Historical Disadvantage and Network Formation: Slavery in the U.S. and Caste in India

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Introduction

- Slavery was designed to destroy social capital (Putnam 2000)
- Sub-castes at the bottom of the social hierarchy exploited for centuries
- Does historical disadvantage prevent groups from mobilizing in reponse to new opportunities?
- Provide two examples where it did not
  (a) The movement of a sub-caste of agricultural laborers into the diamond business in the last quarter of the twentieth century
  (b) Political and economic mobilization by blacks in the postbellum south

Networks as a Solution to Occupational Traps

- New classical theory
  - Occupational traps and persistent inequality arise if
    1. credit market imperfections and fixed cost to investing in human capital
    2. inherited (parental) human capital is occupation-specific (Galor and Zeira 1993, Banerjee and Newman 1993, Mookherjee and Ray 2003)
- Community effects
  - Lead to endogenous stratification, which accentuates family-level persistence in inequality (Loury 1977, Benabou 1996, Fernandez and Rogerson 1996, Durlauf 1996)
- This paper
  - Proposes an informal institutional mechanism – the community-based network - through which families can escape occupational traps

Individual endowments

- 2 types of occupations: business (B) and non-business (NB), returns to ability $r_B > r_{NB}$
- Individual i from community j is endowed with ability $\omega_i^j \sim U[0,1]$, which is independent of parental occupation or ability
- Occupation-specific human capital endowment U_B, U_{NB}^j

Occupational choice without networks

- Sons of businessmen always choose B

$$U_B + r_B \omega_i^j > r_{NB} \omega_i^j$$

- Children of fathers in NB occupation always choose that occupation if
  Condition 1: $U_{NB}^j \geq r_B - r_{NB}$

$$U_{NB}^j + r_{NB} \omega_i^j > r_B \omega_i^j$$

- Occupational persistence will also be obtained with discrete set of occupations and credit market imperfections
- Introducing new D occupation that is perfectly substitutable with B occupation $U_D > U_B$ has little impact on inequality

Occupational choice with networks

- Children of businessmen operate independently (network substitutes for inherited human capital)
- Children of individuals in NB occupation must choose between NB and D
  - Focus on first generation: Each individual works for N periods and $M < N$ cohorts in that generation
  - Let each community-cohort be measure one and let a fraction λ be the children of businessmen
  - $(1-\lambda)\Delta\omega_0$ is the measure of individuals from community j who entered the workforce in period τ and chose to participate in the network
  - Individual i from community j will choose occupation D if $h(1-\lambda)\sum_{\tau=0}^{t-1}\Delta\omega_\tau^j + r_B\omega_i^j \geq U_{NB}^j + r_{NB}\omega_i^j$

Network dynamics

$$\underline{\omega}_t^j = \frac{U_{NB}^j - h(1-\lambda)\sum_{\tau=0}^{t-1}\Delta\omega_\tau^j}{r_B - r_{NB}}$$

$$\Delta\omega_t^j \equiv 1 - \underline{\omega}_t^j$$

$$\Delta\omega_t^j = \frac{h(1-\lambda)}{r_B - r_{NB}}\Sigma_{\tau=0}^{t-1}\Delta\omega_\tau^j - \left(\frac{U_{NB}^j}{r_B - r_{NB}} - 1\right) \equiv \beta\Sigma_{\tau=0}^{t-1}\Delta\omega_\tau^j - \alpha^j. \tag{1}$$

- Solving recursively,

$$\Delta\omega_t^j = (\beta\Delta\omega_0 - \alpha^j)(1+\beta)^{t-1}. \tag{2}$$

- **Condition 2**: $\Delta\omega_0 \geq \alpha^j/\beta$

Proposition 1

- **Proposition 1**: *If Condition 2 is satisfied then (a) The strength of the network increases over time, more steeply in communities with weak outside options (low U^j_{NB}). (b) The share of entrants with a family background in business S^j_t decreases over time and, moreover, will decrease more steeply in communities with weak outside options when $S^j_t > 0.5$.*
- $W^j_t \equiv (1-\lambda)\sum_{\tau=0}^{t-1} \Delta\omega^j_\tau = \frac{(1-\lambda)}{\beta}\left[\Delta\omega^j_t + \alpha^j\right]$
  $S^j_t = \frac{\lambda}{\lambda+(1-\lambda)\Delta\omega^j_t}$
- Results follow from equations (1) and (2)

The survey

- GJEPC database 1995-2003
- 777 firms (84.3 % response rate)
- Extremely low exit rates (1.5 % per year)

Table 3

Table 3. Characteristics of Entrepreneurs

	Kathiawari	Marwari	Palanpuri
Years of schooling	10.84	14.41	12.87
	(0.26)	(0.19)	(0.12)
Father's occupation (%)			
Farming	53.02	2.46	2.54
White-collar professional	5.58	13.93	15.52
Other business/store-owner/sales	11.16	27.05	27.23
Other jewelry business	5.12	29.51	11.96
Diamond cutting & polishing	7.44	1.64	6.62
Diamond broker/trader	2.79	3.28	9.92
Diamond exporter	14.88	22.13	26.21
Any business	34.56	82.40	75.81
	(3.24)	(3.42)	(2.14)
Number of firms	218	125	405

Organization of production

- Buying rough stones
  - Community network
  - Branch in Antwerp
- Selling polished stones
  - All firms have offices in Mumbai
- Cutting and polishing
  - Long-term bilateral relationships

Network Formation

- Supply shock in 1979
- Palanpuris had established long-term relationships with their Kathiawari contractors by that time
- Palanpuris had also established branches in Antwerp

Figure 5

Figure 5: Number of Firms
Number of firms
Year
Palanpuris
Kathiawaris
Marwaris
0
50
100
150
200
250
300
350
400
450
1965
1970
1975
1980
1985
1990
1995
2000
2005

