

Attitudes Shaped by Violence*

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Abstract

We provide a theory of the spread and decline of violence in a structured population. Engaging in violence towards a particular target group of individuals shapes the attitudes of individuals in the perpetrating group. We focus on situations where violence has private costs and provides local benefits to the perpetrating group only socially. The free rider problem is overcome when individuals from the perpetrating group imitate members of their local community who received high payoffs in the previous period. When the typical benefits to violence are high in comparison to the private costs, violence spreads. Violence then begins to decline when these benefits become relatively low. Individuals who engage in violence start developing negative attitudes towards the target group, so as to minimize cognitive dissonance. Similarly, individuals who initially hold negative attitudes towards the target group, but do not engage in violence, gradually develop more favorable attitudes. A key prediction of our theory is that the attitudes produced by violence may last longer than the violence itself. We apply our theory to explain how the incentives for labor coercion against newly freed slaves in the postbellum U.S. South produced racially hostile attitudes among Southern whites, and how these attitudes may have been transmitted locally across generations, to present times. We discuss the evidence supporting this theory.

Key words: violence, attitudes, cognitive dissonance, racial and ethnic politics, slavery, labor coercion, local interaction, networks

*This paper is still work in progress, and is best read alongside our related paper, [Acharya, Blackwell and Sen \(2013\)](#). We welcome all comments and suggestions.

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1 Introduction

A number of recent papers have argued that historical episodes of violence towards a particular group of individuals can have lasting impact on the attitudes held by descendants of the perpetrating group towards the victim group. For example, in [Acharya, Blackwell and Sen \(2013\)](#), we argue that the emancipation of slaves in 1865 produced both political and economic shocks in the U.S. South, and generated incentives for the Southern land-owning elite to engage in, and promote, violence against blacks in the postbellum years. This then produced racially hostile attitudes that have lasted to present times. Similarly, [Voigtländer and Voth \(2012\)](#) argue that the shock of the Black Death in Europe contributed to spreading the misbelief that Jews were responsible for poisoning the wells, which then led to a wave of Jewish pogroms across several European towns. They argue that this violence intensified anti-semitism in towns where such pogroms took place, and that these attitudes were passed down locally over a period of more than half a millennium. Other similar papers are discussed by [Nunn \(2009\)](#), who reviews the broader empirical literature on the long run effects of historical forces.

In this paper, we develop a model of how violence towards a particular group of individuals may spread once it starts, and how such violence may produce hostile attitudes among members of the perpetrating group towards the victim group. We focus on situations where violence has private costs and provides benefits to the perpetrating group only when large segments of local communities contribute to violence. This assumption implies a free rider problem: if violence has private costs but contributing to violence produces almost no marginal benefit, then individuals have no direct incentive to choose violence. We show that this free rider problem is overcome when individuals from the perpetrating group imitate members of the previous generation that lived in their local community and earned high payoffs. When the typical returns to violence are large in comparison to the private costs, violence spreads. Conversely, violence begins to decline when these returns become relatively low. Individuals who engage in violence start developing negative attitudes towards the victim group, so as to minimize cognitive dissonance. Similarly, individuals who initially hold negative attitudes towards the victim group, but do not engage in violence, gradually develop more favorable attitudes (also to minimize cognitive dissonance). A key prediction of our model, which helps explain some of the findings in the literature discussed above, is that the attitudes produced by violence may last longer than the violence itself.

After developing this theory generally, we apply it to the context of race-relations in the U.S. South during the post-Reconstruction period, a period that saw a sharp rise in decentralized violence against blacks ([Logan, 1954](#)). To apply our theory, we

further develop our model to include an explanation for how economic incentives for labor coercion following the abolition of chattel slavery in 1865 gave rise to anti-black violence in these postbellum years. The basic idea behind this application is as follows. The emancipation of slaves following the Civil War produced a major shock to the plantation economy. Instantly, the labor costs of white plantation owners and farmers rose, because they now had to pay their ex-slaves (closer to) market wages. This threatened the viability of the plantation economy, giving landowners an incentive to find new ways of suppressing farm wages. Engaging in, and promoting violence was one of many ways in which such wage-suppression took place; and, in fact, according to [Alston and Ferrie \(1993\)](#), it was the most important way. Because of the racial nature of slavery pre-1865, this violence was racially targeted. Whites then developed hostile attitudes towards blacks to justify this violence. These attitudes were then passed down from one generation to the next, probably through a variety of channels, including the one we highlight in our model: inter-generational socialization.

One of the key predictions of our model is the following “mechanization hypothesis.” As we have argued, the incentives for wage suppression led to a growth in violence and racially hostile attitudes in the decades after Reconstruction. But, as Southern agriculture became more mechanized, starting around 1930, the demand for farm labor began to drop, reducing the economic incentives for wage suppression and violence. Consequently, because of these technological developments in agriculture, our theory predicts that there is a period in time after which these reduced incentives for violence lead violence to decline. We show in our model that shortly after violence begins to decline, racially hostile attitudes also begin to decline. Hence, a key prediction of our theory, which we formally derive, is that for two otherwise similar Southern counties, the county that mechanizes quicker should on average have less racially hostile attitudes today. We then provide some empirical evidence that supports this prediction.

