

Persistence of Inequality after Apartheid: Assessing the Role of Geography and Skills

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^aThe views expressed herein are those of the authors and do not necessarily represent the views of the IMF, its Executive Board or IMF management.

Rising Inequality Despite Almost 30 Years post Apartheid in South Africa

- **Apartheid** in SA (1948-'94): harsh, institutionalized system of racial segregation



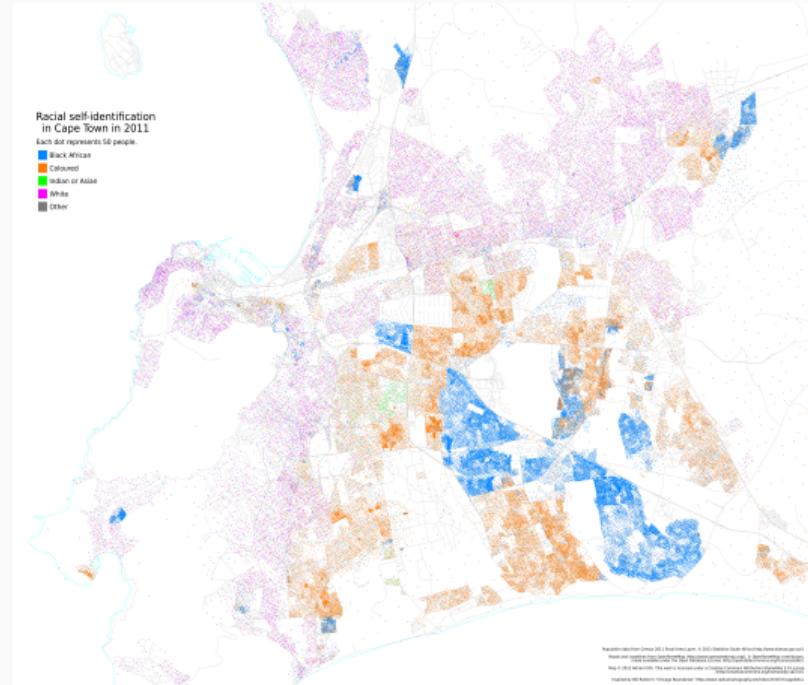
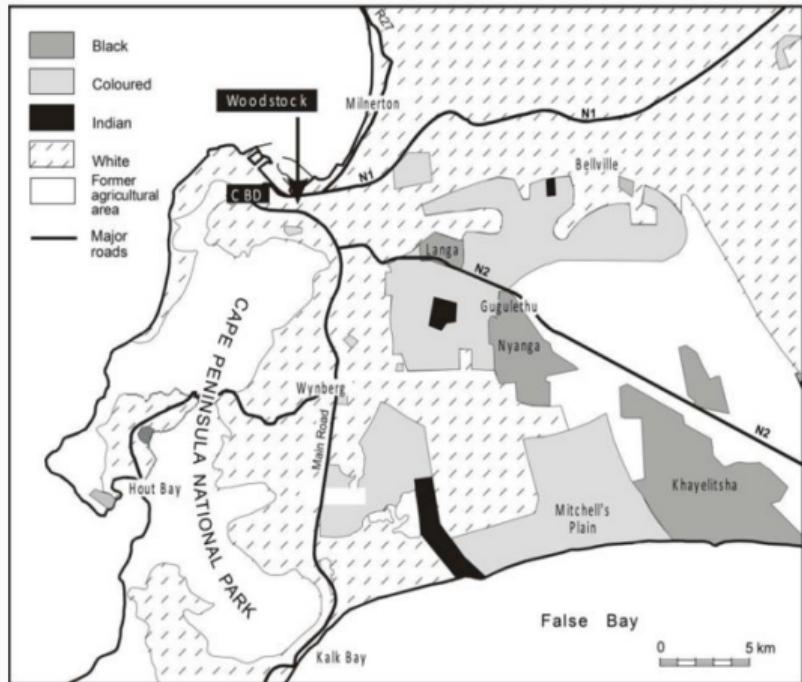
A racially segregated train station entrance during apartheid. Apartheid Museum

[Details](#)

Rising Inequality Despite Almost 30 Years post Apartheid in South Africa

- **Apartheid** in SA (1948-'94): harsh, institutionalized system of racial segregation
- End of Apartheid era => “free” access to education, health, jobs, finance + extensive policies to address inequality:
 - ▶ Inequality and unemployment are very high, mostly for Black
 - ▶ The highest Gini worldwide both for earnings and wealth Plot
 - ▶ Inequality: \downarrow across racial groups, but \uparrow within Plot
 - ▶ Average wage income of $\approx 3/4$ of Black population in Metroareas \downarrow since '96 Plot
- What drives inequality increase and persistence?
⇒ Special role of **Townships** – core spatial concept of Apartheid Details

Modern Cities Still Shaped by Apartheid Policies: Cape Town in 1990s vs 2011



Spatial Segregation: Townships (More Pictures!!!)



Photo: Johnny Miller

Lake Michelle / Masiphumelele (Cape Town, South Africa)

Is South Africa Unique?

- High-quality neighborhoods – important determinant of children/adult outcomes
- Racial segregation and disparities in educational quality are common features of many American cities (e.g. Chicago, St. Louis, Detroit, etc.)
- Developing countries: colonial inheritance (favelas in Brazil) + growing urbanization and development of slums

This paper: Use Apartheid to study role of segregation (broadly!) determined by geography on the rise/persistence of inequality

- **Data:** Compare Townships (exogenous location/assignment) + Calibrate the Model
- **Model:** Slow Transition + Initial Conditions vs. Discrimination/Homophily; Role of Different Channels; Counterfactuals (e.g. Infrastructure improvement)

Plan of the Talk

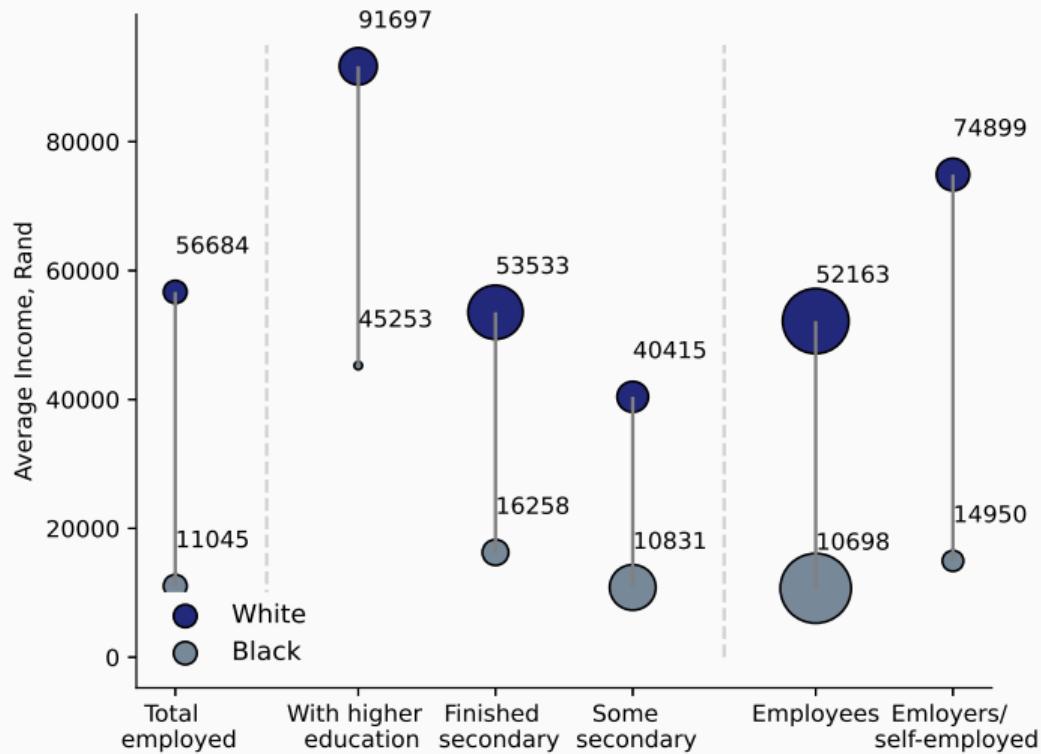
1. Data: Stylized Facts
2. Model Framework
3. Model Estimation
4. Mechanisms: Model Predictions and Data
5. Post-Apartheid Transition: Model and Data

Various National and Local Data Sources

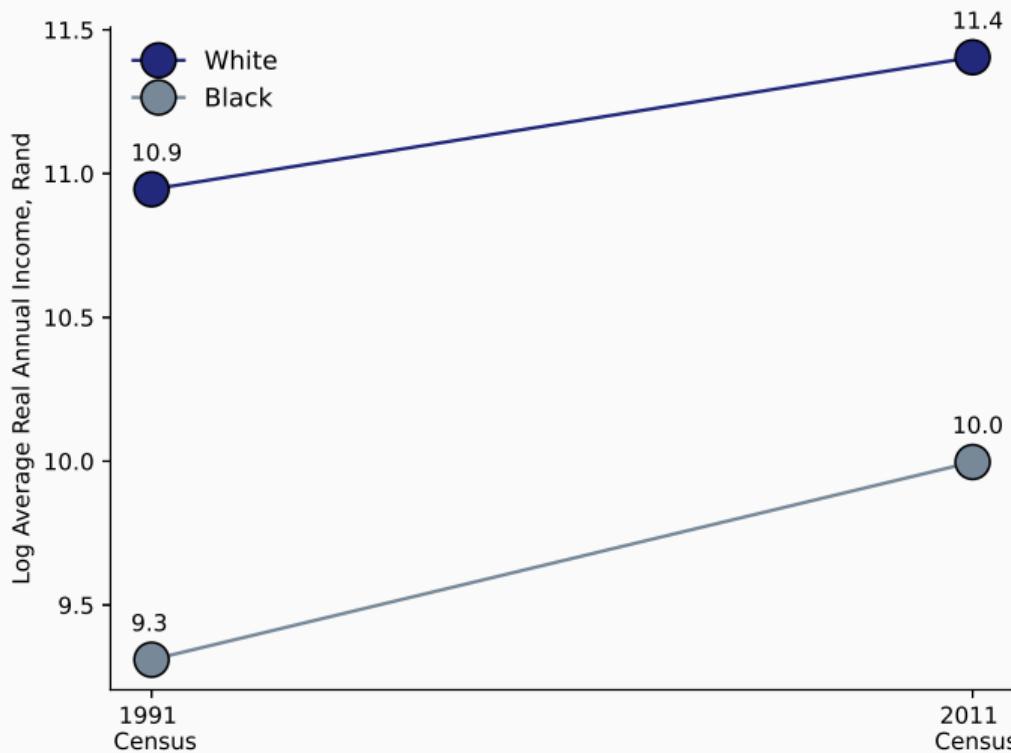
- Townships Geolocations (Available Online!)
 - ▶ AfricaScope ✓
 - ▶ Manual Historical Data Collection (575) ✓
- GeoData (Map Township, Focus on Metropolitan Areas)
 - ▶ Statistics SA: SAL/EA ✓
 - ▶ DYSTURB historical districts ✓
- Censuses: 1991 ✓ (SA + Independent Bantustans) and 2011 ✓ + Labour Force Surveys ✓
 - ▶ Individual Level Data: Demographics, Education, Employment, Income
 - ▶ Compare dynamics across racial groups
- Censuses: 1996✓, 2001, 2011✓ + General Household Survey 2018 ✓
 - ▶ SAL/EA level: Demographics, Education, Employment, Income
 - ▶ Compare dynamics across Townships and Township vs City
- Commuting Survey Data (City of Cape Town, 2013) ✓
 - ▶ Individual data: Demographics, Education, Income, Employment
 - ▶ Commute: Home and Work/Study Location, Time, Cost
- Publicly Available Education Datasets ✓
- Historical Censuses + DYSTURB historical districts (1911, '21, '36, '51, '60, '70, '80) ✓
- Other Sources for Calibration (PSLSD '93, WB, etc) ✓