Figure 6

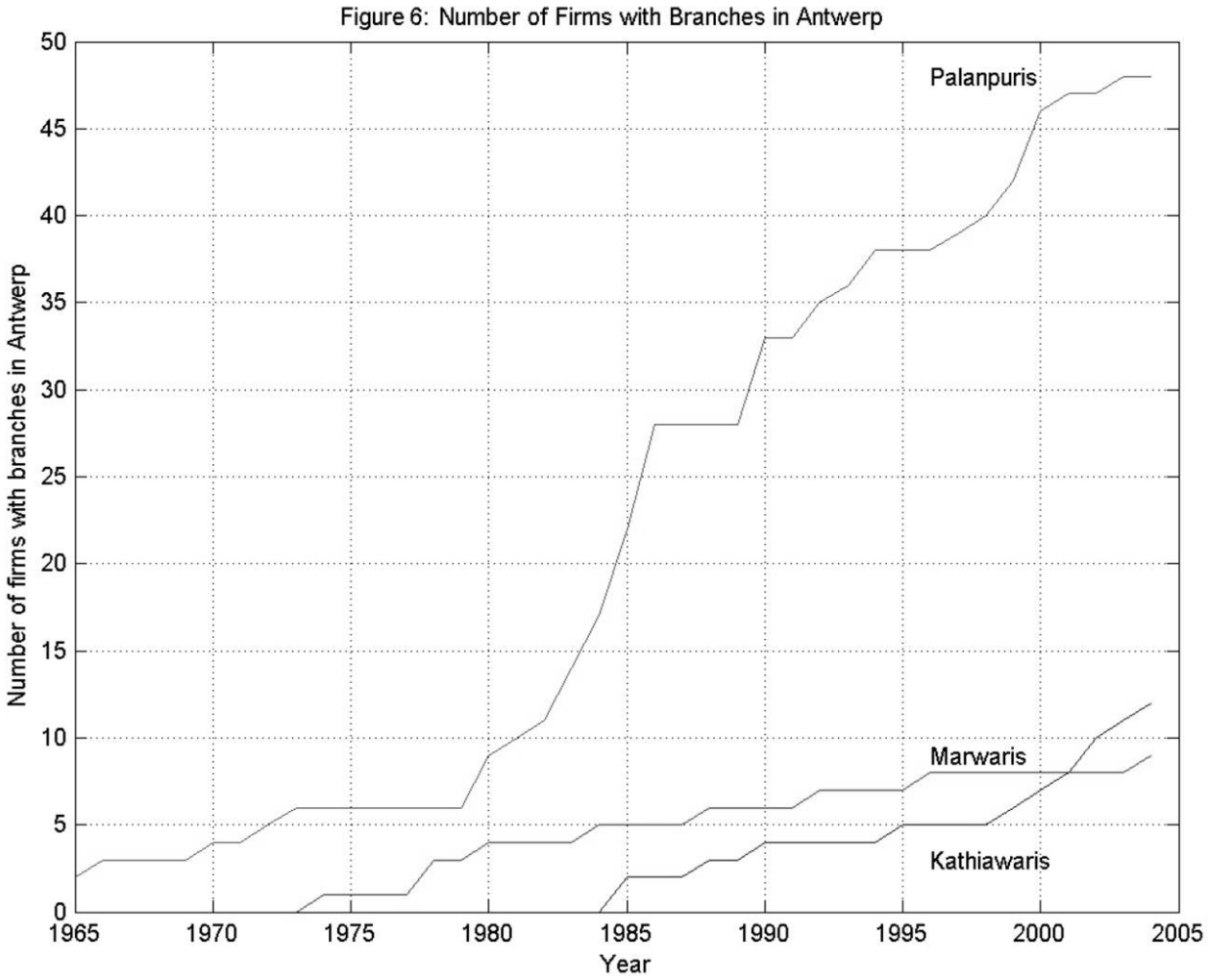


Figure 6: Number of Firms with Branches in Antwerp
Number of firms with branches in Antwerp
Year
Palanpuris
Marwaris
Kathiawaris
0
5
10
15
20
25
30
35
40
45
50
1965
1970
1975
1980
1985
1990
1995
2000
2005

Figure 9

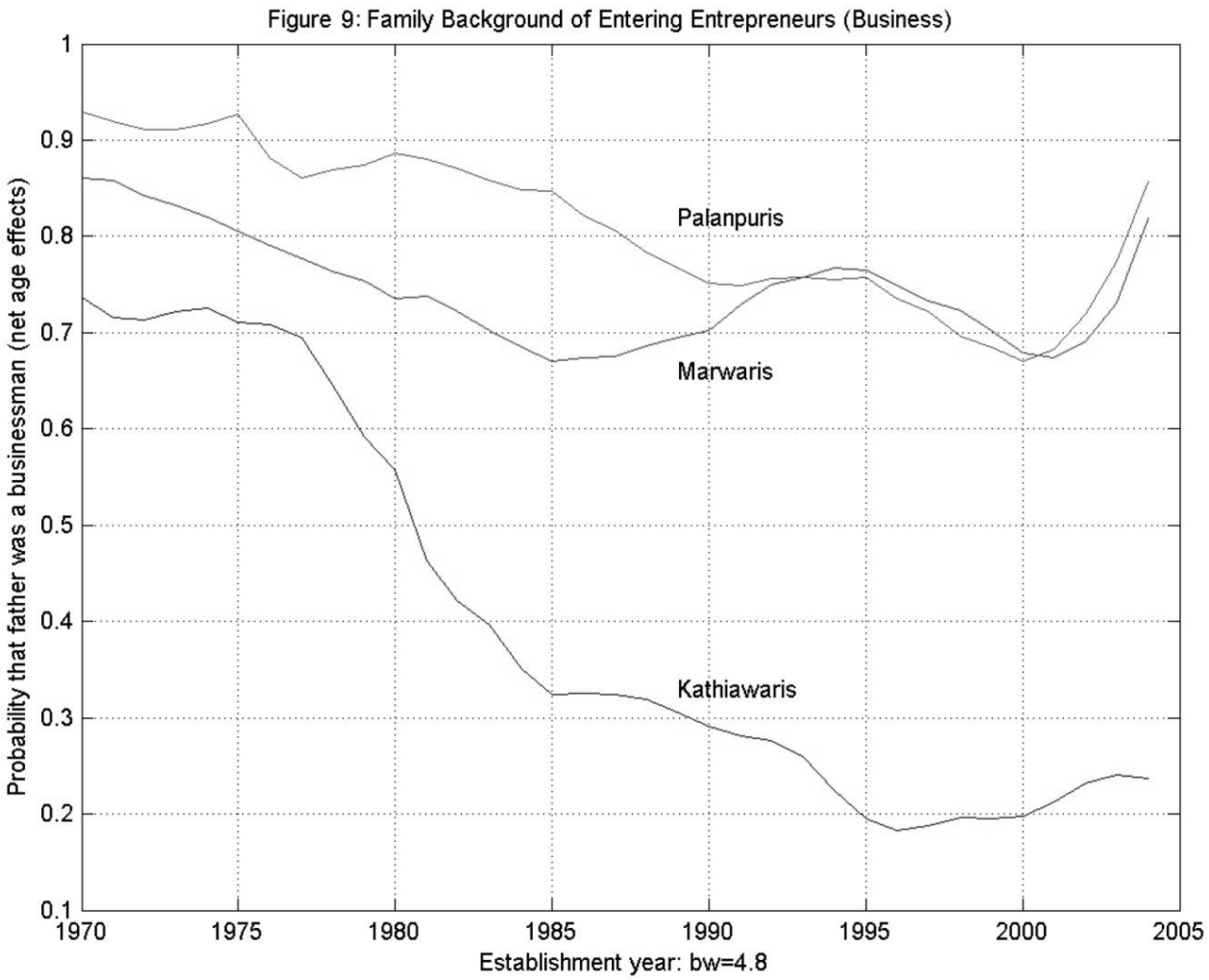


Figure 9: Family Background of Entering Entrepreneurs (Business)
Probability that father was a businessman (net age effects)
Establishment year: bw=4.8
Palanpuris
Marwaris
Kathiawaris
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
1970
1975
1980
1985
1990
1995
2000
2005

