Cohort Size and The Marriage Market:
Explaining a Century of Change in U.S. Marriage Rates

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    - Marriage booms, marriage declines, long-term trends, racial differences

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  - Income inequality
  - Fertility choices
  - Fraction of individuals on welfare

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- In spite of this, there is no general explanation for the variation in marriage formation over time and across races

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  - We then develop a simple search model that theoretically can generate the observed pattern in U.S. marriage rates
  - Finally, we test the model and find that it cannot be rejected

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  - Theory: Policies (incarceration, welfare aid) (Ellwood and Crane, 1990; Charles and Luoh, 2010)

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    - Theories: Sex Ratio (Becker (1973), Schoen (1983), Guttentag and Secord (1983), Angrist (2002), Abramitzky et al (2011))

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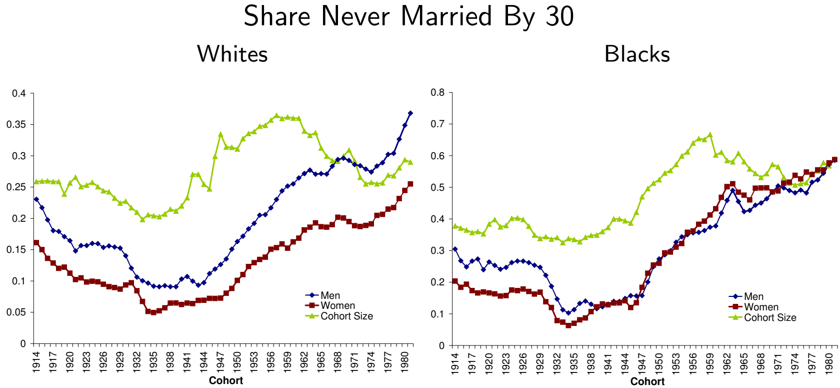
- Tests and results

Result on which the paper is based



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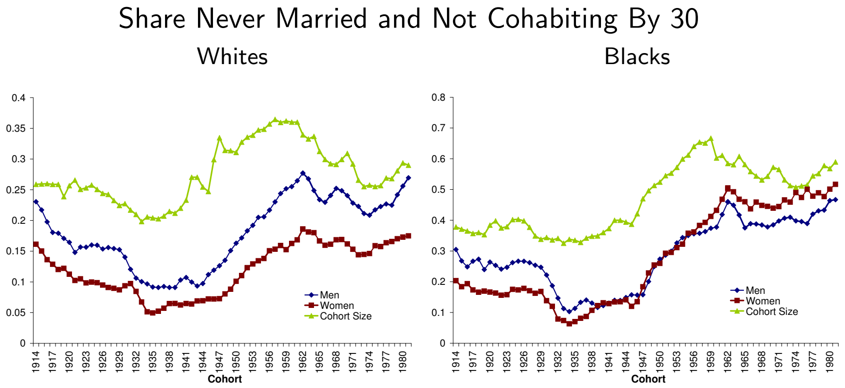

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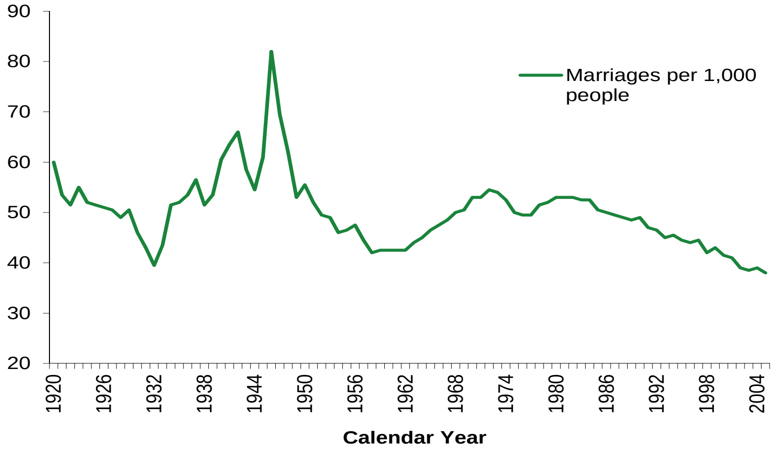

