Reparations and Persistent Racial Wealth Gaps

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The questions

- Persistent wealth and income gap between Black and White.
- A policy proposal is to make reparations toward Black.
  - Logic: compensation for exclusions from labor and capital markets.
  - Hope: *"The wealth gap will not persist if the target of well-executed reparations is direct elimination of it."* [Darity and Mullen (2020)]

Will wealth transfers today eliminate the racial wealth gap in the future?

If not, is there a policy that is effective in eliminating this gap?

Our approach

1. Develop long-run equilibrium model with heterogeneous dynasties.
    - Intergenerational transfers.
    - Choice between labor and risky entrepreneurship.
    - Heterogeneous *expected* returns, reflecting accumulated experiences.
2. Quantify model to reproduce today's wealth/income statistics.
3. Evaluate reparations policy.

Our findings

1. Feeding labor and capital exclusions, model reproduces racial gap:
    - wealth and income,
    - entrepreneurship,
    - income mobility,
    - beliefs about risky returns.

Our findings

1. Feeding labor and capital exclusions, model reproduces racial gap:
   - wealth and income,
   - entrepreneurship,
   - income mobility,
   - beliefs about risky returns.
2. Policy that equalizes wage forever and redistributes wealth today:
   - Even with large wealth transfers, *divergence* of wealth in future.
   - Alternative: entrepreneurial subsidies can lead to convergence.

Contributions to literature

1. Wealth inequality and return heterogeneity.
   - Quadrini (RED00); Cagetti, De Nardi (JPE06); Benhabib, Bisin, Zhu (ECMA11, AER19); Gabaix, Lasry, Lions, and Moll (ECMA16).
2. Transmission of beliefs and social capital.
   - Piketty (QJE95); Bisin, Verdier (JET01); Guiso, Sapienza, Zingales (JEEA08); Fogli, Veldkamp (ECMA11); Fernandez (AER13).
3. Racial gap.
   - Loury (77); Darity, Frank (AER03); Margo (JEH16); Collins, Wanamaker (WP17); Aliprantis, Carroll, Young (WP19); Hsieh, Hurst, Jones, Klenow (ECMA19).

Model

Demographics

- Dynasty ι size:

$$N_{\iota t+1} = (1 + n_{\iota t+1}) N_{\iota t}.$$

- Total population and population growth:

$$N_{t+1} = \int N_{\iota t+1} \mathrm{d}\Phi_t, \qquad 1 + n_{t+1} \equiv N_{t+1} / N_t.$$

Technology

- Time $1 - k_{\iota t}$ to safe technology:

$$(z_{\iota t} + i_t a_{\iota t})(1 - k_{\iota t}).$$

- Time $k_{\iota t}$ to risky technology:

$$\begin{aligned} r_t a_{\iota t} k_{\iota t}, &\quad \text{if} \quad e_{\iota t} = G, \\ 0, &\quad \text{if} \quad e_{\iota t} = B. \end{aligned}$$

- $\mathbb{P}(e_{\iota t} = G) = q^*$ is unknown.

Beliefs about probability of success q^*

- Prior $\pi_{\iota t}(q) = \mathbb{P}_{\iota t}(q^* = q)$, with mean:

$$\mathbb{E}_{\iota t} q^* = \int q \pi_{\iota t}(q) \mathrm{d}q.$$

- After $e_{\iota t}$, update with Bayes' rule:

$$\pi_{\iota t+1}(q) = \begin{cases} \pi_{\iota t}(q) \frac{q}{\mathbb{E}_{\iota t} q^*}, & \text{if} \quad e_{\iota t} = G, \\ \pi_{\iota t}(q) \frac{1-q}{\mathbb{E}_{\iota t}(1-q^*)}, & \text{if} \quad e_{\iota t} = B. \end{cases}$$

- No updating when $k_{\iota t} = 0$: $\pi_{\iota t+1}(q) = \pi_{\iota t}(q)$.

Timeline of decisions

1. Dynasty ι enters period t with state:

$$(z_{\iota t}, a_{\iota t}, \pi_{\iota t}, n_{\iota t+1}, \tau_{\iota t}).$$

2. Chooses entrepreneurial time $k_{\iota t}$.

3. Experiences $e_{\iota t}$ and realizes income $y_{\iota t}$.

4. Chooses $c_{\iota t}$ and transmits $a_{\iota t+1}$ and posterior $\pi_{\iota t+1}$ to $\iota t + 1$.

Preferences and budget

- Utility function:

$$U = \frac{(c_{\iota t} - \bar{c}_t)^{1-\gamma} - 1}{1-\gamma} + \beta^{\gamma} \frac{a_{\iota t+1}^{1-\gamma} - 1}{1-\gamma}.$$

- Budget constraint:

$$c_{\iota t} + (1 + n_{\iota t+1}) a_{\iota t+1} = y_{\iota t}.$$

$$y_{\iota t} = \begin{cases} \tau_{\iota t} + (1-\delta) a_{\iota t} + (z_{\iota t} + i_t a_{\iota t})(1 - k_{\iota t}) + r_t a_{\iota t} k_{\iota t}, & \text{if } e_{\iota t} = G, \\ \tau_{\iota t} + (1-\delta) a_{\iota t} + (z_{\iota t} + i_t a_{\iota t})(1 - k_{\iota t}), & \text{if } e_{\iota t} = B. \end{cases}$$

