

Studying Social Inequality with Data Science

INFO 3370 / 5371
Spring 2024

Opportunity

operationalized by economic mobility
and measured by predictability

Learning goals for today

By the end of class, you will be able to

- ▶ reason about economic opportunity
- ▶ reason about equal opportunity
- ▶ connect these to a data science idea: prediction

What does economic opportunity mean to you?

Economic opportunity: Two definitions

absolute mobility out-earning your parents

relative mobility out-ranking your parents

Absolute upward mobility: Out-earning your parents

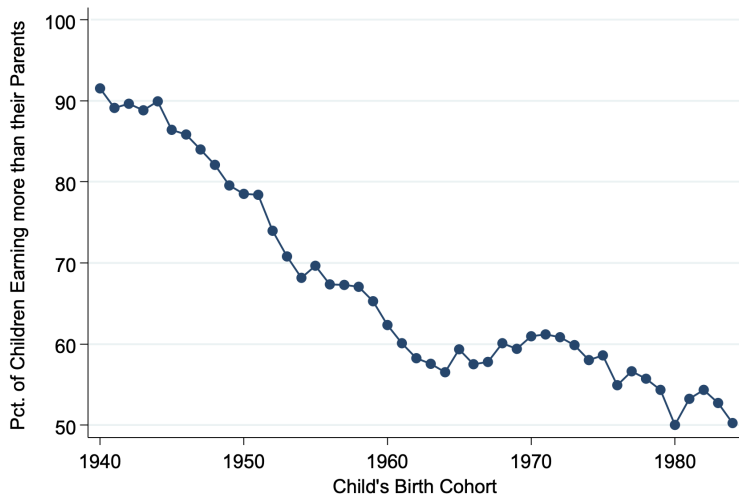
Chetty et al. 2017

What proportion earn more than their parents at age 30?

- ▶ among those born in 1940
- ▶ among those born in 1984

Absolute upward mobility: Out-earning your parents

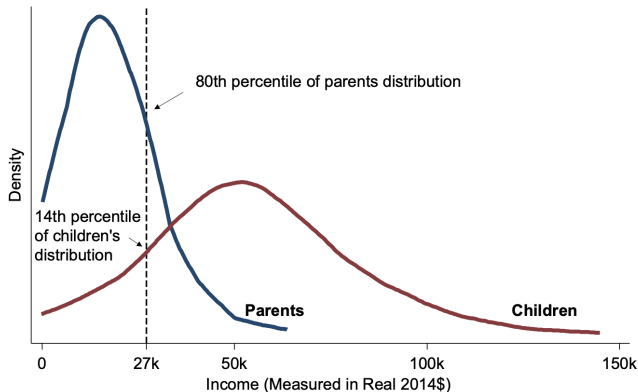
Chetty et al. 2017



Absolute upward mobility: Out-earning your parents

Chetty et al. 2017

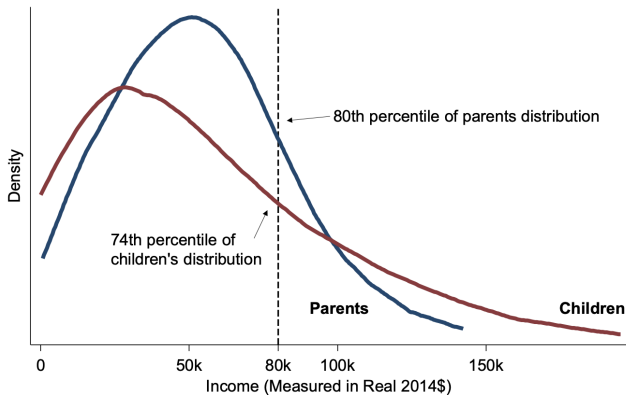
B. Family Income Distributions: 1940 Birth Cohort