This paper: Urban (8 Metroareas) + Blacks/Whites

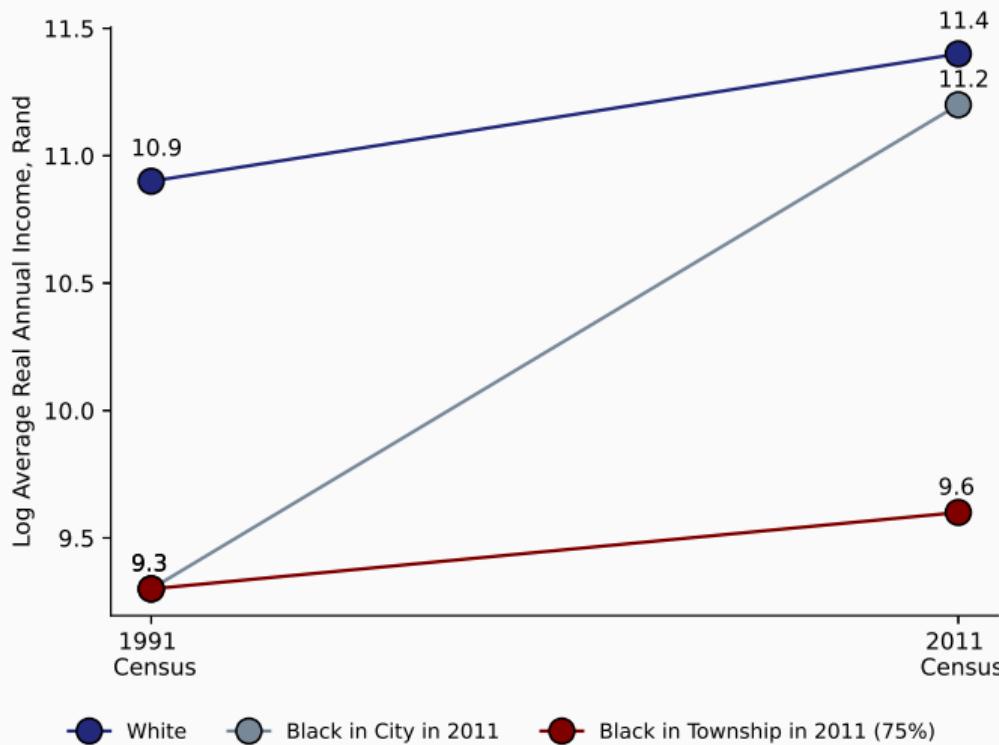
Six-fold Black-White Income Gap in Apartheid South Africa (1991 Census)



Black-White Gap in Income and Education Has Shrunk



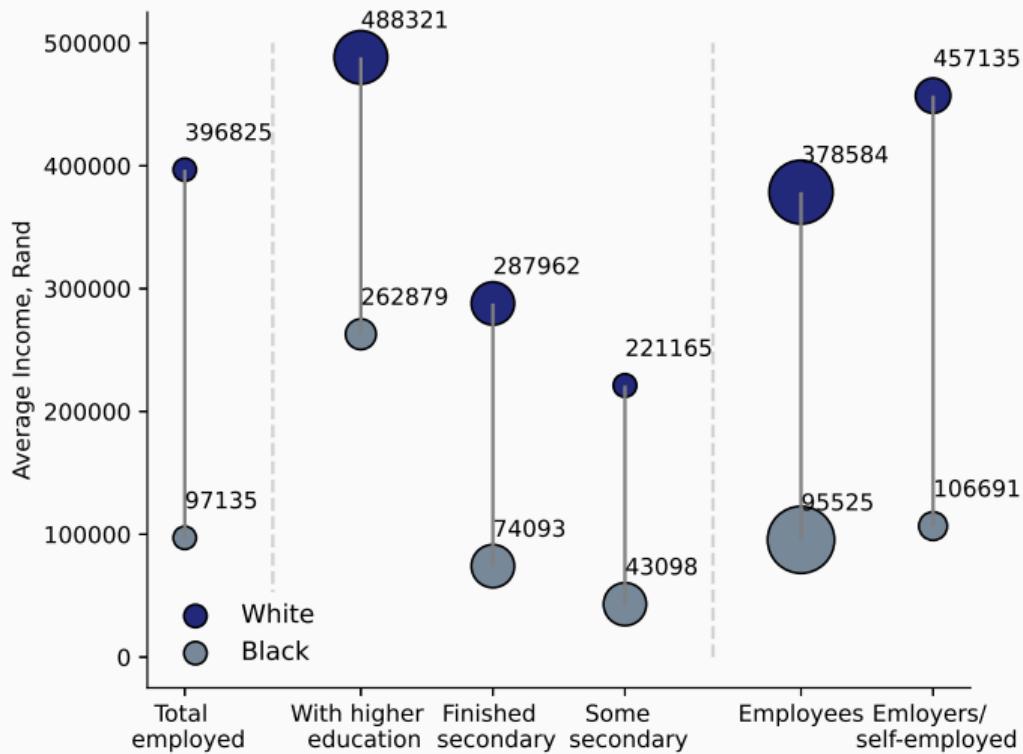
Yet...Income Growth and Level of Education in Townships are Lagging Behind



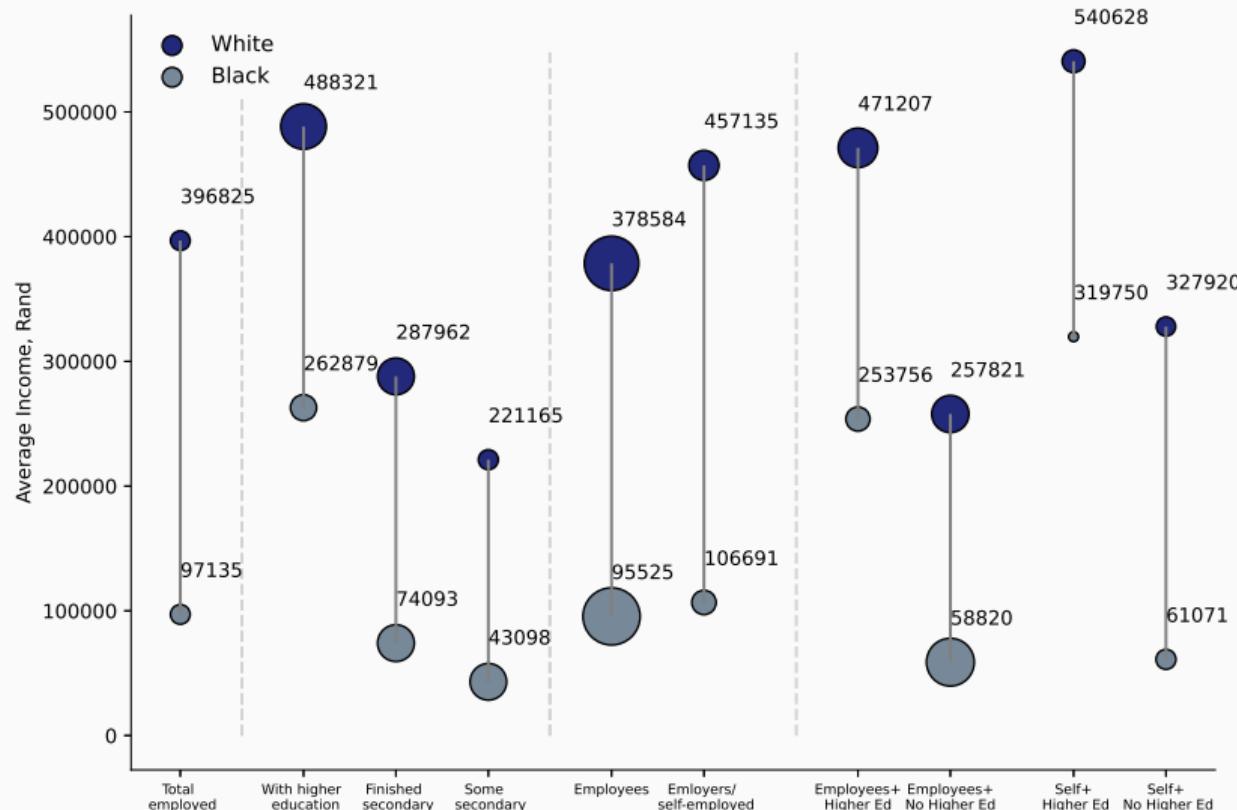
Share of Individuals by Location of Home and Work/Education Place

| | Live in City | | Live in Township | |
|---------------------|--------------|-----------|------------------|-----------|
| | work | education | work | education |
| Commute to City | 93.2% | 91.5% | 72.9% | 25.9% |
| Commute to Township | 6.8% | 8.5% | 27.1% | 74.1% |

Average Individual Income: 2011 Census



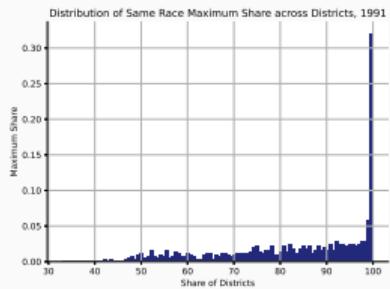
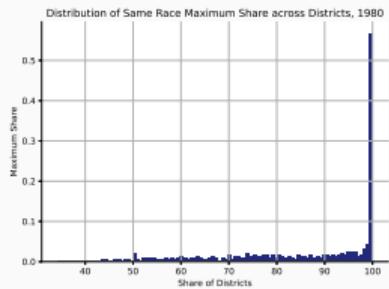
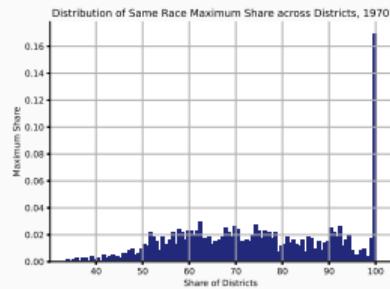
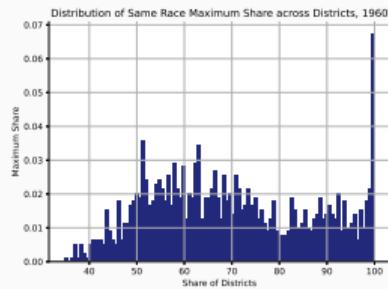
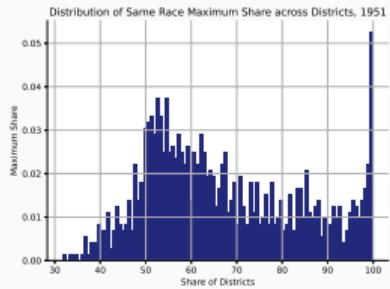
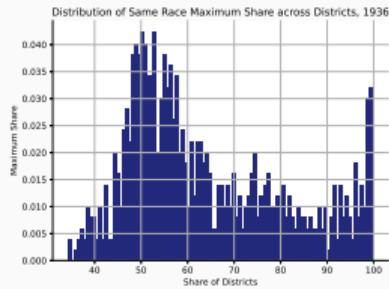
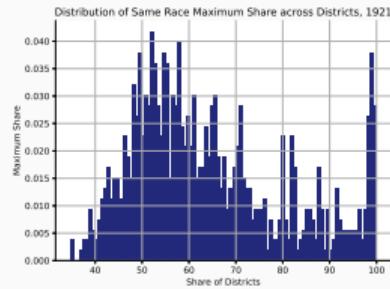
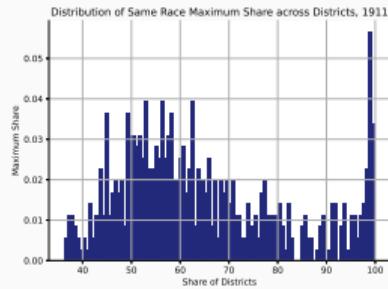
Average Individual Income by Employment and Education, 2011 Census