Dynasty optimization

solutions

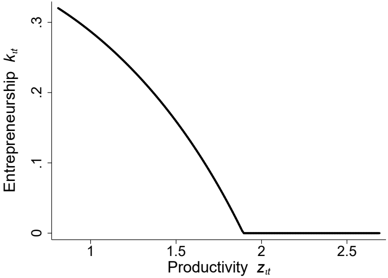
- After $e_{\iota t}$ is realized:

$$\begin{aligned} c_{\iota t} &= \bar{c}_t + \omega_{\iota t+1}(y_{\iota t} - \bar{c}_t), \\ a_{\iota t+1} &= (1 - \omega_{\iota t+1})\frac{y_{\iota t} - \bar{c}_t}{1 + n_{\iota t+1}}. \end{aligned}$$

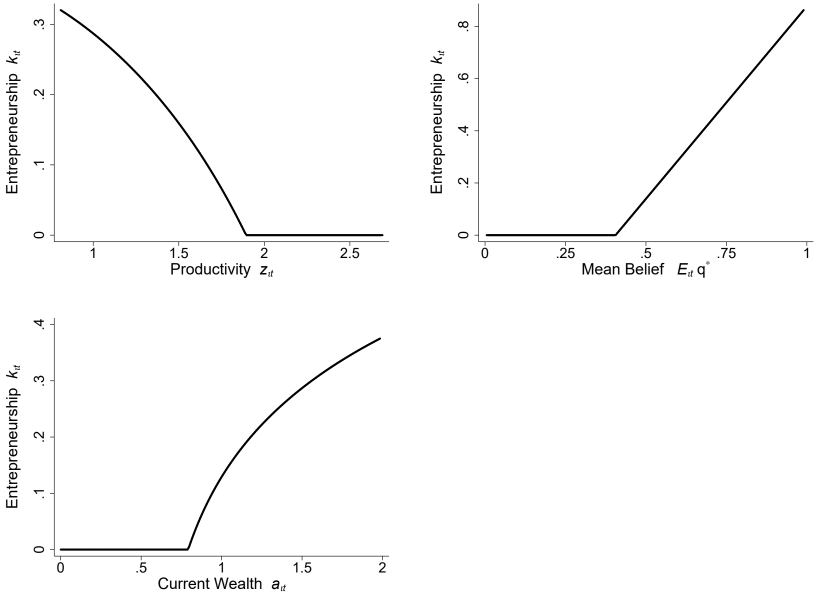
- Before $e_{\iota t}$ is realized:

$$V = \max_{k_{\iota t}} \int \left[qU^*(y_{\iota t}(k_{\iota t}, G)) + (1-q)U^*(y_{\iota t}(k_{\iota t}, B))\right] \pi_{\iota t}(q) \mathrm{d}q.$$

Policy functions



Policy functions



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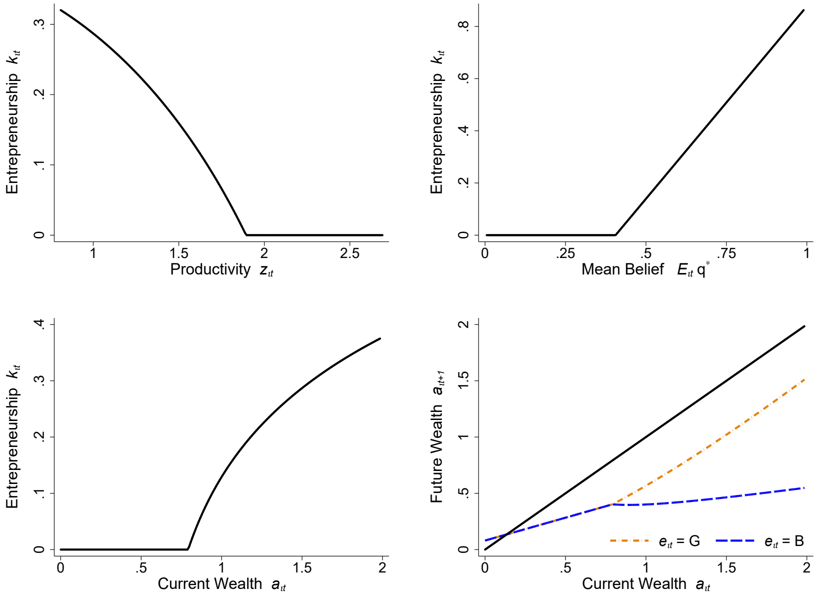


Driving forces: labor and capital market exclusion

1. Labor market exclusion.
   - Slavery.
   $$k_{\iota t}^{b} = 0, \qquad c_{\iota t}^{b} = \bar{c}_t, \qquad a_{\iota t+1}^{b} = 0.$$
   - Wage gap.
   $$\mathbb{E} z_{\iota t}^{b} < \mathbb{E} z_{\iota t}^{w}.$$
2. Capital market exclusion.
   $$k_{\iota t}^{b} = 0.$$

Asset market clearing

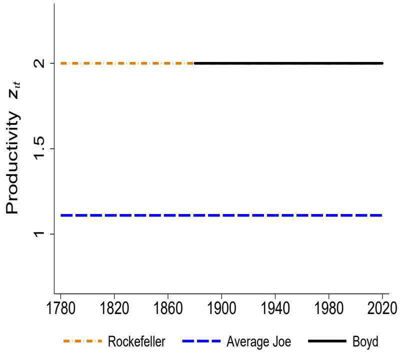
equilibrium

$$\underbrace{N_t \int (1 + n_{\iota t+1}) a_{\iota t+1}(\cdot, r_t) \mathrm{d}\Phi_t}_{\text{desired assets}} = \underbrace{\bar{A}_{t+1} / r_t{}^{\alpha}}_{\text{asset limit}}.$$

- $\alpha = 0$: $A_{t+1} = \bar{A}_{t+1}$ exogenous (e.g. land).
- $0 < \alpha < \infty$: r_t and A_{t+1} jointly determined.
- $\alpha \to \infty$: r_t exogenous (e.g. small open economy).