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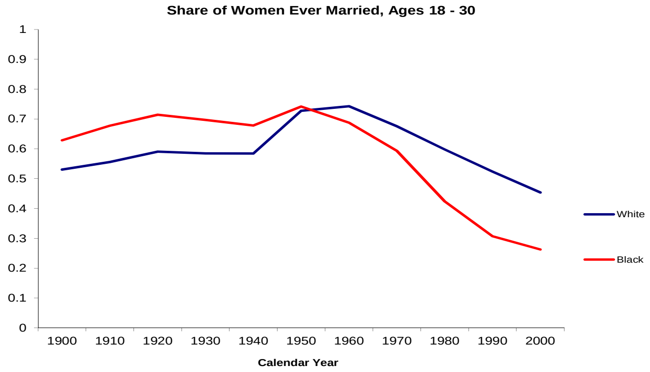

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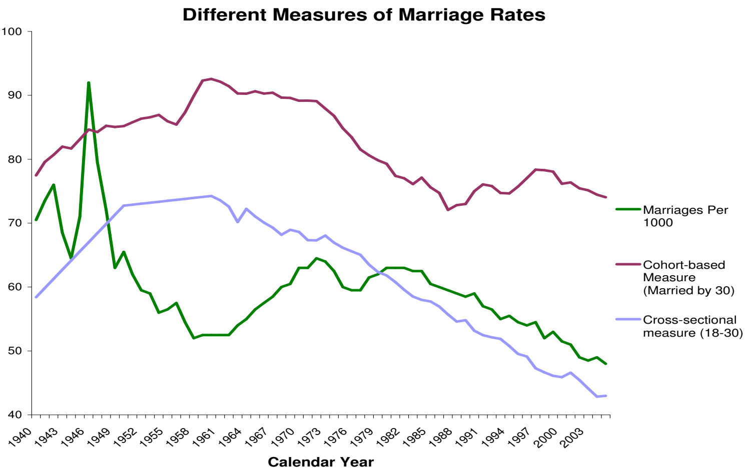

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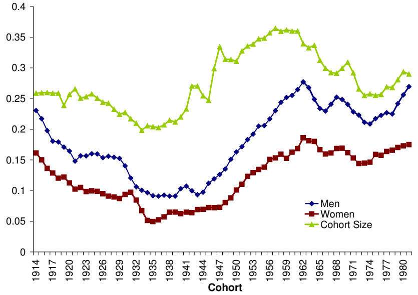
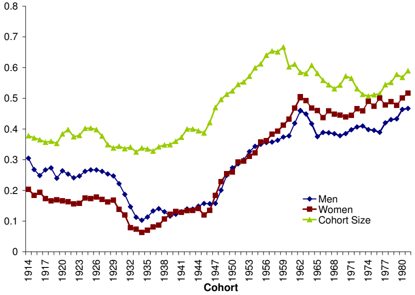
  - It does this for both blacks and whites

Share Never Married and Not Cohabiting By 30

Whites



Blacks



Detail By 40

Empirical Evidence: Longitudinal Variation

- To provide more formal evidence, we regress the log of share ever married on the log of cohort size

Empirical Evidence: Longitudinal Variation

Time Series Regression of Log Share Ever Married on Log Cohort Size

	White Men	Black Men	White Women	Black Women
Ever married	-0.467*	-0.966*	-0.365*	-1.230*
by age 25	(0.107)	(0.102)	(0.075)	(0.113)
R^2	0.21	0.56	0.25	0.63
Ever married	-0.294*	-0.592*	-0.193*	-0.870*
by age 30	(0.037)	(0.048)	(0.026)	(0.064)
R^2	0.50	0.70	0.46	0.74
Ever married	-0.182*	-0.440*	-0.111*	-0.560*
by age 35	(0.015)	(0.031)	(0.011)	(0.043)
R^2	0.71	0.77	0.65	0.74
Ever married	-0.107*	-0.322*	-0.066*	-0.453*
by age 40	(0.008)	(0.019)	(0.007)	(0.026)
R^2	0.77	0.84	0.58	0.85

* Significant at 1%. Standard errors in parentheses.

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  - To eliminate possible endogeneity in changes in cohort size due to migration or other variables, we use changes in total births

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- We then compute 10-year differences in the share ever married and regress it on 10-year differences in cohort size

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Cross-Sectional Regression of Difference of Log Share Ever Married by 30

	White Men	Black Men	White Women	Black Women
10-Yr. Difference in Log Cohort Size	-0.080** (0.028)	-0.090** (0.024)	-0.064** (0.017)	-0.092** (0.019)
N	144	112	144	112
R^2	0.42	0.74	0.23	0.53

Cross-Sectional Regression of Difference of Log Share Ever Married by 40

	White Men	Black Men	White Women	Black Women
10-Yr. Difference in Log Cohort Size	-0.037** (0.007)	-0.049* (0.020)	-0.037** (0.007)	-0.077** (0.014)
N	96	74	96	74
R^2	0.30	0.36	0.12	0.51

* Significant at 10%. ** Significant at 1%. Standard errors in parentheses. Time fixed effects.