Apartheid Allocated Blacks to Townships Based on Ethnolinguistic Groups

- Apartheid created townships to segregate blacks away from city centers
- Allocation of blacks to townships was based on **ethnolinguistic groups**
 - ⇒ allocation is orthogonal to economic forces
 - ▶ 1991 Census: EA are mostly language homogenous
- Townships separated by natural/artificial buffer zone
- Allocation ~ **natural experiment** to identify effect of distance to city center
 - ▶ In 2011 > 50% of Townships have one predominant language (70%)
 - ▶ Movement across townships is limited: migration to city 2X migration to townships
 - ▶ Control by distance to closest city besides CBD ~ control mov't across townships

Historical Race Distribution Across Districts: 1911 – 1991



Same MD Districts

Township Outcomes Using Individual Data from Cape Town

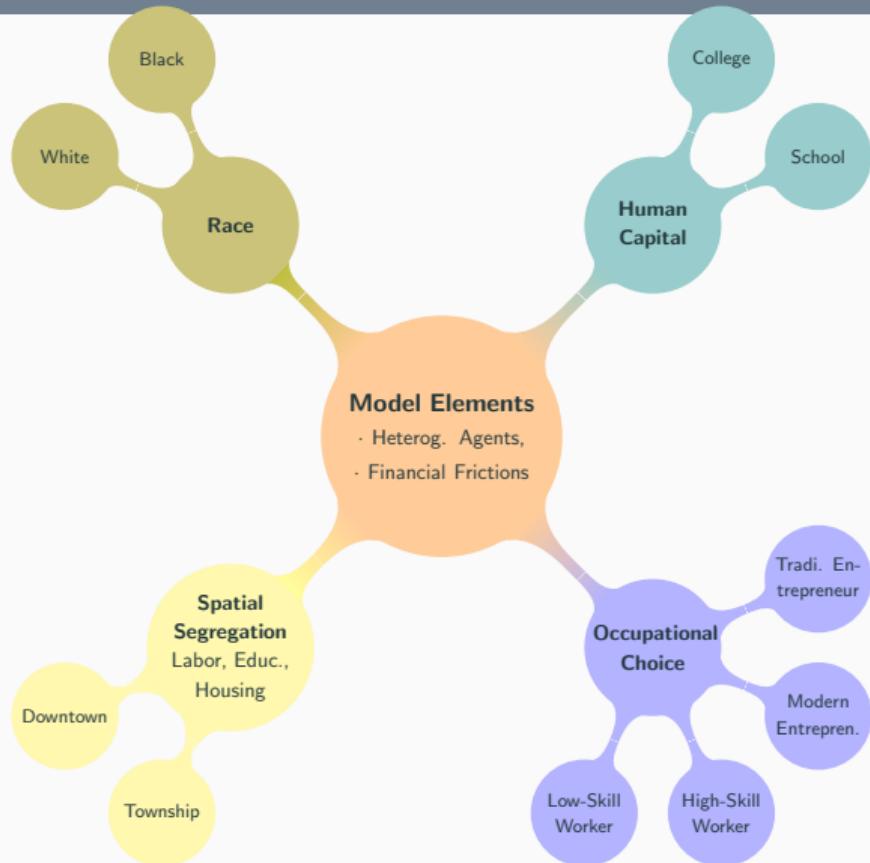
| | Education | | | | HH Assets | | |
|-----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Distance to Cape Town | -0.19 (0.03) | -0.20 (0.03) | -0.14 (0.03) | -0.13 (0.02) | -0.15 (0.04) | -0.11 (0.04) | -0.09 (0.03) |
| Individual Controls | — | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Dist. Near City to CT | — | — | ✓ | ✓ | — | ✓ | ✓ |
| Black Dummy | — | — | — | ✓ | — | — | ✓ |
| Observations | 7,725 | 7,649 | 7,649 | 7,649 | 7,706 | 7,706 | 7,706 |

Notes: Individual Controls are age, gender, household size, number of adults in the household, number of employed. Std. err. clustered at enumeration area. Variables have been standardized to mean zero and std. dev. of one. Unnormalized std. dev.: Dist. to CT 11.7 Km, Education, 1.14, Assets, 1.19.

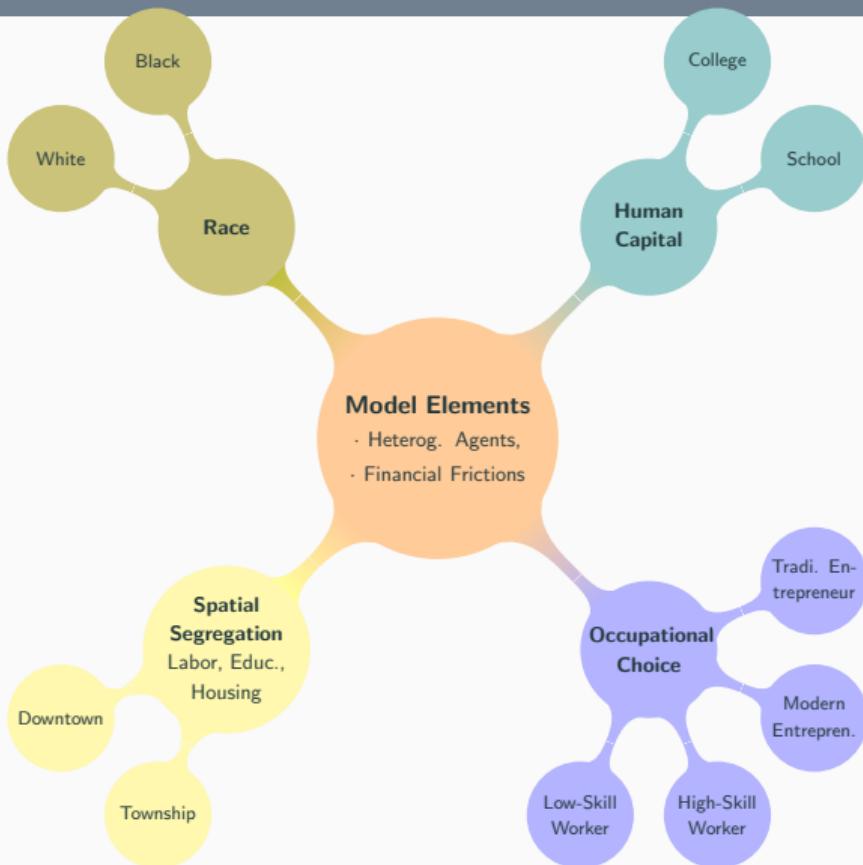
Plan of the Talk

1. Data: Stylized Facts
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Model Incorporates Spatial, Educational and Occupational Regularities



Model Incorporates Spatial, Educational and Occupational Regularities



- Model features:
 - ▶ Forward-looking OLG dynasties
 - ▶ General Equilibrium (Comp.Eq.)
- Modeling strategy:
 1. Calibrate Apartheid Steady State to early 90s
 2. Compute transition to Race-Blind Equilibrium

Model: Main Features

- Household's state has **five** dimensions:
 1. Race – Black and White, $j \in \{B, W\}$ **Important Only for Apartheid Steady State**
 2. Innate talent of parent and kid: $z_k = \rho z_p + \epsilon$ (AR1 in logs)
 3. Human capital of parent: $h_p = \text{talent} + \text{education}$
 4. Level of assets, $a \geq \underline{a}$
- Household lives for 2 periods (25 years each)
- Household consists of a young, Y , and an old, O , member
- When young becomes old, has 1 kid, old dies (OLG structure)

HH Problem: Choose Consumption, Savings, Location, Occupation, Education

$$V^{HH}(a, z_p, z_k, h_p) = \max_{\{c_p, c_k, a', \textcolor{red}{h_k}, \textcolor{red}{I^e, o}, I_H, k\}} U^{HH}(c_p, c_k) + \chi \epsilon_{I_H} + \beta \mathbb{E}_{z'_k, \epsilon'_{I_H}} [V^{HH}(a', z_k, z'_k, h_k)]$$

subject to:

$$U^{HH} = \lambda \frac{c_p^{1-\sigma}}{1-\sigma} + (1-\lambda) \frac{c_k^{1-\sigma}}{1-\sigma}, \quad (\text{Household utility})$$

$$c_p + c_k + \textcolor{red}{c_H} + \textcolor{red}{e_{educ}} + a' \leq a(1+r) + \textcolor{red}{y_p} + y_k - \tau (\mathbb{1}_{e \neq H} + \mathbb{1}_{w \neq H}), \quad (\text{Bdgt cstr.})$$

$$k \mathbb{I}_{o=entrep.} + P_c \mathbb{I}_{college} \leq \textcolor{red}{\lambda_k} a, \quad (\text{Collateral constraint } \text{Financial Markets})$$

$$\epsilon_{I_H} \sim \text{Gumbel iid}$$

Spatial Component: Two locations – Township, T , and City Downtown, D

- Household consumes one unit of housing in either location at price P_H^I
- Supply of housing is perfectly elastic in Township (normalize $P_H^T = 0$)
- Supply of housing is isoelastic in housing price in Downtown, $HS_D = \alpha_H(P_H^D)^{\frac{1}{\gamma_H}}$
- HH chooses each period location of a *house, work and kid's school*
- To work or study in location other than the house – transportation cost, τ

Occupational Choice and Segmented Labor Markets

- There are four possible occupations in each location:
 1. Low-skilled Workers
 2. High-skilled Workers (requires college degree)
 3. Traditional Entrepreneurs, $y_T(\theta) = zA_e k(\theta)^{\alpha_T} L(\theta)^{\gamma_T}$
 4. Modern Entrepreneurs,
 $y_M(\theta) = hA_e k(\theta)^{\alpha_M} (l_H(\theta)^\omega L(\theta)^{1-\omega})^{\gamma_M}, \quad \text{with } \alpha_M > \alpha_T$
- Segmented labor markets for Township and non-Township areas
- Wage depends on the level of human capital and location ($w = h \cdot w_S^{l^w}$)
- Entrepreneurs choose technology and location
- Youth out of school is employed as Low-skilled workers where reside

Data on Entrepreneurs

Educational Choice for the Kid: School and College

- Decide on the level (S, C) and location of school (T, D): $\{ST, CT, SC, CC\}$
- Human capital: talent + education

$$h_k = \begin{cases} z_k h + \textcolor{red}{h}_D \mathbb{1}_{\{I^s=D\}}, & \text{if school} \\ (h^{school})^\eta, & \text{if college} \end{cases}$$

