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1 Introduction

What consequences did slavery have for the strength and stability of the African-American community? This is an old and contentious question. Historians writing in the first half of the twentieth century took the view that slavery, through forced separation and by restricting social interaction, permanently undermined the black community (Du Bois 1908, Frazier 1939, Stampp 1956). The publication of the Moynihan Report in 1965, linking slavery to contemporary social problems among African-Americans, resulted in a complete reversal of this position. Although the Report merely summarized the conventional wisdom at the time, the racially charged controversy that it generated and the resulting backlash spawned a revisionist history that documented a stable, vibrant African-American family and community, both during and after slavery (Blassingame 1972, Genovese 1974, Gutman 1976).

More recently, historians such as Fogel (1989) and Kolchin (1993) have pointed to the frequency of forced familial separation, the relatively small fraction of slaves who lived in large plantations where close-knit communities could form, and the virtual absence of slave rebellions (one indicator of collective mobilization) to argue that "an even-handed appraisal must not only incorporate the important revisionist work of the past two decades but also come to grips with the insecurity of slave life, the limits to slave autonomy, and the particular character that 'community' assumed among the slaves" (Kolchin 1993: 151). Some social scientists have gone even further to assert that "[s]lavery was, in fact, a social system *designed* to destroy social capital among slaves" (Putnam 2000: 294) with current differences in social capital across American states attributed in part to historical slavery, bringing the literature back full circle.

Did slavery permanently destroy the ability of African-Americans to organize themselves and form stable communities as suggested by Putnam and the early historians? Despite the scientific importance and policy relevance of this question, little quantitative evidence has been brought to bear on the subject. Differences between blacks and whites in social capital, or any other individual or institutional outcome, cannot be necessarily attributed to slavery. These differences could arise, for example, due to the discrimination and injustices that continued long after emancipation. The innovation of this paper is to look *within* the African-American population shortly after emancipation. Two significant opportunities presented themselves to African-Americans in the decades following the Civil War. First, blacks were able to vote and elect their own leaders during and just after Reconstruction, 1870-1890. Second, they were able to leave the South and find jobs in northern cities during the Great Migration, 1916-1930. In both of these episodes, blacks would have fared much better if they had worked together to achieve common goals. We will provide evidence that blacks were indeed able to mobilize collectively to achieve these goals, but only in areas

(counties) where specific historical preconditions were satisfied.

A distinctive feature of the antebellum South was the unequal size of slaveholdings and the uneven distribution of the slave population across counties (Stampp 1956). This variation arose as a natural consequence of geographically determined cropping patterns (Wright 1978, 1986). Where plantation crops such as cotton, tobacco, rice, and sugarcane could be grown, slaveholdings and the slave population tended to be large. However, a substantial fraction of slaves, roughly three-quarters of the population, lived in counties with widely dispersed family farms (Genovese 1974). The opportunities for social interaction and the potential to create communities would have been limited in these counties, before and after emancipation. The share of land allocated to the four plantation crops, adjusting for differences in labor intensity across these crops, thus provides a measure of predetermined social ties in each county. We will refer to this measure henceforth as the "plantation share." Nonlinearities are commonly generated in models with network effects or peer effects because there is an externality associated with individual participation. We uncover a specific and consistent nonlinear relationship between the response to political *and* economic opportunities in the postbellum period and the plantation share, which will be shown to be indicative of black collective mobilization in some counties but not others.

Blacks had the freedom to vote and elect their own leaders for a brief period during and just after Reconstruction (Morrison 1987, Foner 1988). They would naturally have voted for the Republican party (the party of the Union) at this time and so black political participation in each southern county can be measured by the number of Republican votes. The number of blacks in our southern counties is monotonically increasing in the plantation share. Nevertheless, initial results in Section 2, using 1872 election data, show that the number of Republican votes across counties is *flat* up to a threshold share, only increasing (steeply) in the plantation share above the threshold.

Starting in the 1890s, blacks gradually began to be disfranchised as Jim Crow laws took effect throughout the South and the nonlinear voting pattern we uncover is no longer discernable by 1900. However, a new (economic) opportunity arose with the Great Migration. Over 400,000 blacks moved north between 1916 and 1918, which exceeds the number that moved in the preceding 40 years, and over a million had left by the time the Great Migration concluded in 1930 (Marks 1989). While a variety of pull and push factors provided the initial impetus for the movement north, networks organized around migrants from the same origin location soon formed in northern cities to secure accommodation and jobs for their members (Gotlieb 1987, Grossman 1989, Carrington, Detragiache, and Vishwanath 1996). Southern counties with stronger social ties would have supported larger networks and, hence, higher levels of migration. The initial analysis in Section 2 uses the black population change across census years to measure out-migration from each southern county over the course of the

Great Migration. The relationship between this measure of migration and the plantation share matches the specific nonlinear relationship that we independently obtain for political participation: migration is flat up to a threshold share and increasing steeply in the plantation share thereafter.

The model that we develop in Section 3 to explain these results extends the canonical permanent wage model to the case where multiple individuals work together as a group on a repeated basis to provide a service to a principal. The principal could have been, for example, a local political leader during Reconstruction or a northern firm during the Great Migration. Each member of the group receives a benefit from participation that is commensurate with the service the group provides to the principal, which is increasing in its size and the strength of social ties. A commitment problem arises because the benefit is received up front by the group, with the expectation that each individual will exert unobserved but costly effort *ex post*. The permanent wage model solves this commitment problem by allowing the principal (employer) and the individual worker to interact repeatedly and by setting the wage so that the individual is indifferent between working and shirking in any period. In our model, the size of the group adjusts endogenously, depending on the strength of social ties, so that participants are indifferent between working and shirking. The main theoretical result is that cooperation cannot be supported below a threshold level of social ties. Above that threshold, the maximum group size that can be supported without sub-groups deviating in any period is increasing in the strength of social ties.[1] If the strength of these ties is increasing in plantation share, then our model provides a simple interpretation, based on variation in collective mobilization across southern counties, for the empirical results described above.

Section 4 of the paper subjects these results to greater scrutiny. Voter turnout is not available by race and so one concern is that the patterns we have uncovered are driven by underlying variation in white votes across counties. As noted, there is no relationship between the number of Republican votes and plantation share in 1990, by which time blacks were effectively disfranchised. This is consistent with the hypothesis that the nonlinear relationship we do observe in the 1870s and 1880s was driven by black voters. Black collective mobilization should also have resulted in an increase in black leaders to the extent that black voters wanted to elect members of their own race. Reassuringly, the probability that a black leader was elected from the county tracks perfectly with the pattern of Republican votes in the 1870s and 1880s.

The measure of out-migration described above is computed as the black population change from 1910 to 1930 *minus* the corresponding change from 1890 to 1910 to adjust

[1]Instead of making social ties increase the efficiency of production, an alternative formulation of the model allows social ties to increase the punishment for deviations from cooperative behavior which, in turn, supports greater mobilization.

for natural changes in the population (assuming that these changes were stable over the two decades). To provide further support for the robustness of the migration result, we construct a second measure using newly available data from Mississippi linking migrants from southern counties to northern cities. Although these data do not provide the year of migration, they provide a direct measure of migration at the county level around the time of the Great Migration. Reassuringly, this measure of migration is highly correlated with our first (indirect) measure derived from the population census. With both measures, the pattern of migration across Mississippi counties matches the pattern across all southern counties: migration is flat up to a threshold plantation share and increasing steeply in the share thereafter. Because the Mississippi data include the destination city for each migrant, assuming that the city he died in was the city to which he moved, we can compute not only the level of migration from each southern county but also the spatial distribution of migrants across northern destination cities. Migrants who move as a group will move to the same place. This implies that spatial concentration should track with the level of migration and this is indeed what we observe.

The identification of network effects, and community effects more generally, with observational data is a challenging problem. Our analysis exploits a specific nonlinearity that we uncover in the data, and explain with a model of collective mobilization, to rule out alternative models. We consider two alternative models in which social ties are irrelevant. These models cover the major explanations for variation in political participation and migration across southern counties that have appeared in the literature. The first alternative model assumes that an external agency such as the Republican party or a northern firm solves the commitment problem and organizes voting or migration. The second alternative model assumes that individuals vote and migrate independently, but that the cost associated with these decisions varies across counties. For example, three push factors that have featured prominently in the literature on the Great Migration are the boll weevil invasion, which drastically reduced cotton cultivation and the demand for black labor in certain counties, the segregation and racial violence that accompanied the Jim Crow laws, and the arrival of the railroads (Marks 1983, Tolnay and Beck 1990, Wright 1986). Although the alternative models can generate variation in political participation or migration across counties with different plantation shares, neither of these models is consistent with the nonlinear pattern with a slope discontinuity that we observe for *both* of these outcomes.

The evidence reported in this paper indicates that African-Americans were able to successfully mobilize in response to new opportunities that became available during the post-bellum period. However, there was wide variation in this response across southern counties. This is not because blacks were intrinsically incapable of working together, but because the organization of agricultural production under slavery and thereafter placed exogenous con-

straints on the frequency of social interactions and the strength of social ties that could emerge. While some counties, where paradoxically blacks were the most disadvantaged, mobilized very successfully, a substantial fraction of the black population resided in counties below the plantation share threshold. Blacks residing in counties below the threshold would have left with relatively little social support during the Great Migration, whereas those above the threshold would have migrated in large groups to a limited number of northern destinations. As discussed in Section 5 of the paper, these differential patterns of migration would have had consequences for the evolution of African-American communities in northern cities and in sending southern counties over the course of the twentieth century. Slavery did have long-term consequences, but this worked through a channel that has previously been unexplored.

2 Postbellum Opportunities and Constraints

This section describes two new opportunities that presented themselves to African-Americans in the postbellum period: (i) the opportunity to vote and elect their own leaders during and just after Reconstruction, 1870-1890 and (ii) the opportunity to migrate to northern cities during the Great Migration, 1916-1930. We are interested in the relationship between predetermined social ties and the collective response to these opportunities across southern counties. This section concludes with a description of these social ties and preliminary evidence supporting this relationship.

2.1 Political Opportunities

Three amendments to the Constitution, passed in quick succession after the Civil War, gave political representation to African-Americans. The 13^{th} Amendment, passed in 1865, abolished slavery. The 14^{th} Amendment, passed in 1866, granted full rights of citizenship to African-Americans. And the 15^{th} Amendment, passed in 1869, gave them the right to vote. This opportunity coincided with the Reconstruction Act of 1867, which put the Confederate states under military (Federal) rule for the next decade. Blacks voted in large numbers for the Republican party during this period and elected their own leaders. But Southern Democrats began to reassert themselves soon after Reconstruction had ended, and southern states began passing legislation from the early 1890s that effectively eliminated blacks from the electorate by 1900 (Du Bois 1908, Morrison 1987).

Although external organizations such as the Freedmen's Bureau and the Union League were active during Reconstruction, the major impetus for African-American political participation came from within (Stampp 1966, Foner 1988).[2] "In record time they organized,

[2]At its peak in 1866, the Freedmen's Bureau employed only 20 agents in Alabama and 12 in Mississippi.

sponsored independent black leaders, and committed themselves to active participation ... It was now possible for blacks to not only field candidates for election but to influence the outcome of elections by voting" (Morrison 1987: 35). During Reconstruction, as many as 600 blacks sat in state legislatures throughout the South. While this political success is impressive, what is even more impressive is the discipline and courage shown by black voters in continuing to vote Republican in large numbers and to elect their own leaders through the 1880s and even into the 1890s, after Federal troops had left the South (Kolchin 1993).

Where did the black leaders come from? To answer this question we need to understand the formation and evolution of the African-American church. Blacks began to convert to Christianity around the middle of the eighteenth century (Woodson 1921, Boles 1988, Kolchin 1993). While slaves worshipped in multiracial churches for the most part, they did appear to have some autonomy in the choice of denomination and most chose to be either Baptist or Methodist (Woodson 1921, Boles 1988, Genovese 1974). Outside the formal church, slaves also worshipped away from their masters in the "invisible institution," which spontaneously evolved into independent black congregations following emancipation (Frazier 1964, Boles 1988, Dvorak 1988, Kolchin 1993). The church was the center of community life in the postbellum period and it was natural that black political leaders would be connected to this institution (Du Bois 1908, Woodson 1921, Frazier 1964, Dvorak 1988). "... preachers came to play a central role in black politics during Reconstruction ... Even those preachers who lacked ambition for political position sometimes found it thrust upon them" (Foner 1988:93). African-American communities did not passively supported their leaders. The political support they provided gave them leverage, and benefits in return, until they were disfranchised towards the end of the nineteenth century (Morrison 1987).

2.2 Economic Opportunities

The first major movement of blacks out of the South after the Civil War commenced in 1916. Over the course of the Great Migration, running from 1916 to 1930, over one million blacks (one-tenth the black population of the United States) moved to northern cities (Marks 1983). This movement was driven by both pull and push factors. The increased demand for labor in the wartime economy coupled with the closing of European immigration, gave blacks new labor market opportunities (Mandle 1978, Gottlieb 1987). Around the same time, the boll weevil invasion reduced the demand for labor in southern cotton-growing counties (Marks 1989). Adverse economic conditions in the South, together with segregation and racial violence, encouraged many blacks to leave (Tolnay and Beck 1990). Their movement was facilitated by the penetration of the railroad into the deep South (Wright 1986). A confluence

It ceased most of its activities by the end of 1868 and was officially abolished in 1872, before black political participation even began (Kolchin 1993).

of favorable and unfavorable circumstances thus set the stage for one of the largest internal migrations in history.

How did rural blacks hear about new opportunities in northern cities? The first links appear to have been established by recruiting agents acting on behalf of northern railroad and mining companies (Henri 1975, Grossman 1991). Independent recruiters, who charged migrants a fee for placing them in jobs, were soon operating throughout the South (Marks 1989). Apart from these direct connections, potential migrants also heard about jobs through ethnic newspapers. The *Chicago Defender*, which has received much attention in the literature, increased its circulation from 33,000 in 1916 to 125,000 in 1918. Industries throughout the Midwest sought to attract black southerners through classified advertisements in that newspaper (Grossman 1991).

Although external sources of information such as newspapers and recruiting agents played an important role in jump-starting the migration process, and agencies such as the Urban League provided migrants with housing and job assistance at the destination, networks linking southern communities to specific northern cities, and to neighborhoods within those cities, soon emerged (Gottlieb 1987, Marks 1991). Just as the church was the center of community life in the South, Baptist and Methodist churches supporting these migrant networks were quickly established (Frazier 1964, Gottlieb 1987, Grossman 1991). "[These] network[s] stimulated, facilitated, and helped shape the migration process at all stages from the dissemination of information through the black South to the settlement of black southerners in northern cities" (Grossman 1991: 67).

