The Redistributive Consequences of Segregation

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Introduction

- Why do we in general observe a non-monotone relationship between income inequality and support for redistributive policies in society?
- Income inequality has increased in many (industrialized) countries over the last 35-40 years
- In general, demand for redistribution in society has not exhibited the same trend (see Ashok et al. (2015))

Introduction

- Socio-economic segregation has increased, especially where inequality is high (Reardon and Bischoff (2011), Chetty et al. (2014)).
- Misperceptions of the income distribution (own survey, Norton and Ariely (2011), Cruces et al. (2013))

Putting the pieces together

- People are segregated according to income.
- They are biased about the overall income distribution.
- This affects people's support for redistributive policies.

Preview of Results

- Demand for redistribution is lower than without segregation and misperceptions.
- An increase in inequality always leads to a smaller increase in demand for redistribution
- and can even lead to a decrease in demand for redistribution.

A Model of Segregation and Misperceptions

Beliefs $\Longrightarrow$ Social Segregation

Beliefs $\Longleftarrow$ Social Segregation

Today's presentation

- Introduce model of group formation with misperceptions
- Apply it to the question of income inequality and support for redistribution
  - non-monotone relationship between inequality and demand for redistribution

Sorting with Misperceptions

Sorting according to income

- Income y is distributed on $Y = [0, y_{\max}]$ with cdf $F(y)$
  - $F(y) \in C([0, y_{\max}])$ and strictly monotonic
- Person with income y_j can pay $b > 0$ to join group S_b and get

$$y_j E[y \in S_b] - b$$

  or pay nothing and get

$$y_j E[y \in S_0]$$

general

Possible partitions

- Any monotone partition $\{[0,\hat{y}),[\hat{y},y_{\max}]\}$ of Y and corresponding sorting fee b is possible

$$
\begin{aligned}
y\bar{E}(\hat{y}) - b &< y\underline{E}(\hat{y}) \quad \forall y \in [0,\hat{y}) \\
y\bar{E}(\hat{y}) - b &\geq y\underline{E}(\hat{y}) \quad \forall y \in [\hat{y},y_{\max}]
\end{aligned}
$$

Sorting with Misperceptions

- Add exogenous belief function
- People's belief about average income in the other group is a continuous function of $\hat{y}$
- Poor group's belief about average income in the rich group: $\bar{E}_p(\hat{y}) \neq \bar{E}(\hat{y})$
- Rich group's belief about average income in the poor group: $\underline{E}_r(\hat{y}) \neq \underline{E}(\hat{y})$
- People are correct about average income in their own group: $\underline{E}_p(\hat{y}) = \underline{E}(\hat{y})$ and $\bar{E}_r(\hat{y}) = \bar{E}(\hat{y})$

Sorting with Misperceptions

- A person with income y_i in the rich group gets utility

$$y_i \bar{E}(\hat{y}) - b$$

- thinks she would get

$$y_i \underline{E}_r(\hat{y})$$

  in the poor group

Biased sorting equilibrium

Definition

A partition of Y and a sorting fee b constitute a biased sorting equilibrium iff

$$y\bar{E}_p(\hat{y}) - b \quad < \quad y\underline{E}(\hat{y}) \quad \forall y \in [0, \hat{y}) \qquad \text{(IC1)}$$

$$y\bar{E}(\hat{y}) - b \quad \geq \quad y\underline{E}_r(\hat{y}) \quad \forall y \in [\hat{y}, y_{\max}] \qquad \text{(IC2)}$$

Consistency requirement

Definition

A partition of Y with corresponding sorting fee b satisfies **consistency** iff

$$y\bar{E}(\hat{y}) - b < y\underline{E}_r(\hat{y}) \quad \forall y \in [0, \hat{y}) \quad \text{(CR1)}$$

$$y\bar{E}_p(\hat{y}) - b \geq y\underline{E}(\hat{y}) \quad \forall y \in [\hat{y}, y_{\max}] \quad \text{(CR2)}$$