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- To deal with possible endogeneity issues we use cross-state variation in mobilization rates during WW II to instrument for changes in cohort size (Acemoglu et al (2004))

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- **Return effect I**: after the war, births could have increased because deployed men who survived the war returned home and started to make up for the missing years
- **Return effect II**: after the war, births could have decline because many deployed men died

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- We construct the mobilization rate measure as the number of white men inducted, divided by the number of white men registered

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- Differences in occupational structures: workers employed in industries central to the war effort were exempted

Empirical Evidence: Mobilization Rates During WW II

Cross-state Differences in Main Observable Variables

	Low	Medium	High
Percent Men Inducted into Army	0.28	0.30	0.32**
	(0.01)	(0.01)	(0.01)
Share Never Married at 30	0.24	0.22	0.21
	(0.06)	(0.05)	(0.05)
Share Farmers	0.24	0.20	0.16
	(0.13)	(0.09)	(0.14)
Age	34.84	34.34	34.15*
	(0.79)	(1.19)	(0.92)
Men's Employment	0.85	0.84	0.83
	(0.02)	(0.03)	(0.03)
Women's Employment	0.26	0.27	0.28
	(0.08)	(0.05)	(0.07)
Log Income	6.55	6.59	6.58
	(0.25)	(0.18)	(0.31)
Years of Education	9.91	9.61	9.16**
	(0.62)	(0.70)	(0.53)
Share German- or Italian-born	0.02	0.02	0.03
	(0.01)	(0.01)	(0.03)
Number of Children by Age 35	1.74	2.00	1.90
	(0.46)	(0.38)	(0.46)

* Difference between high and low groups significant at 5%. ** Significant at 1%.

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  - 1940 education, share farmers, and income interacted with time to allow for potentially different time trends
- In the second specification, we allow the birth-year fixed effect to vary by region

Empirical Evidence: Mobilization Rates During WW II

- In the first stage, we run the following regression:

$$logcohortsize_{c,s} = \sum_{s} \pi_s + \sum_{c} \gamma_c + \sum_{c} \gamma_c \cdot mobrate_s + X_{c,s}\beta + \nu_{c,s}$$

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- We include the mobilization rates in two ways:
  - The overall mobilization rate in a state interacted with year dummies
  - The previous variables plus the cumulative year-by-year mobilization rates and the war casualty rates by state

Empirical Evidence: Mobilization Rates During WW II

First Stage Results. Dependent Variable: Log Cohort Size

	Time FE 1	Time FE 2	Time-Reg. FE 1	Time-Reg. FE 2
Mobilization * 1941	0.227	0.042	0.345	0.291
	(0.483)	(0.505)	(0.545)	(0.545)
Mobilization * 1942	0.681	0.617	1.193**	1.175**
	(0.492)	(0.495)	(0.557)	(0.555)
Mobilization * 1943	-0.151	0.351	0.794	1.098
	(0.500)	(0.694)	(0.568)	(0.733)
Mobilization * 1944	-1.259**	1.528	0.004	1.832
	(0.502)	(1.183)	(0.570)	(1.198)
Mobilization * 1945	-1.545***	-1.584***	-0.606	-0.617
	(0.497)	(0.495)	(0.564)	(0.561)
Mobilization * 1946	-0.835*	-0.874*	-0.061	-0.084
	(0.491)	(0.489)	(0.555)	(0.553)
Mobilization * 1947	-0.604	-0.623	0.033	0.025
	(0.487)	(0.485)	(0.550)	(0.548)
Yr-by-Yr Mobil. * 1943		-0.818		-0.601
		(0.724)		(0.847)
Yr-by-Yr Mobil. * 1944		-2.897***		-1.990*
		(1.111)		(1.150)
Casualty Rate		-2.429		-5.706**
		(2.408)		(2.428)

* Significant at 10%. ** Significant at 5%. *** Significant at 1%. Standard errors in parentheses.