Our paper relates to several existing literatures. First, it relates to a recent empirical literature in the political economy of development, which emphasizes the importance of economic and social incentives in creating cultural norms and attitudes that tend to persist long after the historical forces that produced them disappear (e.g., [Nunn and Wantchekon, 2011](#); [Alesina, Giuliano and Nunn, 2013](#); [Jha, 2013](#)). Second, it contributes to a longstanding theoretical literature that highlights the importance of history and path-dependence in shaping contemporary social outcomes through cultural, institutional and evolutionary channels (e.g., [Boyd and Richerson, 2005, 1988](#); [Bowles and Gintis, 2005](#); [Bowles, 2006](#); [Tabellini, 2008](#)). Despite the growing work in these two literatures, there have been very few papers that connect

the insights of the theoretical literature to the findings of the empirical literature (one of the few papers is [Nunn, 2007](#)). Our paper provides a new connection between these two literatures by modeling the lasting effects of violence on attitudes.

Our paper also relates to the large and growing literature on behavioral game theory. First, it relates to the literature on bounded rationality started by [Simon \(1957\)](#). This is because we can interpret the agents in our model as responding to incentives, just as rational agents do, as they imitate others in hopes of achieving high payoffs themselves (see also [Eshel, Samuelson and Shaked, 1998](#)). However, because our agents imitate others instead of making individually optimal decisions given their choices, they are responding to incentives in only a limited way. Second, our paper also contributes to a growing literature that introduces psychology to game theory (see [Rabin, 1998](#), for a review of the early work). In our model, engaging in violence towards a particular group produces negative attitudes towards that group, because agents seek to minimize “cognitive dissonance,” as defined by [Festinger \(1962\)](#) and other social psychologists. Other models that study the effects of cognitive dissonance in different contexts include [Akerlof and Dickens \(1982\)](#) and [Rabin \(1994\)](#). However, unlike us, these authors study the impact of cognitive dissonance on actions rather than on attitudes. Finally, like previous work by [Boyd and Richerson \(2002\)](#) and [Eshel, Samuelson and Shaked \(1998\)](#), our paper shows that group-beneficial behavior can spread in a structured population, even in spite of the free-rider problem.

The rest of this paper is organized as follows. In Section 2, we develop the general model of how attitudes are shaped by violence. In Section 3, we give our main analytical result. Section 4 develops the application of our theory to labor coercion in the postbellum U.S. South. It also presents some supporting empirical and historical evidence for our theory. In Section 5, we discuss other possible applications and modeling challenges. Section 6 concludes.

2 Model

Consider a society that consists of two groups, A and B , that are geographically structured on an interval $\mathcal{R} = [-\frac{R}{2}, \frac{R}{2}]$. Located at each point on the interval, at any given period of time $t = 0, 1, 2, \dots, \infty$, is exactly one member of group A and one member of group B . We assume that each individual from both groups lives for exactly one period, after which he is replaced by exactly one offspring, who inherits both his location on the interval and his group membership. Since we interpret group A as the dominant group, while group B is a passive group, we will identify members of group A with their location on the interval, generically $r \in \mathcal{R}$. The assumption

that society is geographically structured means that we can define the notion of a community: specifically, we will refer to the interval $\mathcal{B}(r) = [r - \frac{\mu}{2}, r + \frac{\mu}{2}] \cap \mathcal{R}$ as the “local community” of r . We now describe the actions, payoff and behavioral assumptions of the model.

Actions and Payoffs. In each period, members of group A must decide whether or not to engage in violence against group B . Denote the choice by $\alpha_t(r) \in \{0, 1\}$ ($\alpha_t(r) = 1$ means that the member of group A located at $r \in \mathcal{R}$ chooses violence in period t ; $\alpha_t(r) = 0$ means that he does not). Members of group A must also choose the kind of attitude $a_t(r) \in [0, 1]$ to have towards group B . We interpret higher values of $a_t(r)$ as reflecting more hostile attitudes. If $\rho_t(r)$ is the fraction of individuals in r ’s local community that engage in violence against group B , then the “material payoff” received by the group A individual who lives at r is

$$u_t(r) = \pi_t(\rho_t(r)) - v \cdot \mathbf{1}_{\{\alpha_t(r)=1\}} \quad (1)$$

Here, $\pi_t(\rho_t(r))$ is a part of the material payoff that depends only on the aggregate violence against members of group B in r ’s local community. $v > 0$ is the material cost of violence, and $\mathbf{1}_{\{\alpha_t(r)=1\}}$ is an indicator that takes value 1 when r chooses violence. By assuming that $\pi_t(\cdot)$ depends only on the total amount of violence produced in a local community, we are implicitly assuming that violence can produce benefits to group A only socially.