Two broad classes of jobs were available to blacks in northern cities: unskilled service and manufacturing jobs and skilled manufacturing jobs. Connections were needed to gain access to the skilled jobs and many migrants did find positions with the help of referrals from their network. However, much of the literature on black labor market networks during the Great Migration focuses on information provision rather than job referrals (eg. Grossman in Chicago and Gottlieb in Pittsburgh). "Unlike the kinship networks among European immigrants ... which powerfully influenced the hiring of foreign-born newcomers, the southern blacks' family and friends apparently had less leverage inside the workplace" (Gottlieb 1987: 79). A number of explanations are available for the apparent weakness of black networks. First, discrimination by employers and the exclusion of blacks from labor unions could have prevented them from entering skilled occupations in the numbers that were needed for networks to form (Grossman 1991, Collins 1997). Second, blacks may have been less socially cohesive than arriving European migrants (Frazier 1939). Our analysis provides economic foundations for the second explanation, using predetermined features of the southern counties from which the migrants were drawn to explain their relatively low level of social cohesion (on average) in the North.

2.3 Social Constraints

Three features of U.S. slavery distinguished it from slavery elsewhere in the Americas. First, the cultivation of diverse plantation crops in the U.S. as opposed to sugarcane alone in the Caribbean and South America resulted in smaller slaveholdings and greater variation in the size of these slaveholdings. One-quarter of U.S. slaves resided in plantations with less than 10 slaves, one-half in plantations with 10-50 slaves, and the remained in plantations with more than 50 slaves (Stampp 1956, Genovese 1974). In contrast, the median slave in Jamaica lived on a plantation with 150 slaves and one-quarter of the slaves lived on plantations with 250 slaves (Fogel 1989). Second, slaves in the antebellum period were dispersed throughout the American South, resulting in extremely low black population densities on average (Kolchin 1993). However, densities were substantially higher in counties where the geography allowed labor intensive plantation crops like tobacco, cotton, rice, and sugarcane to be grown. Approximately 100 slaves worked on a rice or sugarcane plantation in the United States, 35 on cotton plantations, and a somewhat smaller number on tobacco plantations (Fogel 1989). Third, the inter-state slave trade frequently separated families and plantation communities. This trade was responsive to changes in crop prices and cultivation patterns (Stampp 1956). For example, close to one million slaves moved to southwestern cotton states between 1790 and 1860 as production of that crop boomed (Fogel 1989, Kolchin 1993). Although Fogel and Engerman (1974) estimate that 84 percent of the slaves that moved west migrated with their owners, most other historians assign much greater weight to slave sales (Tadman, 1989, for instance, estimates that sales accounted for 70-80 percent of the slave movement).

A community, which supports collective action and punishes deviations from cooperative behavior can only form if individuals interact with one another sufficiently frequently on a regular basis. Forced separation would naturally have undermined the stability of slave communities (Du Bois 1908, Frazier 1939). Despite these challenges, the slave quarter and the independent informal church that often formed within the quarter, have been identified as domains within which cooperation, mutual assistance, and black solidarity did, nevertheless, emerge (Blassingame 1972, Genovese 1974). "[Large plantations] permitted slaves to live together in close-knit communities – the slave quarters – where they could develop a life of their own" (Fogel 1989: 170). Most slaveholdings were too small to support such communities and interactions across plantations were relatively infrequent (Stampp 1956). Thus, viable communities could only have formed in the antebellum period in those counties where tobacco, cotton, rice, and sugarcane were grown and plantations were relatively large. Following the Civil War, new labor market opportunities opened up for the freedmen (Wright 1986). However, most blacks did not abandon their home plantations and those who

did traveled only a few miles (Mandle 1978, Foner 1988, Steckel 2000).[3] Given the low black population density in most counties, the opportunities for social interaction would have remained limited in the postbellum period. Once again, the greatest potential for community formation would have been in counties where labor intensive plantation crops – tobacco, cotton, rice, and sugarcane – were grown.

Reconstruction was more radical and persistent in the deep South (Kolchin 1993). During the Great Migration, the heaviest black out-migration occurred in an area that had been dominated by the plantation cotton economy (Tolnay and Beck 1990). "Some counties were characterized by extremely high out-migration, while others maintained relatively stable black populations ... Such intra-state variation raises interesting questions about the causes of the differential migration ... Was the cotton economy particularly depressed? Were blacks subjected to more brutal treatment by whites in those areas? Did economic competition between blacks and whites restrict economic opportunity, and thereby encourage out-migration?" (Tolnay and Beck 1990: 350). Our explanation for (part of) the variation across counties is based on internal rather than external forces. Plantations would have been larger and social interactions would have been more frequent in counties where a greater fraction of land was allocated to the four labor intensive plantation crops (not just cotton). Based on the discussion above, social ties would have been stronger in those counties, allowing blacks to work together to achieve common objectives during Reconstruction *and* during the Great Migration.

To test this hypothesis, the first step is to construct a measure of social ties. The earliest year in which crop-specific acreage is available at the county level from the agricultural census is 1890. The simplest measure of social ties that we construct is the share of cultivated land allocated to tobacco, cotton, rice, and sugarcane in that year. A more sophisticated measure adjusts for differences in labor intensity across the four crops, normalizing the weighted statistic so that the mean and variance of the two measures are the same.[4] We will use the second measure – the plantation share – in all of the analysis reported below, although the results are very similar with either measure. The implicit assumption when using 1890 acreage allocation to construct a predetermined measure of social ties is that

[3]Federal assistance to former slaves who sought to acquire land was extremely limited (Kolchin 1993). 40,000 blacks in Georgia and South Carolina were granted land for homesteading by General Sherman in 1865, but the land was returned to their original owners by President Johnson. Similarly, only 4,000 blacks, most of whom resided in Florida, benefited from the Homestead Act of 1866.

[4]Weighted plantation share=0.083 cotton + 0.133 sugarcane + 0.15 rice + 0.333 tobacco, where cotton, sugarcane, rice, and tobacco are measured by the fraction of farm area assigned to each crop and the weights represent the number of workers per acre. These (technological) weights are obtained from Olstead and Rhodes (2010), Niles Weekly Register (1835), House (1954), and Earle (1992), respectively. This weighted statistic is normalized to have the same mean and standard deviation as the unweighted statistic. After this normalization, observations with values exceeding 0.3 are dropped (these outliers account for 1.5 percent of all counties).

cropping patterns are geographically determined and therefore relatively stable over time, and that the black population was relatively immobile until the Great Migration. To provide support for these assumptions we computed the correlation between the slave population in 1860 and the black population in 1890 using data from the population census. This correlation, at the level of the county, is as high as 0.85. We also computed the correlation between our (weighted) measure of social ties in 1890 and the corresponding measure in 1910, based on data from the agricultural census in those years. This correlation, once again at the level of the county, is as high as 0.92.

Figure 1 describes the plantation share in the 15 southern states in which slavery existed prior to emancipation.[5] The message to take away from the figure is that there is substantial variation in this statistic across states and, more importantly, across counties within states. We will take advantage of this variation to include state fixed effects in all the results that we report, although the results are very similar with and without fixed effects. Figure 2 provides preliminary evidence on the relationship between political participation and migration and our predetermined measure of social ties. Political participation is measured by the number of Republican votes in the county in the 1872 presidential election, at which point in time blacks could freely vote and elect their own leaders. Migration is measured by black population change in the county from 1910 to 1930 minus the corresponding change from 1890 to 1910 (to control for natural changes in population across counties). The nonparametric regressions presented in Figure 2 indicate that political mobilization and migration are flat up to a threshold share and increasing in the plantation share thereafter.[6] Nonlinearities are commonly generated in models with network and peer effects because there is an externality associated with individual participation. The model that we develop below will go a step further to provide an explanation for the specific nonlinearity that we have uncovered in Figure 2. That specific nonlinearity will be used to rule out alternative explanations, such as the push factors for out-migration discussed above, that are based on the independent individual response to opportunities across counties rather than collective mobilization.

[5]The slave states are Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, Texas, and Virginia. Among these states, Kentucky, Missouri, Delaware, and Maryland did not join the Confederacy.

[6]State fixed effects are partialled out nonparametrically using a two-step procedure in Figure 2 and all the figures that follow. In the first step, the outcome under consideration (political participation or migration) and each state dummy is separately regressed nonparametrically on plantation share. The residual from the first regression is then regressed on the residuals from the regressions with the state dummies. Using the estimated coefficients, the state fixed effects can be differenced from the dependent variable. This differenced variable is nonparametrically regressed on plantation share in the second step.

3 Theory with a Test

The model developed in this section derives a nonlinear relationship between social ties and collective mobilization that is consistent with Figure 2. The analysis concludes with a statistical test of the model's predictions. This test will be used in Section 4 to empirically validate the model and to rule out alternative explanations for the results that we obtain.

3.1 Production Technology

There are many economic environments in which individuals cooperate to achieve a common objective. For example, a group of individuals could form a cooperative to work together and jointly produce a good. Alternatively, a group of individuals could form a mutual insurance arrangement, pooling their incomes to smooth consumption on the basis of a pre-specified sharing rule. In the applications that we consider, a group of individuals came together to provide a service to a principal, receiving benefits in return. The principal could have been a local political leader during Reconstruction or a northern firm during the Great Migration. Members of the group would have canvassed potential voters and turned out themselves in local, state, and federal elections. Once the leader was elected, the group would have worked on his behalf, helping to provide goods and services to the electorate and increasing his chances of reelection. In return for these services, the group would have received a transfer of some sort. Similarly, workers belonging to the same network could have worked diligently as a team for a northern employer in a production environment where effort was unobserved by the firm, receiving favorable wages in return.

Because the members of the group work together, it is reasonable to assume that the level of service provided by the group is increasing in its size. A larger group would also have greater bargaining power, increasing the benefit it received from the principal in return for the service it provided. For both these reasons, the benefit received by each member of the group will be increasing in its size, N, which is determined endogenously in equilibrium. Members of the group are substitutes for each other and so the service provided, and the benefit received, will be declining in group size at the margin. We introduce social ties, λ, in the model by assuming that these ties allow individuals to work better together. λ varies exogenously across counties, which are otherwise indistinguishable. The benefit derived by each participant can then be described by the function, $W(N, \lambda)$, where $W_N(N, \lambda) > 0$, $W_{NN}(N, \lambda) < 0$, $W_{\lambda N}(N, \lambda) > 0$. The last inequality emphasizes the idea that stronger social ties make the group more efficient.

For analytical convenience we assume that there is a continuum of participants in the group, which thus has measure N. We assume in addition the following boundary conditions:

C1. $N \to 0 \Rightarrow W(N, \lambda) \to 0$

C2. $\lambda \to 0 \Rightarrow W(N, \lambda) \to 0$.

This is just saying that a group of infinitesimal size ($N \to 0$) can provide no service to the principal and that absent social ties ($\lambda \to 0$) a group of any size has no value.

3.2 Social Ties and Equilibrium Group Size

What determines group size or, equivalently, collective mobilization in each county? We bound the equilibrium size of the group by assuming that each member of the group incurs a private effort cost c when it provides the services described above to the principal. Benefits are received up front by the group, with the expectation that each member will exert effort *ex post*. This could well describe the timing of wage setting and work effort in northern jobs, as well as the sequence of transfers (patronage) and community effort during Reconstruction. The commitment problem that arises here is that a self-interested individual will renege on his obligation in a one-shot game. This problem can be avoided if the group interacts repeatedly with the principal. Based on the standard solution to an infinitely repeated game, cooperation can be sustained if individuals are sufficiently patient, i.e. if the discount factor δ is large enough so that the following condition is satisfied:

$$\frac{W(N, \lambda) - c}{1 - \delta} \geq W(N, \lambda).$$

The term on the left hand side is the present discounted value of cooperation for each individual. The right hand side describes the payoff from deviating. In the first period, the deviator or, in our case, an infinitesimal measure of deviators receive the usual benefit without incurring the effort cost. Although effort is not observed immediately, shirking is ultimately revealed to the principal and the rest of the group at the end of the period. The usual assumption is that deviators will be excluded from the group forever after. Other principals are available, but from condition C1 an infinitesimal measure of deviators can provide no useful service to any principal. The continuation payoff is therefore set to zero. Collecting terms, the preceding inequality can be written as,

$$W(N, \lambda) \geq \frac{1 - \delta}{\delta} c.$$

Because there is a continuum of individuals in the group, we assume that the per capita cost c is an infinitesimal number. For $\lambda > 0$, cooperation can always be sustained from the inequality above because $c \to 0$, and since $W(N, \lambda)$ is increasing in N, the entire population of the county will participate.[7] This unrealistic result is obtained because the continuation payoff – set to zero – is independent of N. If cooperation can be sustained for a given

[7] If c was a finite number, it is possible that the inequality would not be satisfied for small λ even if the entire population of the county participated. There would be no participation up to a threshold $\underline{\lambda}$ in that case, but the entire population would continue to participate for counties with $\lambda > \underline{\lambda}$.

group size N, it follows that it can be sustained for any group size larger than N. Genicot and Ray (2003) face the same problem in their analysis of mutual insurance. If individual incomes are independent, then a larger network does a better job of smoothing risk and the entire population should join the insurance arrangement. Genicot and Ray consequently turn to cooperative game theory to place bounds on the size of the group in equilibrium and we will do the same. An appealing and more realistic feature of cooperative games in the context of collective arrangements is that they allow sub-groups rather than individuals to deviate. The continuation payoff is no longer constant because deviating sub-groups can form arrangements of their own and we will see that this pins down the maximum size that the group can attain.

Once we switch to cooperative game theory, the sub-group or coalition rather than the individual becomes the fundamental behavioral unit. Like Genicot and Ray, we only permit credible sub-groups, i.e. those that are stable in their own right, to pose a threat to the group. Moreover, only subsets of existing groups are permitted to deviate. The condition for cooperation can now be described by the expression,

$$\frac{W(N,\lambda)-c}{1-\delta} \geq W(N,\lambda) + \frac{\delta}{1-\delta}\left[W(N',\lambda)-c\right],$$

where N' is the size of the deviating sub-group. The implicit assumption is that other principals are available as long as the sub-group is stable. Collecting terms, the preceding condition can be expressed as,

$$W(N,\lambda) - W(N',\lambda) \geq \frac{1-\delta}{\delta}c.$$

The greatest threat to a group will be from a sub-group that is almost as large, $N - N' \to 0$. If the infinitesimal per capita cost c is of the same order as $N - N'$, the ratio $\tilde{c} \equiv c/(N-N')$ will be a finite number. Dividing both sides of the preceding inequality by $N - N'$, the condition for cooperation is obtained as,

$$W_N(N,\lambda) \geq \frac{1-\delta}{\delta}\tilde{c}.$$

For a given λ, the left hand side of the inequality is *decreasing* in N since $W_{NN}(N,\lambda) < 0$. This implies that there is a *maximum* group size above which cooperation cannot be sustained for each λ (if cooperation can be sustained at all as discussed below). This also ensures that the deviating sub-group of size N' will be stable if the group of size $N > N'$ is stable, as required by our solution concept.