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- In the second stage, we run the following regression:

$$y_{c,s} = \sum_{s} \pi_s + \sum_{c} \gamma_c + \phi \cdot logcohortsize_{c,s} + X_{c,s}\beta + \epsilon_{c,s}$$

Empirical Evidence: Mobilization Rates During WW II

Second Stage. Regression of Log of Share Ever Married on Log Cohort Size

	No Region FE (1)	No Region FE (2)	Region FE (1)	Region FE (2)
(Men)	-0.027*	-0.053*	-0.027*	-0.052*
	(0.003)	(0.01)	(0.003)	(0.01)
(Women)	-0.023*	-0.029*	-0.023*	-0.029*
	(0.001)	(0.01)	(0.001)	(0.01)

* Significant at 1%. Standard errors in parenthesis. Robust standard errors are clustered at the state-level. Each coefficient is the outcome of a separate regression.

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The model: Intuition

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- As a result, women on average marry older men

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  - If in period t an individual of gender i and age a is single, she or he meets a potential spouse with probability $\theta^i_{a,t}$
  - The two spouses then decide whether to marry with the objective of maximizing lifetime utility

The Model: Features

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- Men meet a potential spouse with a positive probability in their first two periods of life
- As a result, the marriage market has both young and old men, but only young women

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- The within-period utility of being married for the couple will be denoted by η, which does not change over time
- η is drawn from a distribution $F(\eta)$ which does not depend on the age of the couple

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- Hence, they marry if $\eta^{'} > \underline{\eta}_{old} = 2\delta$.

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- If a woman meets a young man, they marry if they draw a marriage utility η that is greater than

$$\underline{\eta}_{young} = 2\delta + \beta\frac{1-\beta^{T}}{1-\beta^{T+1}}\gamma\left\{E\left[\eta\,|\eta \geq 2\delta\right] - 2\delta\right\}\left(1 - F\left(2\delta\right)\right)\theta^{m}_{1,t}$$

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- Where $\theta^{m}_{1,t}$ is the probability that an young man meets a woman next period:

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- Notice that in the model cohort size has a direct effect only through the matching probabilities and the reservation value of young men

The model: Results

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Proposition

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Proposition

A positive and permanent shock to cohort size in period τ reduces the fraction of cohort τ individuals who get married. A negative and permanent shock in period τ has the opposite effect.

- This Proposition shows that in a search model a change in cohort size has the desired effect on marriage rates

The model: Results

- The following Proposition describes the implication we will use to test the search model:

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Proposition

In the search model we consider, an increase in cohort size reduces the average age difference between spouses. A reduction in cohort size has the opposite effect.

Outcome of the Test

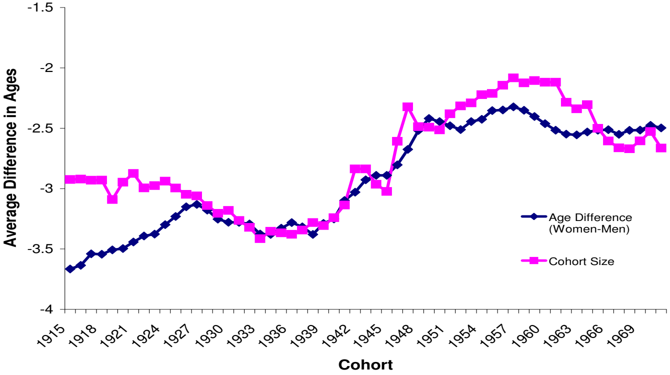
- We will first show graphically the relationship between cohort size and average age difference by race

Outcome of the Test

- We will first show graphically the relationship between cohort size and average age difference by race
- We will then estimate the effect of cohort size on average age differences

Outcome of the Test: Whites

Figure: Age Difference Between Spouses by Cohort, Whites



Outcome of the Test

Regressions: Log Age Difference and Log Cohort Size

	Time Series, 1930-1975	Cross-State, 1940-1950	Cross-State, 1950-1960	Cross-State, 1960-1970
Log Cohort Size	-0.592***			
	(0.043)			
10-Yr. Difference in		0.110	-0.172**	-0.130*
Log Cohort Size		(0.235)	(0.077)	(0.078)
N	46	49	49	49
R-squared	0.81	0.00	0.05	0.09

* Significant at 10%. ** Significant at 5%. *** Significant at 1%.

