Where is the Land of Opportunity?
The Geography of Intergenerational Mobility in the U.S.

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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.
United States traditionally hailed as “land of opportunity”

- Chances of succeeding do not depend heavily on parent’s income

Vast literature has investigated whether this is true empirically

Results debated partly due to limitations in data [Black and Devereux 2011]

- Ex: Mazumder (2005) uses SIPP-SSA sample with 3,000 obs. and imputed earnings for up to 60% of parents
We study intergenerational mobility in the U.S. using administrative data on 40 million children.

We show that the question of whether the U.S. is the “land of opportunity” does not have a clear answer.

- Substantial variation in intergenerational mobility *within* the U.S.
- Some lands of opportunity and some lands of persistent inequality
Outline

1. National Statistics

2. Geographical Variation in Intergenerational Mobility

3. Correlates of Spatial Differences in Mobility
Data

- Data source: IRS Databank [Chetty, Friedman, Hilger, Saez, Yagan 2011]
  - Selected de-identified data from 1996-2012 income tax returns
  - Includes non-filers via information forms (e.g. W-2’s)
Sample Definition

- **Primary sample:** Current U.S. citizens in 1980-81 birth cohorts
  - 6.3 million children, age 30-32 in 2012

- **Expanded sample:** 1980-1991 birth cohorts for robustness checks
  - 40 million children, age 20-32 in 2012
Linking Children to Parents

- Parent(s) defined as first person(s) who claim child as a dependent
  - Most children are linked to parents based on tax returns in 1996

- We link approximately 95% of children to parents
Income Definitions

- Parent Income: mean pre-tax household income (AGI+SSDI) between 1996-2000

- Child Income: mean pre-tax household income between 2010-2012

- For non-filers, use W-2 wage earnings + SSDI + UI income
  - If no 1040 and no W-2, code income as 0

- These *household* level definitions capture total resources in the household

  - Spatial patterns very similar using individual income but IGE magnitudes lower, especially for daughters [Chadwick and Solon 2002]
Part 1
National Statistics
Mean Child Household Income at Age 30 vs. Parent Household Income

Slope $[\text{Par Inc} < \text{P90}] = 0.335 \quad (0.0007)$

Slope $[\text{P90} < \text{Par Inc} < \text{P99}] = 0.076 \quad (0.0019)$
Mean Log Child Income vs. Log Parent Income (Excluding 0’s)

IGE = 0.344

(0.0004)
Mean Log Child Income vs. Log Parent Income (Excluding 0’s)

- $\text{IGE} = 0.344 (0.0004)$
- $\text{IGE} [\text{Par Inc P10-P90}] = 0.452 (0.0007)$
Fraction of Children with Zero Income vs. Log Parent Income

Percentage of Children with Zero Income

Log Parent Income
Mean Log Child Income vs. Log Parent Income
Income of Non-Working Children Coded as $1

IGE = 0.618 (0.0009)
To handle zeros and non-linearity, we use a rank-rank specification (similar to Dahl and DeLeire 2008)

- Rank children based on their incomes relative to other children same in birth cohort
- Rank parents of these children based on their incomes relative to other parents in this sample
Mean Child Percentile Rank vs. Parent Percentile Rank

Rank-Rank Slope (U.S) = 0.341 (0.0003)
Lifecycle Bias: Intergenerational Income Correlation by Age at Which Child’s Income is Measured
Lifecycle Bias: Intergenerational Income Correlation by Age at Which Child’s Income is Measured

Rank-Rank Slope vs. Age at which Child’s Income is Measured

- Population
- SOI 0.1% Random Sample

Age range: 22 to 40
Attenuation Bias: Rank-Rank Slopes by Number of Years Used to Measure Parent Income

![Graph showing the relationship between years used to compute mean parent income and rank-rank slopes. The x-axis represents the years used, ranging from 1 to 16, and the y-axis represents the rank-rank slope, ranging from 0 to 0.4. The slope increases gradually as the number of years increases.]
Part 2
Geographical Variation
Intergenerational Mobility in the United States vs. Denmark

Rank-Rank Slope (U.S) = 0.341
Rank-Rank Slope (Denmark) = 0.180
We study variation in intergenerational mobility at the level of Commuting Zones (CZ’s)

CZ’s are aggregations of counties based on commuting patterns in 1990 census [Tolbert and Sizer 1996, Autor and Dorn 2012]

Similar to metro areas but cover rural areas as well
Geographical Definitions

- Divide children into locations based on where they grew up
  - CZ from which parents filed tax return when they first claimed the child as a dependent
  - Permanently assign child to this CZ, no matter where she lives now