Genicot and Ray show that the largest feasible insurance arrangement is bounded above once they allow for deviations by sub-groups. Our model, in which the group interacts with an external principal, generates stronger predictions that match Figure 2.

Proposition 1. *Cooperation cannot be supported below a threshold level of social ties, $\underline{\lambda}$. Above that threshold, the maximum size of the group that can be supported in equilibrium, N^*, is increasing in the level of social ties, λ.*

To prove the first part of the proposition, we take advantage of condition C2, which tells us that $W_N(N,\lambda) \to 0$ as $\lambda \to 0$. Cooperation cannot be supported for small λ. As λ increases, $W_{\lambda N}(N,\lambda) > 0$ implies that there will be a threshold $\underline{\lambda}$ at which cooperation can be supported, but only for groups of infinitesimal size ($N \to 0$). Above that threshold, since N^* is the largest group that can be supported in equilibrium for a given λ,

$$W_N(N^*,\lambda) = \frac{1-\delta}{\delta}\tilde{c}.$$

Applying the Implicit Function theorem,

$$\frac{dN^*}{d\lambda} = \frac{-W_{\lambda N}(N,\lambda)}{W_{NN}(N,\lambda)} > 0$$

to complete the proof. It is instructive to compare this result and our model with the canonical permanent wage model. In that model, a principal (the firm) interacts with a single worker. The worker's effort cannot be observed immediately by the firm and so a permanent wage contract (repeated game) is used to solve the commitment problem. The wage is set so that the gain from shirking in any period is just offset by the loss in future (permanent) income. In our model, the per capita benefit, which is equivalent to the wage, is determined by the size of the group. The size of the group now adjusts so that each participant is indifferent between shirking and working. Apart from these differences, the structure of the two models is the same.

Instead of making social ties, λ, increase the efficiency of production, an alternative (analytically equivalent) model sets the benefit W to be independent of N and λ, and allows social ties to increase the punishment for deviations from cooperative behavior instead. We could think of W, for example, as being the wage for skilled jobs in a northern city. Workers must exert costly private effort on those jobs and so the firm will only hire individuals if it expects them to be diligent. Suppose that a single individual or, equivalently, an infinitesimal measure of individuals cannot credibly commit to being diligent.[8] What the network does is to increase the cost of deviation by excluding shirkers from future social interactions. If these social interactions are sufficiently valuable, then cooperation can be sustained.

Let the nonpecuniary utility from social interactions be $S(N,\lambda)$. Following an argument along the same lines that we made above, $S_N(N,\lambda) > 0$, $S_{NN}(N,\lambda) < 0$, $S_{\lambda N}(N,\lambda) > 0$. In a noncooperative game, the infinitesimal measure of individuals that deviates receives

[8] Set the payoff from the unskilled job (the outside option) to be zero. Cooperation cannot be sustained if $\frac{W-c}{1-\delta} < W$.

$W + S(N, \lambda)$ without bearing cost c in the period that it deviates and is excluded from skilled jobs and social interactions thereafter. In a cooperative game, the deviating subgroup of measure N' can support economic activity as well as social interaction, albeit at a lower level, receiving a per period continuation payoff $W+S(N', \lambda)$. Following the same steps as above, it is straightforward to verify that Proposition 1 goes through unchanged. The important difference between the alternative model, where social ties support cooperation through collective punishment, and the model described above, where social ties enter the production function, is that the threshold $\underline{S}$ will now be the same regardless of the type of activity (political participation versus labor). This will be true even if W varies by the type of activity. The alternative model thus provides an explanation for the consistent location of the threshold across different activities that we will observe below.

Social ties, λ, are not directly observed by the econometrician. These ties are associated with plantation size and black population density, both of which are increasing in the observed share of land allocated to plantation crops in the county, S. Let social ties λ be a continuous and increasing function of S, $\lambda(S)$. Proposition 1 can then be restated in terms of S: Cooperation cannot be sustained and collective mobilization is flat up to a threshold $\underline{S}$. Above that threshold, collective mobilization is increasing in S, precisely matching Figure 2.

3.3 Testing the Model

The model developed in the previous section can generate the slope discontinuity observed for both political participation and migration in Figure 2. However, it is silent about the precise location of the threshold at which the discontinuity is obtained. To identify the location of the threshold empirically, we estimate a series of piecewise linear regressions that allow for a slope change at different *assumed* thresholds. The pattern of coefficients that we estimate, with accompanying t-ratios, will pin down the location of the *true* threshold and formally test the nonlinearity implied by the model. These implications will later be used to rule out alternative explanations.

Ignoring the state fixed effects to simplify the discussion that follows, the piecewise linear regression that we estimate for each assumed threshold, S, is specified as follows:

$$y_i = \beta_0 + \beta_1 S_i + \beta_2 D_i + \beta_3 D_i(S_i - S) + \epsilon_i \tag{1}$$

where y_i is political participation or migration in county i, S_i is the plantation share in that county, D_i is a binary variable that takes the value one if $S_i \geq S$, and ϵ_i is a mean-zero disturbance term. β_1 is the baseline slope coefficient, β_2 is the level-change coefficient (measuring the level discontinuity at the threshold), and β_3 is the slope-change coefficient. We will estimate this regression for a large number of assumed shares, evenly distributed over the range $[0, 0.3]$.

To derive the pattern of t-ratios that we would expect to obtain, we next proceed to simulate the model. Recall that the model was developed to be consistent with Figure 2. We begin by generating a data set that consists of two variables: the actual plantation share in our southern counties, S_i, and a hypothetical outcome, $\tilde{y}_i$, that approximates the number of Republican votes in those counties in 1872. The hypothetical outcome is generated from the following linear function that broadly matches Figure 2:

$$\tilde{y}_i = 500 + 8000\tilde{D}_i(S_i - 0.08) + \xi_i \tag{2}$$

where $\tilde{D}_i$ is a binary variable that takes the value one if $S_i \geq 0.08$, the "true" threshold in the simulation, and ξ_i is a normally distributed mean-zero error term with the same variance as 1872 Republican votes. Realizations of the error term are drawn from a random number generator to complete the construction of the data set. Notice that the baseline slope coefficient (β_1) and the slope-change coefficient (β_2) are set to zero in equation (2) to be consistent with Proposition 1. To verify that the data we have generated match Figure 2, which is the basis for the simulation, relatively well we nonparametrically regress $\tilde{y}_i$ on S_i in Figure 3A. All the nonparametric regressions in this paper are estimated with a narrow bandwidth. Despite the noise that we have added to the outcome, a slope change at the "true" threshold, 0.08, is clearly visible in the Figure.

Having generated data that match the model, we next proceed to estimate equation (1) sequentially over a large number of assumed thresholds. The t-ratios for β_1 and β_3 are reported in Figure 3B for each of these assumed thresholds. The t-ratio for the baseline slope coefficient remains close to zero for all assumed thresholds below the true threshold and starts to increase thereafter. The t-ratio for the slope-change coefficient starts close to zero, then increases steadily reaching a maximum well above two where the assumed threshold coincides with the true threshold, and then declines thereafter. To understand why the t-ratios follow this pattern, return to Figure 3A and focus on the regression line that is drawn for an assumed threshold to the left of the true threshold. The best fit to the data at that assumed threshold sets $\hat{\beta}_1 = \hat{\beta}_2 = 0$ and $\hat{\beta}_3 > 0$. This implies that the t-ratio on the baseline slope coefficient will be zero and the t-ratio on the slope-change coefficient will be positive. Now suppose we shifted the assumed threshold slightly to the right. It is evident that we would continue to have $\hat{\beta}_1 = \hat{\beta}_2 = 0$ since there is no change to the left of the assumed threshold, but $\hat{\beta}_3$ would increase and the regression line would do a better job of fitting the data to the right of the threshold. The t-ratio on the baseline slope coefficient would remain at zero, while the t-ratio on the slope-change coefficient would increase. This would continue as the assumed threshold shifted gradually to the right until it reached the true threshold.

Once the assumed threshold crosses to the right of the true threshold, the regression line

must fit a piecewise linear function to the left of the assumed threshold. Both $\hat{\beta}_1$ and $\hat{\beta}_2$ will be positive and increasing in magnitude as the assumed threshold shifts to the right. The regression line will nevertheless do an increasingly poor job of fitting the data. This implies that the t-ratio on the baseline slope coefficient is not necessarily monotonically increasing to the right of the true threshold, although it must be positive. In practice, this t-ratio will in fact be monotonically increasing with both political participation and migration. The regression line to the right of the assumed threshold will perfectly fit the data, except for the noise that we have added to the outcome. However, since $\hat{\beta}_1$ is increasing and less precisely estimated as the assumed threshold shifts to the right, the *slope-change* coefficient and the t-ratio on that coefficient will unambiguously decline. The preceding discussion and Figure 3B tell us what to expect when the data are consistent with the model. They also tell us how to locate the true threshold. This will be the assumed threshold at which the t-ratio on the baseline coefficient starts to increase *and* the t-ratio on the slope-change coefficient reaches its maximum value.

4 Empirical Analysis

This section begins by providing empirical support for plantation share as a predetermined measure of social ties. We subsequently document the response to political and economic opportunities in the postbellum South across counties with different plantation shares. This response is consistent with our model of collective mobilization. The empirical analysis concludes by verifying that alternative models can match some but not all the patterns observed in the data.

4.1 Predetermined Social Ties

Social ties in the postbellum South would have been stronger where plantations were historically larger and where more blacks resided in the local area, allowing for frequent social interactions. The first step in the empirical analysis is to establish that both plantation size and the black population in a county are positively correlated with plantation share, our geographically determined measure of social ties.

The 1860 population census provides the number of slaveholdings by size-category in each county.[9] Based on these data, a hypothetical ranking of all slaves in a county can be constructed based on the size of the plantation to which they were assigned. Figure 4A nonparametrically regresses plantation size for the median slave, and the slave at the 25^{th} and 75^{th} percentile of the size distribution, on plantation share. As discussed, tobacco,

[9]These categories are all integers up to 9, 10-14, 15-19, 20-29, 30-39, 40-49, 50-69, 70-99, 100-200, 200-300, and greater than 500.

cotton, rice, and sugarcane were grown on large plantations. Not surprisingly, the size of the slaveholding at each pre-specified percentile level is monotonically increasing in plantation share in the Figure.

To estimate the relationship between the black population in the postbellum period shortly after emancipation and the plantation share, we turn next to the 1870 census. The black population in each county is regressed on plantation share in Figure 4B. Once again we see that the number of blacks is increasing monotonically in plantation share, with formal statistical support for this observation provided below. A larger black population would not result in more frequent social interactions if it was spread over a (proportionately) larger area. Reassuringly, we see that the area of the county in 1880 (the closest available census year with this information) is actually mildly declining in plantation share in Figure 4B.

An obvious alternative explanation for the voting and migration patterns in Figure 2 is that the relationship between black population and plantation share exhibits the same nonlinearity. To examine this possibility we report the t-ratios associated with the test of the model in Figure 4C. The t-ratio on the baseline slope coefficient is greater than two and increasing everywhere. This implies that black population is monotonically increasing in plantation share, which is inconsistent with Figure 2 and the model. Variation in black population across southern counties does not mechanically generate the patterns in Figure 2. The t-ratio on the slope-change coefficient lies below minus-two initially, then increases and even (briefly) crosses plus-two, before declining toward zero. This is indicative of a complex nonlinear relationship between black population and plantation share, which will be useful in ruling out other alternative explanations below.[10]

4.2 Response to Political Opportunities

Black mobilization in a county during Reconstruction would have resulted in greater political participation in the population. Because blacks would have voted Republican at this time, our primary measure of political participation is the number of Republican votes in the county. This statistic is reported at three points in time in Figure 5A, for the 1872, 1880, and 1900 presidential elections. The pattern of votes in 1872, which is at the height of black political power, was reported earlier in Figure 2 and is the motivation for our model of collective mobilization. Although Southern Democrats started to take control and blacks were gradually disfranchised once Reconstruction ended in 1877, blacks continued to vote and to elect their own leaders, with less and less success, into the 1890s. As expected, the

[10]Could the relationship between black population and the plantation share be approximated by a piecewise linear function? We generated a data set using the same functional form as the simulation in Section 3.3 except that the baseline slope coefficient in equation (2) was allowed to have a positive slope. The resulting pattern of t-ratios does not match what we observe in Figure 4C. In particular, the t-ratio on the slope-change coefficient is positive everywhere.

increase in Republican votes past the plantation share threshold is weaker in 1880 than in 1872. However, the specific nonlinearity associated with collective mobilization continues to be obtained. This contrasts with the pattern in 1900, by which point in time blacks would have been completely disfranchised and where we see no relationship between the number of Republican votes and plantation share.

Figure 5B formally tests whether the nonlinear voting pattern we uncovered in Figure 5A in 1872 matches the model. The t-ratio on the baseline slope coefficient is close to zero up to the threshold plantation share in Figure 5A and increasing thereafter. The t-ratio on the slope-change coefficient increases steadily up to that threshold, reaching a maximum value of four, and then declines thereafter. This pattern matches perfectly with the collective model's predictions in Figure 3B and contrasts with what we observed for black population in Figure 4C. We next proceed to establish the robustness of this result. Federal, state, and local elections are synchronized in the American political system and so the voter turnout across counties that we observe for presidential elections would also apply to local elections occurring at the same time, where the implications of the model may be more relevant. Figure 5C reports t-ratios for gubernatorial elections held between 1871 and 1873. The t-ratios are very similar to what we obtained for the 1872 presidential election. The relationship between Republican votes and the plantation share is robust to the type of election and we expect that the same relationship would be obtained with state and local elections, although those data are unavailable.[11]

While the robust nonlinear relationship between Republican votes and plantation share that we have uncovered is indicative of black political mobilization above a threshold share, we do not have direct evidence that the increase in Republican votes was driven by black voters. White "carpetbaggers" from the North and white "scalawags" from the South also voted Republican in southern counties at this time. If the number of white Republican votes was correlated with plantation share, this could confound our interpretation of the results in Figure 5A. One observation from that figure that goes against this alternative explanation is that the number of Republican votes and plantation share were unrelated in 1900, by which time blacks were effectively disfranchised. To provide further support for our hypothesis, we take advantage of the fact that black mobilization should have generated an increase in black leaders, to the extent that blacks wanted to elect members of their own race.