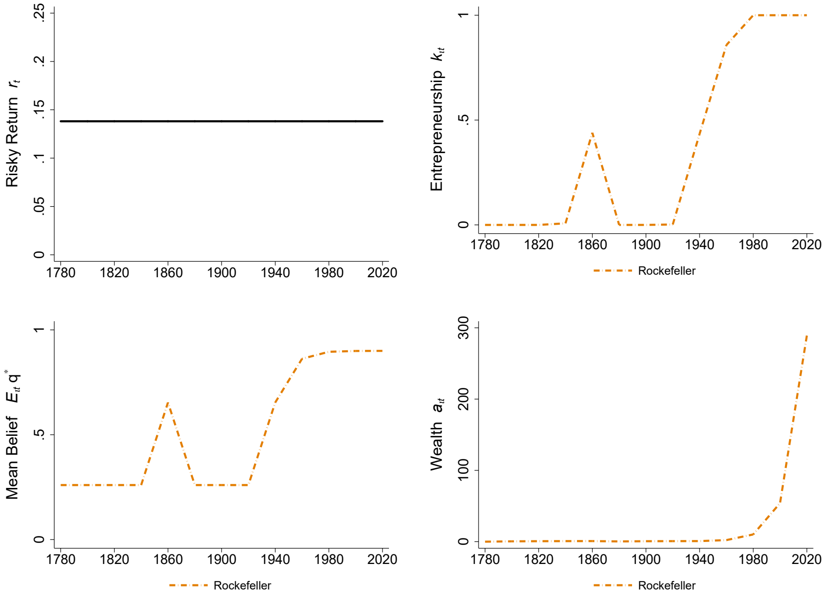
Illustrative Example

Tale of three dynasties

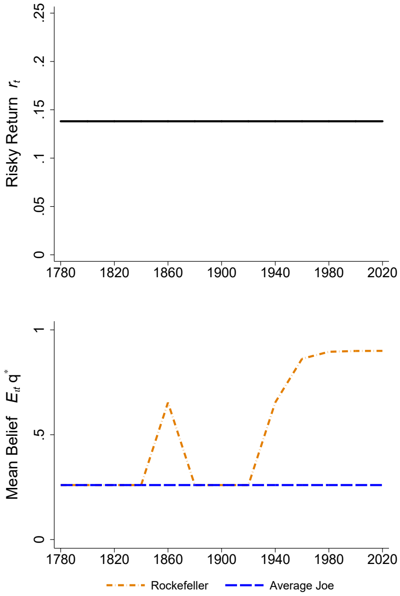


Partial equilibrium

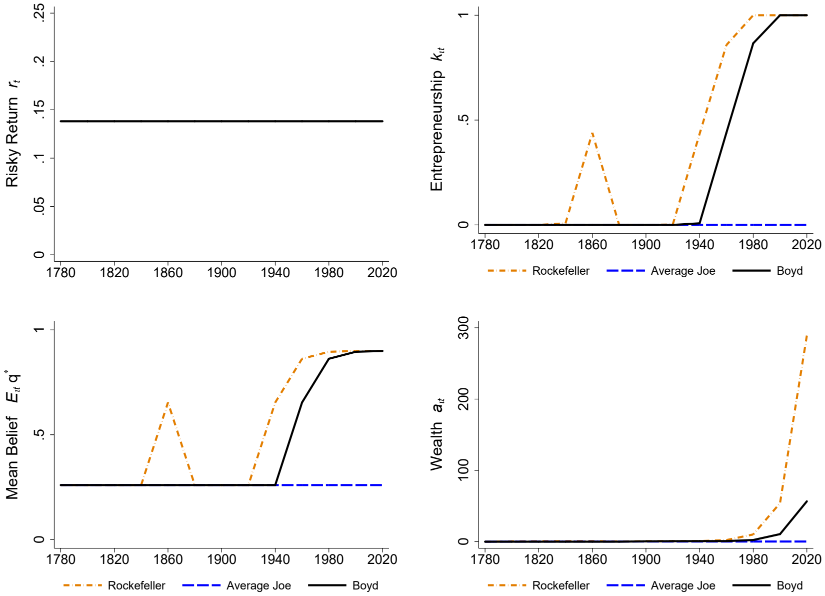
Partial equilibrium



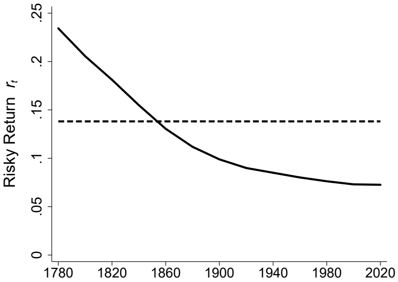
Partial equilibrium



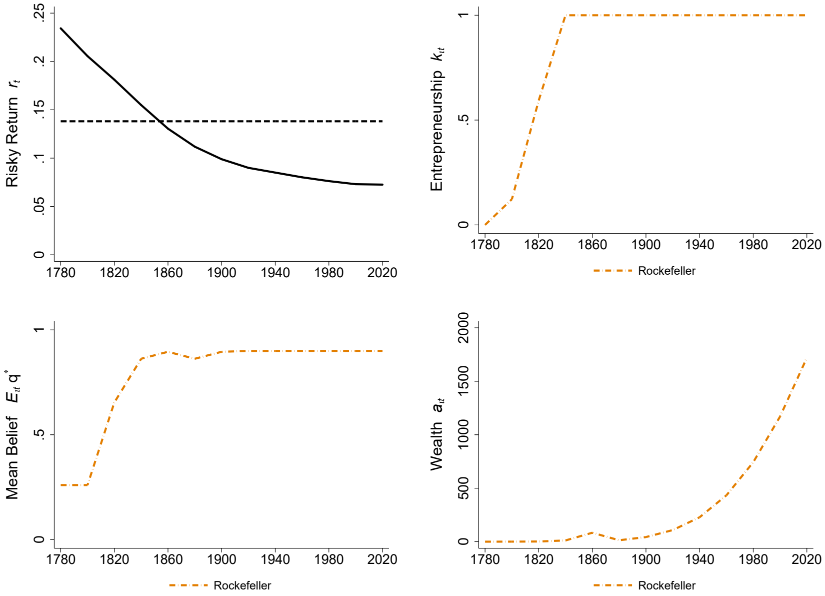
Partial equilibrium



General equilibrium



General equilibrium



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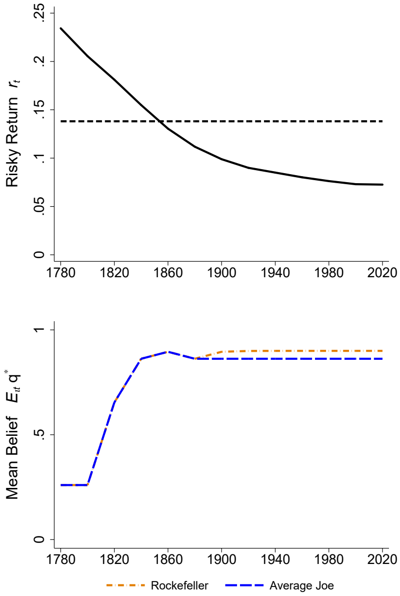

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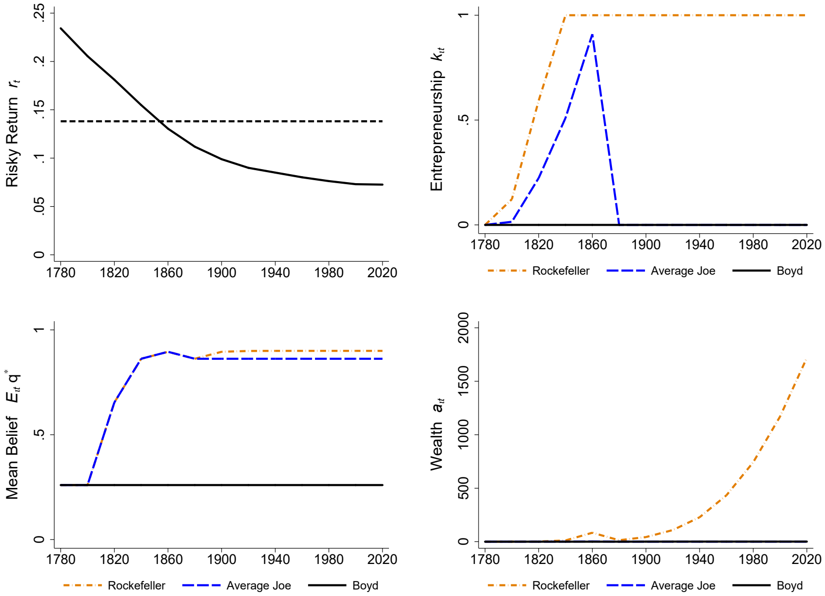


Quantitative Results

Periods

1780	declaration of independence