Absolute upward mobility: Out-earning your parents

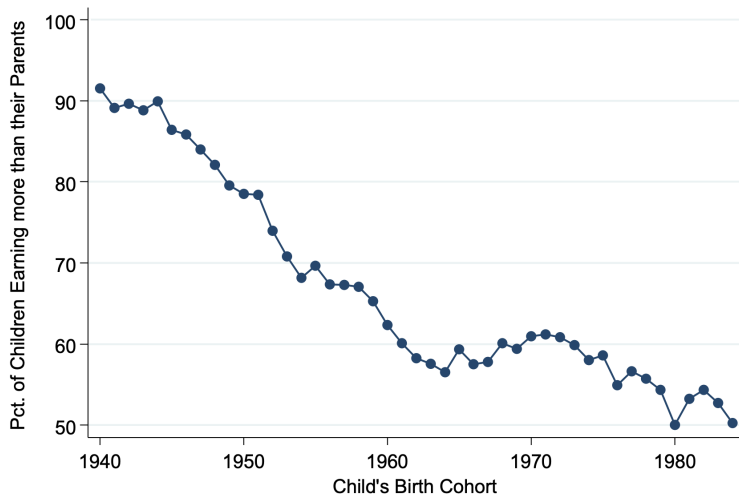
Chetty et al. 2017

C. Family Income Distributions: 1980 Birth Cohort



Absolute upward mobility: Out-earning your parents

Chetty et al. 2017



Economic opportunity: Two definitions

absolute mobility	out-earning your parents	has fallen
relative mobility	out-ranking your parents	

Parent
Income
(Inflation–
Adjusted
Dollars)

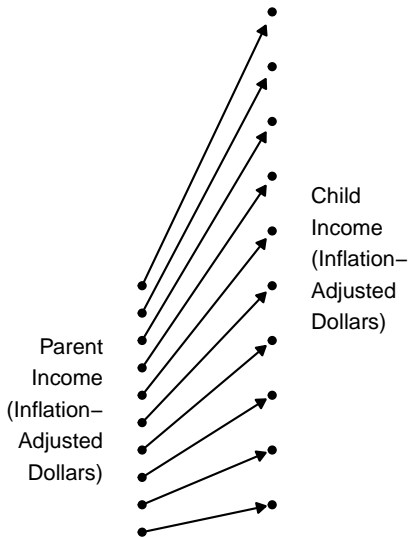
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Child
Income
(Inflation–
Adjusted
Dollars)

**absolute upward
mobility**

landing higher than
your parents in
dollars



**absolute upward
mobility**

landing higher than
your parents in
dollars

Parent
Income
(Inflation–
Adjusted
Dollars)

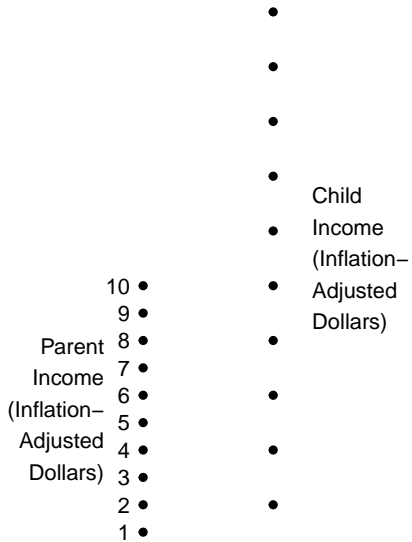
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Child
Income
(Inflation–
Adjusted
Dollars)

**absolute upward
mobility**

landing higher than
your parents in
dollars



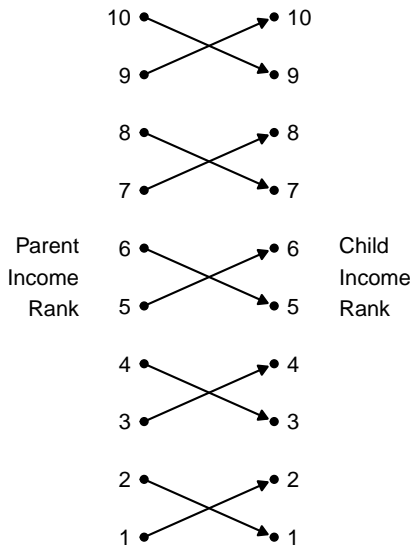
		• 10
		• 9
		• 8
		• 7
	Child	• 6
	Income	(Inflation–
		• 5
	Adjusted	Dollars)
		• 4
		• 3
		• 2
		• 1
10	•	
9	•	
Parent	8	•
Income	7	•
(Inflation–	6	•
Adjusted	5	•
Dollars)	4	•
	3	•
	2	•
	1	•