Foner (1993) provides a complete list of black officeholders during Reconstruction. Almost all of these officeholders were elected to positions in state government. We therefore construct

[11]Republican votes in gubernatorial elections are available, by county, from ICPSR. These elections were held at four-year intervals but were not synchronized across states. Figure 5C is thus based on all gubernatorial elections held between 1871 and 1873. Data on congressional elections are also available in this period, but Republican votes are missing for a substantial fraction of counties. The relationship between Republican votes and plantation share in congressional elections nevertheless matches closely with the pattern for the 1872 presidential election in Figure 5A.

two measures of leadership based on his data: whether a black state representative and whether a black state senator was elected from each county in this period. These measures are regressed nonparametrically on plantation share in Figure 6A. The probability that a black leader, especially a state representative, was elected from a county tracks closely with the pattern of Republican votes in 1872 and 1880, indicating that voting patterns in those years were indeed being driven by black voters. Figure 6B completes the analysis of black leadership by testing the nonlinear relationship with plantation share obtained for state representatives (who accounted for most black leaders) in Figure 6A. Matching Figures 5B and 5C, which test the corresponding relationship for Republican votes, the t-ratio for the baseline slope coefficient is zero up to the same threshold share and increasing thereafter. The t-ratio on the slope-change coefficient increases up to that threshold, reaching a maximum above five, and then declines thereafter. Voting patterns and black leadership during Reconstruction match perfectly with our model of collective mobilization.

The county covers a large area. Given the high transportation and communication costs at the time, it is unlikely that the residents of an entire county were able to work together to support a political leader. As described in Section 2, community life in the postbellum period was centered on the church and not surprisingly African-American churches played an important political role during Reconstruction (Frazier 1964, Dvorak 1988). African-American politicians were disproportionately drawn from the clergy and church congregations worked together to support local leaders (Woodson 1921, Foner 1988). If the county was divided into smaller spatial units that more appropriately defined the scope of the community, then the level of collective mobilization can be conveniently measured by the (maximum) size of the church congregation that could be supported in equilibrium. The level of collective mobilization in each local area would then map into the level of mobilization in the county as a whole as described in Figure 5A and Figure 6A, up to a positive constant.[12]

The Census of Religious Bodies (CRB) provides information on churches in each county, by denomination, at roughly ten-year intervals from 1860 onwards.[13] We measure average congregation size in each denomination by the ratio of church members to the number of churches. This information is available from 1890 onwards.[14] The 1890 census round is the only round in the postbellum period that provides information separately for exclusively African-American sub-denominations within the Baptist and Methodist churches. Some of

[12]Suppose that each county is divided into L local areas. Our estimates of church congregation-size provide a measure of the level of collective mobilization that can be supported in each area. Multiplying congregation-size at each plantation share by L times an appropriate constant, it is evident that mobilization at the local and county level will display the same nonlinear pattern.

[13]The CRB was conducted as part of the population census from 1860 to 1890, with census enumerators collecting information from individual churches in each county. Subsequently, the U.S. Bureau of the Census conducted the CRB separately from the population census in ten-year intervals from 1906 to 1936.

[14]Census rounds prior to 1890 provide the number of church seats. This is less informative in the decades after emancipation because many churches were used in rotation by multiple congregations (Foner 1988).

these sub-denominations, such as the African Methodist Episcopalian (AME) Church and the African Methodist Episcopalian Zion (AMEZ) Church, were established by freed blacks in northern cities at the beginning of the nineteenth century (Du Bois 1908). Black Baptist sub-denominations coalesced much later (Frazier 1964).

When southern blacks were forming their own congregations after emancipation, they could remain part of the mainstream Baptist and Methodist denominations they belonged to as slaves, or they could affiliate with these exclusively African-American sub-denominations, which spread throughout the South after the Civil War. The advantage of having information on the African-American sub-denominations is that the average congregation-size we compute for them will be based entirely on black congregations. Southern whites, like southern blacks, were most often Baptist or Methodist (Kolchin 1993). The average congregation-size that we compute for the Baptists and the Methodists as a whole will thus be based on black as well as white congregations. For this reason, the analysis of congregation-size that follows will be restricted to the 1890 census and will separately consider Baptists and Methodists, African-American sub-denominations among the Baptists and Methodists, and other non-Black denominations such as the Presbyterians, Episcopalians, and Catholics.[15]

Figure 7A nonparameterically regresses average congregation size in each set of denominations described above on plantation share. The pattern for the Baptists and Methodists and for the African-American sub-denominations matches the corresponding pattern for black political participation and leadership that we obtained earlier: average congregation size is flat up to a threshold share and increasing in plantation share thereafter. Notice that the increase in congregation size is greater for the African-American sub-denominations than for Baptists and Methodists as a whole. This implies that the results are not being driven by variation in the size of white congregations across counties. Consistent with this interpretation, no particular relationship between congregation size and plantation share is observed for other (non-black) denominations. Figure 7B formally tests whether the nonlinear pattern observed in Figure 7A for the Baptists and the Methodists is consistent with our model of collective mobilization. The t-ratios for the baseline slope and slope-change coefficients display the familiar pattern and the same result would be obtained with the African-American sub-denominations except that the coefficient on the slope-change variable is slightly less precisely estimated and the threshold matches more closely with the thresholds obtained earlier for voting and black leadership. Figure 7A thus provides micro-foundations, based on collective mobilization at the appropriate spatial level, for variation in political participation and black leadership across counties.

[15]The African-American sub-denominations included in the 1890 CRB are Regular Baptist (colored), African Methodist Episcopal, African Methodist Episcopalian Zion, Colored Methodist Episcopalian, and Colored Cumberland Presbyterian. Among these sub-denominations, only the Cumberland Presbyterians, who had a small following, fell outside the umbrella of the Baptists and the Methodists.

4.3 Response to Economic Opportunities

Based on the model, black mobilization during the Great Migration should have generated a higher level of migration above a plantation share threshold. Retaining the notation of the model, let $N(S)$ be the measure of migrants from the county, where S is the plantation share. The model tells us that $N_S(S) > 0$ above the threshold $\underline{S}$. If we take the model entirely seriously, there should be no migration below the threshold. To reconcile the model with the preliminary results in Figure 2 and the results that follow, we make the additional assumption that a constant measure of individuals n migrates from each county without the support of a community network.[16]

The model can then be easily extended to generate predictions for the *distribution* of migrants across northern destinations. Assume that the n individuals who migrate on their own are distributed evenly across $M \geq 2$ destinations. The $N(S)$ individuals who move as a group form a network at a single destination. The Herfindahl-Hirschman Index, which is defined as the sum of the squared share of migrants across all destinations, can then be used to measure the concentration of migrants in the north. Below the threshold $\underline{S}$, $N(S) = 0$. This implies that the Herfindahl-Hirschman Index, $H(S) = M\left[\frac{n/M}{n}\right]^2 = 1/M$, is uncorrelated with plantation share. Above the threshold,

$$H(S) = \left[\frac{\frac{n}{M} + N(S)}{n + N(S)}\right]^2 + (M-1)\left[\frac{\frac{n}{M}}{n + N(S)}\right]^2.$$

Differentiating this expression with respect to S,

$$H_S(S) = \frac{2(M-1)\frac{n}{M}N(S)N_S(S)}{[n + N(S)]^3} > 0.$$

The specific nonlinear relationship between the level of migration and plantation share that we derived in Section 3 applies to the distribution of migrants at the destination as well. The Herfindahl-Hirschman Index is constant up to a threshold share, which coincides with the threshold for the level of migration, and increasing in plantation share thereafter.

We begin by examining the relationship between the level of migration and plantation share across southern counties. The population census provides the state but not the county of birth. We cannot, therefore, use the birth-location of blacks residing in northern counties in 1920 and 1930 to measure the level of migration from each southern county. What we do instead is to indirectly measure migration at the onset of the Great Migration by the change in black population in southern counties from 1910 to 1920, $P_{1910} - P_{1920}$. The corresponding statistic over the duration of the Great Migration is the change from 1910 to 1930, $P_{1910} -$

[16] We noted earlier that labor recruitment agencies and northern firms jump-started the Great Migration. Without fixed costs, these external agencies would have entered all counties. If there was a capacity constraint to their recruitment activity, a constant number of migrants would have ended up moving without the support of a network in all counties.

P_{1930}. Population changes could arise due to migration or because births and deaths do not balance. To account for natural changes in the population due to excess fertility or mortality, we construct double-differenced measures of migration: $(P_{1910} - P_{1920}) - (P_{1900} - P_{1910})$ and $(P_{1910} - P_{1930}) - (P_{1890} - P_{1910})$. The implicit assumption when constructing the short (long) double-difference is that natural population change is stable over a twenty (forty) year period.

Figure 8A nonparametrically regresses the change in population, $P_{1910} - P_{1920}$ and $P_{1900} - P_{1910}$, separately for black and whites, on plantation share. $P_{1900} - P_{1910}$ for blacks is negative everywhere and mildly declining in plantation share. This implies that the black population was increasing on net throughout the South, particularly in counties with large plantation shares. This pattern is reversed in the subsequent decade. There is no population change up to a threshold plantation share and a large *decline* in the population thereafter, which we attribute to migration. In contrast, population change for the whites is stable over the two decades, providing a useful benchmark for the results we obtain for the blacks.

Figure 8B adjusts for natural population change by nonparametrically regressing the short double-difference, $(P_{1910} - P_{1920}) - (P_{1900} - P_{1910})$, and the long double-difference, $(P_{1910} - P_{1930}) - (P_{1890} - P_{1910})$, on plantation share. The regression with the long double-difference was reported earlier in Figure 2 and we see that the same pattern is obtained with the short double-difference. Our measure of black migration is flat up to a threshold share and increasing steeply in plantation share thereafter. This contrasts with the white-migration benchmark (not reported), where no discernable relationship with plantation share is obtained. Figures 8C and 8D formally test the nonlinear migration patterns for the short double-difference and the long double-difference, respectively. The t-ratios for the baseline slope coefficient and the slope-change coefficient match Figure 3B and are consistent with the specific nonlinearity implied by the model. The t-ratio on the slope-change coefficient with the short double-difference in Figure 8C reaches its maximum value to the right of 0.1. Notice, however, that there is a wide range of plantation shares with t-ratios close to that value. In contrast, the maximum value for the corresponding t-ratio with the long double-difference in Figure 8D is clearly identified and is located close to the threshold obtained earlier for political participation during Reconstruction.

Although it does account for natural population change, the double-differenced statistic is still an indirect measure of migration. To verify the robustness of the results in Figure 8 we consequently utilize newly available data from the state of Mississippi that link southern counties to northern destinations. These data merge Medicare records, which include the zip code of residence and are reliably available from the 1905 birth-cohort onward, with social security records (the Numident file), which include the town and county of birth. Under the assumption that individuals remained in the city (MSA) to which they moved, we can compute the number of migrants and the distribution of migrants across northern cities, by

race, for each Mississippi county. These statistics are computed for individuals born between 1905 and 1925. While the large number of cohorts allows us to measure migration from each southern county with precision, this also implies that some individuals who moved after the Great Migration will also be included in these cohorts. This will not qualitatively change the analysis that follows, because southern counties that channeled their members to particular northern destinations during the Great Migration would have continued to do so thereafter.

Figure 9A nonparametrically regresses the short and long double-difference statistics that we use to indirectly measure migration, and a direct measure based on the 1905-1925 birth cohorts, on plantation share across Mississippi counties.[17] Reassuringly, these measures of migration track closely together and, moreover, match the pattern that was obtained across all southern counties. Although not reported, this pattern is obtained across Mississippi counties for Republican votes in 1872, the probability that a state representative was elected, and church congregation size (Baptist and Methodist as well as African-American sub-denominations). Figure 9B reports nonparametric regressions with the number of migrants and the distribution of migrants, measured by the Herfindahl-Hirschman Index. As predicted for black migration, both statistics are flat up to the same threshold share and increasing in plantation share thereafter. In contrast, the number and the distribution of white migrants is uncorrelated with plantation share. The specific nonlinearity we have uncovered appears consistently across multiple outcomes and data sets. We will use this nonlinearity to rule out alternative explanations for the empirical results below.

4.4 Alternative Explanations

The analysis concludes by examining two alternative models in which social ties are irrelevant and assesses their ability to match the results presented above. The first alternative assumes that an external agency organizes political participation during Reconstruction and the movement north during the Great Migration. The second alternative drops the collective aspect and assumes that individuals participate and receive benefits independently, but adds heterogeneity to the cost of participation. These two models cover the major explanations for variation in political participation and migration across counties that have appeared in the literature.

Consider a model of centralized mobilization in which an external agency solves the commitment problem and organizes the residents of the county. Depending on the context, this agency could be the Republican party or a northern firm. The value to the agency $V(N)$ is an increasing function of the number of individuals, N, that it can mobilize. It is

[17] All the nonparametric regressions up to this point in the analysis have included state fixed effects. Since we are now focussing on a single state, the two-step procedure used to partial out the state fixed effects is no longer required.

reasonable to assume that N is an increasing function of the black population of the county, which, in turn, is increasing in the plantation share S in our data. N is thus an increasing function of S, $N(S)$. The alternative model can thus explain the increase in Republican votes and migration to the right of a plantation share threshold, simply because there is a larger black population to draw from. To explain the absence of such a relationship to the left of the threshold, we introduce a fixed cost k. The external agency will only enter counties where it expects to mobilize a sufficiently large number of individuals. Because V is increasing in N, and N is increasing in S, there exists a threshold $\underline{S}$ below which there is no entry.[18] N is constant (zero) to the left of $\underline{S}$ and increasing in S to the right of $\underline{S}$. This alternative model has many features in common with our model of *decentralized* collective mobilization. What distinguishes the alternative model from our model is a level discontinuity at the threshold (a discrete jump to $N(\underline{S})$) which is needed to just offset the fixed cost and which is not implied by our model. We do not observe a discrete jump at the threshold in any of the figures presented in this paper. What we observe instead is a slope discontinuity at the threshold. Although we do not report the t-ratio on the level-change coefficient (β_2) in the preceding figures for expositional convenience, formal tests of the model are consistent with this observation.

The second alternative model that we consider assumes that individuals vote and migrate in response to external forces that vary across counties. For example, three push factors that have featured prominently in the literature on the Great Migration are the boll weevil invasion in cotton-growing counties, racial intimidation and violence, and the arrival of the railroad. It is entirely possible that the strength of these push factors and other factors that determined the response to new opportunities in the postbellum period varied with plantation share. To allow for this possibility, let the individual's cost of political participation or migration consist of a county-level component $c(S)$ and an (additive) idiosyncratic component ϵ. Let the distribution of ϵ be characterized by the function F, and denote the benefit from these activities by W. Both costs, $c(S) + \epsilon$, and benefits, W, will vary with the type of activity. An individual will participate in these activities if $W - c(S) - \epsilon \geq 0$, which implies that a fraction $F(W - c(S))$ of the county participates. Denote the black population of the county by the function $P(S)$. It follows that the overall response,

$$N(S) = F(W - c(S))P(S).$$

For $N(S)$ to be flat below a threshold plantation share around 0.08, as observed for both voting and migration, the first term on the right hand side of the preceding equation must just offset changes in the black population at *each* point in the plantation share distribution

[18] This threshold must satisfy the condition $V(N(\underline{S})) = k$. $V(N(S)) < k$ for $S < \underline{S}$ since $V_S(N(S)) > 0$ and so there is no entry below the threshold.

to the left of the threshold. We saw in Figure 4B that $P(S)$ was a complex nonlinear function. It is consequently highly unlikely that the condition needed for $N(S)$ to be flat everywhere to the left of the threshold will be (coincidentally) satisfied. For example, Figure 10A nonparametrically regresses the number of miles of railroad in 1911 divided by the area of the county (available in 1880) on plantation share. After an initial steep decline close to zero, this measure of railroad access is *increasing* in plantation share up to the threshold (0.08). Access to railroads would have stimulated migration, reinforcing rather than offsetting the positive relationship between black population and plantation share to the left of the threshold. Although data on lynchings and the boll weevil invasion are currently unavailable, we expect each of these push factors to have similarly reinforced the increase in black population.