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- The goal is to determine whether quantitatively we can match the patterns observed in the data
- The model is estimated using Simulated Method of Moments

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  - The annual discount factor is set equal to 0.98

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  - Each period in the model corresponds to 10 years
  - Each generation starts making decisions at age 20 and lives for 50 years (5 periods)
  - We assume that Nash-bargaining is symmetric by setting γ equal to 0.5
  - We augment the model to allow for a fraction of men that are unwilling to marry no matter the value of match quality $1 - \phi$

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  - The two shape parameters α_1 and α_2
  - The fraction of men unwilling to marry ϕ

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The Model: Estimation

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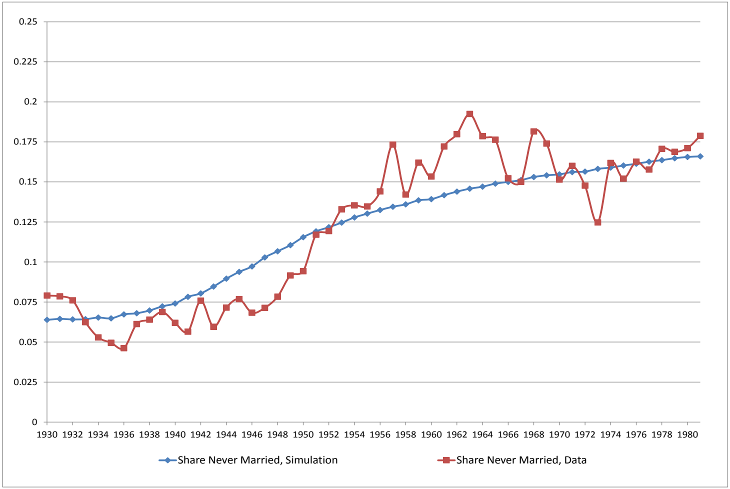
- The goal of the exercise is to understand whether the model can quantitatively match the patterns observed in the data

Estimated Parameters

Parameters	Estimates	Standard Errors
First Shape Parameter	0.020	[0.010]
Second Shape Parameter	0.071	[0.039]
Value of Being Single	0.107	[0.037]
Fraction of Men Unwilling to Marry	13.3	[0.143]

The Model: Estimation



Conclusion

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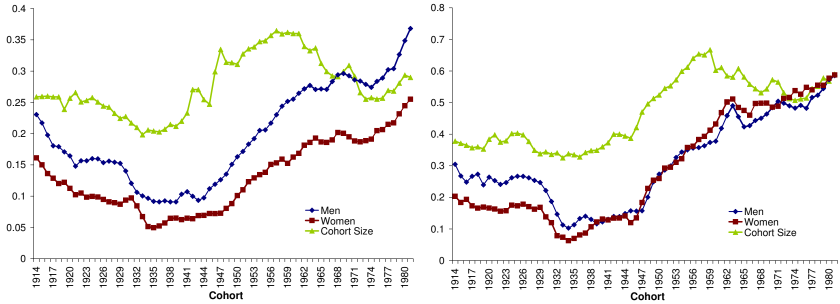
- We show that cohort size on its own explains a large fraction of the variation in the marriage rates over the last century
- We then develop a simple search model that has the potential of generating the relationship between changes in cohort size and changes in marriage rates
- We test the model and show that it is consistent with the patterns observed in the data

THE END

Empirical Evidence

Share Never Married By 30

Whites | Blacks



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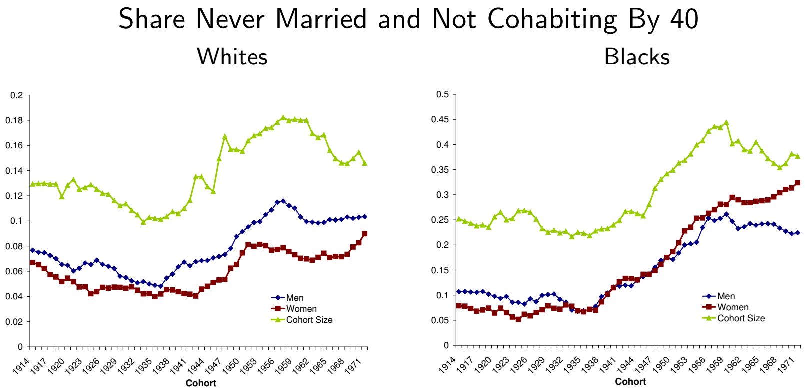
Empirical Evidence



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