...	...
1880	abolition of slavery
...	...
1960	abolition of capital market exclusion
...	...
2020	today
2040	reparations, wage equalization
...	...

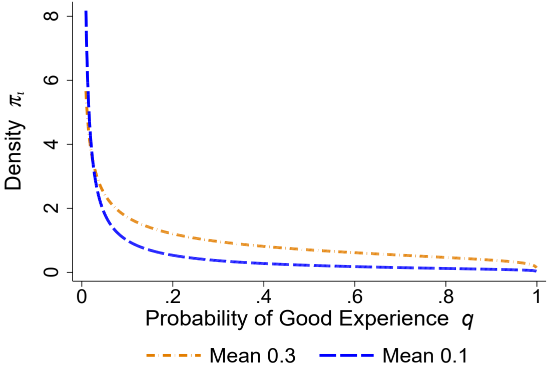
Exogenous processes

time series pop/wages

- Population: $\{N_t^w, N_t^b\}$ from Census.
- Wages $z_{\iota t}^h = \max\{Z_t \mu_t^h \theta_{\iota t}, \bar{c}_t\}$ with $\log \theta_{\iota t} = \rho_t \log \theta_{\iota t-1} + \sigma_t \varepsilon_{\iota t}$:
  - g_t from Madison Project.
  - μ_t^h from Margo (2016).
  - ρ_t from Aaronson, Mazumder (2008) and σ_t from ACS.
- Assets: $\bar{A}_{t+1}/\bar{A}_t = (1+g)(1+n)$ and $a_{\iota 1} = 0$.