- For 1980 cohort, this is typically location when child is age 16
  - Verify using younger cohorts that measuring location at earlier ages yields very similar results
In every CZ, we measure parent and child incomes using ranks in the national income distribution. This allows us to identify both relative and absolute mobility. Important because more relative mobility is not necessarily desirable from a normative perspective.
Intergenerational Mobility in Salt Lake City

What are the outcomes of children of low vs. high income parents?
Intergenerational Mobility in Salt Lake City

\[ Y_{100} - Y_0 = 100 \times (\text{Rank-Rank Slope}) \]

Salt Lake City: \( Y_{100} - Y_0 = 26.4 \)
Intergenerational Mobility in Salt Lake City vs. Charlotte

Child Rank in National Income Distribution vs. Parent Rank in National Income Distribution

Salt Lake City: $Y_{100} - Y_0 = 26.4$

Charlotte: $Y_{100} - Y_0 = 39.7$
What are the outcomes of children whose parents' income rank is $P$?
Intergenerational Mobility in Salt Lake City

$Y_0 = E[\text{Child Rank} \mid \text{Parent Rank } P = 0]$
Intergenerational Mobility in Salt Lake City

Expected outcomes for all children can be summarized using slope + intercept in CZ

\[ Y_P = Y_0 + (\text{Rank-Rank Slope}) \times P \]
Intergenerational Mobility in Salt Lake City

Focus on mean outcomes of children from families below median: "Absolute Upward Mobility"

\[ Y_{25} = E[\text{Child Rank} \mid \text{Parent Rank} < 50] \]
Intergenerational Mobility in Salt Lake City

Salt Lake City $Y_{25} = 46.2 = $31,100
Intergenerational Mobility in Salt Lake City vs. Charlotte

Salt Lake City $Y_{25} = 46.2 = $31,100
Charlotte $Y_{25} = 35.8 = $22,900
Intergenerational Mobility in San Francisco vs. Chicago

San Francisco: $Y_{100} - Y_0 = 25.0, \ Y_{25} = 44.4$

Chicago: $Y_{100} - Y_0 = 39.3, \ Y_{25} = 39.4$
In each CZ, regress child national rank on parent national rank in micro data:

\[
Rank_{\text{child}} = \alpha + \beta Rank_{\text{parent}}
\]

- Relative mobility = \(100 \times \beta\)
- Absolute upward mobility = \(\alpha + 25 \times \beta\)
The Geography of Upward Mobility in the United States
Mean Child Percentile Rank for Parents at 25th Percentile ($Y_{25}$)

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

Note: Lighter Color = More Absolute Upward Mobility
### Highest Absolute Mobility In The 50 Largest CZs

| Upward Mobility Rank | CZ Name              | $Y_{25}$ | $Y_{100} - Y_0$ | $P(\text{Child in Q5} | \text{Parent in Q1})$ |
|----------------------|----------------------|----------|-----------------|--------------------------|
| 1                    | Salt Lake City, UT   | 46.2     | 0.264           | 10.83%                   |
| 2                    | Pittsburgh, PA       | 45.2     | 0.359           | 9.51%                    |
| 3                    | San Jose, CA         | 44.7     | 0.235           | 12.93%                   |
| 4                    | Boston, MA           | 44.6     | 0.322           | 10.49%                   |
| 5                    | San Francisco, CA    | 44.4     | 0.250           | 12.15%                   |
| 6                    | San Diego, CA        | 44.3     | 0.237           | 10.44%                   |
| 7                    | Manchester, NH       | 44.2     | 0.296           | 10.02%                   |
| 8                    | Minneapolis, MN      | 44.2     | 0.338           | 8.52%                    |
| 9                    | Newark, NJ           | 44.1     | 0.350           | 10.24%                   |
| 10                   | New York, NY         | 43.8     | 0.330           | 10.50%                   |
## Lowest Absolute Mobility In The 50 Largest CZs

| Upward Mobility Rank | CZ Name            | $Y_{25}$ | $Y_{100} - Y_0$ | P(Child in Q5|Parent in Q1) |
|----------------------|--------------------|----------|-----------------|----------------|
| 41                   | Nashville, TN      | 38.2     | 0.357           | 5.73%          |
| 42                   | New Orleans, LA    | 38.2     | 0.397           | 5.12%          |
| 43                   | Cincinnati, OH     | 37.9     | 0.429           | 5.12%          |
| 44                   | Columbus, OH       | 37.7     | 0.406           | 4.91%          |
| 45                   | Jacksonville, FL   | 37.5     | 0.361           | 4.92%          |
| 46                   | Detroit, MI        | 37.3     | 0.358           | 5.46%          |
| 47                   | Indianapolis, IN   | 37.2     | 0.398           | 4.90%          |
| 48                   | Raleigh, NC        | 36.9     | 0.389           | 5.00%          |
| 49                   | Atlanta, GA        | 36.0     | 0.366           | 4.53%          |
| 50                   | Charlotte, NC      | 35.8     | 0.397           | 4.38%          |
Relative Mobility Across Areas in the U.S.
Rank-Rank Slopes ($Y_{100} - Y_0$) by Commuting Zone