- School free, ! opportunity cost ($y_k = n_k \cdot w_L^{I^h}$) + transportation cost, $\textcolor{red}{\tau}$, $\mathbb{I}_{\{I^s \neq I^h\}}$
- College is only in the city + the fee P_c + transportation cost, $\textcolor{red}{\tau}$, $\mathbb{I}_{\{I^h=T\}}$

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Estimation Strategy

1. **Apartheid Steady State: total segregation by definition**
2. Compute counterfactual SS without Apartheid constraints (race-blind): sorting on assets and education
3. Compare transitions/SS for different township-city pairs with different τ
4. Compute transition between the SS and compare with data
→ Policy analysis: Effect of public housing (RDP) over transition (Picarelli, 2019)

Estimate Model Starting with Steady State in Apartheid

- Blacks live in Townships, Whites in non-Townships
- Blacks can't go to college or city school
- Blacks can't be entrepreneurs
- Blacks can't borrow

Location Distribution 1991

Education in 1991

Employment in 1991

Model's Calibration Combines estimates from HH data and Target Moments

| Moments | Model Parameters | | | | |
|-------------------------------------|------------------|-------|----------------------|-------|----------------------|
| Description | Target | Model | Var. | Value | Description |
| Share of Low-Skilled Entrepreneurs | 5.7% | 4.3% | σ_ε | 0.55 | Variance of a Talent |
| Ratio Income Entr./Worker | 2.0 | 2.9 | A_e | 2.6 | Entrep. productivity |
| Share of High-skilled Entrepreneurs | 3.1% | 2.6% | h | 0.95 | Returns to Talent |
| Ratio Income College/School | 3.9 | 4.1 | η | 1.3 | Return to College |
| Share of College Educated | 10.0% | 8.5% | P_c | 0.8 | Price of College |
| Ratio Income School White/Black | 3.1 | 2.7 | h^{NT} | 1.15 | School quality diff. |

Notes: Statistics computed from household heads in 1991 South Africa Census

- Estimated outside of the model:

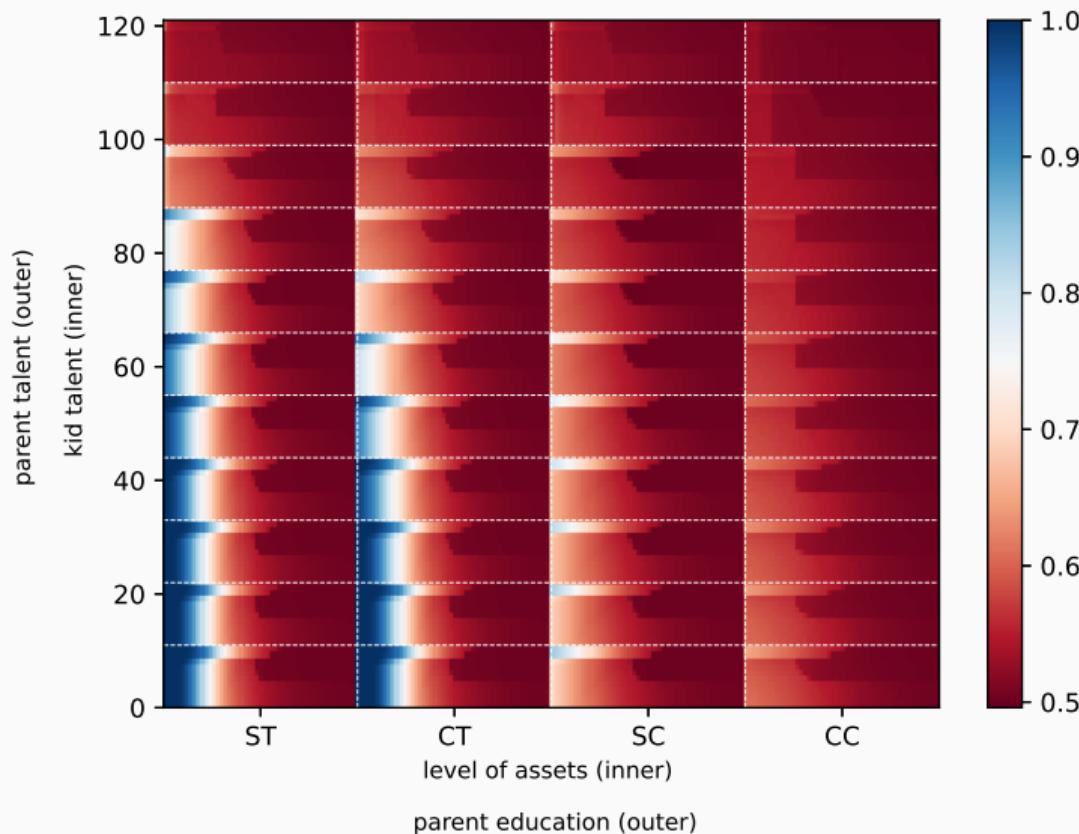
- ▶ **Trans. costs** $\tau = 0.103w_L$ (PSLSD, SA '93); $\lambda_k = 1.87$, $r = 2.5\%$ (WB)
- ▶ Production function Parameter Values

+ Off-the-shelf from lit.: $\sigma = 1.5$, $\lambda = 0.7$, $\rho = 0.47$, $\delta = 6\%$, $\beta = 0.96$, $\gamma_h = 0.5$, $\kappa = 0.12$

Estimation Strategy

1. Apartheid Steady State: total segregation by definition
2. **Compute counterfactual SS without Apartheid constraints (race-blind):**
sorting on assets and education
3. Compare transitions/SS for different township-city pairs with different τ
4. Compute transition between the SS and compare with data
→ Policy analysis: Effect of public housing (RDP) over transition (Picarelli, 2019)

Race-Blind Equilibrium: Poor & Less Educated Live in Township



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Model Predictions and Data: Household's Choices

- **Location:** Rich & Educated => city + in GE labor opportunities/income (salary/profit) vs transportation cost/ housing price
- **Work/School Location:** Home location => school location (τ) + availability of jobs & income + wealth + talent => work loc.

| | Live in City | | Live in Township | |
|---------------------|--------------|---------|------------------|---------|
| | school | college | school | college |
| Commute to City | 89.9% | 97.1% | 18.2% | 85.1% |
| Commute to Township | 10.1% | 2.9% | 81.8% | 14.9% |

Model Predictions and Data: Household's Choices

- **Kid's Education:** Rich, college educated, productive => college/city school
(income + opportunity cost + financial constraint + τ + human/physical capital)

| | (1) | (2) | (3) | (4) |
|---|-------------------|-------------------|-------------------|-------------------|
| Distance Cape Town | -0.75 (0.12) | -0.59 (0.11) | -0.29 (0.08) | -0.36 (0.011) |
| Dist. Cape Town $\times \mathbb{1}_{\text{Township}}$ | -0.053 (0.022) | -0.069 (0.020) | -0.071 (0.016) | -0.058 (0.018) |
| Household Assets | | | 0.31 (0.010) | 0.33 (0.014) |
| Household Income | | | | 0.018 (0.011) |
| Individual Controls | — | ✓ | ✓ | ✓ |
| Observations | 28,815 | 24,065 | 24,065 | 15,366 |

Notes: Individual Controls are age, gender, household size, number of adults in the household, number of employed. Std. err. clustered at enumeration area. Variables have been standardized to mean zero and std. dev. one.

Model Predictions: Household's Choices

- **Kid's Education:** Rich, college educated, productive => college/city school
(income + opportunity cost + financial constraint + τ + human/physical capital)
- **Work/School Location:** Home location => school location (τ) + availability of jobs & income + wealth + talent => work loc.
- **Location:** Rich & Educated => city + in GE labor opportunities/income
(salary/profit) vs transportation cost/ housing price
- **Occupation:**
 - ▶ School only: Low-skilled labor or entrepreneurship (wealth, productivity/human capital)
 - ▶ College: High-skilled labor or *modern entrepreneurship* (in GE some trad. entrep.)
- Plots: Kid's Education, Occupational Choice, Home Location, Assets

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Township Outcomes: Model Predictions for Steady State

Vary $\tau \in \{0.1, 0.3, 0.5\} \times w^{LS}$ for post-Apartheid SS, with closer Township to City:

- **Less** densely populated
- **More educated** (college) and higher human capital
- **Poorer** in assets and income (on average) \leq selection

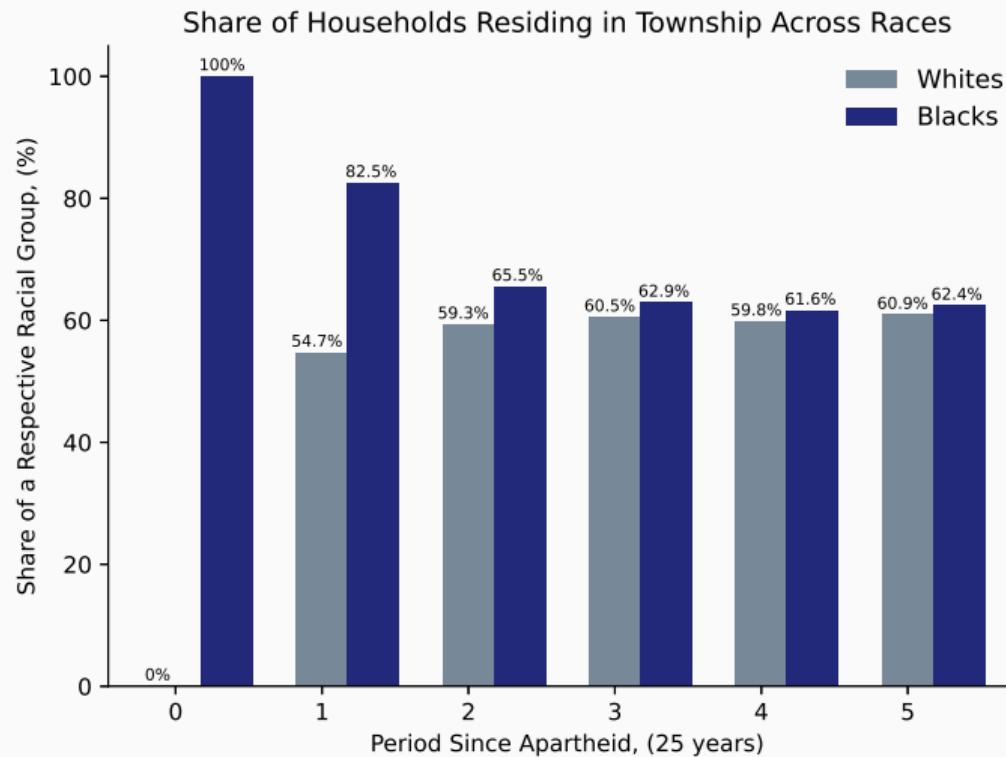
=> **Higher** Inequality in education & **Lower** in income/wealth w/ Distance/Cost **Larger**