Initial beliefs

$$\pi_{\iota 1}(q) = \text{Beta}\left(\frac{b\bar{q}_{\iota 1}}{1-\bar{q}_{\iota 1}}, b\right), \quad \bar{q}_{\iota 1} \sim \text{U}[0, \bar{q}] \quad [\Longrightarrow \mathbb{E}_{\iota 1} q^* = \bar{q}_{\iota 1}]$$



Parameterization

all parameters

$$\beta^{1/20} = 0.983, q^* = 0.91, \bar{q} = 0.30, b = 1.20, \bar{c}_t = 0.81 Z_t, \bar{A}_1 = 0.23.$$

(2020)	Data	Model
wealth / lifetime income	0.25	0.25
labor share	0.56	0.56
risky return	0.07	0.07
top 10% wealth share	0.76	0.76
top 50% wealth share	0.99	0.98
entrepreneurship rate	0.03	0.03

Wealth and income concentration

	Wealth		Income	
(2020, share of top)	Data	Model	Data	Model
50 percent	0.99	0.98	0.86	0.89
20 percent	0.87	0.86	0.62	0.71
10 percent	0.76	0.76	0.47	0.60
5 percent	0.64	0.67	0.37	0.52
1 percent	0.37	0.53	0.20	0.40
0.1 percent	0.14	0.25	0.07	0.19

Racial gap in wealth and income

	Wealth Ratio		Income Ratio	
(2020, White / Black)	Data	Model	Data	Model
Mean	6.7	5.7	2.2	2.9
99 percentile	7.5	5.3	4.0	3.8
90 percentile	5.3	2.5	2.0	1.8
50 percentile	9.7	17.5	1.8	1.8

Evolution of wealth racial gap

	Wealth Ratio	
	Data	Model
1900	28.2	42.5
2020	6.7	5.7

[Source of data: Higgs (1982) and Margo (1984).]

Entrepreneurship

▸ concentration

	Fraction Entrepreneurs	
(2020, percent)	Data	Model
Total	2.6	3.0
White	3.1	3.6
Black	0.3	0.0

[SCF: define $k > 0$ if business assets above mean net worth.]

Income mobility gap in 1990

$$\text{Upward Rank Mobility}(d) = \mathbb{P}(\text{rank}(y_t) > \text{rank}(y_{t-1}) | \text{rank}(y_{t-1}) \in d)$$

(1990)	Data		Model	
Decile d	White	Black	White	Black
1	0.97	0.80	0.87	0.81
3	0.76	0.54	0.65	0.49
5	0.58	0.51	0.49	0.38
7	0.36	—	0.38	0.25
9	0.31	—	0.24	0.18

[Source of data: Collins and Wanamaker (2017).]

Income mobility gap in 1930

$$\text{Upward Rank Mobility}(d) = \mathbb{P}(\text{rank}(y_t) > \text{rank}(y_{t-1}) | \text{rank}(y_{t-1}) \in d)$$

(1930)	Data		Model	
Decile d	White	Black	White	Black
1	0.90	0.68	0.85	0.58
3	0.59	0.31	0.62	0.31
5	0.38	—	0.48	0.22
7	0.28	—	0.38	0.13
9	0.16	—	0.25	—

[Source of data: Collins and Wanamaker (2017).]

Dispersion of beliefs

$$P_t(\pi_{\iota t}, \bar{r}) = \sum_{q:qr_t > \bar{r}} \pi_{\iota t}(q), \quad \text{with } \bar{r} = 0.006 \text{ s.t. } \int P_{\iota t} d\Phi = 0.51$$

	Data	Model
Mean	0.51	0.51
Mean, White	0.51	0.53
Mean, Black	0.44	0.41
Std Deviation	0.29	0.28
Std Deviation, White	0.29	0.30
Std Deviation, Black	0.29	0.16

Counterfactual history

▸ add ▸ parameters

(2020, mean gaps)	Wealth	Income	Entrepreneurship
No Differences	1.0	1.0	0.0
All Differences	5.7	2.9	3.6

Counterfactual history

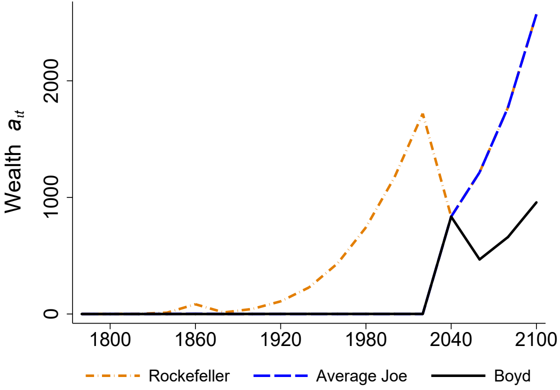
▸ add ▸ parameters

(2020, mean gaps)	Wealth	Income	Entrepreneurship
No Differences	1.0	1.0	0.0
All Differences	5.7	2.9	3.6
– Labor Exclusion	2.3	1.7	3.3
– Capital Exclusion	5.7	2.9	3.6
– Demographics	5.5	2.9	3.6