In addition to the material payoffs described above, we assume that each member of group A incurs a “psychological cost” $\gamma \cdot |\alpha_t(r) - a_t(r)|$, where $\gamma > 0$ is a scale parameter. We interpret this cost as reflecting the “cognitive dissonance” associated with engaging in violence towards blacks but not holding sufficiently anti-black views, or holding anti-black views but not engaging in violence (Festinger, 1962). This implies that the total payoff for a member of group A located at r equals the material payoff minus the psychological cost, i.e.,

$$u_t(r) - \gamma \cdot |\alpha_t(r) - a_t(r)|. \quad (2)$$

Behavioral Assumptions. We assume that the dynamic linkage across periods arises from intergenerational socialization: each group A member r observes the material payoffs of group A members from his parent’s generation that lived in his local community, and then decides whether or not to engage in violence by “imitating” the individual from the previous generation that received the highest material pay-

off.¹ More formally, define the sets of group A members in r 's local community that respectively do not engage, and engage, in violence in period t to be

$$\begin{aligned}\mathcal{A}_t^0(r) &= \{\tilde{r} \in \mathcal{B}(r) : \alpha_t(\tilde{r}) = 0\} \\ \mathcal{A}_t^1(r) &= \{\tilde{r} \in \mathcal{B}(r) : \alpha_t(\tilde{r}) = 1\}\end{aligned}\tag{3}$$

We assume that the individual who lives at r in period $t + 1$ engages in violence if and only if the highest material payoff among individuals in his local community that commit violence in period t is larger than the highest material payoff among individuals who choose not to commit violence; in other words, if $\mathcal{A}_t^0(r)$ and $\mathcal{A}_t^1(r)$ are both nonempty, then

$$\alpha_{t+1}(r) = \begin{cases} 0 & \text{if } \sup u_t(\mathcal{A}_t^1(r)) < \sup u_t(\mathcal{A}_t^0(r)) \\ 1 & \text{if } \sup u_t(\mathcal{A}_t^1(r)) \geq \sup u_t(\mathcal{A}_t^0(r)) \end{cases}\tag{4}$$

and if $\mathcal{A}_t^0(r) = \emptyset$, then $\alpha_{t+1}(r) = 1$, while if $\mathcal{A}_t^1(r) = \emptyset$, then $\alpha_{t+1}(r) = 0$. The latter part of this assumption says that if every member of group A in r 's local community took the same action in the previous period, then r takes that action in the current period. This imitation rule is an ‘‘optimistic’’ imitation rule in the sense that r aspires to the highest material payoff received by his parent's neighbors and then imitates the individual who received the highest material payoff. It is analogous to, but differs from, the imitation rule in [Eshel, Samuelson and Shaked \(1998\)](#). These authors assume that agents compare the average (rather than highest) payoff associated with each action taken by individuals in their neighborhood in the previous period, when deciding what action to take in the current period.²

Finally, given the choice of violence, the group A individual located at r in period $t + 1$ optimally chooses his attitude $a_{t+1}(r)$ subject to the constraint

$$a_{t+1}(r) \in [a_t(r) - \kappa, a_t(r) + \kappa]\tag{5}$$

which says that the individual may choose a racial attitude that is at most a distance $\kappa > 0$ away from the the attitude of his parent. The interpretation is that children socialize with their parents, acquiring information and perspectives from this interaction, which in turn constrain their social beliefs.

¹Though we assume that imitation is based on agents' observations of material payoffs rather than total payoffs, our substantive results would not be different if instead we assumed that the psychological part of payoffs was also observable, and agents imitated on the basis of total payoffs. This analysis is available upon request.

²We could reproduce results analogous to those of [Eshel, Samuelson and Shaked \(1998\)](#) by assuming their imitation rule, but we assume the optimistic imitation rule instead because it facilitates a more parsimonious exposition of our main ideas.

An alternative modeling strategy would be to assume that attitudes, rather than actions, are imitated and then actions are chosen optimally given the individual's attitude. However, because we are interested in providing an endogenous theory for the path of attitudes, we assume that attitudes follow actions rather than the other way around. More importantly, this is also the perspective of an influential school of thought in social psychology, going back to the work of [Festinger \(1962\)](#).

3 Result

In this section, we give our main result, which characterizes the recursive paths of violence and attitudes in the society described in the previous section. To focus on the substantively interesting case where violence is initially increasing and then decreasing, we add two assumptions to the model as follows.

First, recall that we assumed that violence produces benefits to group A only socially, since $\pi_t(\cdot)$ depends only on the fraction $\rho_t(r)$ of individual's in r 's local community that engage in violence. To this, we add the following assumption.

ASSUMPTION 1: (i) $\pi_t(\rho)$ is continuous and strictly increasing in ρ for all t , and (ii) there exists $t^* > 0$ s.t. $v < \pi_t(1) - \pi_t(\frac{1}{2}) \forall t < t^*$ and $v > \pi_t(1) - \pi_t(\frac{1}{2}) \forall t \geq t^*$.

Part (i) of this assumption implies that the return to violence is increasing in the amount of violence produced in the local community. Part (ii) states that in early periods the cost of violence is relatively low, but in later periods it is high.

Second, note that if no individual engages in violence in the first period, then by our imitation rule no individual will ever engage in violence. So, we will assume that a concentrated mass, λ_0 , of individuals adopt violence in the first period, and focus on how violence may spread or decline after this point. Formally, our assumptions about the initial conditions of the model are as follows.