Figure 10

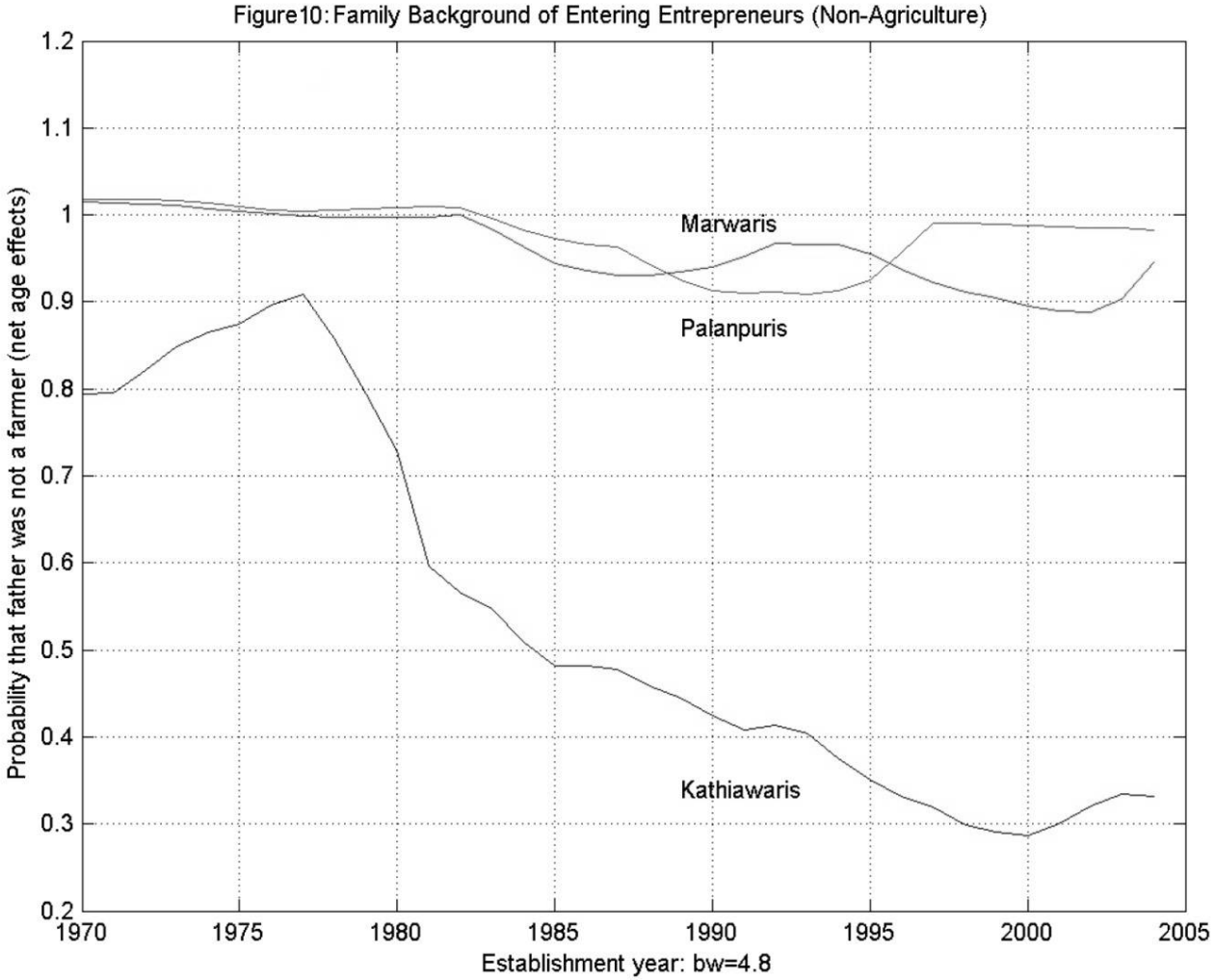


Figure10: Family Background of Entering Entrepreneurs (Non-Agriculture)
Probability that father was not a farmer (net age effects)
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
1970
1975
1980
1985
1990
1995
2000
2005
Establishment year: bw=4.8
Marwaris
Palanpuris
Kathiawaris

Participation in the Network

- Model assumes that individuals with a business background operate independently of the network
- Follows from Proposition 1(b) that share of entrants that choose to participate in the network should be increasing over time, more steeply in communities with weak outside options
- In the diamond industry, participation in the network is measured by (i) organizations of production, (ii) marriage inside the industry
- Kathiawaris more likely to marry within industry and to organize their firms to be reliant on the network over time

Network Strength

- Compositional change in entrants is driven by underlying change in network strength
  - Unconditional comparison of profit trajectory across communities is thus uniformative
- If firm-level panel data are available, fixed effects can be used to account for compositional change
  - Fixed effects should have a greater effect on the export trajectory for the Kathiawaris
  - Kathiawari trajectory should be steepest once fixed effects are included
  - Given the constant proportions production technology, exports map linearly into profits in the diamond industry

Table 7

Table 7. Firm Performance

Dependent variable:	exports					
Sample:	all firms		father non-business		all firms	
	(1)	(2)	(3)	(4)	(5)	(6)
Year-Kathiawari	1.874	7.419	10.076	16.752	2.744	8.266
	(3.938)	(2.223)	(4.758)	(5.242)	(3.803)	(2.362)
Year-Marwari	-7.514	-6.626	-8.018	-9.374	-8.214	-7.583
	(2.332)	(2.153)	(2.130)	(2.432)	(2.520)	(2.408)
Year	12.940	14.272	7.941	9.784	17.593	20.585
	(2.093)	(1.906)	(1.658)	(2.137)	(4.440)	(3.287)
Year-proportion small stones	--	--	--	--	-0.100	-0.123
					(0.056)	(0.031)
Firm fixed effects	No	Yes	No	Yes	No	Yes
Number of observations	6,114	6,114	2,034	2,034	5,965	5,965

Slavery and Social Capital in the Postbellum South

Unique Features of U.S. Slavery

1. Small slaveholdings because sugar was relatively unimportant (Fogel 1989)
   - average slaveholdings was 20 for tobacco, 35 for cotton, 100 for rice/sugar
   - median plantation had 17.5 slaves in 1860 census
2. Active domestic slave trade
   - 20% of slaves had at least a partial breakup of their families (Escott 1979)
   - 13% of marriages broken by slave trade (Fogel and Engerman 1974), 20% in the upper south (Tadman 1975)
   - Slaveowners tried to keep families intact so overall movement would have been much higher

Continued

- These features of U.S. slavery may explain why community structure was weak in the antebellum period and why the U.S. is unique in its lack of widespread armed resistance and weakness of slave rebellions (Kolchin 2003, Patterson 1982)
- But does this mean that social capital could not have been created once slavery was dismantled?
- We assume:
  a) Blacks are now free to interact socially, but the frequency is constrained by population density (cropping patterns)
  b) They are also free to form collective arrangements (networks) that provide insurance and jobs and generate political patronage
- What is the largest coalition that can be sustained?

A Model of Coalition Formation

- The per capita benefit from participating in a network of size N is $\Phi(N)$
  - $\Phi_N(N) > 0$, $\Phi_{NN}(N) < 0$
  - Concavity is a standard feature of mutual insurance arrangements and labor networks. Will generally arise if participants (inputs) are substitutes
- Each individual must contribute c each period for the collective benefit to be realized
  - Introduce a commitment problem by assuming that shirking is not detected and does no affect benefits, immediately
  - An individual who shirks will be excluded from future participation *and* social interactions

Continued

- The utility derived from social interactions within the group is $S(\lambda, N)$ where λ is the population density
  - $S_N(\lambda, N) > 0$, $S_{NN}(\lambda, N) < 0$, $S_{\lambda N}(\lambda, N) > 0$
- A parametric example:
  - If individuals are distributed uniformly on a disk of radius R, the mean of the inverse distance $\frac{1}{S}$ is $\frac{16}{3\pi R}$
  - If the frequency of interactions is $\frac{1}{S}$, then the expected number of total interactions for any individual is $\frac{16(N-1)}{3\pi R}$
  - $\lambda = \frac{N}{\pi R^2}$ so $S(\lambda, N) \approx \frac{16}{3}\sqrt{\frac{\lambda N}{\pi}}$
  - As assumed, $S_N(\lambda, N) > 0$, $S_{NN}(\lambda, N) < 0$, $S_{\lambda N}(\lambda, N) > 0$