Reparations

Illustrative example: equalize wealth in 2040

partial equilibrium



Logic for wealth divergence after reparations:

$$k_{\iota t} = k(z_{\iota t}, a_{\iota t}, \mathbb{E}_{\iota t} q^*; r_t).$$

Baseline policy

1. Eliminate wage gap starting in 2040 and forever.

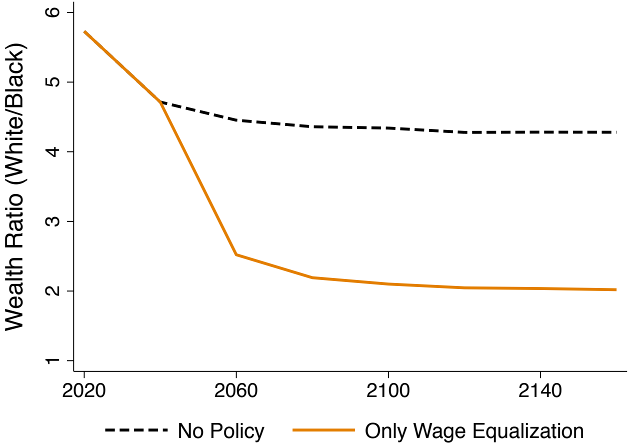
2. Find (τ, Λ) to equalize *mean* wealth in 2040:

$$\int (a_\iota^b + \tau) d\Phi^b = \int (1 - \Lambda) a_\iota^w d\Phi^w \quad \text{s.t.} \quad \phi\tau = (1 - \phi) \int \Lambda a_\iota^w d\Phi^w.$$

$$\Lambda = \lambda \mathbb{I}(a_\iota^w < a^*) + (1 - \lambda) \mathbb{I}(a_\iota^w \geq a^*) \frac{a_\iota^w - a^*}{a_\iota^w}.$$

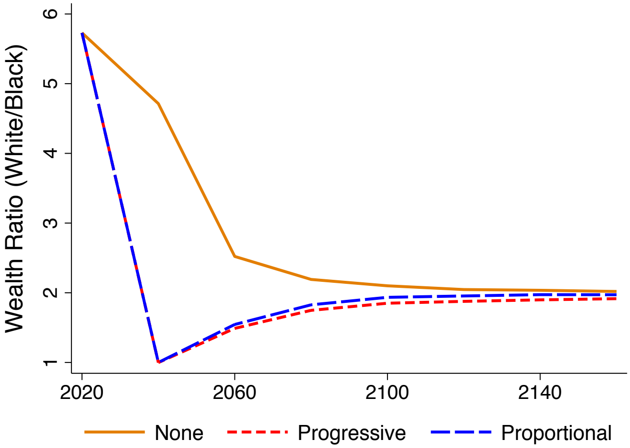
- Progressive: $\lambda = 0$ and $a^* > 0$.
- Proportional: $a^* = \infty$ and $\lambda > 0$.

Evolution of mean wealth gap after wage equalization



Divergence of mean wealth gap after reparations

▸ beliefs



Larger wealth transfers would not lead to convergence

(relative to mean wealth)		Wealth Ratio			Output Change (percent)		
Transfer	Financing	2040	2100	∞	2040	2100	∞
$\tau = 0.75$	$a^* = 112$	1.0	1.9	1.9			
$\tau = 2.23$	$a^* = 16$						

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Transfer	Financing	2040	2100	∞	2040	2100	∞
$\tau = 0.75$	$a^* = 112$	1.0	1.9	1.9	-4.3	-4.3	0.0
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$\tau = 2.23$	$a^* = 16$	0.3	1.3	1.9	-16.6	-16.5	0.0
$\tau = 0.75$	$\lambda = 0.13$	1.0	1.9	1.9	-2.9	-2.1	0.0
$\tau = 2.23$	$\lambda = 0.38$	0.3	1.6	1.9	-8.9	-7.0	0.0

Subsidies to Black entrepreneurs

(relative to mean wealth)		Wealth Ratio			Output Change (percent)		
Transfer	Financing	2040	2100	∞	2040	2100	∞
$\tau = 0.75$	$a^* = 112$	1.0	1.9	1.9	-4.3	-4.3	0.0
$s = 0.22$	$a^* = 112$						
$\tau = 2.23$	$a^* = 16$	0.3	1.3	1.9	-16.6	-16.5	0.0
$s = 0.27$	$a^* = 16$						

[Find $\tilde{s}$ such that $\phi q^*(r + \tilde{s}) \int a_\iota^b k_\iota^b d\Phi^b = (1 - \phi) \int \Lambda a_\iota^w d\Phi^w$. Annual $s = (1 + \tilde{s})^{1/20} - 1$.]

Subsidies to Black entrepreneurs

▸ proportional

(relative to mean wealth)		Wealth Ratio			Output Change (percent)		
Transfer	Financing	2040	2100	∞	2040	2100	∞
$\tau = 0.75$	$a^* = 112$	1.0	1.9	1.9	-4.3	-4.3	0.0
$s = 0.22$	$a^* = 112$	4.0	1.7	1.3	-3.3	-4.0	0.1
$\tau = 2.23$	$a^* = 16$	0.3	1.3	1.9	-16.6	-16.5	0.0
$s = 0.27$	$a^* = 16$	2.9	0.9	1.0	-13.5	-14.3	0.2

[Find $\tilde{s}$ such that $\phi q^*(r + \tilde{s}) \int a_\iota^b k_\iota^b \mathrm{d}\Phi^b = (1 - \phi) \int \Lambda a_\iota^w \mathrm{d}\Phi^w$. Annual $s = (1 + \tilde{s})^{1/20} - 1$.]

Learning from others' experiences

	Friends		Wealth Ratio		
	F^o	F^c	2040	2100	∞
1.	0	0	1.0	1.9	1.9
2.	1	0	1.0	1.9	1.9
3.	2	0	1.0	1.9	1.8
4.	4	0	1.0	1.9	1.5
5.	10	0	1.0	1.9	1.0
6.	1	1	1.0	1.8	1.0

[F^o: number of own's group observations; F^c: number of cross group observations.]