Outcomes of Township Relative to the City

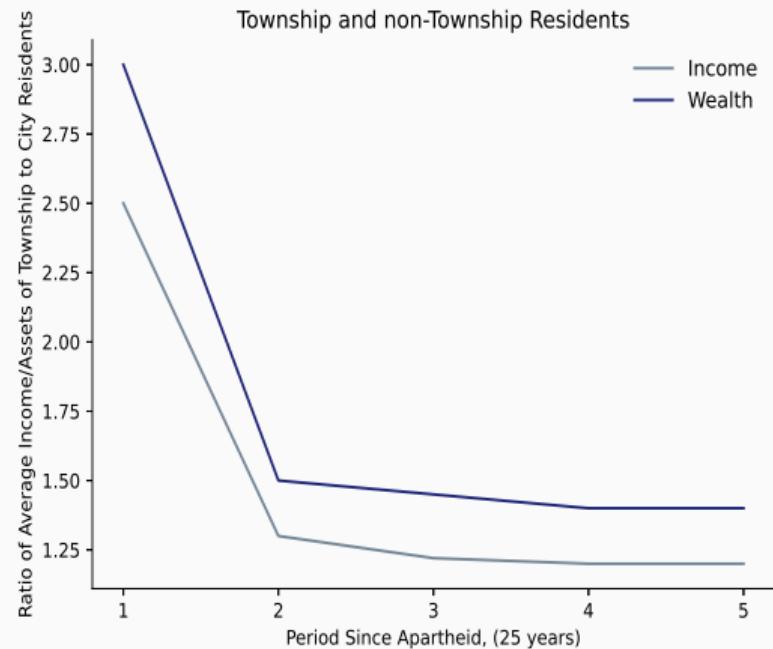
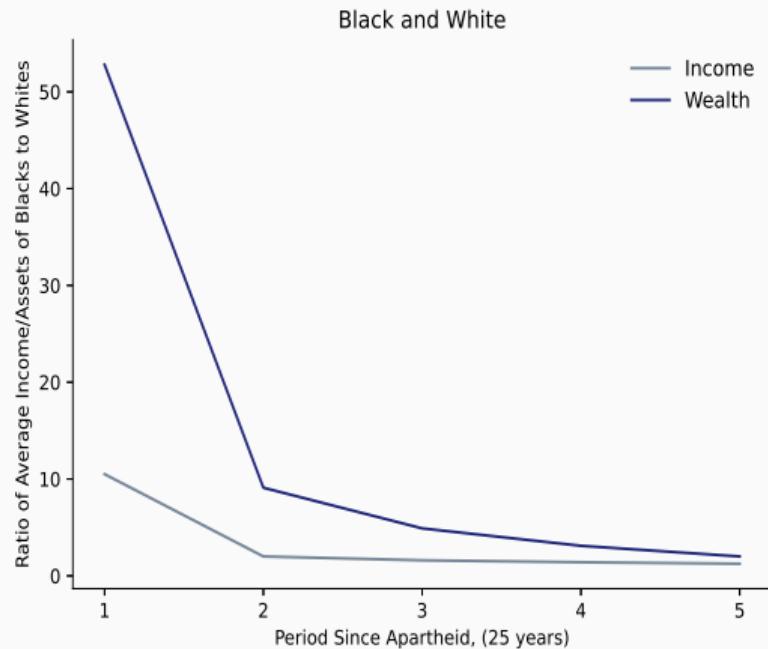
| | College Degree | Average Wealth | Average Income |
|----------------------------|----------------|----------------|----------------|
| $\tau = 0.1 \times w^{LS}$ | 0.97 | 0.70 | 0.80 |
| $\tau = 0.3 \times w^{LS}$ | 0.76 | 0.95 | 0.95 |
| $\tau = 0.5 \times w^{LS}$ | 0.57 | 1.01 | 0.91 |

What about *transition dynamics*?

Relatively Slow Transition but Substantial Mixing



Inequality: Declines both Across Races and Locations



First Period Transition: Model and Data

- *Inequality and Race:*
 - ▶ Decline in income and wealth gap ✓
 - ▶ Slower entrepreneurship and college ✗
- *Inequality and Education/Occupation:*
 - ▶ Large Income Gap for college and non-college + across races ✓
 - ▶ Returns to entrepreneurship ✓, particularly for Whites ✓
- *Inequality and Spatial Sorting:*
 - ▶ Decline in income and wealth gap ✗
 - ▶ Racial mixing in Townships ✗
 - ▶ Shrinking of income gap across races conditional on non-Township ✓

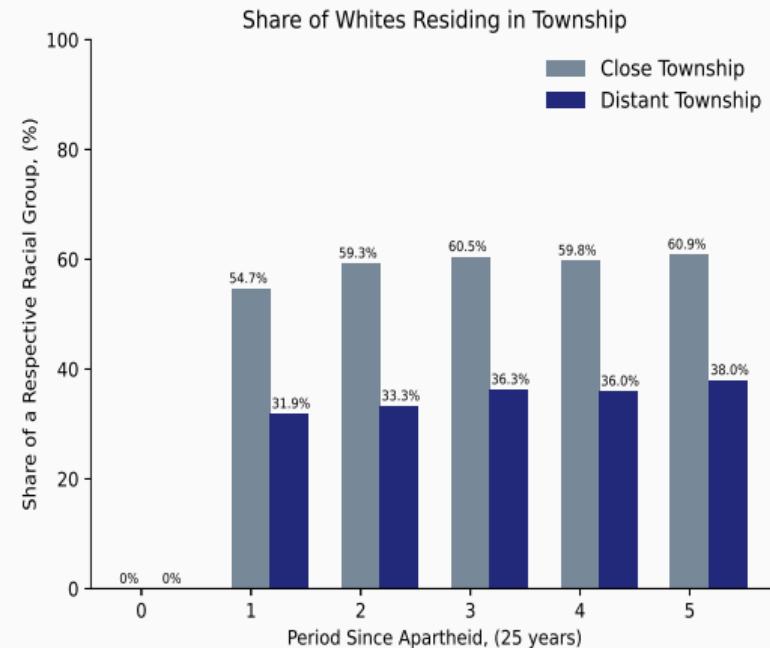
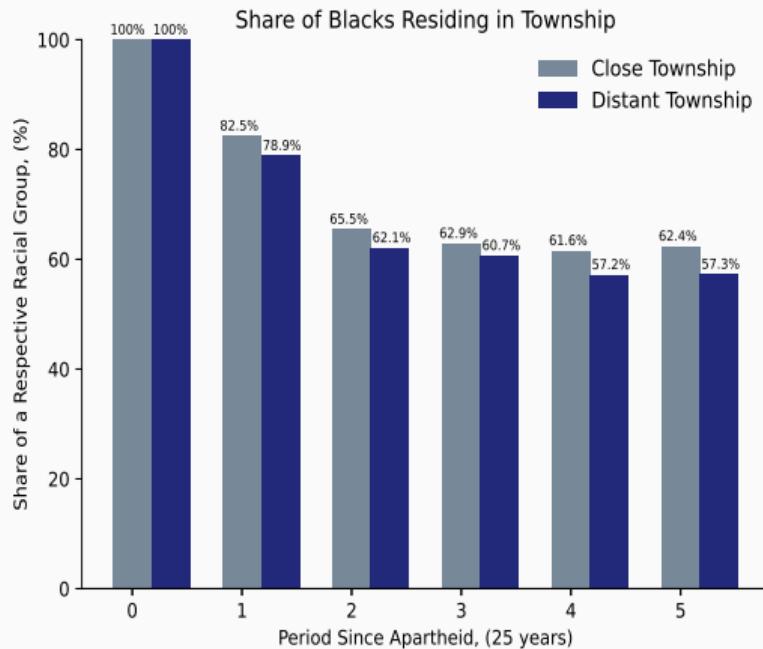
With more persistence in inequality as distance increases ✓

Transition Dynamics: Preliminary Analysis Main Outcomes

Vary *only* τ for post-Apartheid transition, closer Township to the City Data:

- Faster entry of Blacks into college and entrepreneurship
- Faster residential mixing
- Faster decline in income gap and wealth gap across races, BUT slower across locations

Faster Racial Mixing in Townships for Closer Townships



Transition Dynamics: Preliminary Analysis Main Outcomes

Vary *only* τ for post-Apartheid transition, closer Township to the City Model Outcomes:

- Faster entry of Blacks into college and entrepreneurship
- Faster residential mixing
- Faster decline in income gap and wealth gap across races, BUT slower across locations

=> Policies to \downarrow inequality and poverty

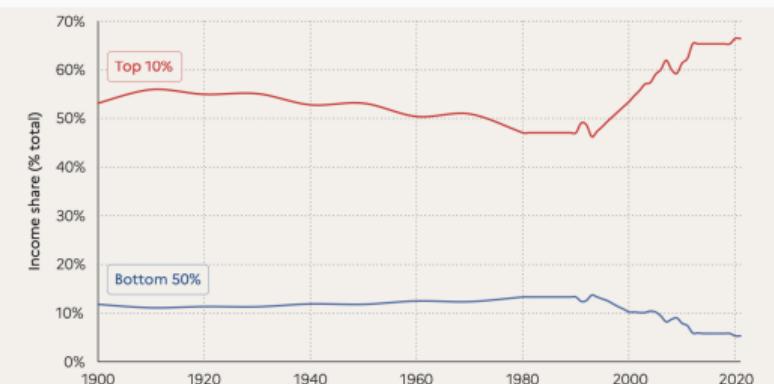
- Make labor and education markets more accessible, i.e. \downarrow Cost
- Bring business and education into Township

South Africa: Context

- Starting from 1948 the system of legislation that enforced racial segregation, political and economic discrimination was implemented [Apartheid]
- Apartheid is the period of white supremacy:
 - ▶ More than 80 percent of the country's land for white minority
 - ▶ Black South Africans were forcibly reallocated to areas separated from white
 - ▶ Most social contracts between the races were forbidden
 - ▶ Separate educational standards, restrictions for each race to certain types of jobs and access to credit
- A new constitution that enfranchised blacks and other racial groups was adopted in 1993 and took effect in 1994

Income and Wealth Inequality in South Africa

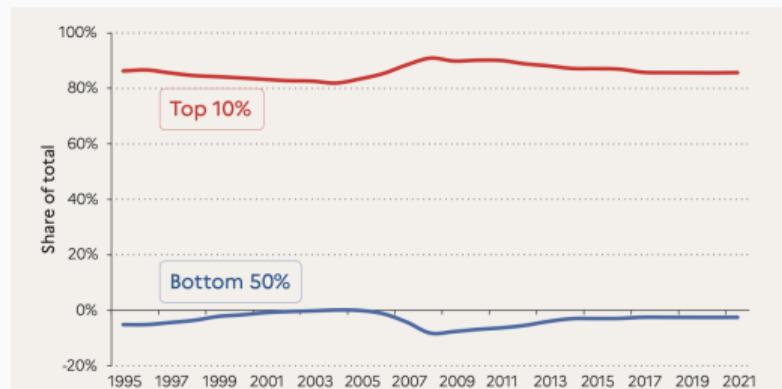
Top 10% and bottom 50% Income Shares



Interpretation: The Top 10% income share is equal to 67% in 2021. Income is measured after the operation of pensions and unemployment insurance systems and before income tax.

Sources and series: see wir2022.wid.world/methodology, and Chancel and Piketty (2021).