Non-cooperative Solution

- Restrict attention to individual deviations
- The condition for stability is $\frac{\Phi(N)-c}{1-\delta} \geq \Phi(N) - \frac{\delta}{1-\delta} S(\lambda, N)$
  $\rightarrow \Phi(N) + S(\lambda, N) \geq \frac{c}{\delta}$
- For every λ there exists $\underline{N}$ above which cooperation can be sustained
- The non-cooperative solution is uniformative if we are interested in the largest feasible coalition (Genicot and Ray 2000 make the same point)

Cooperative Solution

a) Treat coalitions as the fundamental behavorial unit
b) Only permit credible coalitions - those that are stable in their own right - to pose a threat to the cooperative arrangement
c) Only subsets of existing groups are permitted to deviate

- The condition for stability now is
$\frac{\Phi(N)-c}{1-\delta} \geq \Phi(N) + \frac{\delta}{1-\delta}[\phi(N') - c] - \frac{\delta}{1-\delta}[S(\lambda, N) - S(\lambda, N')]$

$\rightarrow [\Phi(N) - \Phi(N')] + [S(\lambda, N) - S(\lambda, N')] \geq \frac{c(1-\delta)}{\delta}$

Continued

- The greatest threat to an N-member coalition comes from sub-coalition that is almost as large
- $\Phi_N(N) + S_N(\lambda, N) \geq \frac{c(1-\delta)}{\delta}$

A1 Cooperation cannot be maintained without social sanctions

- $\Phi_N(N) < \frac{c(1-\delta)}{\delta}$

A2 Increasing network size has no effect on social interactions when density is close to zero

- $S_N(\lambda, N) \to 0$ as $\lambda \to 0$

Proposition

(a) *There exists a density $\underline{\lambda}$ below which the singleton coalition is the only feasible coalition*

- This follows from $A1$, $A2$, and $S_{\lambda N} > 0$

(b) *Above $\underline{\lambda}$, there exists a max feasible coalition $\bar{N}(\lambda)$, which is increasing in λ*

- $\Phi_N(\bar{N}) + S_N(\lambda, \bar{N}) = \frac{c(1-\delta)}{\delta}$
- $\frac{d\bar{N}}{d\lambda} = \frac{-S_{\lambda N}(\lambda, N)}{\Phi_{NN}(N) + S_{NN}(\lambda, N)} > 0$
- Easy to verify that the deviating sub-coalition is stable

Empirical Analysis

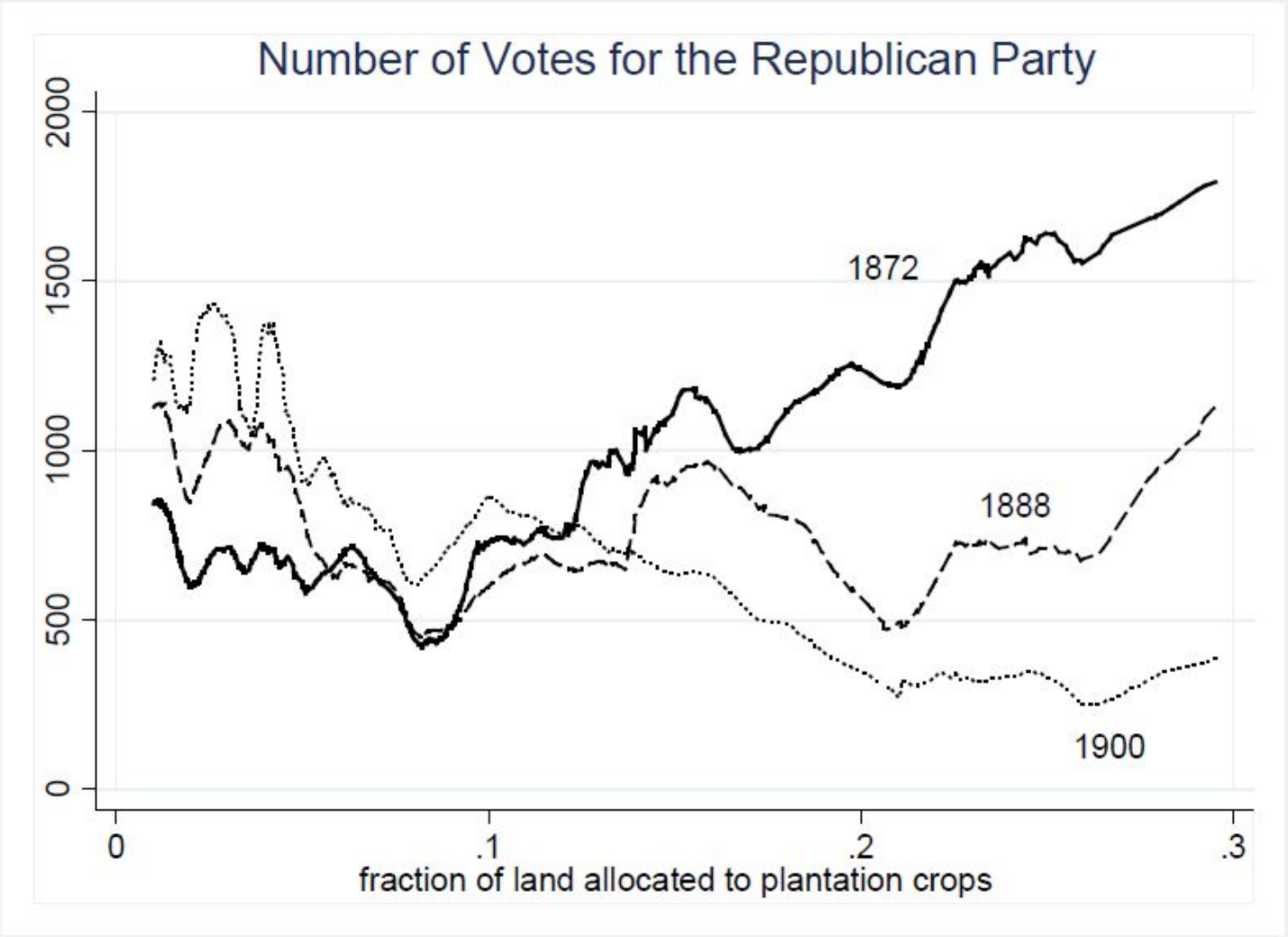
- Density λ in the postbellum period is predetermined by cropping patterns under slavery
  - cotton, tobacco, sugarcane, rice were major plantation crops
  - labor intensive eg. man-hours/acre in 1910: wheat 15, corn 35, cotton 116 (Rasmussen 1962)
  - use share of land allocated to plantation crops in 1860 at the county level in 15 former slave states as the determinant of λ
- Study the effects of this variable on
  - political mobilization: voting and election of black leaders 1867-1880
  - social mobilization: church participation and church size 1890
  - economic mobilization: migration 1910-1930