Corr. with baseline $\bar{y}_{25} = -0.68$ (unweighted), -0.61 (pop-weighted)
Mean Relationship between Absolute and Relative Mobility

Mean Pivot Point = 85.1\textsuperscript{th} Percentile

Parent Rank in National Income Distribution

Coef. from Regression of Child Rank on Relative Mobility
Average Pivot Point: $P = 85.1$

On average across CZ’s, more relative mobility $\rightarrow$ higher absolute mobility for families below $P = 85$.
Mean Relationship between Absolute and Relative Mobility

Outcomes vary less across areas for high income families

Average Pivot Point: $P = 85.1$
## Stability of Intergenerational Mobility Measures Across Areas

<table>
<thead>
<tr>
<th>Alternative Measures</th>
<th>Correlation with Baseline Specification</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$Y_{25}$</td>
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<tr>
<td>Cohort 83-5</td>
<td>0.96</td>
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<tr>
<td>Cohort 86-88</td>
<td>0.82</td>
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<tr>
<td>Cost-of-Living Adjusted</td>
<td>0.86</td>
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<tr>
<td>Indiv. Inc. Male Children</td>
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<tr>
<td>Parent Income 2011/12</td>
<td>0.94</td>
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<tr>
<td>Local Ranks Relative Mobility</td>
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<tr>
<td>College Attendance (18-21)</td>
<td>0.53</td>
</tr>
<tr>
<td>Teen Birth Rate (Females)</td>
<td>-0.64</td>
</tr>
</tbody>
</table>
Upward Mobility ($Y_{25}$) Adjusted for Differences in Cost of Living
Parent and Child Income Deflated by Cost of Living Based on ACCRA data

Corr. with baseline $\bar{Y}_{25} = 0.98$ (unweighted), 0.86 (pop-weighted)
Part 3
Correlates of Intergenerational Mobility
Correlates of Intergenerational Mobility

- Correlate differences in mobility with observable factors
  - Focus on hypotheses proposed in sociology and economics literature and public debate
  - Goal: stylized facts to guide search for causal mechanisms

- First clues into potential mechanisms: timing
  - Spatial variation in inequality emerges at very early ages
  - Well before children start working
College Attendance Rates vs. Parent Income Rank in the U.S.

Slope = 0.675 (0.0005)
College-Income Gradients by Area
Slopes from Regression of College Attendance (Age 18-21) on Parent Inc. Rank

Corr. with baseline $\bar{y}_{100} - \bar{y}_0 = 0.68$ (unweighted), 0.72 (pop-weighted)
Teenage Birth Rates for Females vs. Parent Income Rank in the U.S.

Slope = -0.300 (0.0005)
Corr. with baseline $\bar{y}_{100} - \bar{y}_0 = -0.58$ (unweighted), -0.68 (pop-weighted)
Correlates of Intergenerational Mobility

- Early emergence of gradients points to factors that affect children when growing up (or anticipatory responses to later factors)
  - E.g. schools or family characteristics [e.g., Mulligan 1999]

- Start by exploring racial differences
  - Most obvious pattern from map: upward mobility lower in areas with larger African-American population
Absolute Upward Mobility vs. Fraction Black in CZ

Correlation = -0.580 (0.066)
Upward Mobility ($Y_{25}$) for ZIP-5’s with ≥ 80% White Residents

Corr. with baseline $\bar{y}_{25} = 0.91$ (unweighted), 0.73 (pop-weighted)
White Upward Mobility vs. Overall Upward Mobility at Varying ZIP-5 Race Thresholds

Fraction of White Individuals in Restricted Sample

Coef. from Reg. of Upward Mobility Ests. On Baseline Ests.