Wealth Distribution

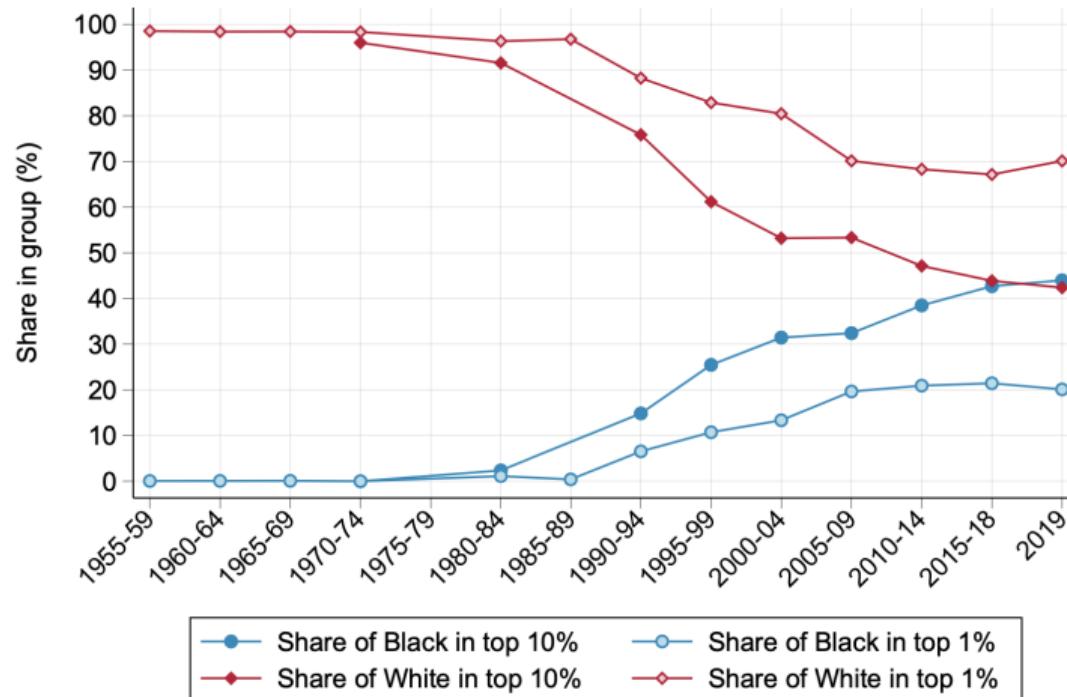


Interpretation: In 2021, the wealthiest 10% of the population own 87% of total household wealth. Household wealth is the sum of all financial assets (e.g. stock, bonds) and non-financial assets (e.g. housing), net of debts.

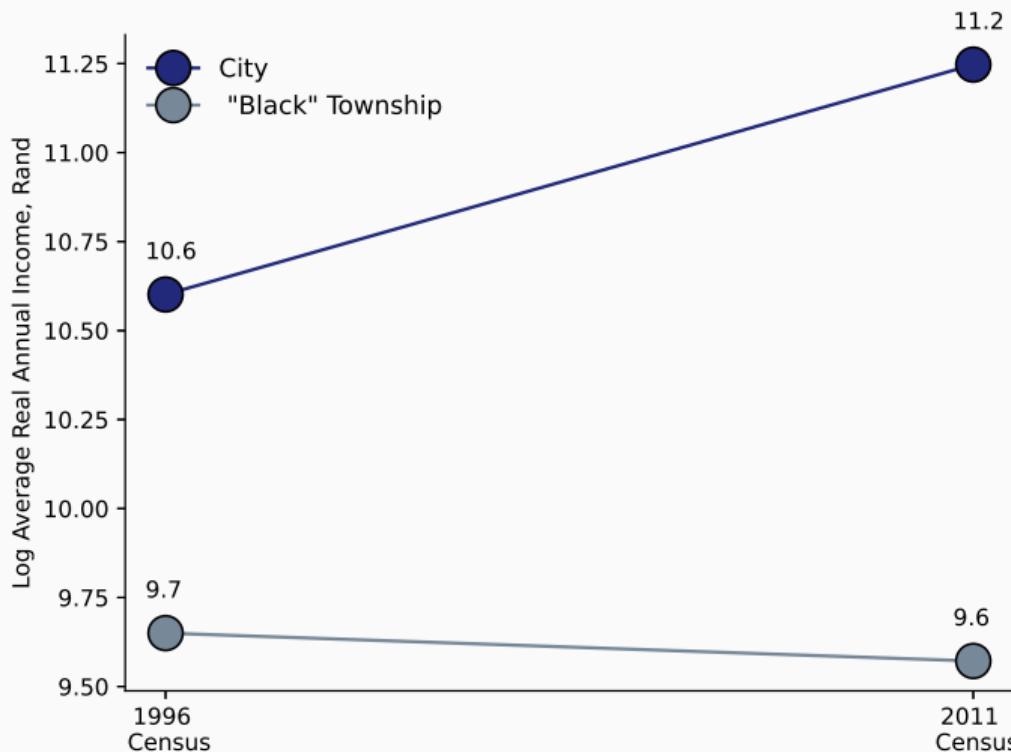
Sources and series: wir2022.wid.world/methodology.

Inequality Across Racial Groups Declined

(a) Share of Black versus White earners in top factor income groups, 1955-2019



Inequality Between Townships and Rest has Increased Since 1996

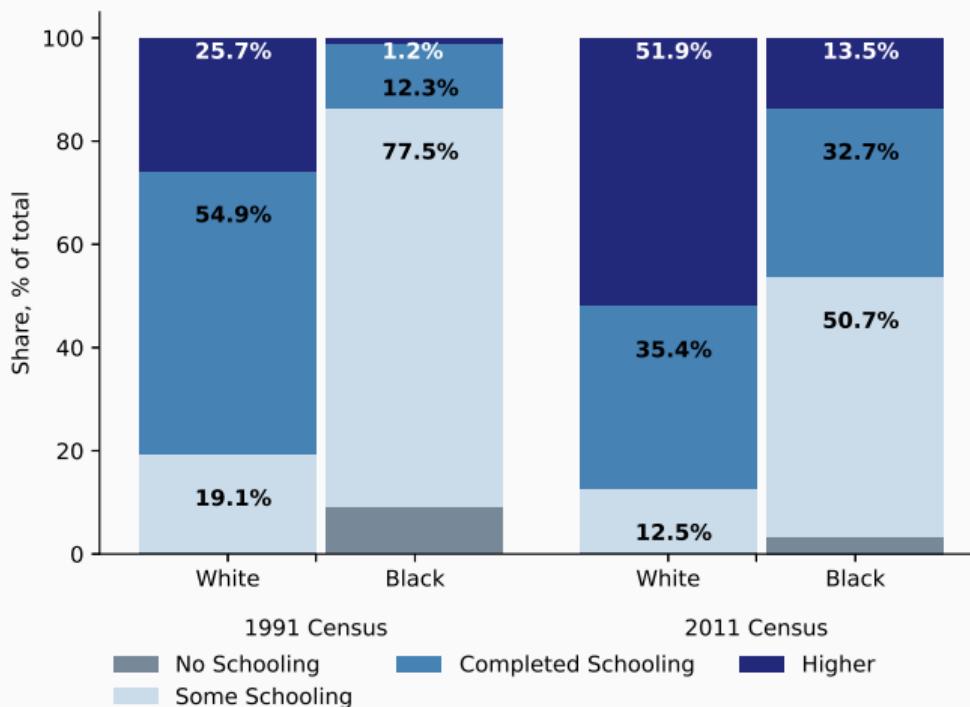


Source: 1996 and 2011 Census [back](#)

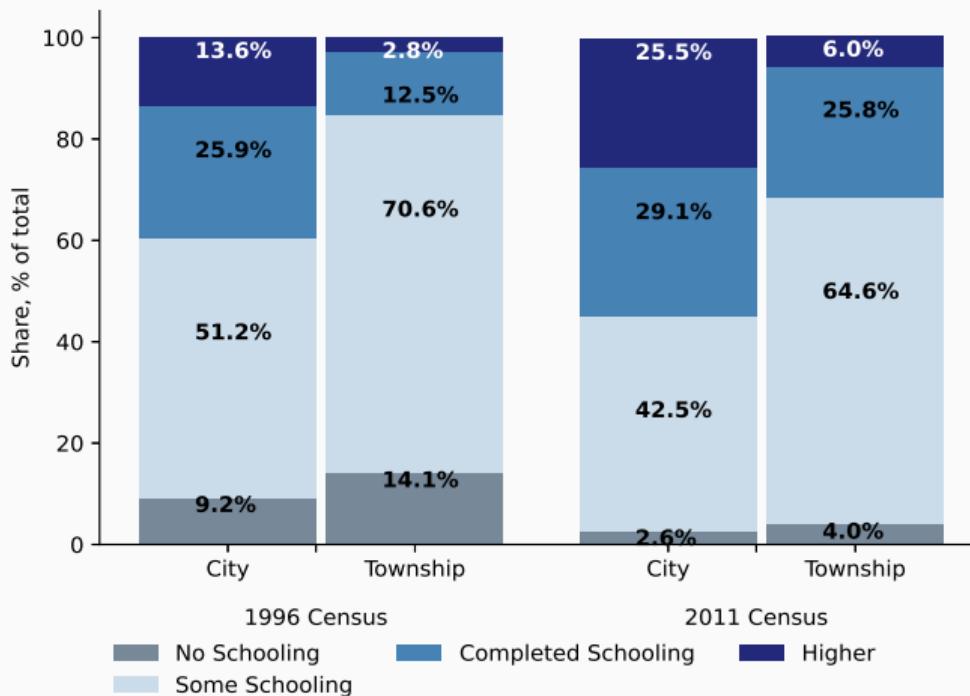
Spatial Segregation: Townships

- Township – non-white neighborhoods, a core spatial concept of Apartheid
- Located on city peripheries, separated by natural/artificial buffer zone [26km]
- ≈ slums: slightly better amenities, more distant from urban economic centers
- Job search and other forms of economic integration very expensive
- Schools' quality is lower
- During Apartheid entrepreneurship was forbidden for most parts
- Banking sector mostly for transaction rather than for business expansion

Narrowed Education Gap Between Blacks and Whites



Townships: ↑ School, Little Higher, Low Quality (stud/teach ⇒ 28.5 vs 34.3)