ASSUMPTION 2: (i) $\lambda_0 \geq \mu$, and (ii) $(\alpha_0(r), a_0(r)) = \begin{cases} (1, \kappa) & \text{if } r \in [-\frac{\lambda_0}{2}, \frac{\lambda_0}{2}] \\ (0, 0) & \text{otherwise} \end{cases}$

Given the assumption that a concentrated mass λ_0 of group A individuals adopt violence in the first period, part (i) of this assumption guarantees that there is at least one individual whose entire local community engages in violence in the first period. (This assumption is stronger than necessary for our purposes, as we explain following the statement of Theorem 1 below.) Part (ii) of the assumption states that the small community of individuals that adopt violence in the first period is centered at 0, and that these individuals have the same attitudes that they would have chosen

if their parents' attitudes were 0 (but, in fact, they are the first generation of group A individuals in the model).

Before stating our main result, note that for all periods $t < t^*$, there is a unique number $\rho_t^* \in (\frac{1}{2}, 1)$ satisfying $\pi_t(\rho_t^*) - v = \pi_t(\frac{1}{2})$, which follows from Assumption 1. In addition, in all that follows we will identify the “degenerate interval” $[0, 0]$ with the empty set \emptyset . Our main result below recursively characterizes the spread and decline of violence and attitudes in the population, over time.

THEOREM 1: Suppose that Assumptions 1 and 2 hold. If R is large enough, then the paths of violence and attitudes are recursively given by

$$(\alpha_{t+1}(r), a_{t+1}(r)) = \begin{cases} (1, \min\{a_t(r) + \kappa, 1\}) & \text{for all } r \in [-\frac{\lambda_{t+1}}{2}, \frac{\lambda_{t+1}}{2}] \\ (0, \max\{a_t(r) - \kappa, 0\}) & \text{for all } r \notin [-\frac{\lambda_{t+1}}{2}, \frac{\lambda_{t+1}}{2}] \end{cases} \quad (*)$$

$$\text{where } \lambda_{t+1} = \begin{cases} \lambda_t + 2\mu(1 - \rho_t^*) & \text{if } t < t^* \\ \max\{0, \lambda_t - \mu\} & \text{if } t \geq t^* \end{cases} \quad (\dagger)$$

Proof. See Appendix A.

Theorem 1 implies that the mass of individuals that adopt violence grows up to period t^* after which it declines. The theorem also implies that as group A individuals adopt violence toward group B , they also develop increasingly hostile attitudes towards that group. If the critical period t^* is sufficiently large (and ρ_t^* is sufficiently lower than 1 in all of these periods), then a large mass of group A individuals continue to develop increasingly hostile attitudes toward group B , even after violence begins to decline. Consequently, average attitudes may peak in a period $t^{**} > t^*$ after which they begin to decline. In particular, it will take longer for average attitudes to decline all the way to 0 than it will for the mass of individuals adopting violence to go to 0. We illustrate this in Section 4.2, where we apply the result of Theorem 1 to show that violence against newly freed slaves in the postbellum period of the American South might have produced racially hostile attitudes towards blacks that have lasted to the present.

The assumption that “ R is large enough” that appears in the statement of Theorem 1 can be made precise. Note that violence is increasing until period t^* ; thus the mass of individuals adopting violence peaks in period t^* . This mass is simply $\lambda_{t^*} = \lambda_0 + 2\mu \sum_{t < t^*} (1 - \rho_t^*)$. Thus, for there to be enough “space” for the mass of individuals adopting violence to grow this much, we require $R > \lambda_{t^*} + \mu$, which is an assumption on the primitives of the model. We state it as such.

ASSUMPTION 3: $R > \lambda_0 + \mu (1 + 2 \sum_{t < t^*} (1 - \rho_t^*))$.

Finally, note that our assumption that agents imitate members of their local community (of the previous generation), rather than optimally decide whether or not to engage in violence, is important for the result that violence can spread in the population. Because violence produces benefits only socially, whereas its costs are private, optimizing agents would succumb to the free-rider problem and choose not to contribute to violence. That said, our assumption that a small concentrated mass λ_0 of individuals choose violence in the first period is also important for this result. However, as we mentioned before, the assumption that $\lambda_0 \geq \mu$ is stronger than necessary for the result of Theorem 1 to hold. If $v < \pi_0(1) - \pi_0(\frac{1}{2})$ (as implied by Assumption 1), then there exists $\lambda^* \in (\frac{\mu}{2}, \mu)$ such that $v = \pi(\frac{\lambda^*}{\mu}) - \pi(\frac{1}{2})$. Theorem 1 holds when we replace the assumption that $\lambda_0 \geq \mu$ with the weaker assumption that $\lambda_0 \geq \lambda^*$. However, if $\lambda_0 < \lambda^*$ then the mass of group A individuals who adopt violence in the first period is too small for violence to be sustained, let alone spread, and it disappears completely from society.