Conclusion

Conclusion

- Develop framework for analysis of economics of reparations.
- Model reproduces racial gaps in response to labor/capital exclusion.
- Evaluation of reparations:
  - Divergence of wealth in response to direct wealth transfers today.
  - Entrepreneurial subsidies today can lead to convergence of wealth.
  - Learning from others supplement to direct wealth transfers.

Appendix

Solutions

back

$$c_{\iota t} = \bar{c}_t + \frac{(1+n_{\iota t+1})^{\frac{1-\gamma}{\gamma}}}{(1+n_{\iota t+1})^{\frac{1-\gamma}{\gamma}} + \beta} \times (y_{\iota t} - \bar{c}_t).$$

$$a_{\iota t+1} = \frac{\beta}{(1+n_{\iota t+1})^{\frac{1-\gamma}{\gamma}} + \beta} \times \frac{y_{\iota t} - \bar{c}_t}{1+n_{\iota t+1}}.$$

$$k_{\iota t} = \begin{cases} 0, \quad \text{if} \quad r_t a_{\iota t} \le z_{\iota t} + i_t a_{\iota t}, \quad \text{or} \quad \bar{q}_{\iota t} r_t a_{\iota t} \le z_{\iota t} + i_t a_{\iota t}, \\ \left(1 + \frac{\tau_{\iota t} + (1-\delta) a_{\iota t} - \bar{c}_t}{z_{\iota t} + i_t a_{\iota t}}\right) \left(\frac{\left[\frac{\mathbb{E}_{\iota t} q^*}{1-\mathbb{E}_{\iota t} q^*}\left(\frac{r_t a_{\iota t}}{z_{\iota t} + i_t a_{\iota t}} - 1\right)\right]^{\frac{1}{\gamma}} - 1}{\left[\frac{\mathbb{E}_{\iota t} q^*}{1-\mathbb{E}_{\iota t} q^*}\left(\frac{r_t a_{\iota t}}{z_{\iota t} + i_t a_{\iota t}} - 1\right)\right]^{\frac{1}{\gamma}} - 1 + \frac{r_t a_{\iota t}}{z_{\iota t} + i_t a_{\iota t}}} \right), \quad \text{else.} \end{cases}$$

Equilibrium

back

Given $\Phi_1^h(a_1, \pi_1, N_1)$, $\{z_{\iota t}, e_{\iota t}, n_{\iota t+1}\}_{\iota t}$, $\{\bar{A}_t, i_t, \chi_t, \bar{k}_t^b\}_t$ equilibrium is:

- policy functions $\{k_{\iota t}, y_{\iota t}, c_{\iota t}, a_{\iota t+1}, \pi_{\iota t+1}\}_{\iota t}$,
- risky returns $\{r_t\}_t$,

such that:

1. dynasties maximize utility, beliefs from Bayes' rule,
2. expropriation rule: $(1-\phi_t)\int \tau_{\iota t} \mathrm{d}\Phi_t^w = \chi_t \phi_t \int (z_{\iota t} - \bar{c}_t) \mathrm{d}\Phi_t^b$,
3. asset market clears: $N_t \int (1 + n_{\iota t+1}) a_{\iota t+1} \mathrm{d}\Phi_t = \bar{A}_{t+1}/r_t^{\alpha}$.

Income and expenditure accounting

back

$$C_t + \underbrace{(1+n^a_{t+1})A_{t+1} - (1-\delta)A_t}_{S_t} = \underbrace{Z_t N_t + R_t A_t}_{Y_t},$$

where:

$$Z_t N_t \equiv N_t \int z_{\iota t}(1-k_{\iota t})\mathrm{d}\Phi_t,$$

$$R_t A_t \equiv i_t \int (1-k_{\iota t})a_{\iota t}\mathrm{d}\Phi_t + q^* r_t \int k_{\iota t}a_{\iota t}\mathrm{d}\Phi_t,$$

$$1 + n^a_{t+1} \equiv \frac{\int (1+n_{\iota t+1})a_{\iota t+1}\mathrm{d}\Phi_t}{\int (1+n_{t+1})a_{\iota t+1}\mathrm{d}\Phi_t}.$$

Population and wages

▸ back

	Population Growth		Labor Productivity			
	White	Black	Agg. Growth	Racial Gap	Persistence	Dispersion
1780	3.40	2.81	0.39	0.28	0.40	0.71
1800	3.06	2.89	0.39	0.28	0.40	0.71
1820	2.99	2.45	1.00	0.28	0.40	0.71
1840	3.23	2.20	1.27	0.28	0.40	0.71
1860	2.40	1.98	1.40	0.28	0.40	0.71
1880	2.19	1.48	1.68	0.30	0.40	0.71
1900	1.74	0.85	1.32	0.32	0.40	0.71
1920	1.09	1.04	0.82	0.35	0.40	0.71
1940	1.39	1.93	2.29	0.38	0.40	0.71
1960	0.64	1.71	2.28	0.44	0.35	0.63
1980	0.07	1.35	2.01	0.57	0.32	0.67
2000	0.07	0.07	1.43	0.62	0.58	0.85
2020	0.07	0.07	1.43	0.65	0.58	0.85

Parameterization

back

Parameter	Value	Source/Logic
γ	1.00	log preferences
α	1.77	inverse of labor share
$1-(1-\delta)^{1/20}$	0.05	NIPA fixed assets
$(1+i)^{1/20}-1$	0.02	Jorda et al (2019)
$\beta^{1/20}$	0.98	match targets
q^*	0.91	match targets
$\bar{A}_1$	0.23	match targets
$\bar{q}$	0.30	match targets
b	1.20	match targets
$\bar{c}_t$	$0.81\ Z_t$	match targets