Labour Force Survey, Q2 2011

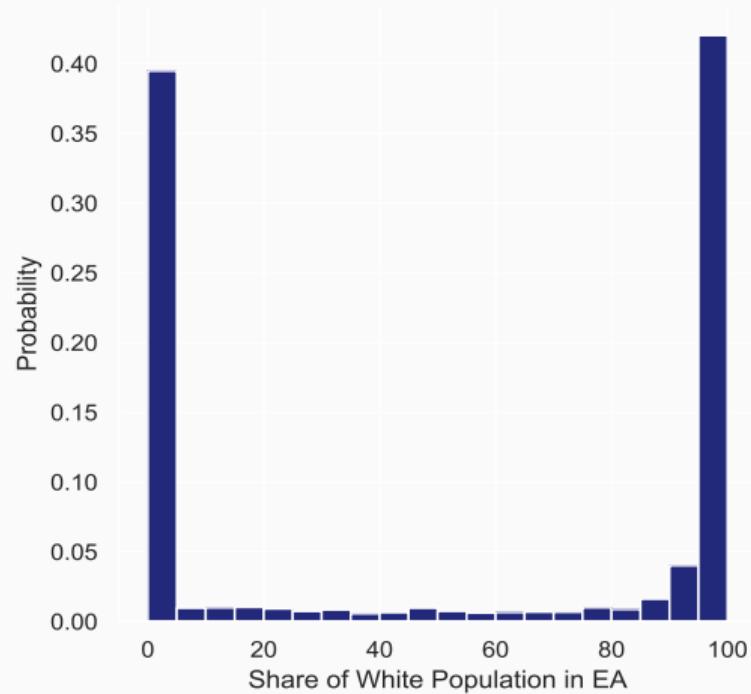
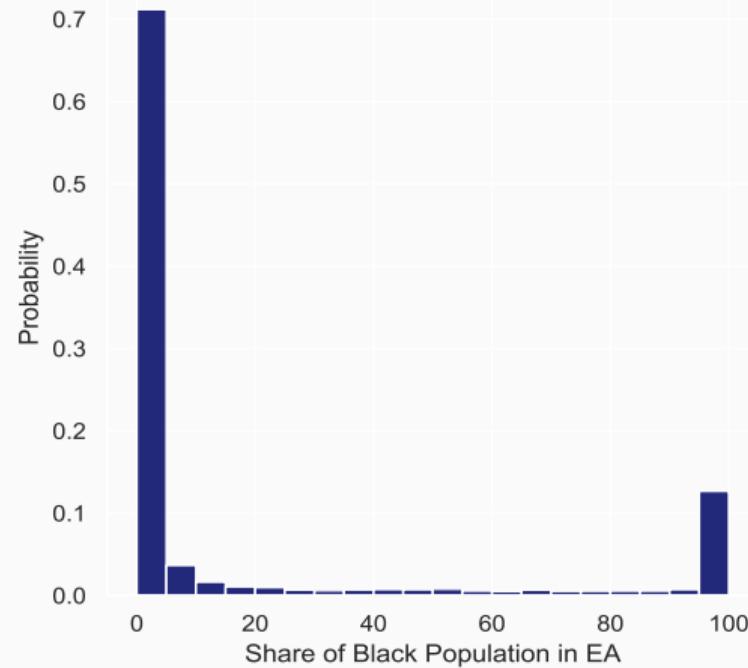
- 1/3 of Black Adults Employed in Informal Sector (only 6.5% among Whites)
- 13% of Black are self-employed or own a business (vs. 18% for Whites)
- Black entrepreneurs: 71.5% are self-employed, 3.9% own a firm with > 10 empl.
- White entrepreneurs: 34.3% are self-employed, 20.9% own a firm with > 10 empl.
- Most owners of larger firms are highly educated

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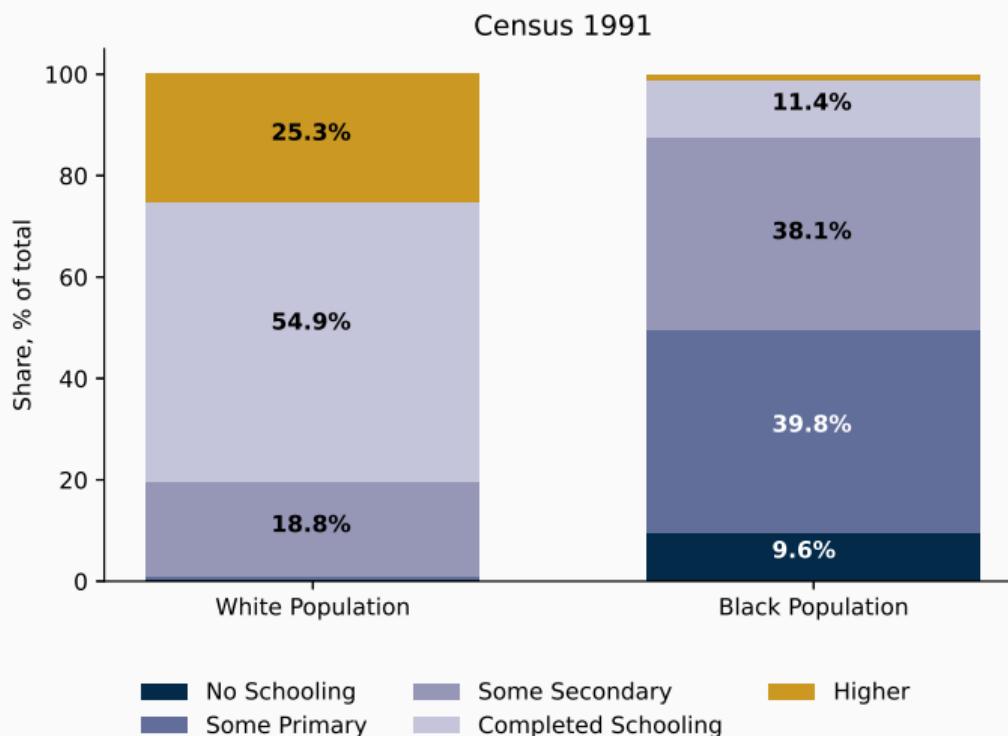
- No state contingent bonds (kid productivity) and financial wealth is non-negative.
- Financial intermediary receives deposits and makes within-period loans to finance capital/education,
 - ▶ r lending rate for schooling,
 - ▶ $r(1 + \delta)$ lending rate in the production market where δ is the depreciation rate.
- Collateral constraint,

$$k\mathbb{I}_{o=\text{entrep.}} + P_c\mathbb{I}_{\text{college}} \leq \lambda_k a.$$

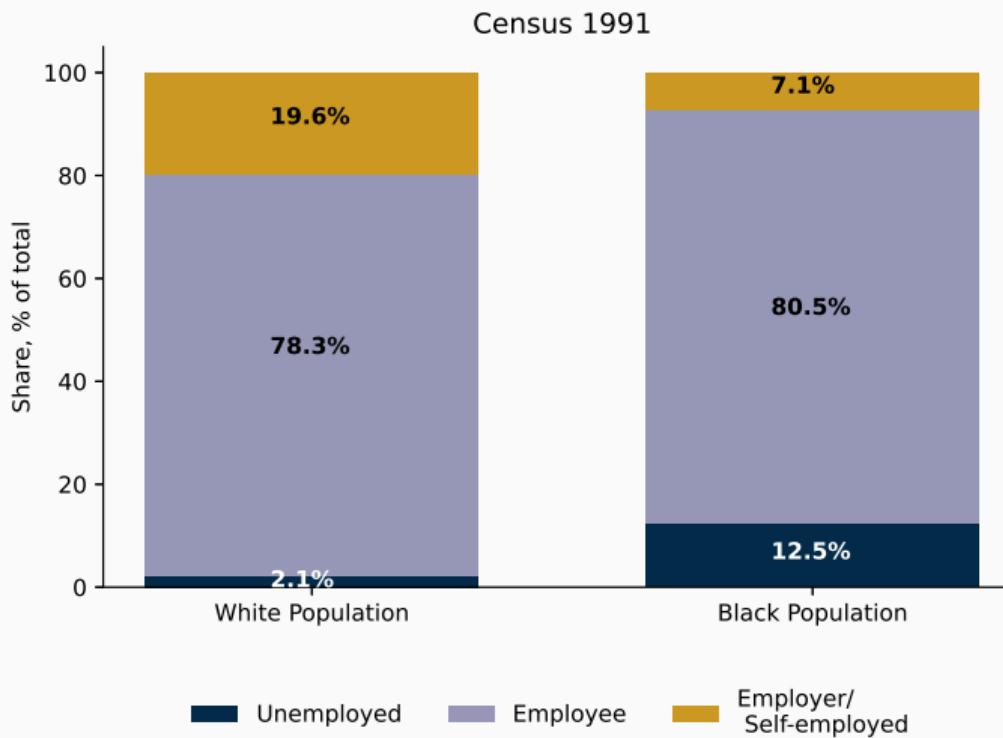
Distribution of Individuals Across EAs by Population Groups: 1991