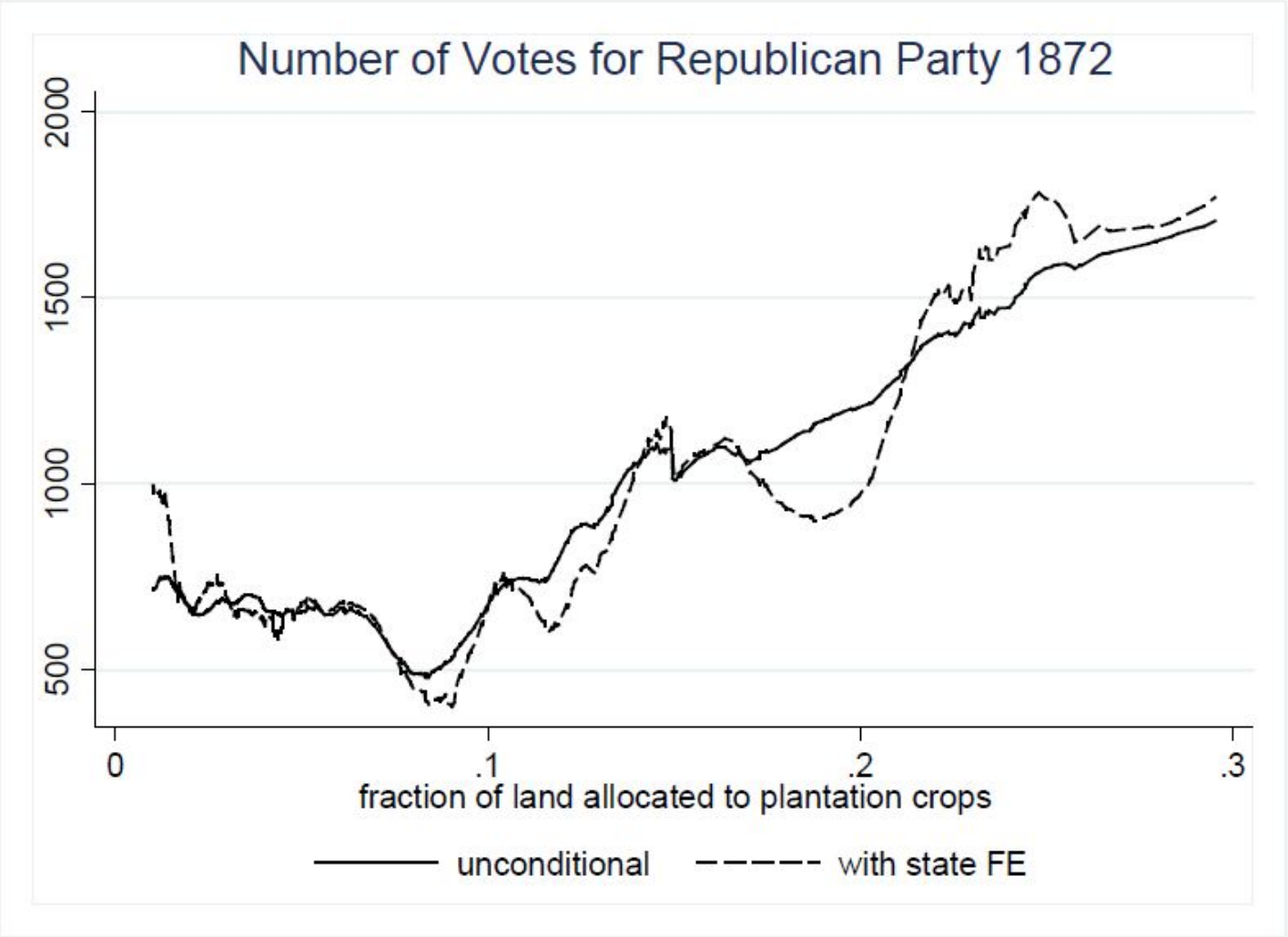
Preliminary Results

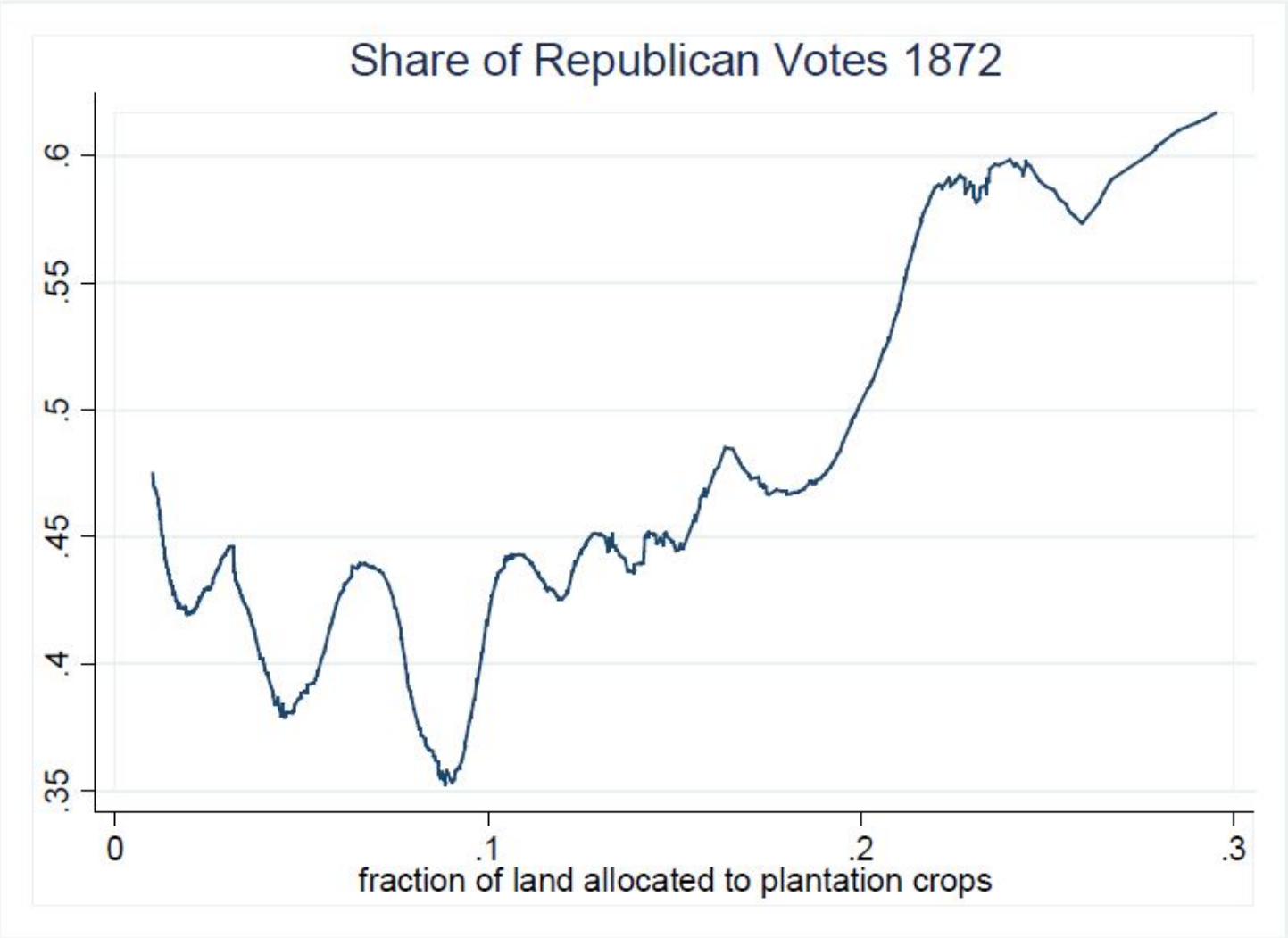
- 1860 fraction of land allocated to plantation crops $(0 - 0.3)$
- 1900 black population density $(10 - 30)$, black population $(5,000 - 15,000)$, fraction black $(0.2 - 0.6)$ increase linearly in this variable
- 1900 fraction black literate $(0.5 - 0.4)$ decreasing and share farm laborers $(0.1 - 0.25)$ increasing in this variable