4 An Application to the Postbellum U.S. South

In [Acharya, Blackwell and Sen \(2013\)](#), we showed that the prevalence of slavery in Southern counties in 1860 is a strong and robust predictor of the racial and political attitudes of Southern whites today. In that paper, we gave a variety of evidence against several possible explanations for this finding, and proposed a set of surviving theories that could potentially explain our set of results. One of our theories was that violence towards blacks expanded in the Southern countryside after slavery was abolished, in part because the Southern white elite had an incentive to promote violence to suppress black wages—essentially, a new form of labor coercion. Where there were more plantations, and more ex-slaves, there were greater incentives for such violence. This violence then generated racially hostile attitudes, which were passed down through generations. In this section, we motivate this theory with some historical evidence. We then develop the theory formally by extending the model of the previous section to the context of this application. Finally, we provide some new empirical evidence that supports a key prediction of this “labor coercion theory.”

4.1 Historical Evidence for Postbellum Labor Coercion

Immediately after the Civil War, two major institutional changes took place in the U.S. South: black slaves were freed, and the federal government attempted to provide them with political rights and protections, including the right to vote. As these

events were unfolding, Southern whites, especially those involved in the plantation economy, felt an increasing uncertainty regarding the security of their property and their political power, and began finding alternative methods of protecting their control over the scarce resources of the South. For example, they introduced Black Codes and Jim Crow laws (Klinkner and Smith, 2002). They also promoted white supremacist organizations like the Ku Klux Klan (KKK), which, with the support of Southern conservatives and the Democratic Party, created an environment of intimidation and violence against newly freed blacks, with the initial purpose of disfranchising them (Klinkner and Smith, 2002).³ Over time, this racial violence became increasingly intense, manifesting itself in acts such as lynchings and hate crimes.

Although the racial violence perpetrated by groups like the KKK was initially intended to prevent blacks from voting, this violence had important effects on the plantation economy, especially considering the large-scale changes experienced by the Southern rural labor market following the abolition of slavery in 1865 (Shapiro, 1988; Woodman, 1977, 1979). The emancipation of slaves generated a severe shock to agricultural labor market, raising the labor costs of plantation owners. In particular, it weakened the wage-bargaining position of white planters *vis-a-vis* black employees, who could now demand market wages, and more easily sell their labor elsewhere (Higgs, 1977; Alston and Kauffman, 2001; Wright, 1986). Racist violence, however, tempered this change by lowering the outside options of blacks, particularly by reducing their potential wages and mobility. This meant that racist violence gave white planters greater market power, through the opportunity to pay lower wages, or to substitute wages with valuable (though perhaps ostensible) protection for their farmhands against the violence (i.e., what Alston and Ferrie (1993) refer to as “paternalistic wage contracts”). At the same time, white planters themselves had an interest in promoting the violence that was being perpetrated against blacks by organizations like the KKK, precisely because of their need to secure cheap farm labor. Indeed, Alston and Ferrie (1993) write very clearly that “the disfranchisement of blacks and poor whites that helped create the South’s regime of social control could not have occurred without the cooperation of the white rural elite.”

Over time, anti-enticement laws and anti-vagrancy laws made it even harder for blacks to leave their jobs, further lowering the value of their outside options, and thus their wages (Naidu, 2010, 2012). Other forms of labor coercion (such as bonded

³By the turn of the century, other measures—such as poll taxes, residency requirements, white primaries, and literacy tests—were introduced as institutional mechanisms to suppress the black vote (Klinkner and Smith, 2002). But in the period just after the Civil War, before these institutional measures were adopted, the threat of violence was the most important institutional mechanism through which disfranchisement took place (Kousser, 1974).

labor) and exploitation (such as the criminal lease system) further expanded to take slavery’s place (Blackmon, 2008; Lichtenstein, 1996). On top of this, new labor and tenancy laws began to consistently favor the white Southern agricultural elites over blacks (Woodman, 1995). Finally, as Blackmon (2008, pp. 64) notes, “the South had a judicial tradition of using criminal courts to settle civil debts, and of treating a man’s labor as currency with which to pay fines and mortgages.” Blackmon (2008) describes how under this system of “peonage” (or “debt bondage”), many illiterate African Americans were randomly captured by rural whites, both rich and poor, who then falsely accused them of failing to pay their debts and used the court system to extract money or labor from them. By some estimates, nearly 40% of Southern blacks were imprisoned under peonage at the start of the 20th century (Blackmon, 2008).

Motivated by this evidence, we propose a theory in which Southern whites engage in violence with the purpose of suppressing black farm wages. Because blacks were increasingly mobile after 1865, we hypothesize that violence is effective in suppressing wages only if it is carried out socially, i.e. if enough members of the local community are complicit in carrying it out. If only a single farmer engages in violence towards his farmhand, then the farmhand may simply leave the plantation to find work elsewhere, and the violence becomes ineffective; but if large segments of the local community engage in violence, then the prospect of leaving the plantation to find work elsewhere becomes more fearful, and violence becomes effective in suppressing farm wages. This implies that violence produces benefits to the perpetrators only socially, as in the model of Section 3. We develop this application formally in the next section.

4.2 A Model of Wage-Suppression

Consider the following extension to the baseline setup in Section 3. Let group A represent a community of white farm owners, and let group B be the group of recently freed black slaves (now farmhands). Located at each point $r \in \mathcal{R}$ is exactly one plantation, where exactly one farmer and one farmhand reside. Whenever there is no confusion, we will identify both farmers and farmhands with their location on the interval, $r \in \mathcal{R}$. We assume that after farmers make their decisions of whether or not to engage in violence against blacks in their local community (for example, whether or not to join the KKK), both farmers and farmhands make economic decisions. The choice of farmers to engage in violence will have implications for these decisions. We explain these as follows.