Adults by Highest Level of Education: 1991



Adults by Employment Status: 1991

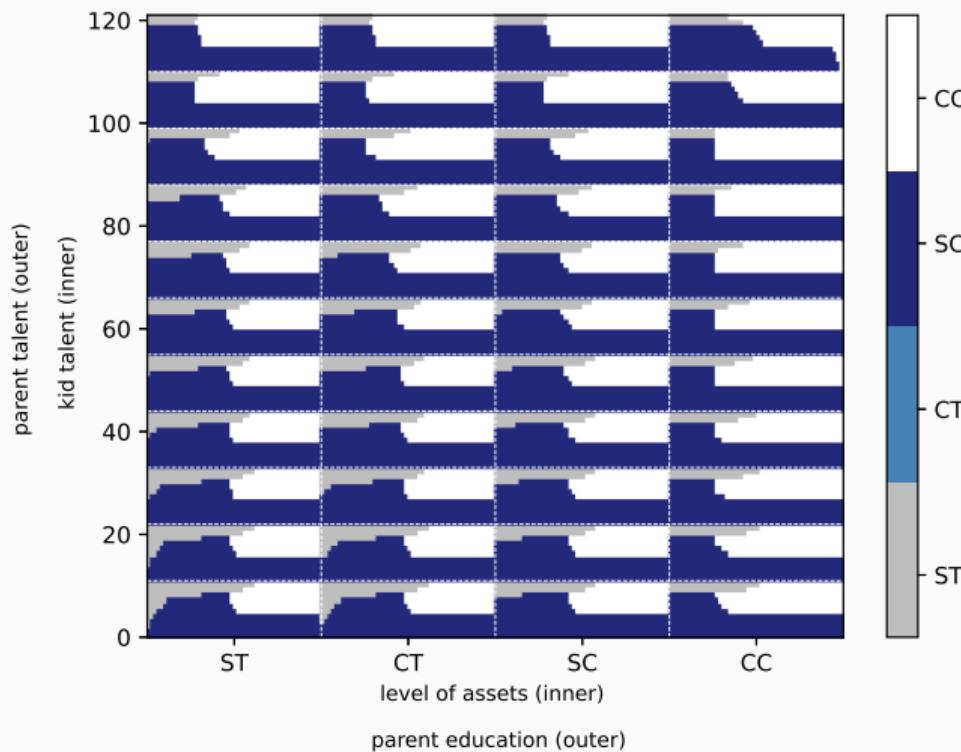


Externally Calibrated Parameters

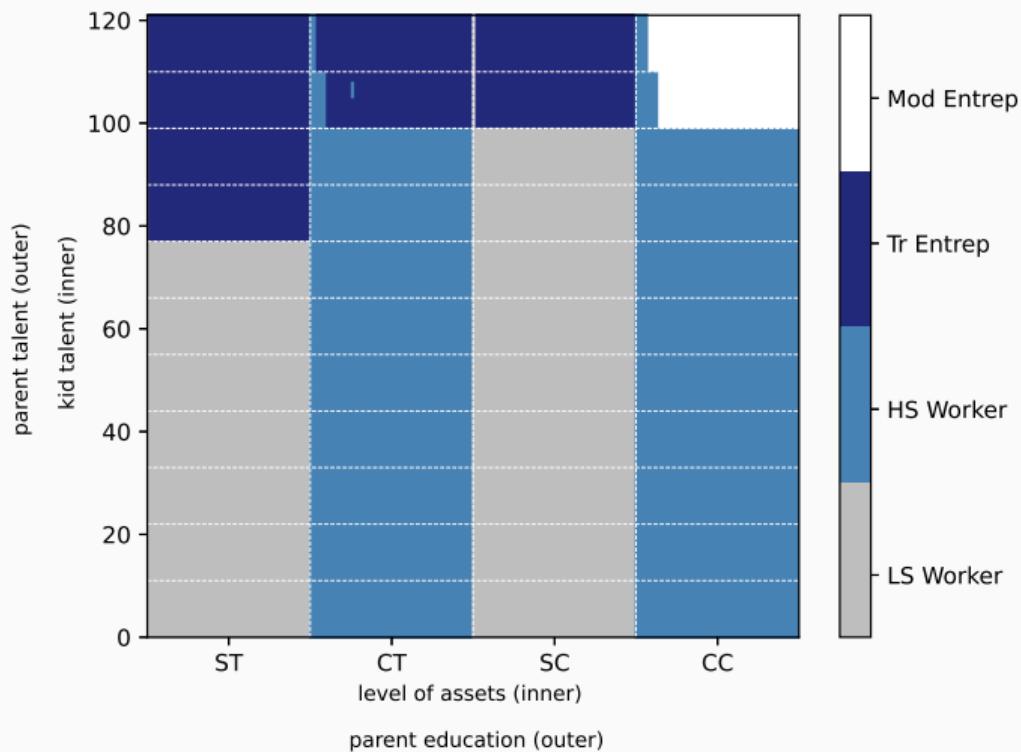
| Param. | Value | Description | Source |
|------------|-------|-----------------------------------|-------------------------------|
| σ | 1.5 | Coeff. Relative Risk Av. | [Buera and Shin, 2013] |
| λ | 0.7 | Household Pareto Weight | [Krueger and Ludwig, 2013] |
| ρ | 0.47 | Talent Persistence | [Mestieri et al., 2017] |
| δ | 0.06 | Yearly Depreciation | [Buera and Shin, 2013] |
| γ_h | 0.5 | Housing supply inverse elasticity | [Cavalleri et al., 2019] |
| γ_T | 0.41 | Labor Share Trad Tech | [Mestieri et al., 2017] |
| α_T | 0.20 | Capital Share Trad Tech | [Mestieri et al., 2017] |
| γ_M | 0.41 | Labor Share Modern Tech | [Mestieri et al., 2017] |
| α_M | 0.30 | Capital Share Modern Tech | US estimates |
| ω | 0.65 | Low-skill Share in Mod. Wage Bill | [Machin and van Reenen, 1996] |

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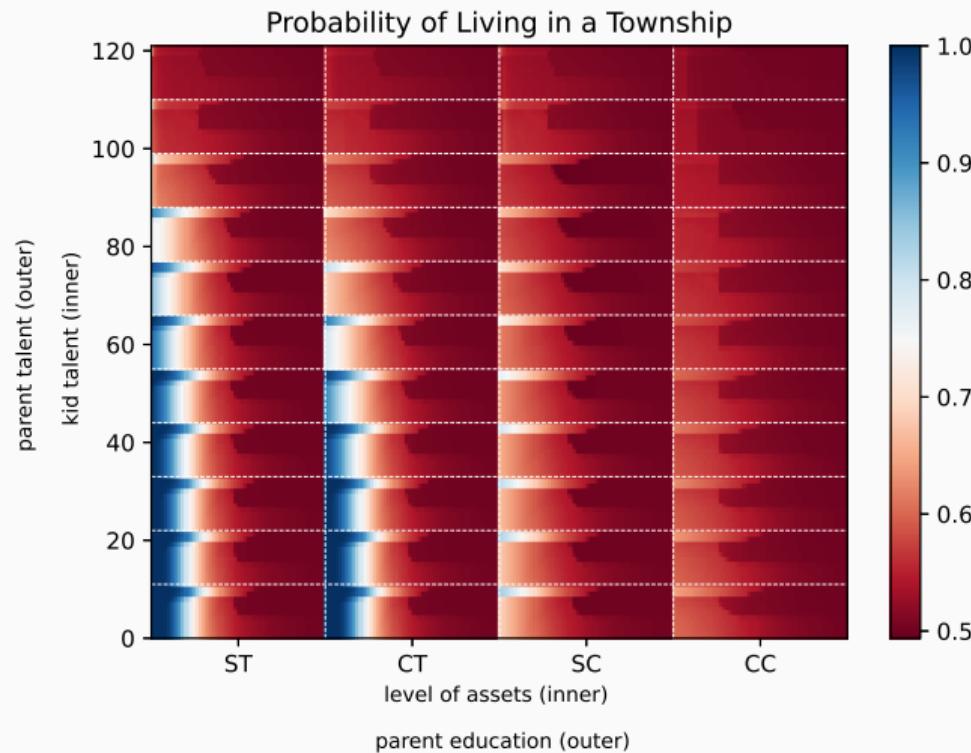
Household Policy Function: Education of Kid



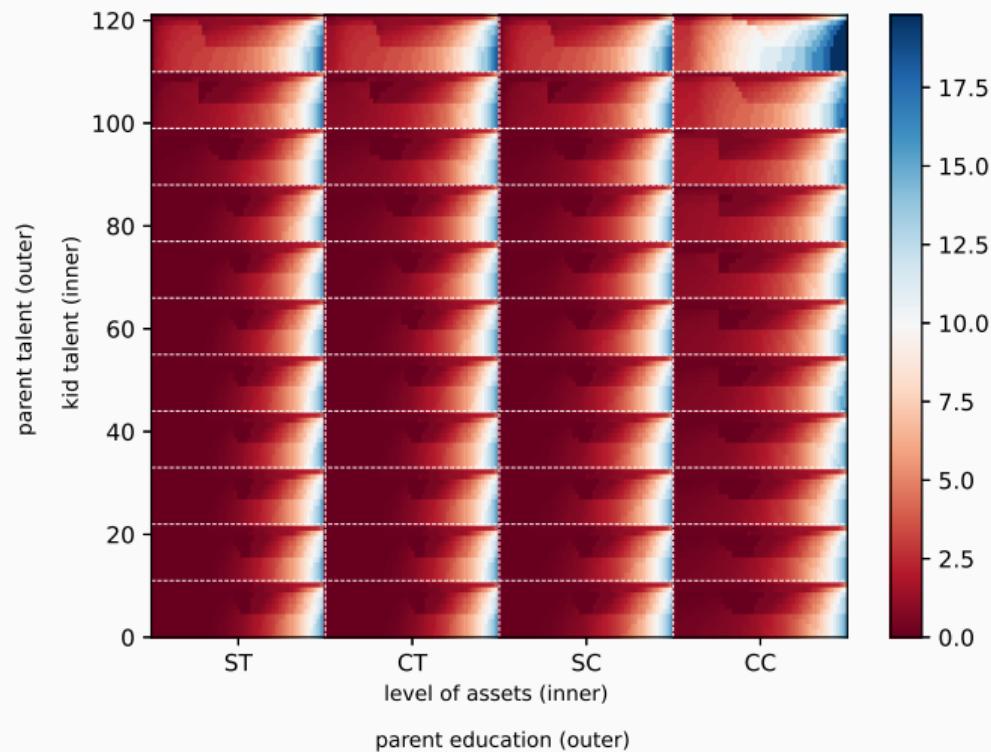
Household Policy Function: Occupational Choice



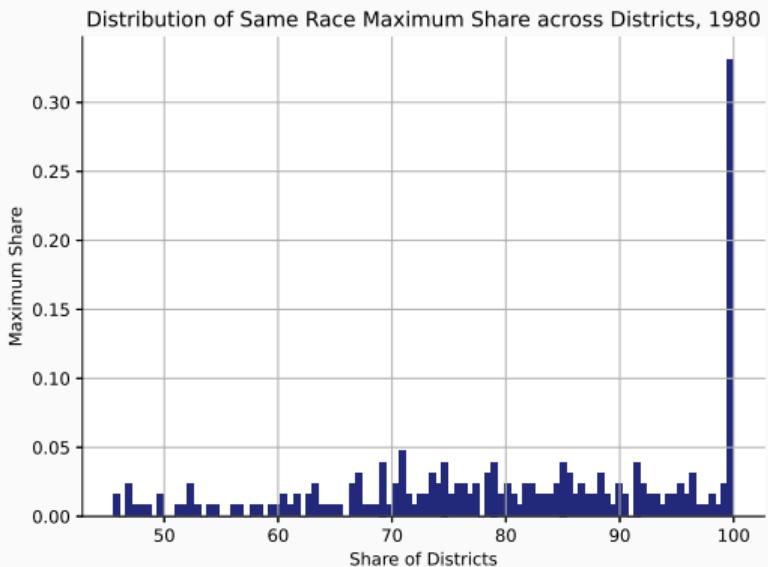
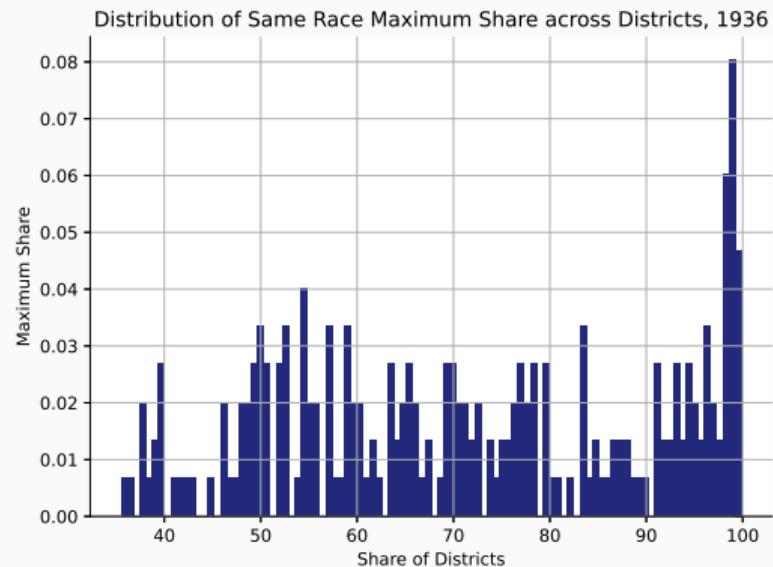
Household Policy Function: Home Location



Household Policy Function: Assets



Historical Race Distribution Across Districts: Same Districts 1936 & 1980



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Township Outcomes 1996 vs 2011: Higher Growth for Closer Townships

| | Education | | HH Income | |
|------------------|-------------------|-------------------|-------------------|-------------------|
| | (1) | (2) | (3) | (4) |
| Distance to City | -2.722 (1.047) | -2.109 (0.931) | -0.131 (0.052) | -0.124 (0.066) |
| Major City FE | | ✓ | | ✓ |
| Observations | 148 | 148 | 148 | 148 |

Notes: Columns (1), (2) use the change in share of individuals with completed secondary and higher education. Columns (3), (4) use the change in average HH income and control for change in average education level. Distance to city is a dummy for townships with higher than median distance to the city (similar for absolute distance). St. errors (in parenthesis) are clustered at MN level.

Same for individuals residing in closer Townships: assets/income, education [back](#)

Bibliography

-  Buera, F. and Shin, Y. (2013).
Financial frictions and the persistence of history: A quantitative exploration.
Journal of Political Economy, 121(2):221 – 272.
-  Cavalleri, M. C., Cournède, B., and Özsöğüt, E. (2019).
How responsive are housing markets in the oecd? national level estimates.
(1589).
-  Krueger, D. and Ludwig, A. (2013).
Optimal progressive labor income taxation and education subsidies when education decisions and intergenerational transfers are endogenous.
American Economic Review, 103(3):496–501.
-  Machin, S. and van Reenen, J. (1996).
Technology and changes in skill structure: Evidence from an international