A well documented feature of the Great Migration is positive selection on education (eg. Lieberson 1978, Margo 1990, Tolnay 1998). Although education does not play a role in our model it could easily be incorporated by allowing educated individuals to get jobs at the destination without the support of a network. Positive selection on education can then be generated under reasonable conditions (as long as the network is not too strong). To assess the consequences of such positive selection for migration across southern counties, we regress literacy in 1910, by race, on plantation share in Figure 10B. Black literacy is declining in plantation share for the most part, while the pattern for white literacy is reversed. Although changes in black literacy and black population work in opposite directions, we need more than that for the two effects to cancel at each point in the plantation share distribution. Inspection of Figure 10B indicates, for example, that black literacy is mildly *increasing* around a plantation share of 0.05.

It is possible that a combination of factors could just offset black population, but this combination of factors would need to explain both voting and migration. Some push factors, such as the boll weevil invasion and access to railroads, would not apply to political participation during Reconstruction. Other factors such as racial violence and intimidation would have opposing effects on voting and migration. Most importantly, a combination of external forces that increased the propensity of individuals to migrate (independently) in some counties would not necessarily channel them to a restricted number of destinations. The observation in Figure 9B that the level of migration and the concentration of migrants across destinations track closely together is difficult to explain without a model of collective mobilization.[19]

[19]This result could also be obtained with a model of centralized mobilization in which an external agency organized the movement of blacks from southern counties above a plantation share threshold. The absence of a level discontinuity at the threshold allowed us to rule out this alternative explanation above.

5 Conclusion

What consequences did slavery have for the strength and stability of the African-American community? Instead of using whites as the benchmark, we look within the African-American population in the decades following the Civil War. The analysis reported in this paper indicates that blacks were able to respond collectively to the new political and economic opportunities that became available, but only in southern counties where specific preconditions, determined by the organization of agricultural production under slavery and thereafter, were satisfied. Over 50 percent of southern counties and one-third of the black population were situated below the threshold at which collective mobilization could be supported (at a plantation share around 0.08). Black migrants from those counties would have moved to northern cities with relatively little social support. Based on the voting and migration patterns described above, if we take 0.2 as the threshold above which the maximum level of collective mobilization could be sustained, then 20 percent of the counties and 30 percent of the black population would have been situated above that higher threshold. Blacks from those counties would have moved in large groups to a small number of northern destinations.

This variation in the pattern of out-migration would have had consequences for the formation and evolution of black communities in northern cities. Relatively weak communities would have formed in destinations that received migrants who moved independently from diverse origin locations. In contrast, the small number of northern destinations that received the bulk of their migrants from southern counties above the threshold, especially the higher threshold, would have formed more cohesive communities. This variation in initial conditions would, in turn, have shaped the evolution of African-American communities over the course of the twentieth century. Differential out-migration would also have had consequences for the evolution of black communities in southern counties. Given the well documented positive selection on education among northern migrants, counties above the higher threshold would have lost the bulk of their most able residents over the first half of the twentieth century. The resulting social dislocation would then explain Putnam's observation that those counties have relatively low social capital today. Wilson (1987) famously argued that the exit of educated black professionals from northern neighborhoods after Civil Rights and desegregation resulted in social dislocation and the concentration of poverty in inner-cities. A similar dynamic process may well have occurred in certain southern counties at the beginning of the twentieth century, paradoxically because they were better positioned to support collective migration. Slavery did have long-term effects on individual and institutional outcomes, but this worked through channels that have previously been unexplored and which we will examine in future research.

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Figure 1: Cropping Patterns Across Southern Counties in 1890

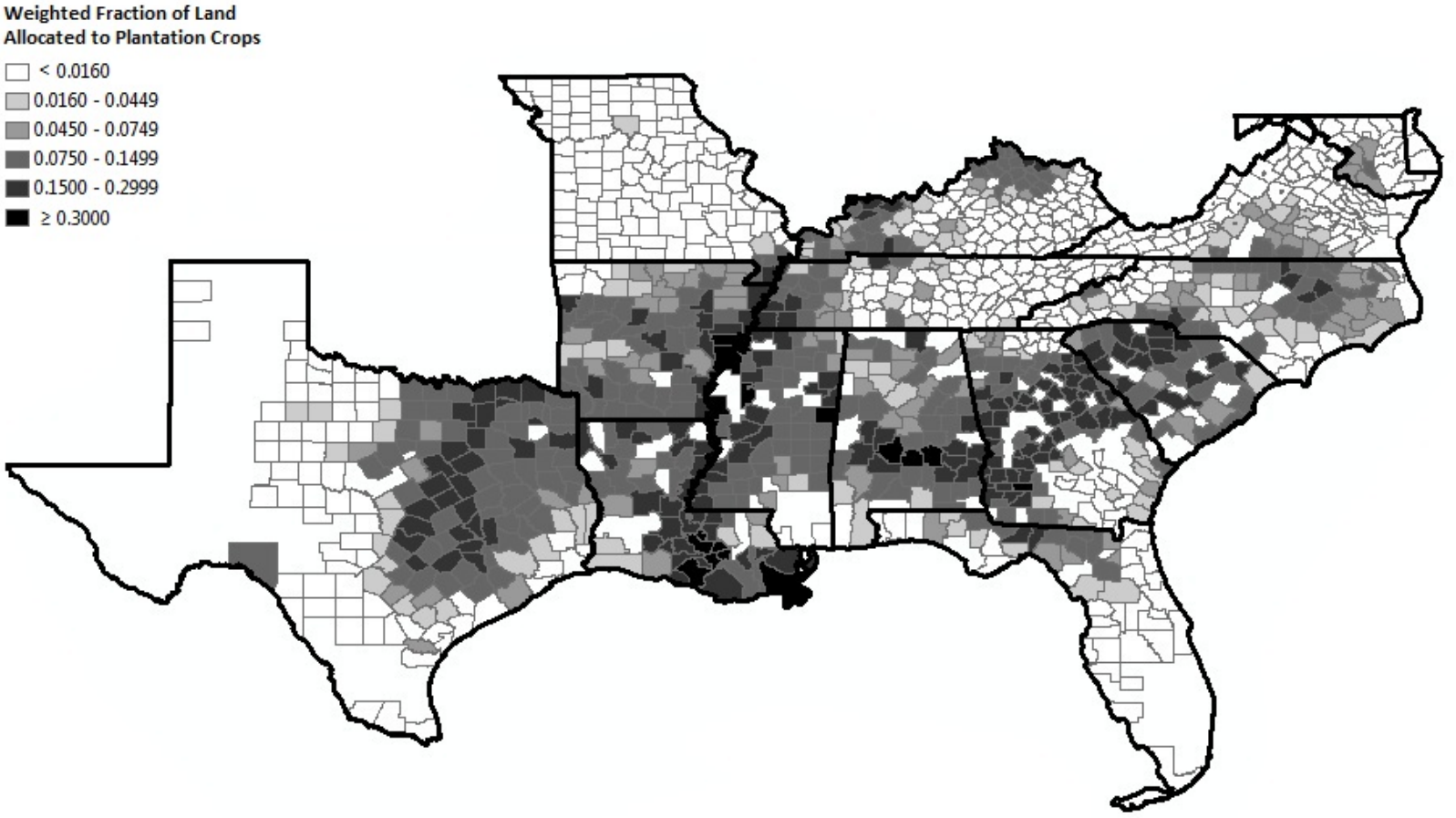


Figure 2: Response to Political and Economic Opportunities

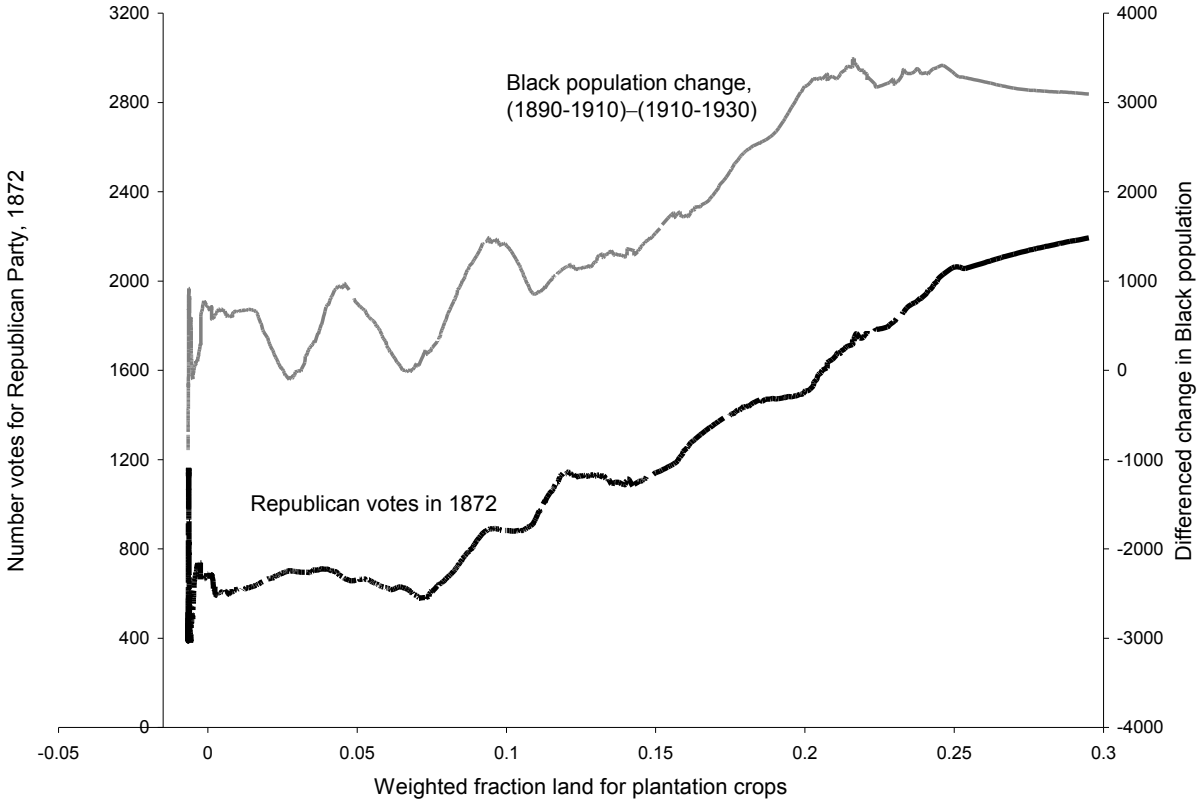
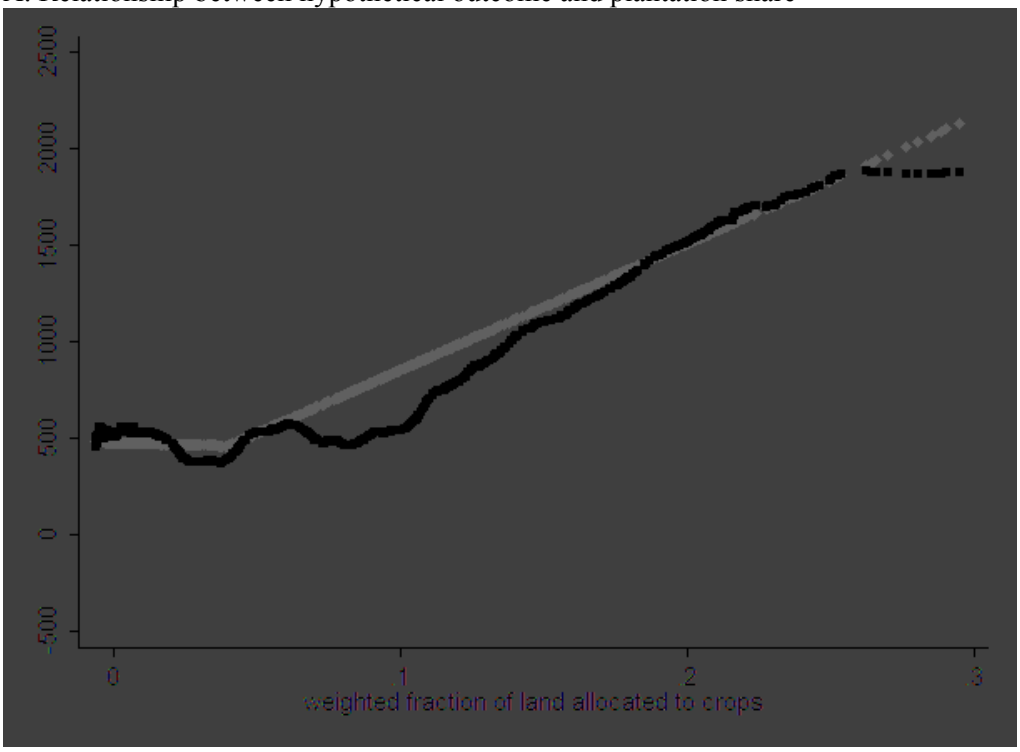