	10 •	• 10	
	9 •	• 9	
	8 •	• 8	
	7 •	• 7	
Parent	6 •	• 6	Child
Income			Income
Rank	5 •	• 5	Rank
	4 •	• 4	
	3 •	• 3	
	2 •	• 2	
	1 •	• 1	

	10 •	• 10	
	9 •	• 9	
	8 •	• 8	
	7 •	• 7	
Parent	6 •	• 6	Child
Income	5 •	• 5	Income
Rank	4 •	• 4	Rank
	3 •	• 3	
	2 •	• 2	
	1 •	• 1	

**relative upward
mobility**

landing higher than
your parents in
ranks



relative upward mobility

landing higher than
your parents in
ranks

example

half move up
half move down

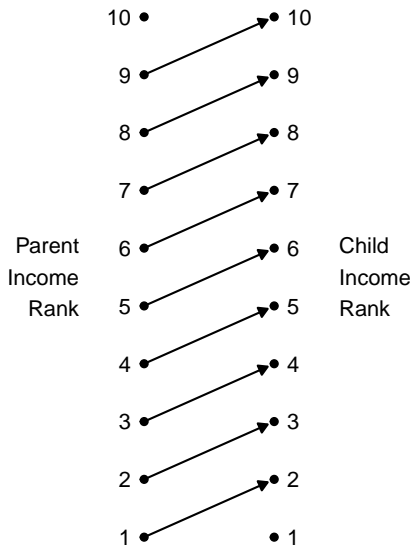
	10 •	• 10	
	9 •	• 9	
	8 •	• 8	
	7 •	• 7	
Parent	6 •	• 6	Child
Income			Income
Rank	5 •	• 5	Rank
	4 •	• 4	
	3 •	• 3	
	2 •	• 2	
	1 •	• 1	

relative upward mobility

landing higher than
your parents in
ranks

example

90% move up

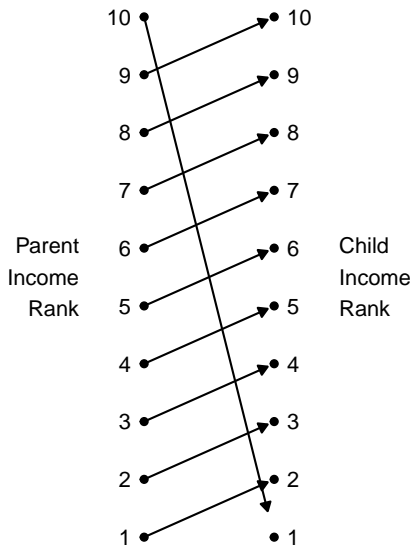


relative upward mobility

landing higher than
your parents in
ranks

example

90% move up



relative upward mobility

landing higher than
your parents in
ranks

example

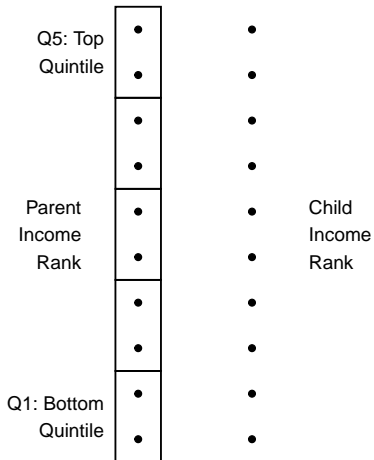
90% move up

Relative upward mobility: Reaching the top

Chetty et al. 2014

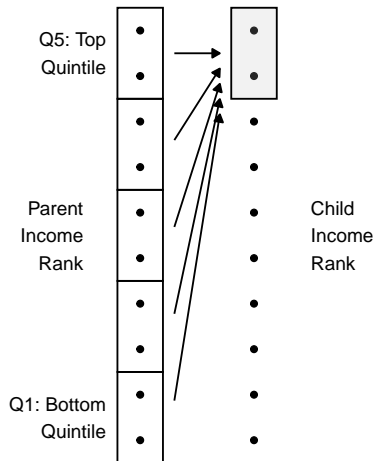
Relative upward mobility: Reaching the top