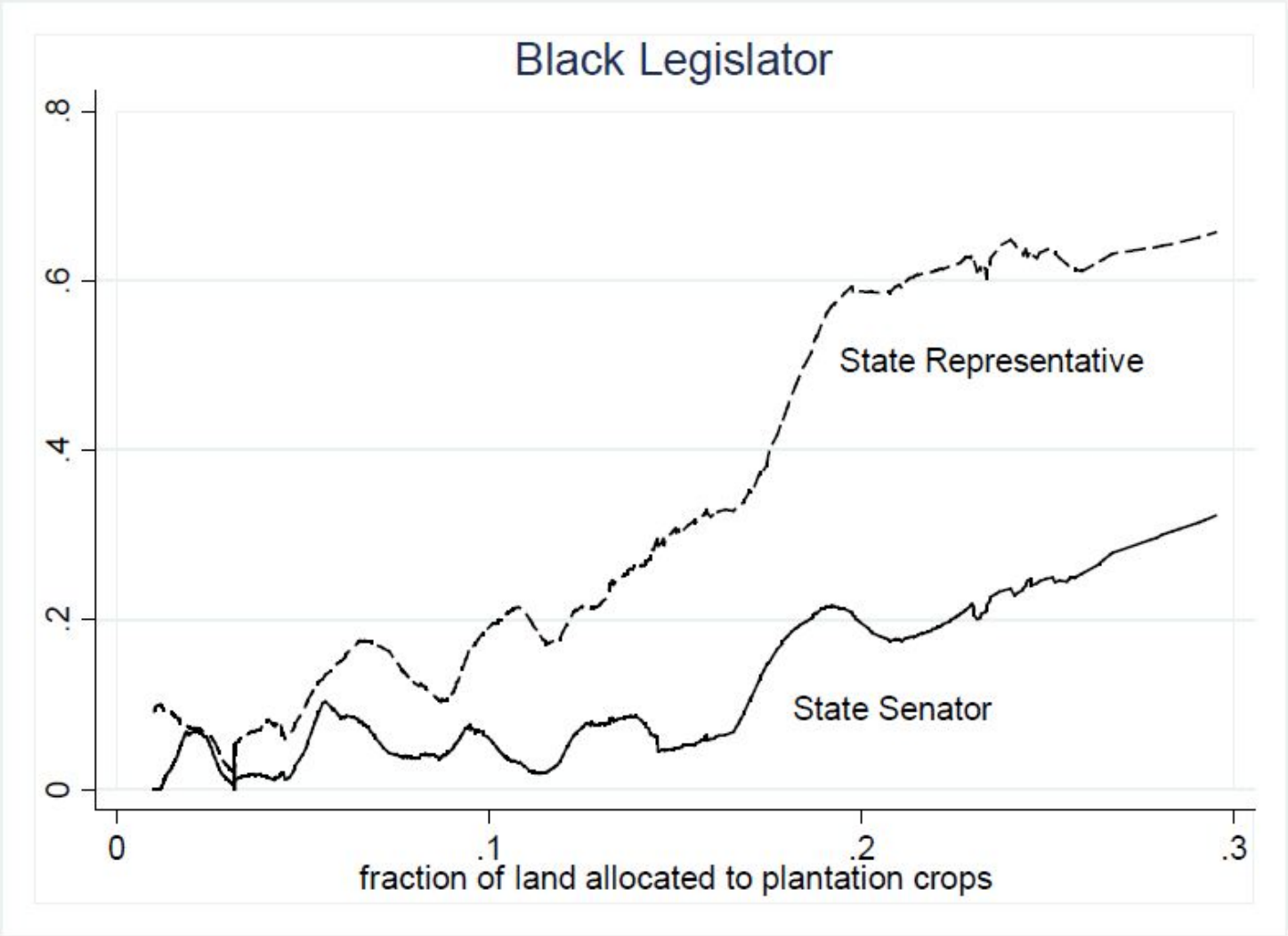
Political Mobilization

- Three periods in the aftermath of the Civil War (Morrison 1987)
  - Cooperationist (1867-70): large-scale black voting
  - Black Republicanism (1870-75): election of black leaders
  - Fusion (1875-90): Republicans lose ground to the Democrats
- Jim Crow laws begin by 1890, but almost all black leaders elected before 1880 (Foner 1996)


Number of Votes for the Republican Party
2000
1500
1000
500
0
1872
1888
1900
0
.1
.2
.3
fraction of land allocated to plantation crops


Number of Votes for Republican Party 1872
2000
1500
1000
500
0
.1
.2
.3
fraction of land allocated to plantation crops
unconditional
with state FE


Share of Republican Votes 1872
.35
.4
.45
.5
.55
.6
0
.1
.2
.3
fraction of land allocated to plantation crops