Economic Decisions. In each period t , each farmhand r is endowed with a total amount of labor $\bar{L} > 0$ that he must allocate between two activities: farmwork, and

employment outside of the farm. For work outside the farm, he receives an external wage rate $w_t^o(r)$ per unit labor. For work on the farm, in each period t farmer r offers him a wage contract $(w_t(r), L_t(r))$ where $L_t(r) \leq \bar{L}$ is the amount of labor he requests from the farmhand at a wage of $w_t(r)$ per unit. The farmhand either accepts or rejects the offer. If he accepts, then he receives a payoff

$$w_t(r)L_t(r) + w_t^o(r)(\bar{L} - L_t(r)) \quad (6)$$

where the first term in this expression is what he earns from farmwork, and the second is what he earns from selling the remainder of his labor outside the farm. If he rejects, then he sells all of his labor outside the farm, so he receives a payoff $w_t^o(r)\bar{L}$.

By employing $L_t(r)$ units of the farmhand's labor on his plantation in period t , farmer r is able to produce $\min\{m_t L_t(r), Y\}$ units of output. Here, $Y > 0$ is a limit on the amount of output that a farmer can produce, as he is constrained, for example, by the size of his plot, which we assume is fixed through time and equal across plantations. m_t is the state of mechanization of agriculture in period t . Machines are a substitute for labor: with more tractors, for instance, the farmer requires less labor to produce output. Thus, farmer r 's profit in period t is

$$\min\{m_t L_t(r), Y\} - w_t(r)L_t(r). \quad (7)$$

The Economic Implications of Violence. If a farmer engages in violence, he contributes to lowering the external wage rate of local farmhands. Given that $\rho_t(r)$ is the fraction of farmers in r 's local community that engage in violence in period t , we assume that the outside wage rate for a farmhand living at r is

$$w_t^o(r) = (1 - \rho_t(r)) \bar{w} \quad (8)$$

where $\bar{w} > 0$. Thus, if all farmers in r 's local community engage in violence, then the outside wage rate for a farmhand living in plantation r is 0. If a zero mass of them engage in violence, then r 's outside wage rate is \bar{w} . r 's outside wage rate is decreasing in the proportion of farmers in his local community that engage in violence against blacks. Equation (8) above, therefore, represents a reduced form approach to modeling the idea that when there is more violence against blacks in the local community, the prospect of leaving the plantation to find work elsewhere becomes more fearful for farmhands.

One way to motivate equation (8) is as follows. Suppose a black farmhand who leaves the plantation to find work outside the farm (say, in a nearby city) may find work at a wage rate $\bar{w} > 0$, but there is also some chance that he will be harmed

along the way. The probability of being harmed is increasing in the proportion of farmers in the local community that engage in violence. Specifically, if the farmhand is located at r , then for each unit of labor that he attempts to sell outside of the farm, his probability of being harmed is $\rho_t(r)$; and if he is harmed, then he loses that labor unit, receiving a payoff of 0. Therefore, his expected wage rate per unit of labor that he attempts to sell outside of the farm is given by (8).

We end our description of the model by summarizing the timing of events within each period t . First, all farmers simultaneously decide whether or not to engage in violence, and what attitudes to have towards blacks. Then, each farmer r offers a feasible contract $(w_t(r), L_t(r))$ to his farmhand. Each farmhand r then either accepts or rejects the contract. Finally, economic activity takes place, all agents receive their payoffs, and the period ends.

4.3 The Paths of Violence and Racial Attitudes

Our goal in this section is to apply Theorem 1 to characterize the co-evolution of violence and attitudes. To facilitate a direct path to our main substantive results, we make the following assumption.

ASSUMPTION 4: (i) $Y \leq m_t \bar{L}$ for all t , and (ii) $\bar{w} \leq m_t$ for all t .

Part (i) of this assumption states that land is always the constraining factor, not labor. Part (ii) states that a farmhand's marginal product (up to output level Y) is always at least as large as his maximum outside wage rate. These assumptions guarantee that all farmers will always have a positive demand for farm labor, and they will always seek to produce the maximum possible Y units of output.

We say that the labor market is in “equilibrium” in period t if the profile of contracts offered, $\{(w_t(r), L_t(r))\}_{r \in \mathcal{R}}$, and the profile of decision rules for farmhands on which contracts to accept and which to reject in period t , constitute a subgame perfect equilibrium (SPE) in that period, given the choice for each farmer of whether or not to engage in violence (as implied by our imitation rule).⁴ We refer to such an SPE as a “labor market equilibrium.”