Corollary

In a biased sorting equilibrium with consistency any equilibrium cutoff $\hat{y}^*$ must satisfy

$$\hat{y}^* \bar{E}(\hat{y}^*) - \hat{y}^* \underline{E}_r(\hat{y}^*)$$

$$= \hat{y}^* \bar{E}_p(\hat{y}^*) - \hat{y}^* \underline{E}(\hat{y}^*)$$

$$= b$$

Underestimating inequality

Poor underestimate rich, rich overestimate poor:

$$\begin{aligned} \bar{E}_p(\hat{y}) &< \bar{E}(\hat{y}) \quad \forall \hat{y} \in (0, y_{\max}) \\ \underline{E}_r(\hat{y}) &> \underline{E}(\hat{y}) \quad \forall \hat{y} \in (0, y_{\max}) \end{aligned}$$

See e.g. Kiatpongsan and Norton (2014), Norton and Ariely (2011), Norton et al. (2014) and my own survey

more

Proportional biased beliefs

- Poor's belief about rich group:

$$\bar{E}_p(\hat{y}) = \beta(1 - F(\hat{y}))\hat{y} + (1 - \beta(1 - F(\hat{y}))\bar{E}(\hat{y})$$

- Rich's belief about poor group:

$$\underline{E}_r(\hat{y}) = \beta F(\hat{y})\hat{y} + (1 - \beta F(\hat{y}))\underline{E}(\hat{y})$$

  - $\beta \in (0, 1)$

Existence and uniqueness of equilibrium

- Equilibrium cutoff:

$$\hat{y}^*[\bar{E}(\hat{y}^*) - \underline{E}_r(\hat{y}^*)] = \hat{y}^*[\bar{E}_p(\hat{y}^*) - \underline{E}(\hat{y}^*)]$$

- Unique equilibrium cutoff > 0 exists

$$\hat{y}^* = E$$

Consistency

Inequality and the Demand for Redistribution

Voting for redistribution

- Meltzer Richard Model: people vote for linear tax rate
- Without misperceptions:
  - **high** inequality $\Longrightarrow$ **high** demand for redistribution
  - **increase** in inequality $\Longrightarrow$ **increase** in demand for redistribution
- With misperceptions:
  - **lower** perceived inequality $\Longrightarrow$ **lower** demand for redistribution
  - **increase** in inequality can lead to **decrease** in **perceived** inequality $\Longrightarrow$ **decrease** in demand for redistribution

Redistribution without misperceptions

- Linear taxation and redistribution: person with income y_j has post-redistribution income

$$(1-t)y_j + \tau(t)E$$

- Preferences are single-peaked $\implies$ median voter theorem holds
- The tax rate determined by majority voting will be the median earner's optimal tax rate given by

$$\tau'(t^*) = \frac{y^M}{E}$$

if $\frac{y^M}{E} < 1$ and $t^* = 0$ otherwise

- Tax rate is decreasing in "equality ratio" $\frac{y^M}{E}$

Redistribution with misperceptions

- If people knew the average income in the other group they could calculate overall average income correctly:

$$E = F(\hat{y})\underline{E}(\hat{y}) + (1 - F(\hat{y}))\bar{E}(\hat{y})$$

- With segregation and misperception, poor people underestimate average income

$$E_p(\hat{y}) = F(\hat{y})\underline{E}(\hat{y}) + (1 - F(\hat{y}))\bar{E}_p(\hat{y}) < E$$

- Rich people overestimate average income

$$E_r(\hat{y}) = F(\hat{y})\underline{E}_r(\hat{y}) + (1 - F(\hat{y}))\bar{E}(\hat{y}) > E$$

Redistribution with misperceptions

- $\hat{y}^* = E$
- The median earner is in the poor group and her preferred tax rate is given by

$$\tau'(\tilde{t}^*) = \frac{y^M}{E_p}$$

$$\frac{y^M}{E_p} > \frac{y^M}{E}$$

more

Proposition (Segregation $\Longrightarrow$ Low taxes)

The median voter' s preferred tax rate is lower in the presence of economic segregation.

Increasing inequality and redistribution

Without misperceptions

- Effects of a mean-preserving spread of the income distribution:
  - Equality ratio $\frac{y^M}{E}$ decreases

$$\Delta \left(\frac{y^M}{E} \right) = \frac{\Delta y^M}{E} = \frac{\Delta y^M}{y^M} \frac{y^M}{E}$$

  - Demand for redistribution t^* increases

Increasing inequality and redistribution

With misperceptions

- Equilibrium cutoff stays at $\hat{y}^* = E$
- E_p decreases because $\Delta \bar{E}_p < \Delta \bar{E}$
- Perceived equality ratio:

$$\Delta \left(\frac{y^M}{E_p} \right) = \frac{\Delta y^M E_p - y^M \Delta E_p}{\left(E_p\right)^2} = \left(\frac{\Delta y^M}{y^M} - \frac{\Delta E_p}{E_p} \right) \frac{y^M}{E_p}$$