Sensitivity of targets

back

	A/Y	ZN/Y	q^*r	top10%	top50%	$\mathbb{P}(k>0)$
Baseline	0.25	0.56	0.07	0.75	0.98	0.03
$A_0 = 0.15$	0.22	0.71	0.07	0.67	0.97	0.02
$\beta^{1/20} = 0.95$	0.13	0.72	0.09	0.70	0.98	0.02
$q^* = 0.70$	0.23	0.72	0.07	0.68	0.97	0.02
$\bar{q} = 1.0$	0.25	0.53	0.07	0.75	0.98	0.09
$b = 0.1$	0.25	0.52	0.07	0.73	0.98	0.11
$\bar{c} = 0.50Z$	0.28	0.56	0.07	0.65	0.95	0.06
$\pi_{\iota t}(q^*) = 1$	0.25	0.50	0.07	0.71	0.98	0.18
$i = 0.03$	0.25	0.56	0.07	0.73	0.97	0.03
$\gamma = 3.00$	0.24	0.62	0.07	0.74	0.98	0.01

Entrepreneurs' wealth and income concentration

▸ back

	Wealth		Income	
Share of top ...	Data	Model	Data	Model
50 percent	0.88	0.96	0.89	0.97
20 percent	0.66	0.84	0.68	0.86
10 percent	0.51	0.68	0.52	0.70
5 percent	0.39	0.52	0.40	0.53
1 percent	0.20	0.23	0.19	0.23
0.1 percent	0.06	0.06	0.06	0.07

Counterfactual history

back

(2020, mean gaps)	Wealth	Income	Entrepreneurship
All Differences	5.7	2.9	3.6
− Labor Exclusion	2.3	1.7	3.3
− Capital Exclusion	5.7	2.9	3.6
− Demographics	5.5	2.9	3.6
No Differences	1.0	1.0	0.0
+ Labor Exclusion	5.5	2.9	3.6
+ Capital Exclusion	2.1	1.7	3.2
+ Demographics	0.7	0.8	-0.9

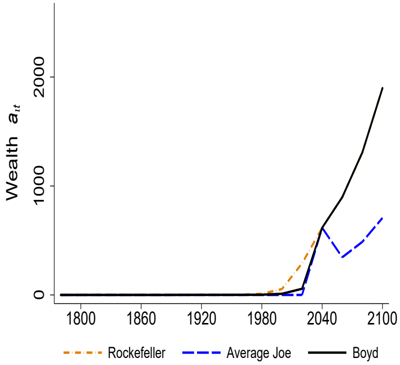
Counterfactuals: structural features of the economy

back

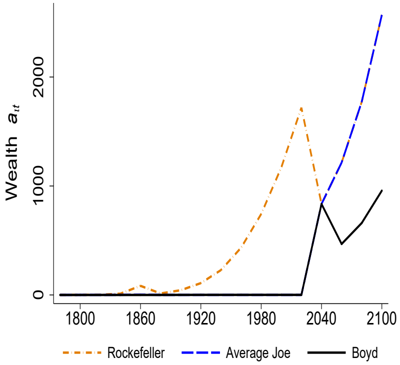
(mean gaps)	Wealth	Income	Entrepreneurship
Baseline	5.6	2.9	3.6
$\pi_{\iota t}(q^*) = 1$	5.9	2.9	14.3
$\beta^{1/20} = 0.95$	4.0	2.2	2.8
$q^* = 0.70$	4.0	2.1	2.5
$i = 0.03$	5.4	2.8	3.2
$\gamma = 3.00$	4.6	2.5	0.7
$\bar{c} = 0.50Z$	4.1	2.6	7.6
$r = 0.13$	10.6	10.5	9.3
$r = 0.10$	2.5	1.7	0.7

Illustrative example: equalize wealth in 2040

back



(a) Partial equilibrium



(b) General equilibrium

Beliefs account for wealth divergence

back

		Wealth Ratio		
Financing	Beliefs	2040	2100	∞
Progressive	$\pi_\iota(q)$	1.0	1.9	1.9
	$\pi_\iota(q^*) = 1$	1.0	1.6	1.0
Replica	$\pi_\iota(q)$	1.0	1.6	1.9
	$\pi_\iota(q^*) = 1$	1.0	1.0	1.0
Proportional	$\pi_\iota(q)$	1.0	1.9	1.9
	$\pi_\iota(q^*) = 1$	1.0	1.7	1.0

Subsidies financed with proportional tax

back

(relative to mean wealth)		Wealth Ratio			Output Change (percent)		
Transfer	Financing	2040	2100	∞	2040	2100	∞
$\tau = 0.75$	$\lambda = 0.13$	1.0	1.9	1.9	-2.9	-2.1	0.0
$s = 0.22$	$\lambda = 0.13$	4.0	1.8	1.3	-1.8	-1.8	0.1
$\tau = 2.23$	$\lambda = 0.38$	0.3	1.6	1.9	-8.9	-7.0	0.0
$s = 0.27$	$\lambda = 0.38$	2.9	1.2	1.0	-5.8	-5.7	0.2

[Find $\tilde{s}$ such that $\phi(r + \tilde{s}) \int a_\iota^b k_\iota^b d\Phi^b = (1 - \phi) \int \Lambda a_\iota^w d\Phi^w$. Annualized $s = (1 + \tilde{s})^{1/20} - 1$.]