Chetty et al. 2014



Relative upward mobility: Reaching the top

Chetty et al. 2014



Relative upward mobility: Reaching the top

Chetty et al. 2014

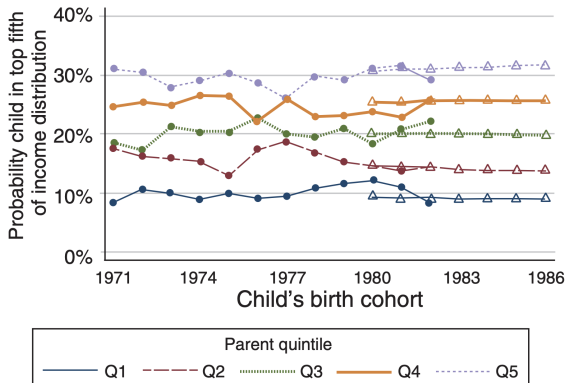


FIGURE 3. PROBABILITY OF REACHING TOP QUINTILE AT AGE 26 BY BIRTH COHORT

Economic opportunity: Two definitions

absolute mobility	out-earning your parents	has fallen
relative mobility	out-ranking your parents	roughly constant

What does **equal** opportunity mean to you?

Now, the premise that we're all created equal is the opening line in the American story. And while we don't promise equal outcomes, we've strived to deliver equal opportunity – the idea that success doesn't depend on being born into wealth or privilege, it depends on effort and merit.

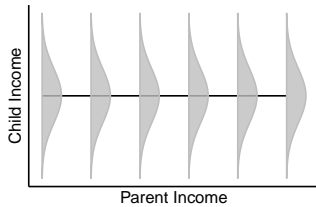
— Barack Obama, [Remarks on the Economy](#), Dec 2013. [\[Video\]](#)

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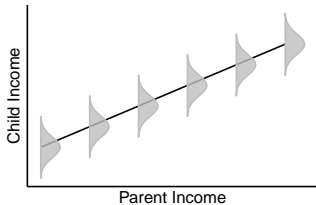
— Barack Obama, [Remarks on the Economy](#), Dec 2013. [\[Video\]](#)

How would you quantify opportunity using data science?

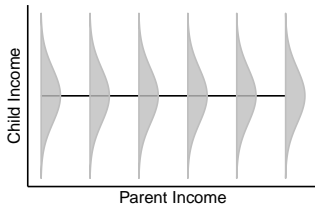
Equal Opportunity



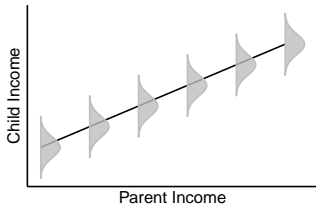
Unequal Opportunity



Equal Opportunity

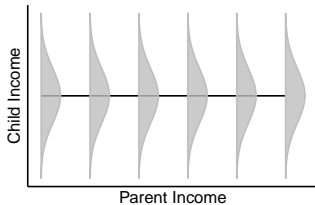


Unequal Opportunity



Child outcomes are **predictable** given family background

Equal Opportunity



Child outcomes are **unpredictable** given family background

Respondent Education	Parent Education	Grandparent Education	Sex	Race	Grandparent Income	Parent Income	
							Case 1
							Case 2
							Case 3
							Case 4
							Case 5

Respondent Income

Respondent Education

Parent Education

Grandparent Education

Sex

Race

Grandparent Income

Parent Income

Case 1

Case 2


Case 3

Case 4

Case 5

Respondent Income

Learn a
prediction
function



Respondent Education

Parent Education

Grandparent Education

Sex

Race

Grandparent Income

Parent Income

Case 1

Case 2

Case 3

Case 4

Case 5

Respondent Income

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Learn a
prediction
function
→

Respondent Education

Parent Education

Grandparent Education

Sex

Race

Grandparent Income

Parent Income

Case 1

Case 2

Case 3

Case 4

Case 5

Case 6

Case 7

Case 8

Respondent Income

Learn a
prediction
function



Predict for
new cases



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Respondent Education

Parent Education

Grandparent Education

Sex

Race

Grandparent Income

Parent Income

Case 1

Case 2

Case 3

Case 4

Case 5

Case 6

Case 7

Case 8

Learning Set

Holdout Set

The challenge

How well can you predict respondent incomes?

Get started [here](#)

Learning goals for today

By the end of class, you will be able to

- ▶ reason about economic opportunity
- ▶ reason about equal opportunity
- ▶ connect these to a data science idea: prediction