- Percentage decrease in perceived equality is less than in the absence of segregation

Proposition (Inequality $\nearrow \Longrightarrow$ Redistribution $\searrow$)

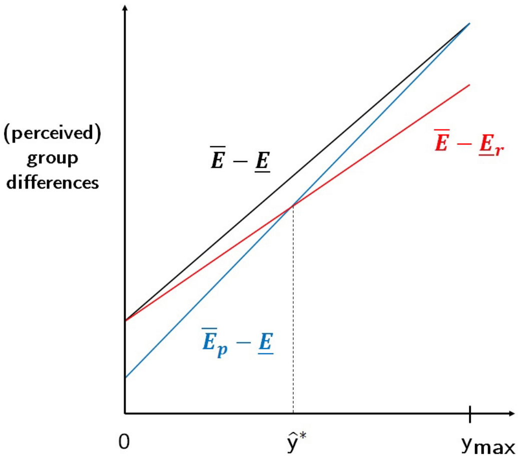
There always exists a mean-preserving spread that leads to a decrease in the median voter's demand for redistribution.

more

Conclusion

- Model of sorting with misperceptions, interaction of beliefs and segregation
- Application to inequality and redistribution
  - Non-monotone relationship between inequality and demand for redistribution
- Outlook:
  - Empirical analysis, especially in European countries
  - Supply side

Consistency



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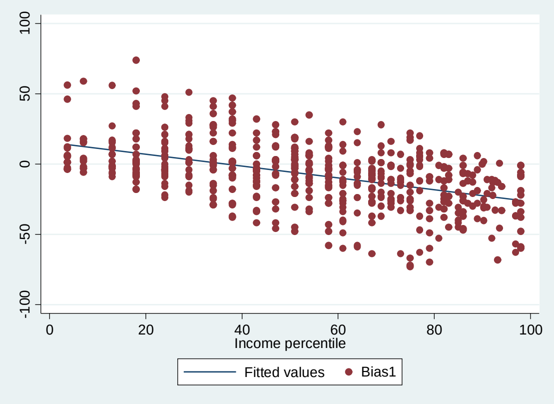
Positional bias

Poor people tend to overestimate and rich people tend to underestimate their relative position (Bias1 = Perceived income percentile - True income percentile)



Inequality and the supply side of segregation I

- Suppose a profit-maximizing monopolist can decide whether or not to offer segregation
- Profit:

$$\hat{y}^*(\bar{E} - \underline{E}_r)(1 - F(\hat{y}^*)) - c$$
$$= E(E - \underline{E})[1 - \gamma F(E)(1 - F(E))] - c$$

Inequality and the supply side of segregation II

- An increase in inequality can make it profitable for the monopolist to become active
- Median voter's demand for redistribution changes from

$$T'^{-1}\left(\frac{y^M}{E}\right)$$

to

$$T'^{-1}\left(\frac{\hat{y}^M}{E_p}\right)$$

where

$$E_p = E - \beta(1-F)^2(\bar{E} + \Delta\bar{E} - E)$$

- **there always exists a mean-preserving spread that leads to a decrease in demand for redistribution**

back

- The median earner is the decisive voter if

$$\frac{E}{E_r(E)} \geq \frac{y^M}{E_p(E)}$$

- A sufficient condition for this inequality to hold is

$$E - y^M \geq \beta \frac{\bar{E}(E) - \underline{E}(E)}{4}$$

which is satisfied (for a given β) if the income distribution is sufficiently positively skewed with not too much mass in the upper and lower tails of the distribution

- as long as $E - y^M > 0$ then even if

$$4(E - y^M) \geq \bar{E}(E) - \underline{E}(E)$$

this inequality can always be satisfied if β is small enough

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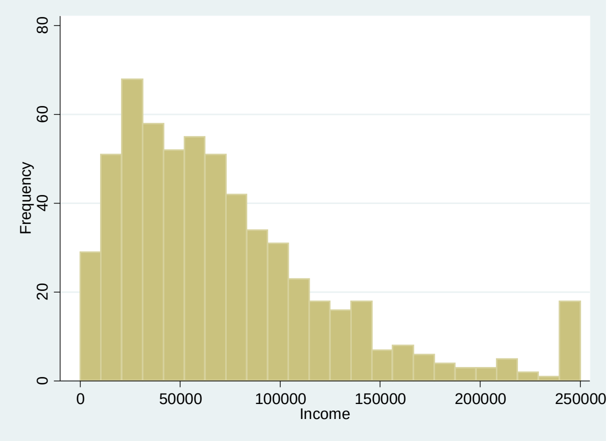

