]
Absolute Upward Mobility vs. High School Dropout Rate

$\rho = -0.648$ (0.073)
Policies to Improve Upward Mobility

- Five factors give us hints about where to look to improve social mobility
  - But they do not identify causal mechanisms or policy tools

- What specific policies can improve mobility?

- Focus here on one set of feasible policies: improving the quality of education
The Importance of Education: A Kindergarten Test

- I’ll say a word to you. Listen for the *ending* sound.
- You circle the picture that *starts* with the same sound

“cup”
Which Education Policies Matter?

Correlations suggest that improving children’s school performance could have lasting benefits.

But simply spending more on schools has little effect on outcomes [Hanushek 2001]

Which aspects of education are most important?
Using “Big Data” to Study Teachers’ Impacts

School district records
2.5 million children
18 million test scores

Tax records
Earnings, College Attendance, Teen Birth

Source: Chetty, Friedman, Rockoff 2012
Measuring Teacher Quality

One prominent measure of teacher quality: teacher value-added

How much does a teacher raise her/his students’ test scores on average?
A Quasi-Experiment: Entry of High Quality Teacher

Entry of High Value-Added Teacher

Average Test Score

School Year

Scores in 11th Grade

Scores in 10th Grade
A Quasi-Experiment: Entry of Low Quality Teacher

Entry of Low Value-Added Teacher

Average Test Score vs. School Year

- Scores in 11th Grade
- Scores in 10th Grade
College Attendance vs. Teacher Quality

Attending College at Age 20

Teacher Quality (Value-Added) Percentile

5th
Median
95th
Teenage Pregnancy vs. Teacher Quality

Women with Teenage Births

Teacher Quality (Value-Added) Percentile
The Value of Improving Teacher Quality

Teacher Quality (Value-Added) Percentile

5th  Median  95th
The Value of Improving Teacher Quality

+$50,000 \text{ lifetime earnings per child} = $1.4 \text{ million per classroom of 28 students} = $250,000 \text{ present value with 5\% int. rate}
Suppose that the bottom 5 percent of teachers could be replaced by teachers of average quality. [...] That’s more than $1.4 million in gains for the classroom.”

- NY Times, 1/11/2012

The correct answer? Panic!

Well, not exactly. But a landmark new research paper underscores that the difference between a strong teacher and a weak teacher lasts a lifetime. Having a good fourth-grade teacher makes a student 1.25 percent more likely to go to college, the research suggests, and 1.25 percent less likely to get pregnant as a teenager. Each of the students will go on as an adult to earn, on average, $25,000 more over a lifetime — or about $700,000 in gains for an average size class — all attributable to that ace teacher back in the fourth grade. That’s right: A great teacher is worth hundreds of thousands of dollars to each year’s students, just in the extra income they will earn.
Policy Impacts

“We know a good teacher can increase the lifetime income of a classroom by over $250,000.... Every person in this chamber can point to a teacher who changed the trajectory of their lives”


“A recent study by Harvard and Columbia economists found that students with effective teachers are less likely to become pregnant, more likely to go to college and more likely to get higher-paying jobs....Ineffective teachers are hurting our students’ futures – we can’t allow that.”

- Michael Bloomberg, *State of the City*, 2012
Policy Impacts

Vergara v. California | Legal Claims

**Civil Rights**
- Under longstanding California Supreme Court precedents, Plaintiffs have a fundamental right to equal educational opportunity.

**Harm to Students**
- Teacher quality is the key determinant of educational effectiveness and has a profound impact on students’ lifetime achievement.
- The problem is worse for students who attend schools that serve predominantly minority and lower-income populations because those schools are staffed by a disproportionate share of grossly ineffective teachers.
- In some school districts, students of color are two to three times more likely to have bottom-quartile teachers than their white and Asian peers.
Lessons for Education Policy

1. Teacher quality matters: attract top talent to teaching (e.g., Finland)

2. Standardized testing can provide valuable input into identifying good teachers and schools

3. Teaching quality matters in all grades, not just at early ages

4. Teacher quality may be more important than class size

5. Non-cognitive/social skills are as important as cognitive skills
Translating the Lessons to Developing Countries

Simply improving teacher attendance has large impacts in India [Kremer et al. 2006]

Paying teachers based on performance significantly raised test scores [Muralidharan and Sundararaman 2011]
Broader Lessons for Economic and Social Policy

1. Place-based policies are valuable
   - Focus on improving Charlotte, Indianapolis, and Atlanta; not just national interventions
Broader Lessons for Economic and Social Policy

1. Place-based policies are valuable

2. Harnessing big data can provide a scientific evidence base for designing many policies
   - Social safety nets
   - Pension policies

3. Simply collecting and disseminating performance data can spark social change
   - Tax policies
<table>
<thead>
<tr>
<th>Commuting Zone</th>
<th>Odds of Rising from Bottom to Top Fifth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dubuque, IA</td>
<td>17.9%</td>
</tr>
<tr>
<td>Salt Lake City, UT</td>
<td>11.5%</td>
</tr>
<tr>
<td>Washington DC</td>
<td>10.5%</td>
</tr>
<tr>
<td>Indianapolis, IN</td>
<td>4.8%</td>
</tr>
<tr>
<td>Memphis, TN</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

An Opportunity and a Challenge
Absolute Upward Mobility Adjusting for Cost of Living Differences
Absolute Upward Mobility Adjusting for Growth
Residual of Expected Rank for Below-Median Children ($Y_{25}$)

Corr with baseline $Y_{25} = 0.85$
Intergenerational Mobility by Birth Cohort, 1971-1981 Using SOI Sample
Correlation of Child Income Percentile Rank (at Age 30) and Parent Income Rank

$\beta = 0.004 \pm 0.003$
Intergenerational Income Mobility by Birth Cohort, 1971-1986
Correlation of Child Income Percentile Rank (at Age 26) and Parent Income Rank

Rank

Rank Slope

Full Pop. $\beta = -0.004$

(0.001)

SOI Sample $\beta = 0.001$

(0.002)

Child's Birth Cohort
College Attendance Rate vs. Parent Income Gradient by Birth Cohort

\[ \beta = -0.001 \pm 0.001 \]
Absolute Upward Mobility vs. Mean Household Income in CZ

Upward Mobility ($Y_{25}$) vs. Mean Real Household Income Per Working Age Adult in 2000 ($\text{\$1000s, log scale}$)

\[ \rho = 0.086 \]

\[ \text{(0.080)} \]
Absolute Upward Mobility vs. Income Growth in CZ

Annualized Real Income Growth From 1990 to 2008

$\rho = 0.403$ (0.096)
Intergenerational Mobility in San Francisco vs. Chicago

San Francisco:

\[ Y_{25} = 44.8 \]

Chicago:

\[ Y_{25} = 39.9 \]
The Washington D.C. Commuting Zone

- Charles
- St. Mary's
- Calvert
- Prince George's
- Montgomery
- Frederick
- Fairfax
- D.C.
- Arlington
- Prince William
- Loudoun
- Warren
- Fauquier
- Rappahannock
- Alexandria
- Prince George's
- Calvert
- Charles
- St. Mary's