Empirical Estimates

Prediction with No Spatial Heterogeneity Cond. on Race
Race and Upward Income Mobility

- Racial shares matter at community level for both blacks and whites

- One potential mechanism: racial and income segregation
  - Historical legacy of greater segregation in areas with larger African-American population
  - Racial segregation is associated with greater income segregation
  - Such segregation could affect both low-income blacks and whites [Wilson 1987, Massey and Denton 1988, Cutler and Glaeser 1997, Graham and Sharkey 2013]
Absolute Upward Mobility vs. Racial Segregation

Theil Index of Racial Segregation in 2000 (log scale)

Correlation = -0.361
(0.068)
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
Absolute Upward Mobility vs. Income Segregation

![Graph showing the relationship between Upward Mobility and Rank-Order Index of Income Segregation. The correlation coefficient is -0.393 (0.065).]
## Intergenerational Mobility and Segregation

<table>
<thead>
<tr>
<th>Dep. Var.:</th>
<th>Upward Mobility $Y_{25}$</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
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<tr>
<td>Racial Segregation</td>
<td>-0.361</td>
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<tr>
<td></td>
<td>(0.045)</td>
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<tr>
<td>Income Segregation</td>
<td>-0.393</td>
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<tr>
<td></td>
<td>(0.065)</td>
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<tr>
<td>Segregation of Poverty (&lt;p25)</td>
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<td></td>
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<tr>
<td>Segregation of Affluence (&gt;p75)</td>
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<td></td>
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<tr>
<td>Share with Commute &lt; 15 Mins</td>
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<td></td>
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<tr>
<td>Urban Areas Only</td>
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<tr>
<td>R-Squared</td>
<td>0.131</td>
</tr>
<tr>
<td>Observations</td>
<td>709</td>
</tr>
</tbody>
</table>
Spatial Correlates of Upward Mobility

- Racial Segregation (-)
- Segregation of Poverty (-)
- Frac. < 15 Mins to Work (+)
Next, investigate properties of local income distribution: mean income levels and inequality.

Many economic channels for link between static income distribution and intergenerational mobility [e.g. Becker and Tomes 1979, Han and Mulligan 2001, Solon 2004]

Inequality is negatively correlated with intergenerational mobility across countries [e.g. Corak 2013]
Absolute Upward Mobility vs. Mean Household Income in CZ

Correlation = 0.050

(0.071)
Upward Mobility vs. Inequality in CZ
The “Great Gatsby” Curve Within the U.S.

Correlation = -0.578 (0.093)
Upward Mobility vs. Top 1% Income Share in CZ

Correlation = -0.190 (0.072)
Upward Mobility vs. Bottom 99% Gini Coefficient

Correlation = -0.647 (0.092)
Spatial Correlates of Upward Mobility

Correlation

- Racial Segregation
- Segregation of Poverty
- Frac. < 15 Mins to Work
- Mean Household Income
- Gini Coef.
- Top 1% Inc. Share
## Absolute Mobility and Inequality: The Great Gatsby Curve

<table>
<thead>
<tr>
<th></th>
<th>Variation Across CZs Within U.S.</th>
<th>Variation Across Countries</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Upward Mobility</td>
<td>Upward Mobility</td>
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<tr>
<td></td>
<td>$Y_{25}$</td>
<td>$Y_{25}$</td>
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<tr>
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<tr>
<td>Gini coefficient</td>
<td>-0.578</td>
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<tr>
<td></td>
<td>(0.093)</td>
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<tr>
<td>Gini bottom 99%</td>
<td>-0.634</td>
<td>-0.624</td>
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<tr>
<td></td>
<td>(0.090)</td>
<td>(0.113)</td>
</tr>
<tr>
<td>Top 1% income share</td>
<td>-0.123</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td>(0.039)</td>
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<tr>
<td>CZ intersects MSA</td>
<td></td>
<td>X</td>
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<tr>
<td>R-Squared</td>
<td>0.334</td>
<td>0.433</td>
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<td>Number of observations</td>
<td>709</td>
<td>709</td>
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</table>

### Notes
- Absolute Mobility and Inequality: The Great Gatsby Curve summarizes the variation in economic mobility and inequality across different regions and countries.
- The table presents the Gini coefficient, Gini bottom 99%, and Top 1% income share as measures of inequality, alongside upward mobility elasticity indices.
- The R-Squared values indicate the proportion of variance explained by the model.
Spatial Correlates of Upward Mobility

Correlation

0 0.2 0.4 0.6 0.8 1.0
Spatial Correlates of Upward Mobility

- Racial Segregation (-)
- Segregation of Poverty (-)
- Frac. < 15 Mins to Work (+)
- Mean Household Income (+)
- Gini Coef. (-)
- Top 1% Inc. Share (-)
- Local Tax Rate (+)
- State EITC Exposure (+)
- Tax Progressivity (+)
- Student-Teacher Ratio (-)
- Test Scores (Inc Adjusted) (+)
- High School Dropout (-)