We can characterize the unique labor market equilibrium in any given period t , using standard arguments. Since farmers offer take-it-or-leave-it wage contracts, they possess all of the wage bargaining power, and can squeeze farmhands to their

⁴Since all players live for only one period (and, therefore, do not care about what happens in future periods), the sequence of strategy profiles that constitute period-by-period SPEs is also the unique SPE of the infinite horizon dynamic game.

reservation wage (see also [Bardhan and Udry, 1999](#), Ch. 6). In particular, if farmer r offers a wage rate $w_t(r)$ equal to the outside option $w_t^o(r)$ of his farmhand, then it is incentive compatible for the farmhand to accept the contract for any amount of labor requested. Assumption 4 above guarantees that each farmer r requests $L_t(r) = Y/m_t$ units of labor in period t . Therefore, we have the following result.

LEMMA 1: Under Assumption 4, the wage contracts that are offered and accepted in labor market equilibrium in period t are given by $(w_t^o(r), Y/m_t)$ for all r .

Lemma 1 implies that the fact that farmhands can work safely on the plantation, but risk being harmed for work outside the farm, results in a “protection premium” that is fully internalized by the farmer. Specifically, the equilibrium contract is “as if” the farmer provides the farmhand with protection of his labor on the farm in exchange for a premium $(\bar{w} - w_t^o(r))L_t(r)$, which is exactly equal to the worker’s surplus. [Alston and Ferrie \(1993\)](#) refer to the protection received by farmhands in exchange for this premium as a form of “paternalism.”

Lemma 1 enables us to write the profit to each farmer r as a function of the fraction $\rho_t(r)$ of farmers in his local community that engage in violence. Substituting the equilibrium contract from Lemma 1 into equation (7) and simplifying, we get

$$\pi_t(\rho_t(r)) = Y \left[1 - (1 - \rho_t(r)) \frac{\bar{w}}{m_t} \right] \quad (9)$$

which satisfies part (i) of Assumption 1. Part (ii), on the other hand, is satisfied if the following assumption holds.

ASSUMPTION 1': There exists $t^* > 0$ such that $v < \frac{1}{2}\bar{w}Y/m_t$ for all $t < t^*$ and $v > \frac{1}{2}\bar{w}Y/m_t$ for $t \geq t^*$.

The assumption says that the cost of violence is initially relatively small in comparison to typical farm wages, but in later periods it is high. It captures the idea that farming technology is improving with time, i.e. that $\{m_t\}$ is an increasing sequence. In particular, Assumption 1' is implied by the assumption that farming technology is initially low, but improves sufficiently with time. Finally, note that Assumption 1' is also consistent with the idea that there is a date $t > t^*$ after which the level of mechanization is constant.

In addition to these assumptions, we maintain Assumption 2. Given that in this application $\rho_t^* = \frac{1}{2} + \frac{vm_t}{\bar{w}Y}$ for all $t < t^*$, we can restate Assumption 3 as an assumption on the primitives of this applied model.

ASSUMPTION 3': $R > \lambda_0 + \mu \left(2t^* - 1 - \frac{2v}{\bar{w}Y} \sum_{t < t^*} m_t \right)$.

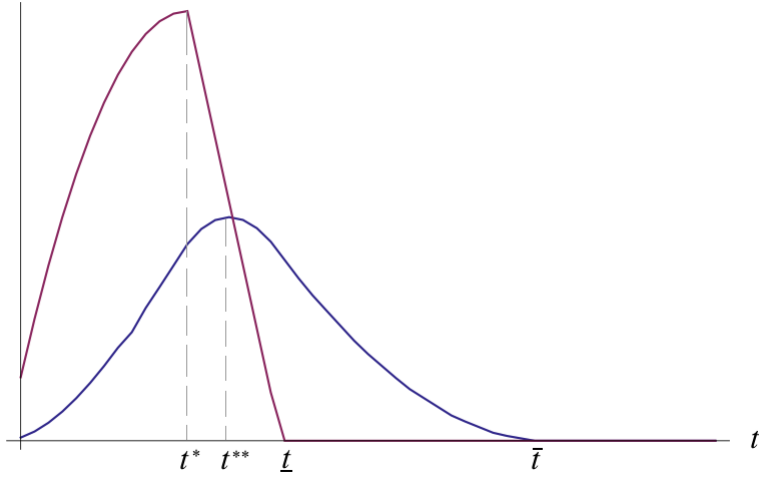


Figure 1: Paths of violence and racial attitudes for a numerical example. Average violence, $\bar{\alpha}_t$, in red and average attitudes, \bar{a}_t , in blue.

Finally, because our results in this section characterize the paths of “average violence” and “average attitudes” in society, we define these quantities as follows. These are, respectively,

$$\bar{\alpha}_t = \frac{1}{2R} \int_{r \in \mathcal{R}} \alpha_t(r) dr = \frac{\lambda_t}{2R}; \quad \bar{a}_t = \frac{1}{2R} \int_{r \in \mathcal{R}} a_t(r) dr \quad (10)$$

This follows because both $\alpha_t(r)$ and $a_t(r)$ will be measurable functions according to Theorem 1. Then, we have the following result, which states that under some natural conditions on the parameters, the average violence and average anti-black attitudes first rise, and then they both decline; but that the attitudes shaped by violence last longer than the violence itself.