Figure 3: Model Simulation

A. Relationship between hypothetical outcome and plantation share



B. T-ratios

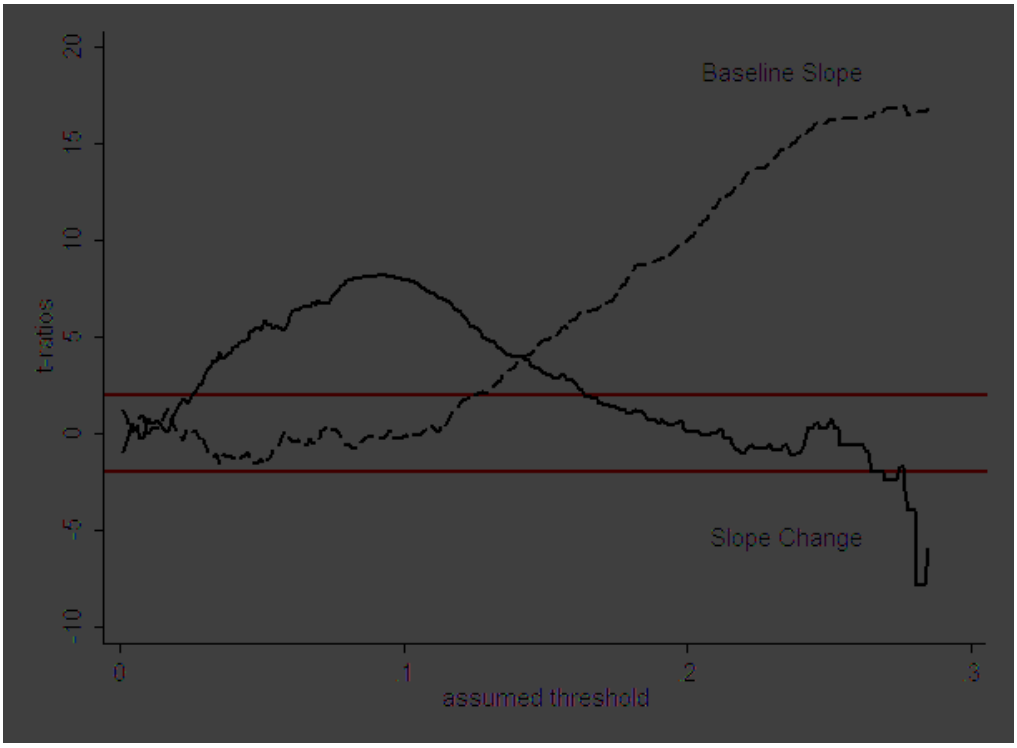
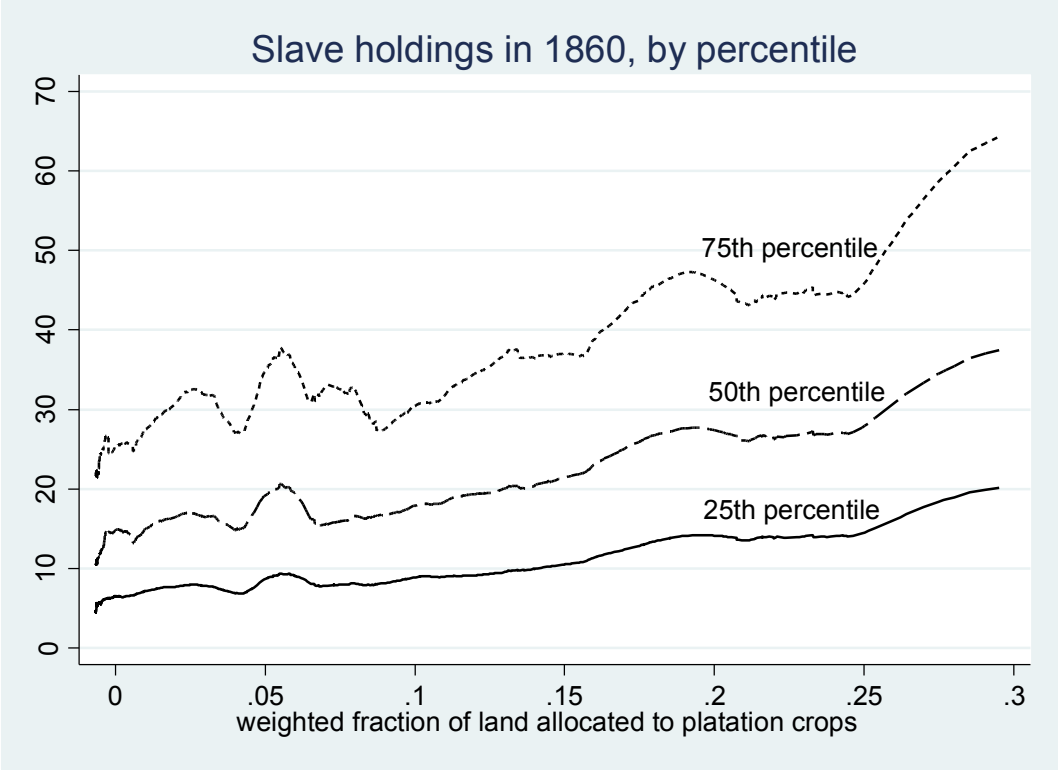


Figure 4: Measures of Social Ties

A. Slavery holdings in 1860



B. Black Population and County Area

C. T-ratios for Black Population in 1870

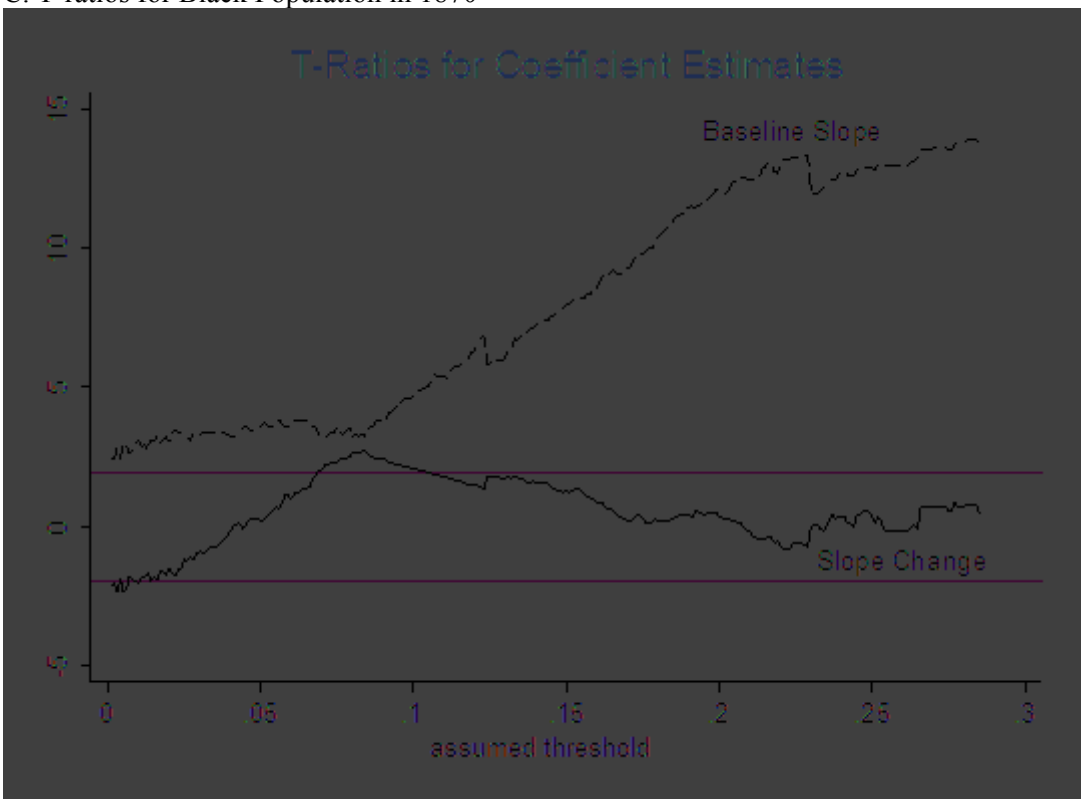
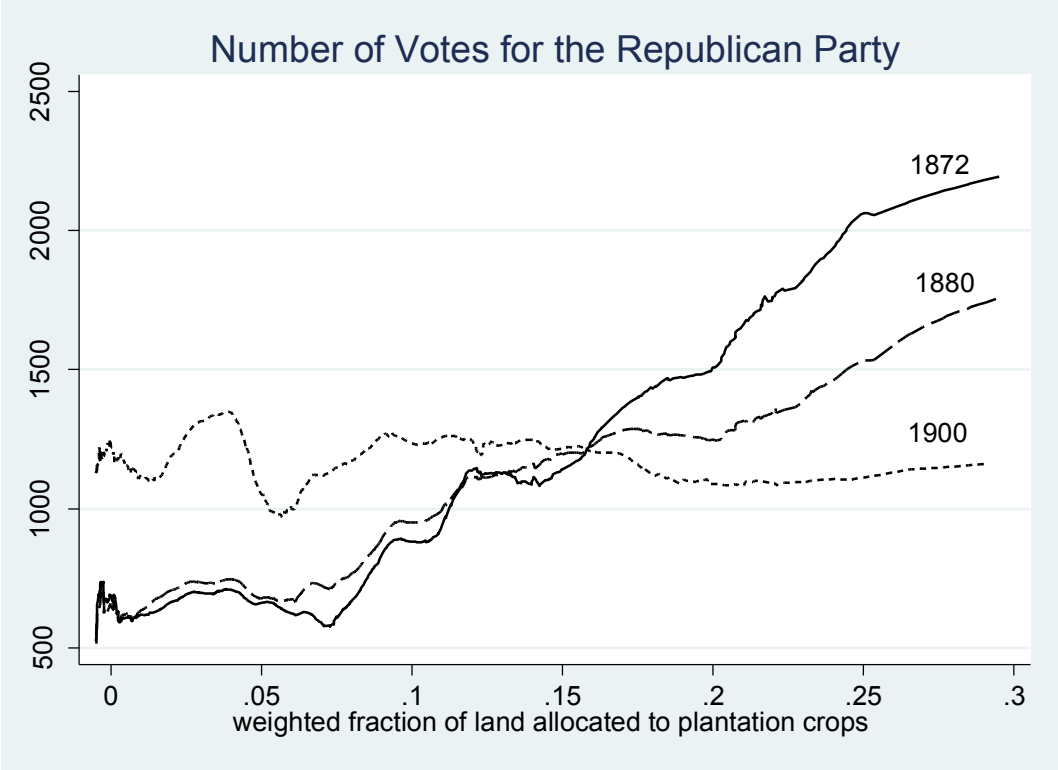
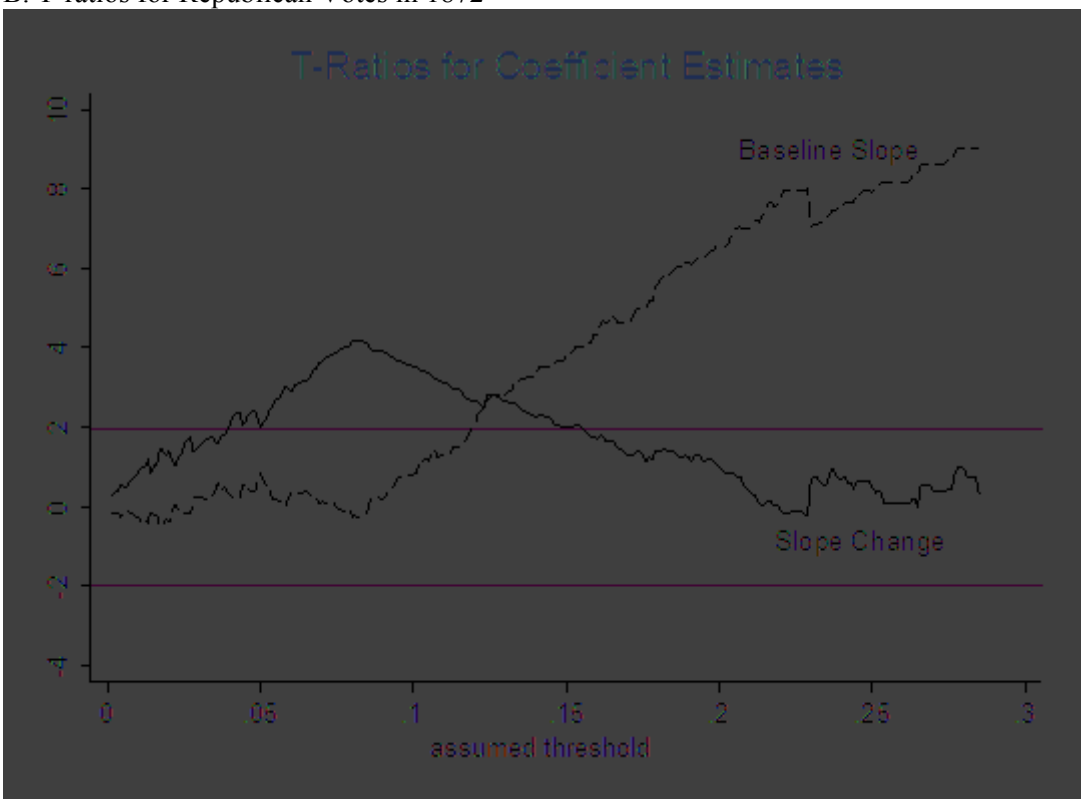


Figure 5: Voting Patterns

A. Republican Votes in Presidential Elections



B. T-ratios for Republican Votes in 1872



C. T-ratios for Republican Votes in Gubernatorial Elections, 1871-1873

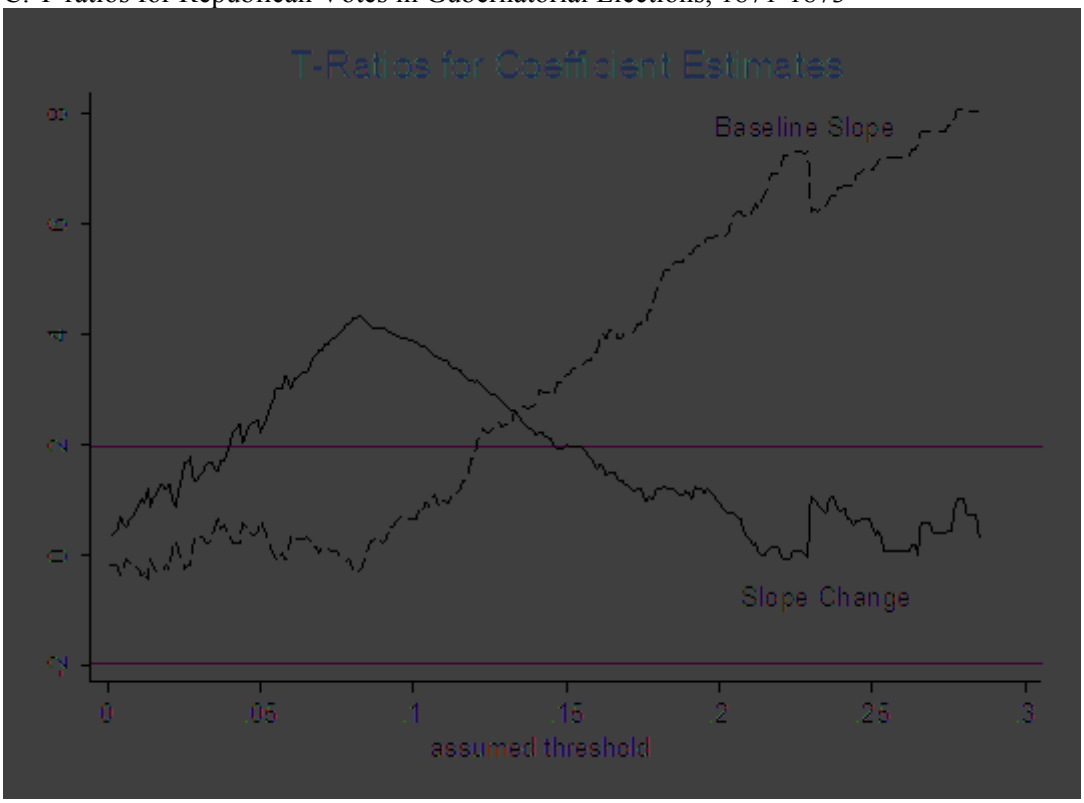
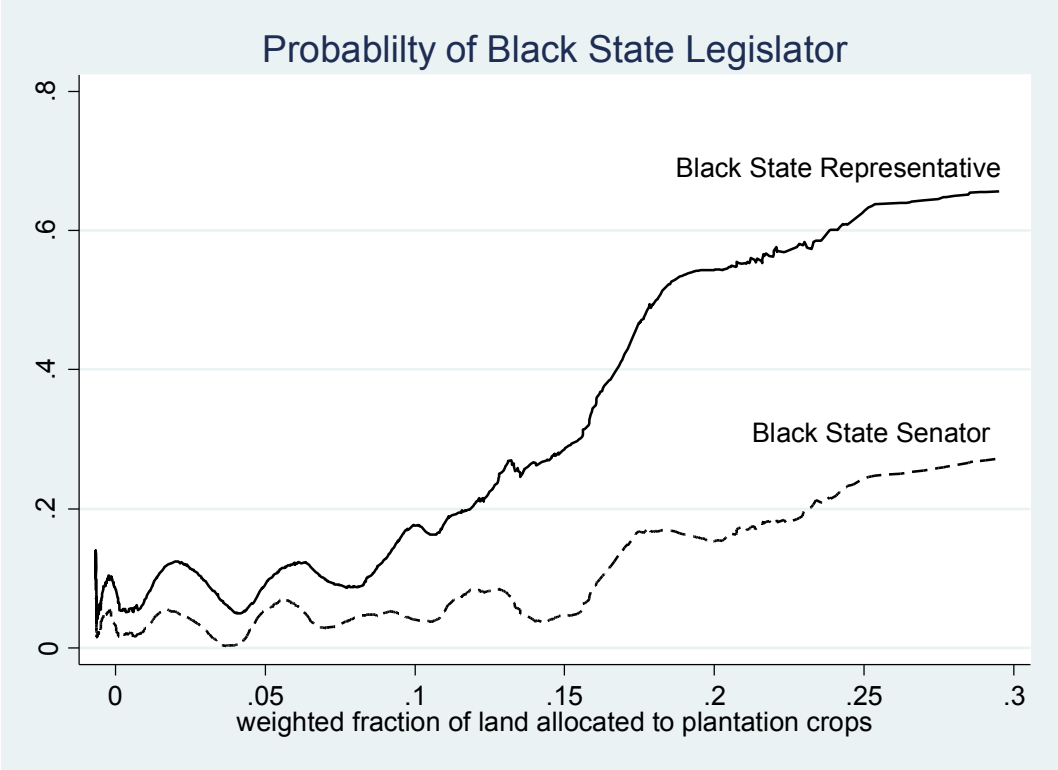