Correlation
Spatial Correlates of Upward Mobility

Correlation

- Racial Segregation (-)
- Segregation of Poverty (-)
- Frac. < 15 Mins to Work (+)
- Mean Household Income (+)
- Gini Coef. (-)
- Top 1% Inc. Share (-)
- Local Tax Rate (+)
- State EITC Exposure (+)
- Tax Progressivity (+)
- Student-Teacher Ratio (-)
- Test Scores (Inc Adjusted) (+)
- High School Dropout (-)
- Colleges per Capita (+)
- College Tuition (-)
- Coll Grad Rate (Inc Adjusted) (+)
- Manufacturing Share (-)
- Chinese Import Growth (-)
- Teenage LFP Rate (+)
Upward Mobility and Fraction of Single Mothers in CZ

Correlation = -0.764 (0.074)
Upward Mobility and Fraction of Single Mothers in CZ
Married Parents Only

Correlation = -0.662 (0.087)
## Comparison of Alternative Hypotheses

<table>
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<tr>
<th>Dep. Var.</th>
<th>(1)</th>
<th>Upward Mobility ( (Y_{25}) )</th>
<th>(3)</th>
<th>(4)</th>
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<tr>
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<td>-0.085</td>
<td>-0.112</td>
<td>-0.165</td>
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<td></td>
<td>(0.029)</td>
<td>(0.020)</td>
<td>(0.034)</td>
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<tr>
<td>Gini Bottom 99%</td>
<td>-0.050</td>
<td>-0.019</td>
<td>-0.313</td>
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<tr>
<td></td>
<td>(0.063)</td>
<td>(0.039)</td>
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<tr>
<td>High School Dropout Rate</td>
<td>-0.157</td>
<td>-0.142</td>
<td>-0.286</td>
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<td></td>
<td>(0.061)</td>
<td>(0.030)</td>
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<td>Social Capital Index</td>
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<td></td>
<td>(0.056)</td>
<td>(0.053)</td>
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<tr>
<td>Fraction Single Mothers</td>
<td>-0.484</td>
<td>-0.438</td>
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<td>-0.808</td>
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<tr>
<td></td>
<td>(0.070)</td>
<td>(0.072)</td>
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<td>(0.085)</td>
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<tr>
<td>Fraction Black</td>
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<td>(0.073)</td>
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**State FEs**

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<td>R-squared</td>
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<td>Observations</td>
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</tr>
</tbody>
</table>
Substantial variation in upward and relative mobility across the U.S.

- Implies CZ-level neighborhood effects are 60% as large as parent-child income correlation

- Intergenerational mobility is shaped by environment and may therefore be manipulable (not pure genetics)
Future Research

Key questions for future work:

1. Is the variation due to differences in people (sorting) or places?

   Currently studying this question by analyzing individuals who move across areas [Chetty and Hendren 2014]

2. If place effects, what policies cause improvements in mobility?

   To facilitate this work, we have posted statistics on mobility online at www.equality-of-opportunity.org
## Downloadable Data on Intergenerational Mobility

<table>
<thead>
<tr>
<th>Data Description</th>
<th>Format 1</th>
<th>Format 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred Mobility Measures by Commuting Zone</td>
<td>Stata file</td>
<td>Excel file</td>
</tr>
<tr>
<td>Online Data Table 1: National 100 by 100 Transition Matrix</td>
<td>Stata file</td>
<td>Excel file</td>
</tr>
<tr>
<td>Online Data Table 2: Marginal Income Distributions by Centile</td>
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<td>Excel file</td>
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<tr>
<td>Online Data Table 3: Intergenerational Mobility Statistics and Selected Covariates by County</td>
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<td>Online Data Table 4: Intergenerational Mobility Statistics by Metropolitan Statistical Area</td>
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<td>Online Data Table 5: Intergenerational Mobility Statistics by Commuting Zone</td>
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<td>Online Data Table 6: Quintile-Quintile Transition Matrices by Commuting Zone</td>
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<td>Online Data Table 7: Income Distributions by Commuting Zone</td>
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<td>Online Data Table 8: Commuting Zone Characteristics</td>
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<td>Online Data Table 9: Commuting Zone Characteristics Definitions and Data Sources</td>
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<td>Downloadable Map of Absolute Upward Mobility</td>
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</table>


For more information on the data, please email info@equality-of-opportunity.org