Figure: Sample household income distribution

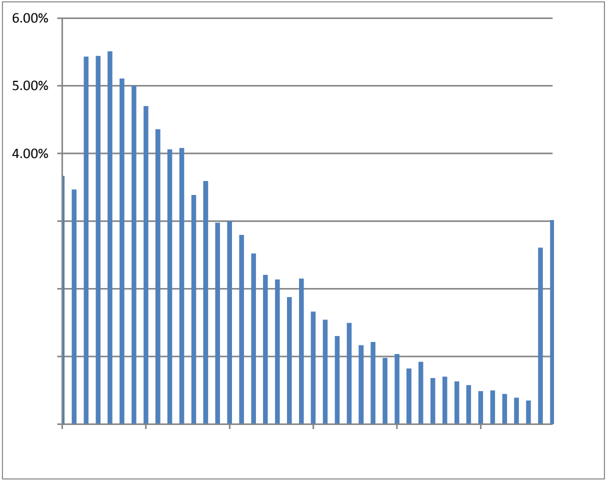

Figure: US household income distribution

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Secretary, Nurse, Teacher, Cleaner, University lecturer, Artist, Electrician, Office manager, Solicitor, Farm worker, Chief executive, Software designer, Call center worker, Postal worker, Scientist, Lorry driver, Accountant, Shop assistant

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Positional bias

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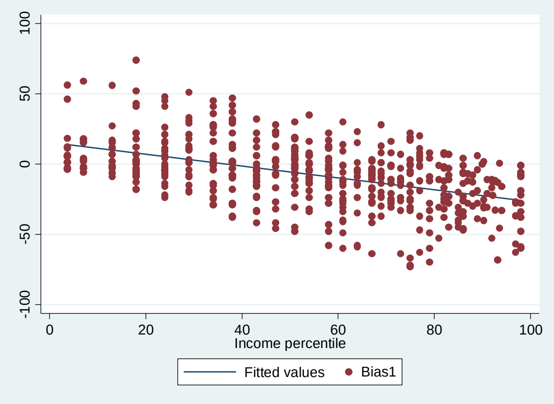

Sorting according to income

- Income y is distributed on $Y = [0, y_{\max}]$ with cdf $F(y)$
  - $F(y) \in C([0, y_{\max}])$ and strictly monotonic
- Person with income y_j can pay $b > 0$ to join group S_b and get

$$U(y_j, E[y \in S_b]) - b$$

  or get

$$U(y_j, E[y \in S_0])$$

- $U(.,.)$ is continuous, strictly increasing in both arguments and strictly supermodular

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Uniqueness in Case 1 with general utility

Uniqueness is guaranteed if additionally it holds that at any $\hat{y}^*$ for which

$$U(\hat{y}^*, \bar{E}(\hat{y}^*)) - U(\hat{y}^*, \underline{E}_r(\hat{y}^*)) = U(\hat{y}^*, \bar{E}_p(\hat{y}^*)) - U(\hat{y}^*, \underline{E}(\hat{y}^*))$$

we have that

$$U_1(\hat{y}^*, \bar{E}(\hat{y}^*)) - U_1(\hat{y}^*, \underline{E}_r(\hat{y}^*)) \leq U_1(\hat{y}^*, \bar{E}_p(\hat{y}^*)) - U_1(\hat{y}^*, \underline{E}(\hat{y}^*))$$

$$U_2(\hat{y}^*, \underline{E}_r(\hat{y}^*)) \geq U_2(\hat{y}^*, \underline{E}(\hat{y}^*))$$

and

$$U_2(\hat{y}^*, \bar{E}(\hat{y}^*)) \leq U_2(\hat{y}^*, \bar{E}_p(\hat{y}^*))$$

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Biased sorting equilibria

Four possible combinations of biases:

1. Poor underestimate rich, rich overestimate poor
2. Poor overestimate rich, rich underestimate poor
3. Poor overestimate rich, rich overestimate poor
4. Poor underestimate rich, rich underestimate poor

Existence of sorting equilibria

Proposition

Biased sorting equilibria with consistency always exist in Case 1 and Case 2 and can never exist in Case 3 and Case 4.