Figure 6: Elected Black Leaders

A. Black State Representative and Senator



B. T-ratios for Black State Representative

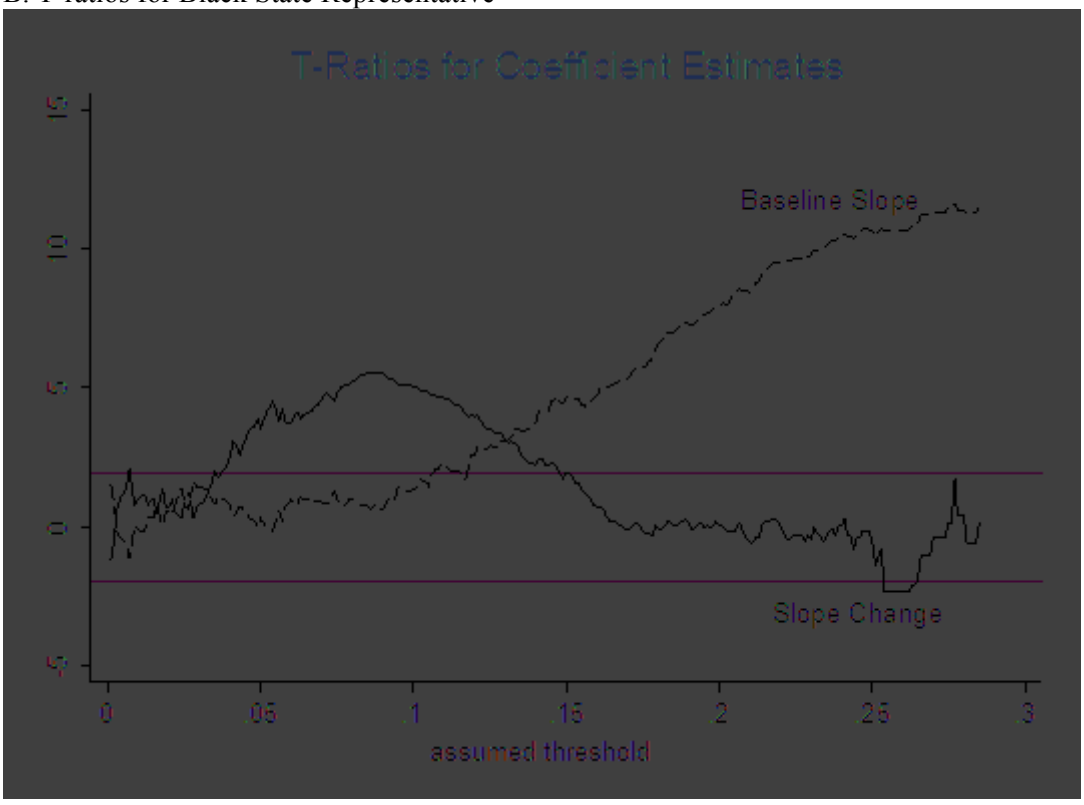
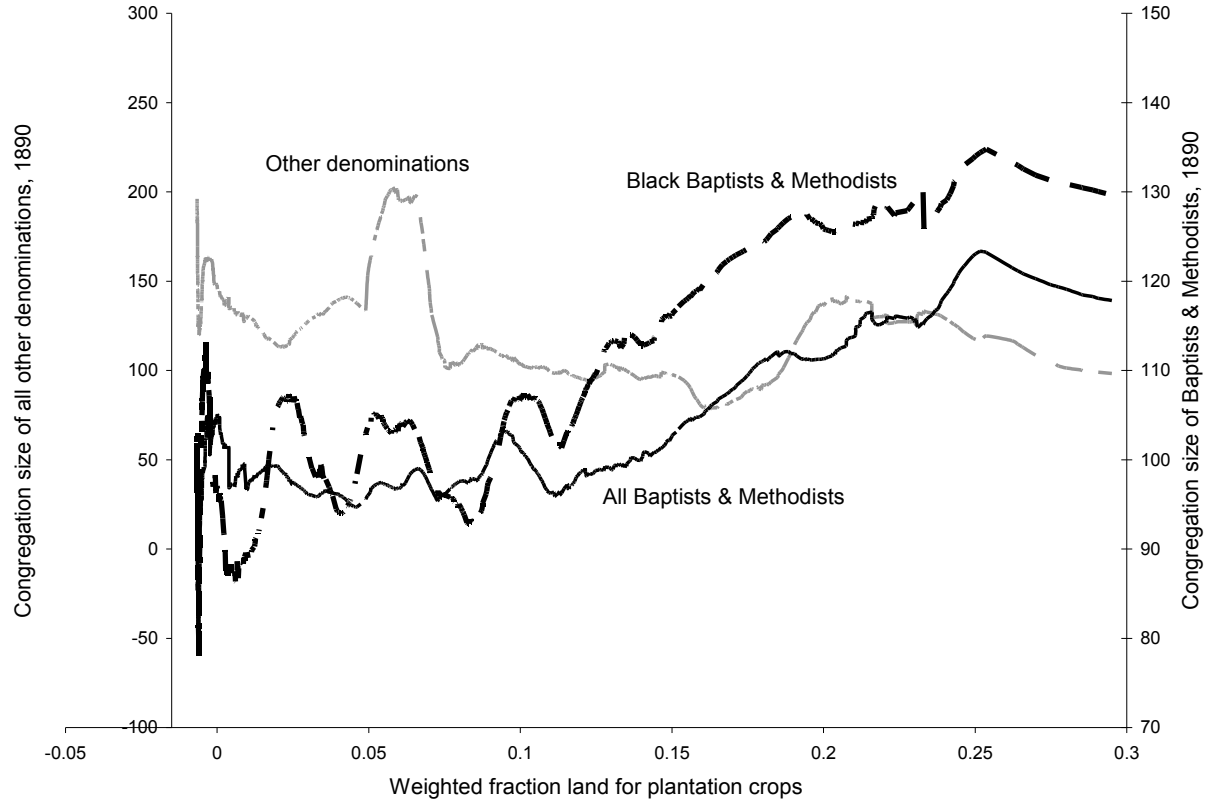


Figure 7: Church Congregation Size

A. Congregation Size by Denomination



B. T-ratios for Baptist and Methodist Congregation Size

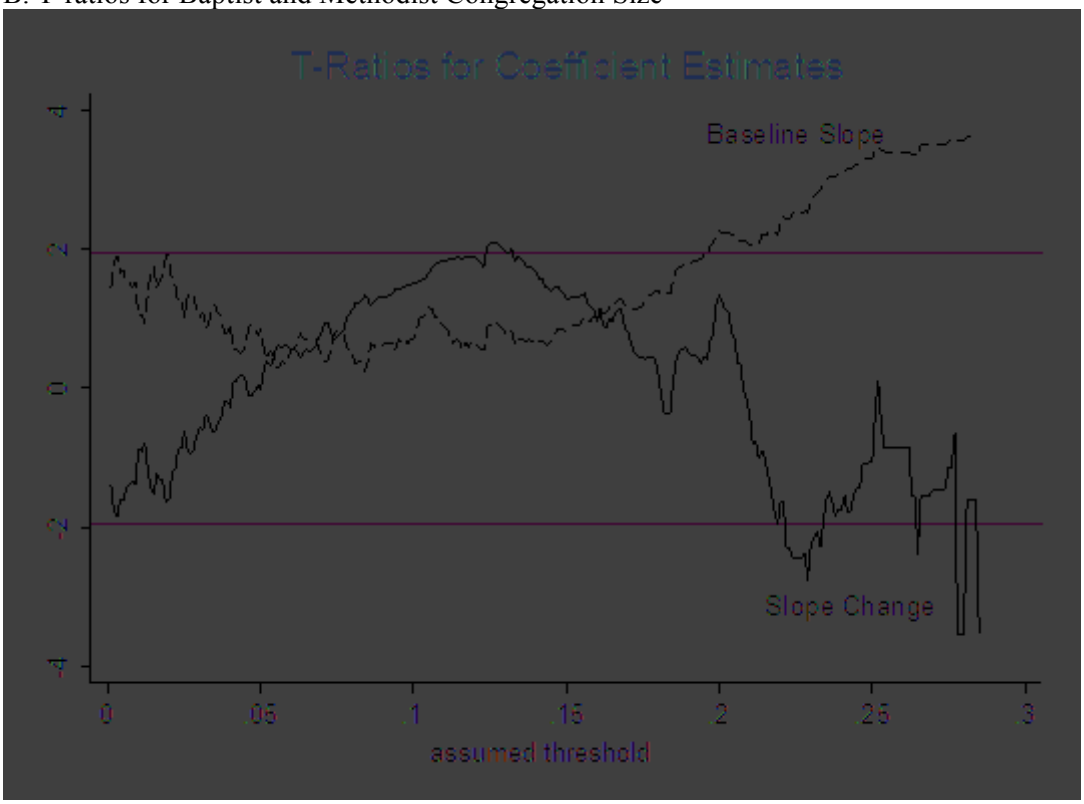
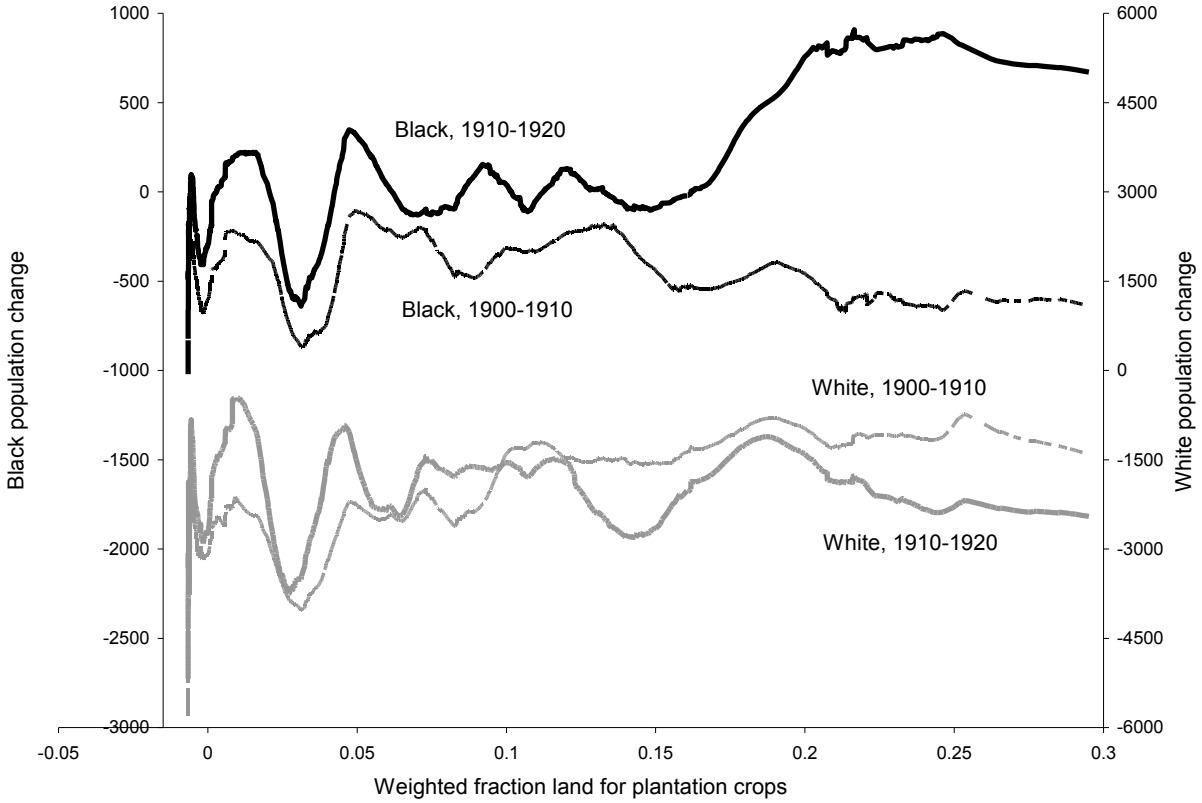
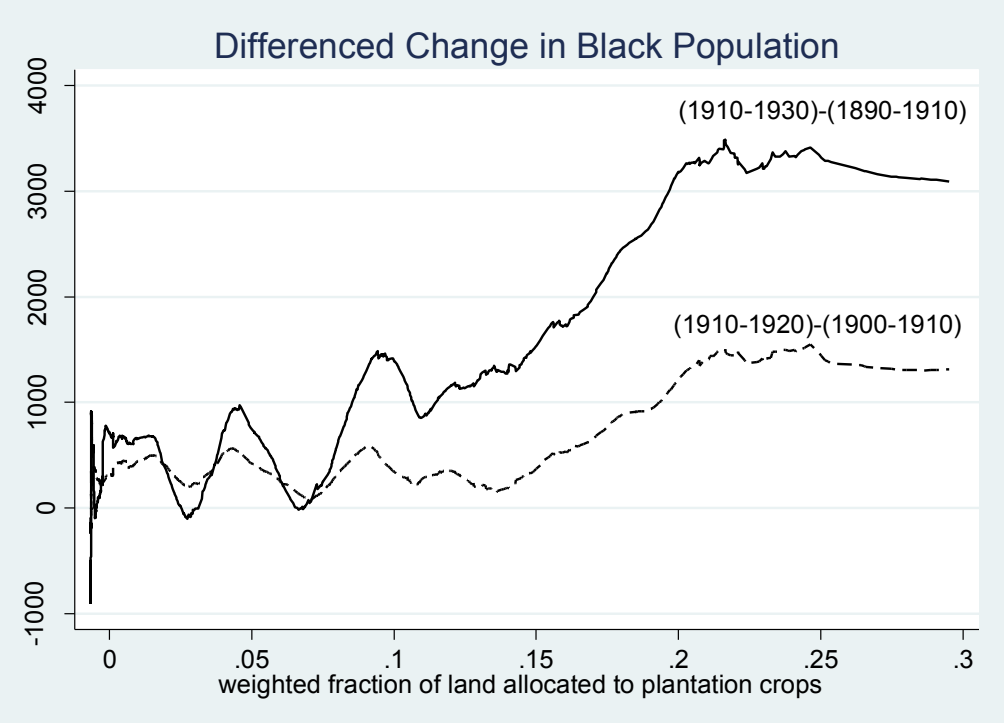