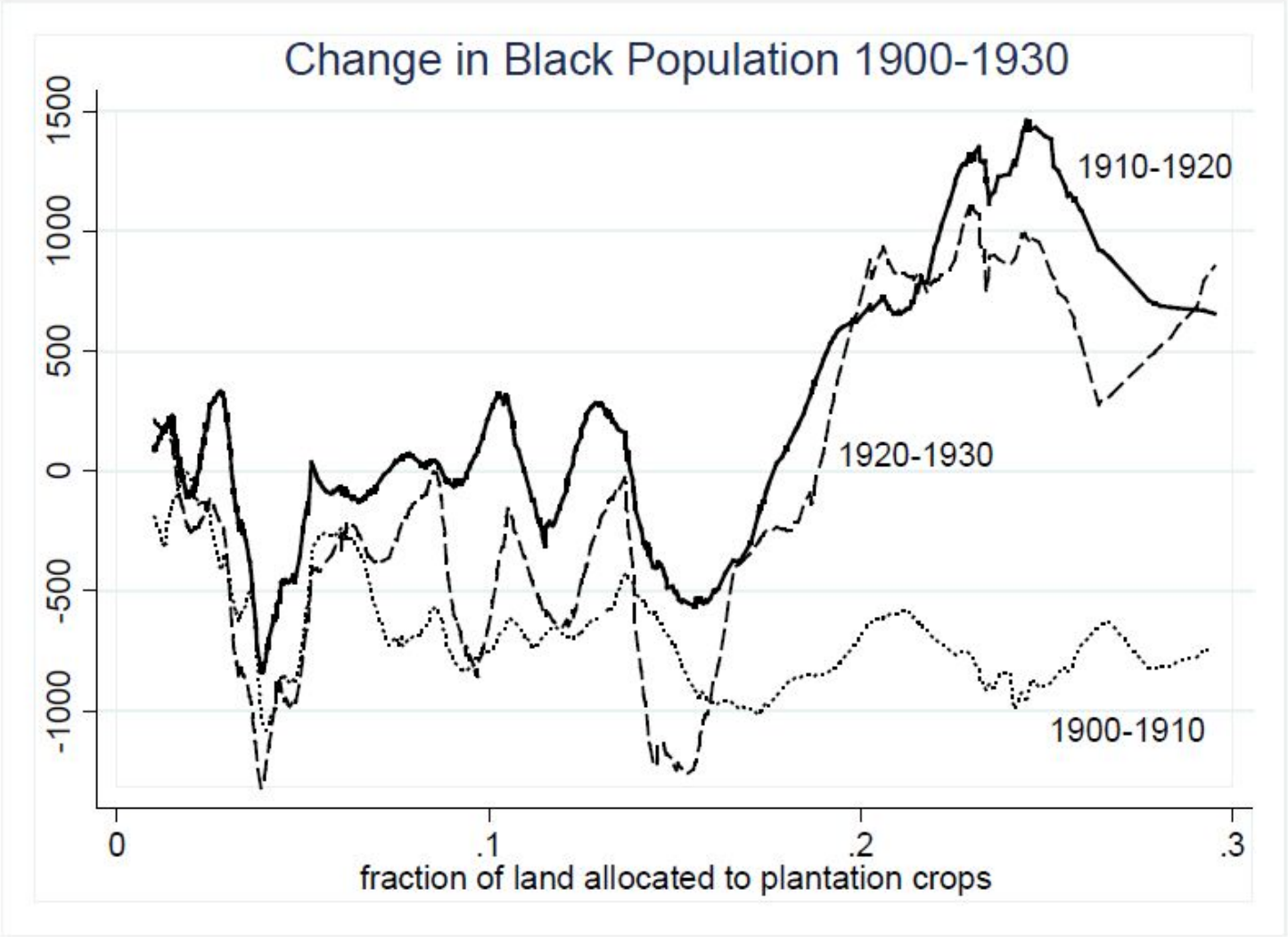

Black Legislator
.8
.6
.4
.2
0
State Representative
State Senator
0
.1
.2
.3
fraction of land allocated to plantation crops

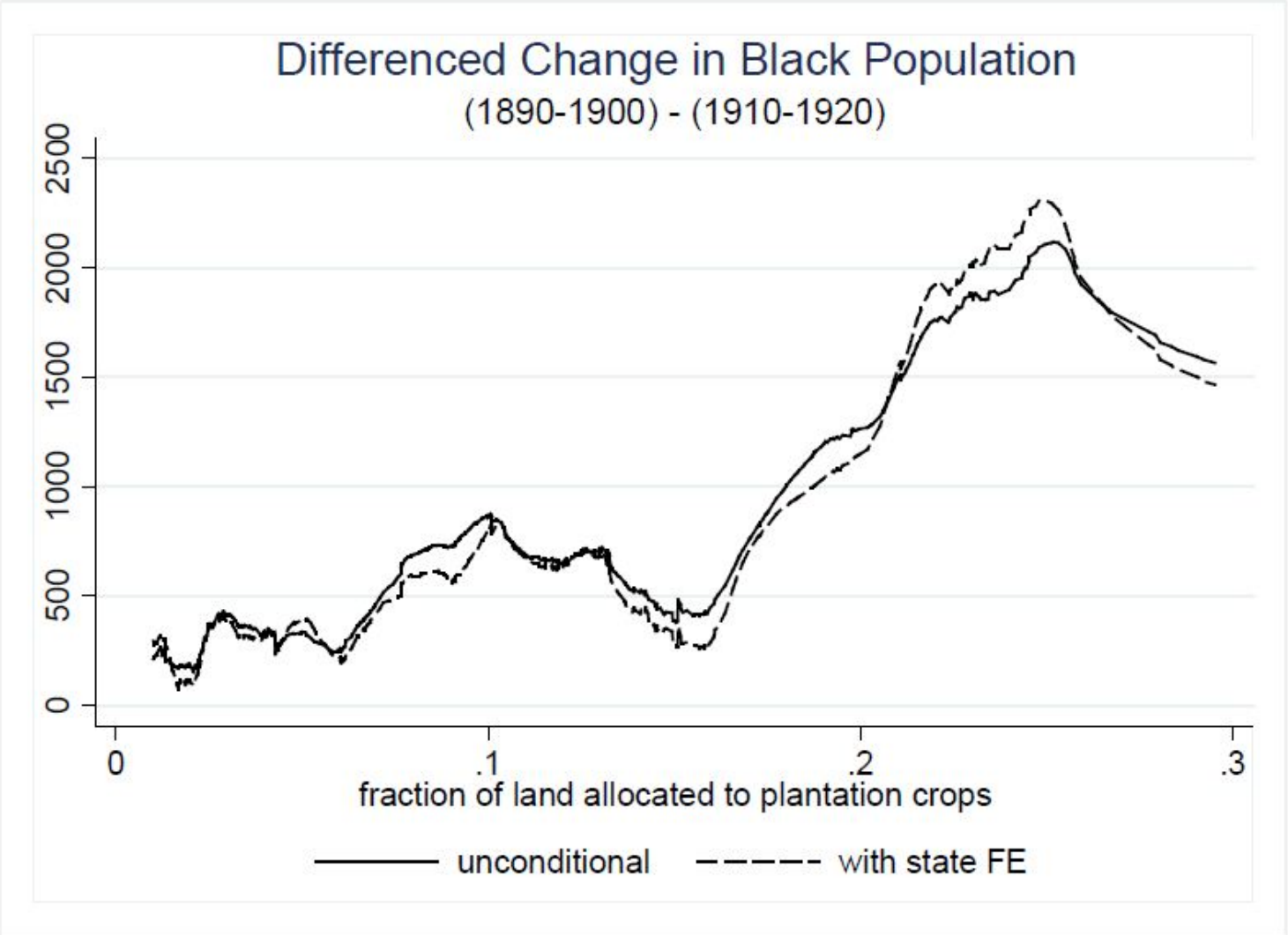
Social Mobilization

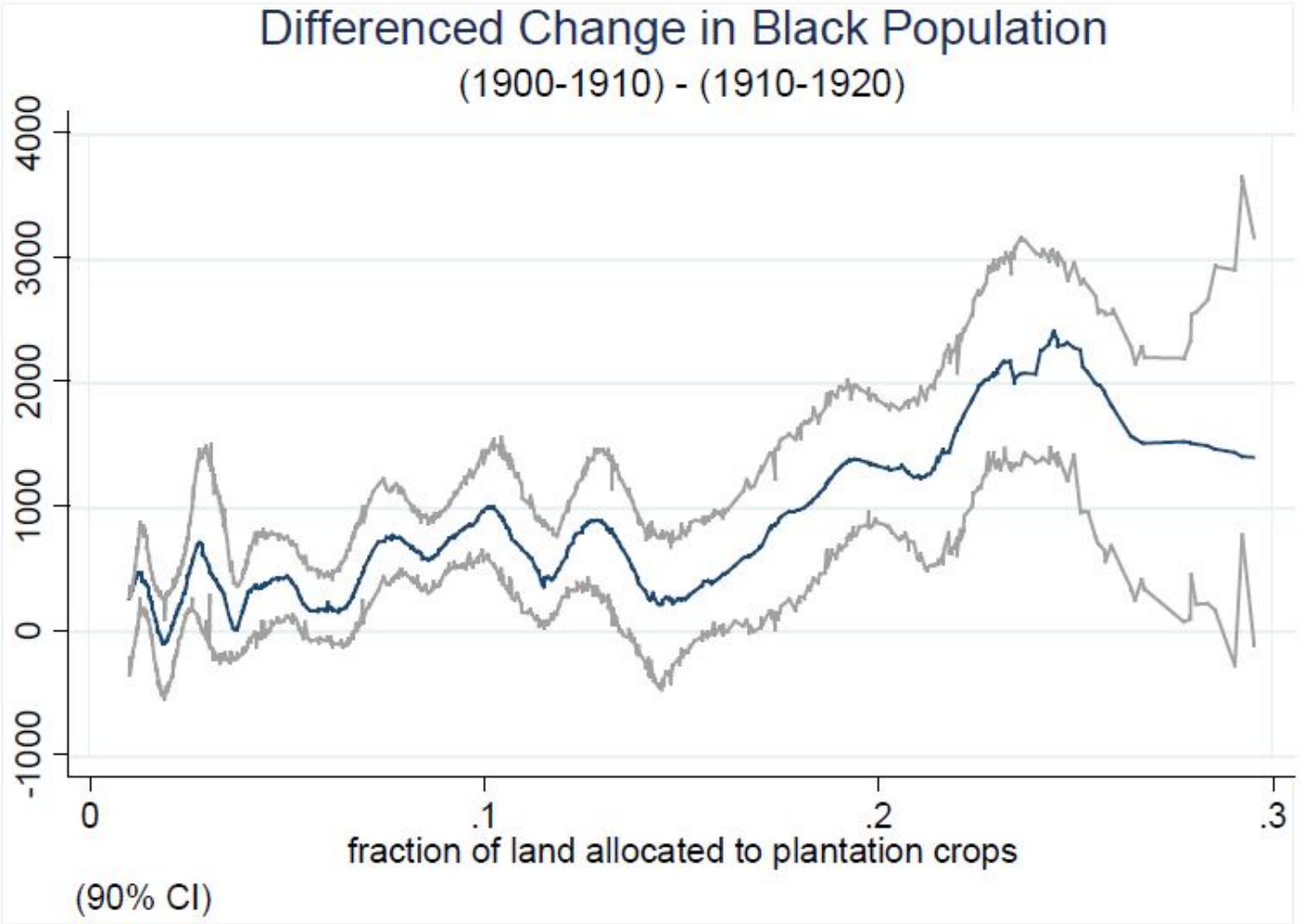
- Slaves could attend church but were not allowed to have their own churches
- Two denominations dominated the postbellum period (Wilson 1985)
  - Methodists (first churches set up in Philadelphia and New York)
  - Baptists (homegrown)
- Census of Religious Bodies separates black and white churches in 1890
  - Average black church size just over 100
  - Black church participation increases linearly in the fraction of land allocated to plantation crops in 1860
  - These results can be explained in the context of the model by low c and a very concave Φ function