- The perceived differences between groups must be equal at the equilibrium cutoff:

$$\bar{E}(\hat{y}^*) - \underline{E}_r(\hat{y}^*) = \bar{E}_p(\hat{y}^*) - \underline{E}(\hat{y}^*)$$

Uniqueness of equilibrium

Proposition

If

$$\frac{d\left|\bar{E}(\hat{y})-\bar{E}_p(\hat{y})\right|}{d\hat{y}}<0 \; and \; \frac{d\left|\underline{E}_r(\hat{y})-\underline{E}(\hat{y})\right|}{d\hat{y}}>0$$

then there exists a unique biased sorting equilibrium with consistency in Case 1 and Case 2.

general

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Assumptions

1. **Range:**

$$\bar{E}_p(\hat{y}) \in [\hat{y}, y_{\max}] \text{ and } \underline{E}_r(\hat{y}) \in [0, \hat{y}]$$

2. **Constant direction of bias:**

$$\begin{aligned} \bar{E}_p(\hat{y}) &< (>) \bar{E}(\hat{y}) \quad \forall \hat{y} \in (0, y_{\max}) \\ \underline{E}_r(\hat{y}) &< (>) \underline{E}(\hat{y}) \quad \forall \hat{y} \in (0, y_{\max}) \end{aligned}$$

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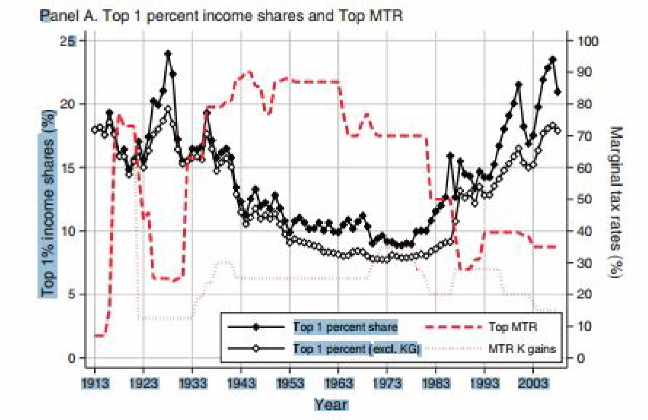

estates tax: https://www.irs.gov/pub/irs-soi/ninetyestate.pdf

Evidence from Household Surveys

look at support for redistribution over time (GSS and ANES)

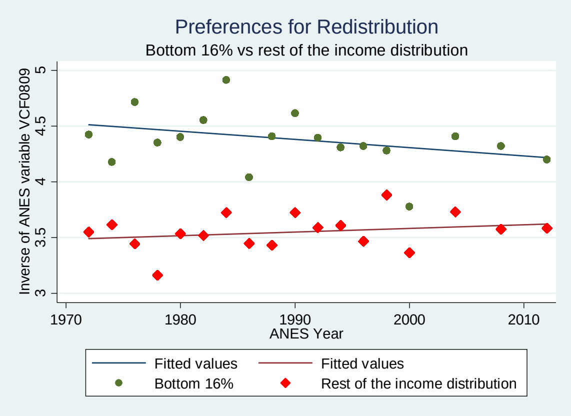

Figure: ANES variable *VCF0809*: Should the government see to it that everybody has a job and a good standard of living? Average preferences of the bottom 16% and the rest of the income distribution

Bias2

```
. summarize dev_av
```

Variable	Obs	Mean	Std. Dev.	Min	Max
dev_av	603	.403361	.3184763	.0272741	6.704556

Bias

```
. summarize dev_av2
```

Variable	Obs	Mean	Std. Dev.	Min	Max
dev_av2	603	-.3555657	.3711611	-.9998074	6.704556

Camsd (Social circle diversity)

```
. summarize camsd
```

Variable	Obs	Mean	Std. Dev.	Min	Max
camsd	603	7.319444	3.590801	0	19.09188

Factor (Social Segregation)

```
. summarize f7
```

Variable	Obs	Mean	Std. Dev.	Min	Max
f7	509	3.88e-11	.6054928	-1.673802	1.848242