Figure 8: Migration

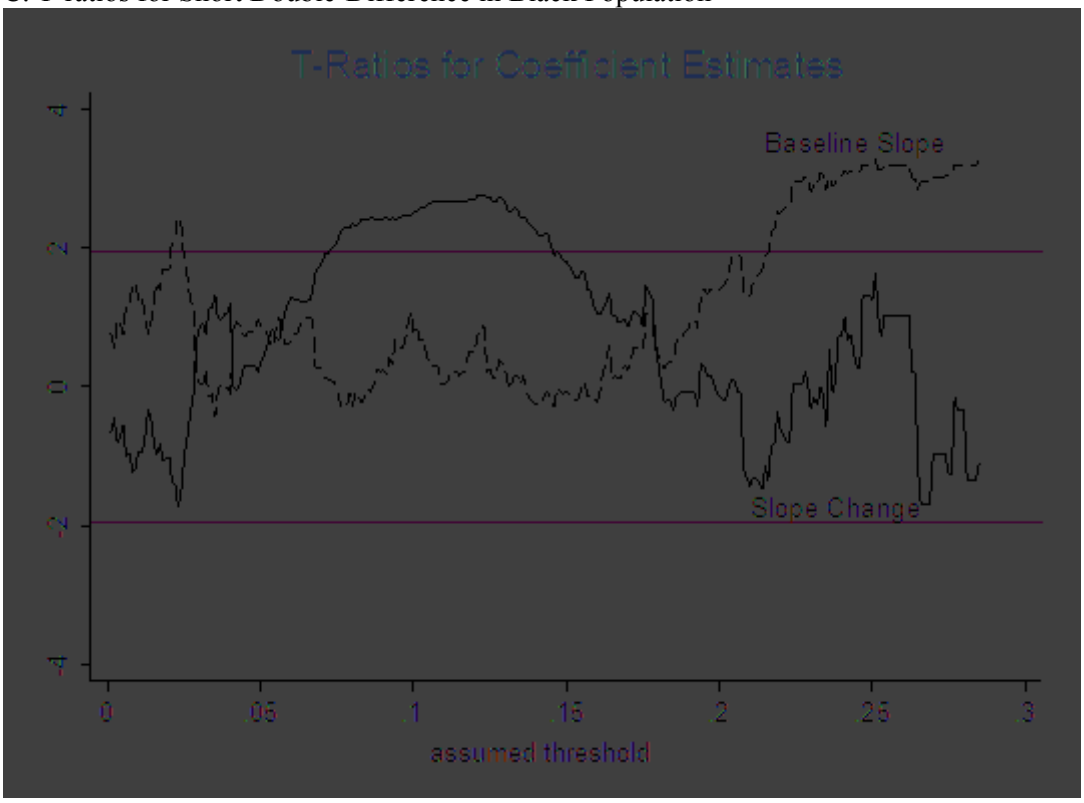
A. Population Change



B. Differenced change in Black Population



C. T-ratios for Short Double-Difference in Black Population



D. T-ratios for Long Double-Difference in Black Population

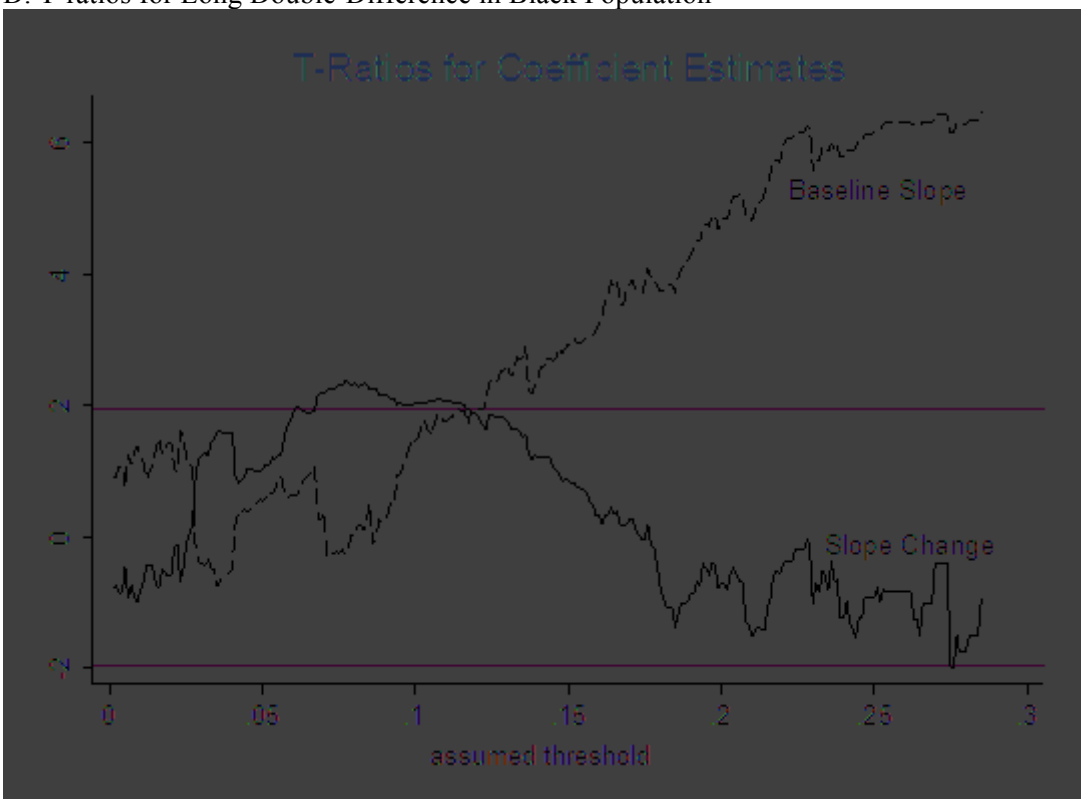
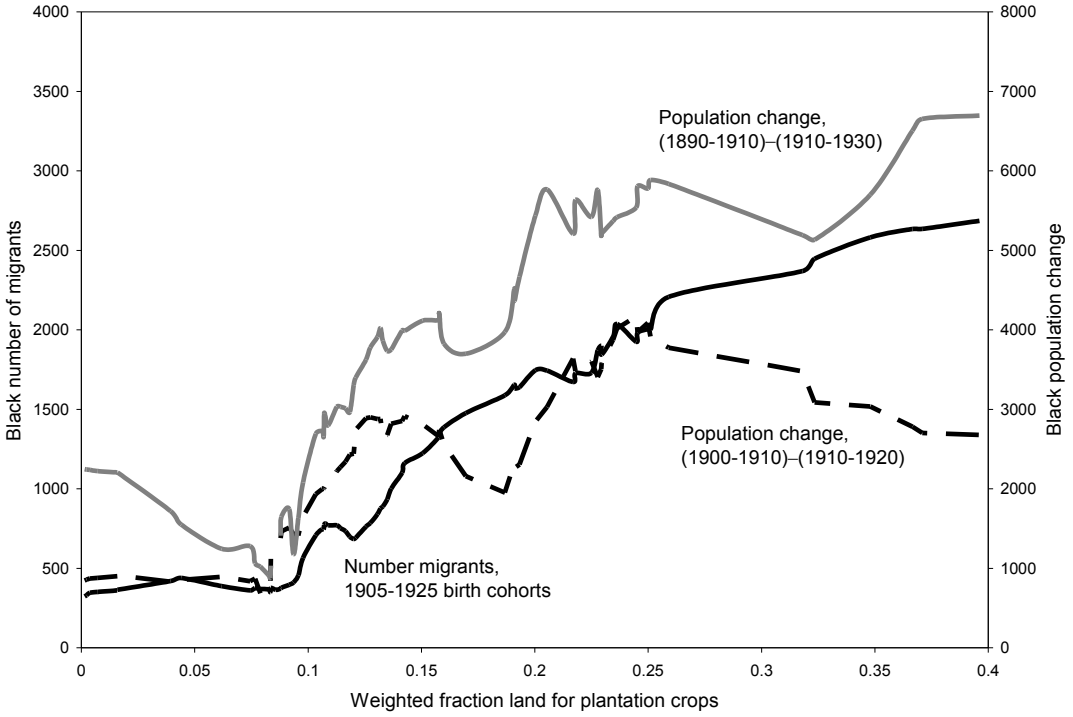


Figure 9: Migration from Mississippi

A. Alternative Measures of Black Migration



B. Level and Distribution of Migrants

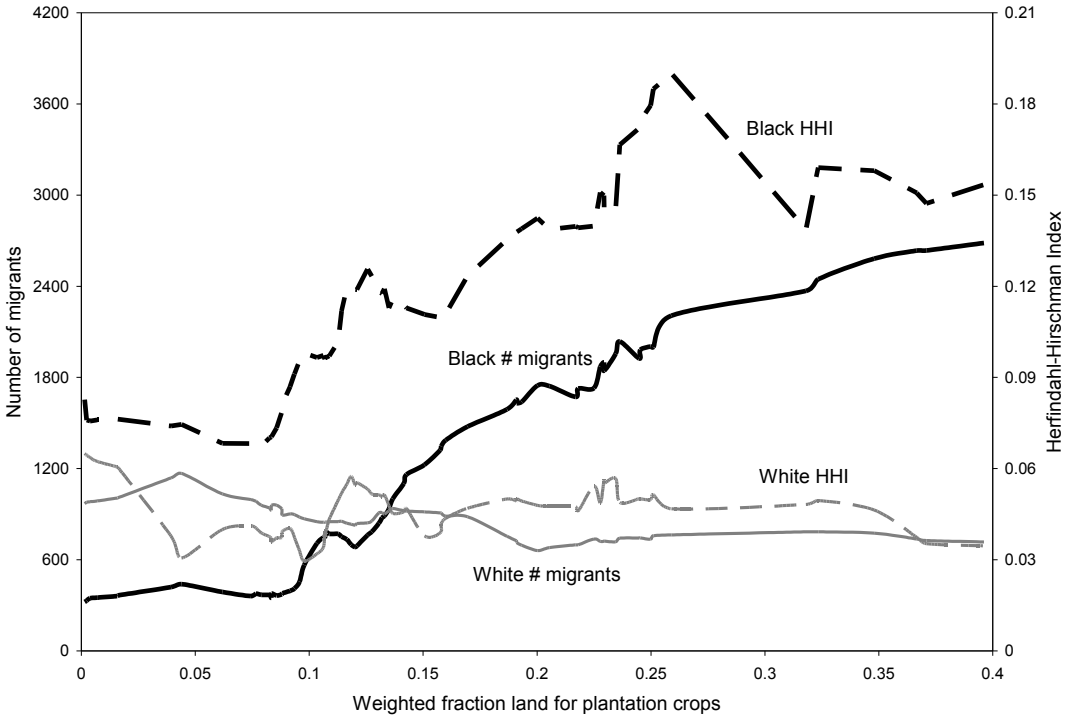
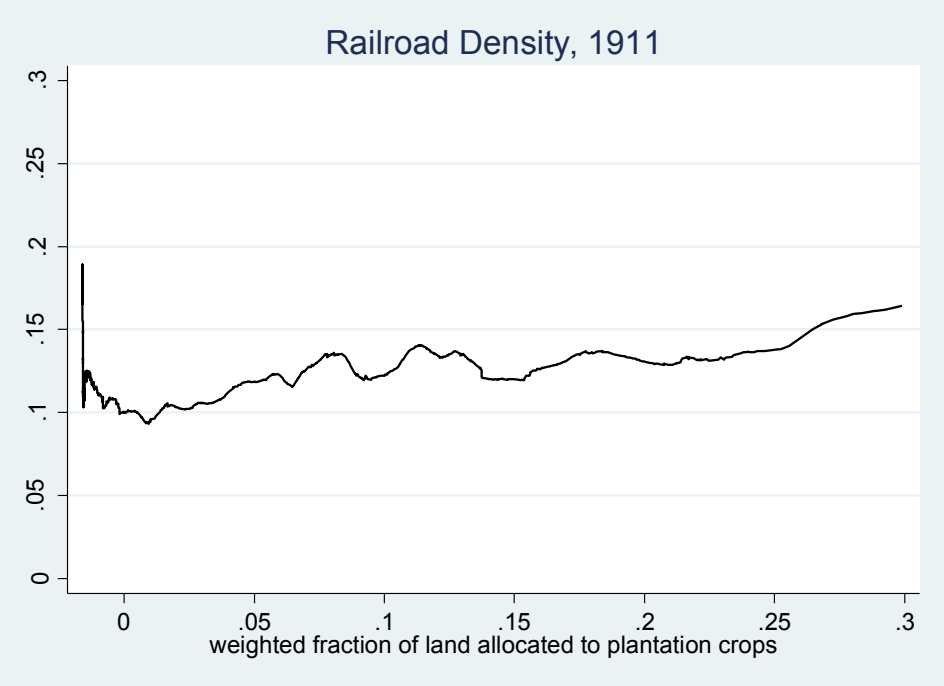


Figure 10: Alternative Explanations

A. Railroads



B. Literacy Rates