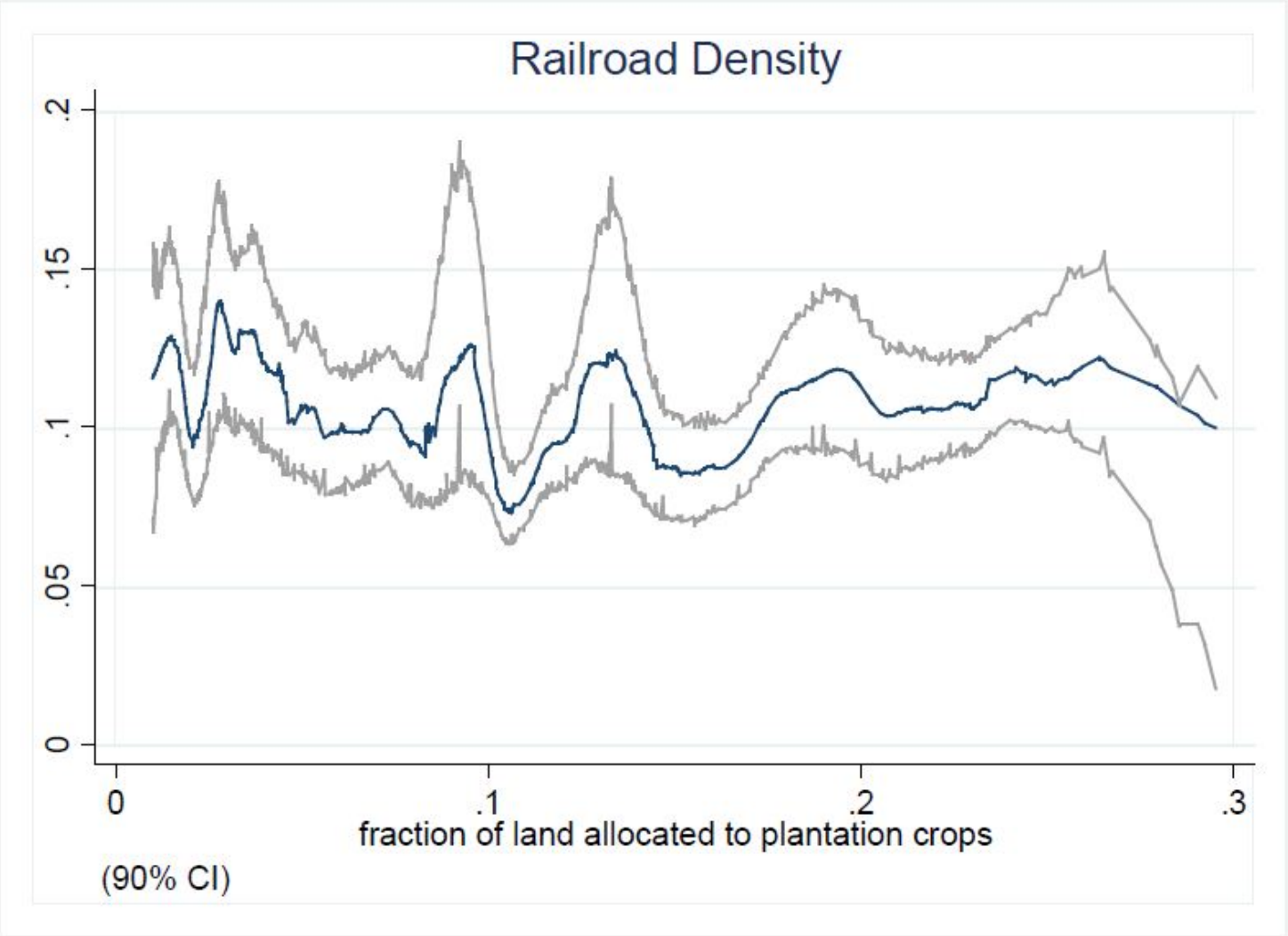
Economic Mobilization

- The Great Migration 1915-1960 moved 5 million blacks to the north. Largest migration in U.S. history (Harrison 1992)
- Explanations for variation in migration rates
  - Economic conditions (Boustan 2010)
  - Education (Margo 1990)
  - Railroads (Sanders 2010)
  - Social Capital (use non-linearity and matched county data)


Change in Black Population 1900-1930
1500
1000
500
0
-500
-1000
1910-1920
1920-1930
1900-1910
0
.1
.2
.3
fraction of land allocated to plantation crops


Differenced Change in Black Population
(1890-1900) - (1910-1920)
0
500
1000
1500
2000
2500
0
.1
.2
.3
fraction of land allocated to plantation crops
unconditional
with state FE


Differenced Change in Black Population
(1900-1910) - (1910-1920)
4000
3000
2000
1000
0
-1000
0
.1
.2
.3
fraction of land allocated to plantation crops
(90% CI)


Railroad Density
0
.05
.1
.15
.2
0
.1
.2
.3
fraction of land allocated to plantation crops
(90% CI)

Conclusion

- In the U.S. application, historical disadvantage is coincidentally *positively correlated* with conditions (population density) that facilitate collective mobilization
- In the Indian application, historical disadvantage *increases* the rate at which new networks strengthen
- Historical disadvantage does not appear to be a constraint, so why do such transitions not occur more often?
- The absence of opportunities may be the answer
  - Opportunities for economic mobility did not arrive until 1915 in the south
  - Kathiawaris had to wait for a confluence of favorable circumstances to break into business