PROPOSITION 1: Suppose Assumptions 1', 2, 3' and 4 hold, and the labor market is in equilibrium in every period. If κ is sufficiently small, t^* sufficiently large, and v is small in comparison to $m_t/\bar{w}Y$ for sufficiently many periods $t \leq t^*$, then

- (i) average violence $\bar{\alpha}_t$ is increasing in periods $t \leq t^*$, and then decreasing afterwards, until a period $\underline{t} > t^*$, after which it is forever 0.
- (ii) there exists a period t^{**} such that $t^* < t^{**} < \underline{t}$ and the average attitude \bar{a}_t is increasing until period t^{**} , then decreasing afterwards, until a period $\bar{t} > \underline{t}$, after which it is forever 0.

Proof. See Appendix B. \square

The proof of this result, in the Appendix, clarifies what we mean by κ being sufficiently small, t^* being sufficiently large and v being small in comparison to $m_t/\bar{w}Y$ for all $t \leq t^*$. We now provide a numerical example to depict the paths of average violence and average attitudes.

EXAMPLE— In Figure 1, we depict the paths of violence and racial attitudes for a numerical example. The model’s parameters can be written $(\theta, \{m_t\}, t^*)$, where $\theta = (\bar{L}, R, Y, \bar{w}, \lambda_0, \kappa, \mu, v)$. In this example, we set $\bar{L} = 10$, $R = Y = 1$, $\bar{w} = 0.5$, $\lambda_0 = \mu = 0.1$, $\kappa = 0.05$, $v = 0.025$ and $m_t = 0.8(t + 1)$ for $t = 0, \dots, 18$ and $m_t = 16$ for all $t > 18$. It is easy to verify that these parameters satisfy Assumptions 1', 2, 3' and 4, with $t^* = 12$. Figure 1 shows that average violence, \bar{a}_t , in red, first rises and peaks in period $t^* = 12$, after which it declines to 0 in period $\bar{t} = 19$. The average attitude, \bar{a}_t , in blue, first rises and peaks in period $t^{**} = 15$, after which it declines to 0 in period $\bar{t} = 37$. \square

Finally, we end this section with a remark about the model’s interpretation. When taken literally, the model suggests that it is only the descendants of former slaveholders that should hold racially hostile attitudes. Of course, this is a consequence of the model’s abstraction, since the model does not even incorporate whites who are not plantation owners (such as white farmhands). In Acharya, Blackwell and Sen (2013), we argued that local elites, such as former slaveholders, were likely to have spread racially hostile attitudes to other local non-elite whites as well, *a la* Zaller (1992). However, we do not provide a formal theory of how this might occur, since a parsimonious model of how elites influence mass behavior has yet to be developed (and is certainly beyond the scope of this paper). Nevertheless, we do not deny that this is likely to be a very important part of the explanation for why anti-black violence became so prevalent in the South, for both political and economic reasons.

That said, there remains the question of why poor white farmhands would support wage suppression if white labor and black labor are substitutes, linking whites’ farm wages with blacks’ wages. Indeed, there is some evidence that violence took place against poor whites as well (Kousser, 1974), and that in some places, poor whites who recognized the effects of black violence on their own wages opposed violence against blacks (Alston and Ferrie, 1999). On the other hand, Blackmon (2008) documents several instances where poor whites would abduct and return runaway black farmhands to their employers, in exchange for a bounty, even well into the early 20th century. Similarly, Blackmon (2008) suggests that many of the false accusations of debt-default against blacks were leveled by poor whites, to extract money or labor through peonage or the threat of incarceration and convict-leasing. This evidence

suggests that several poor whites were complicit with the Southern white elite in promoting violence against blacks. Consequently, one can think of a “plantation” r in our model as representing a small sub-community of elite and non-elites, led by a white elite whose incentives determine the behavior attitudes of the other non-elite whites in his community.

4.4 Empirical Implications

In this section, we use the characterization of the paths of violence and attitudes from the previous section, to generate two new empirical predictions.

Suppose that all Southern counties have n precincts, but differ in the number of former slave-holding precincts. The society modeled in the previous section represents one slaveholding precinct. Assume that the parameters $(\theta, \{m_t\}, t^*)$ are the same for all former slaveholding precincts in a county j , and denote the parameters for this county by $(\theta_j, \{m_{t,j}\}, t_j^*)$. Let $k_j \leq n$ denote the number of former slave-holding precincts in a county j , with $k_j > 0$. Assume that the mass of white population living in each of the remaining $n - k_j$ precincts of the county is also R , but there are no plantations, so no former-slaves, in these precincts. Consequently, assume that the choice of violence and attitudes of all individuals r in all of these non-slaveholding precincts is always $(\alpha_t(r), a_t(r)) = (0, 0)$ for all individuals r and all periods t . This implies that the average violence and average attitude in the county in period t are

$$\bar{\alpha}_{t,j} = \left(\frac{k_j}{n}\right) \bar{\alpha}_t(\theta_j, \{m_{t,j}\}, t_j^*); \quad \bar{a}_{t,j} = \left(\frac{k_j}{n}\right) \bar{a}_t(\theta_j, \{m_{t,j}\}, t_j^*) \quad (11)$$

where we have written $\bar{\alpha}_t$ and \bar{a}_t for each of the identical former slaveholding precincts as functions of the parameters, to emphasize this dependence. Obviously, the quantities $\underline{t}_j = \underline{t}(\theta_j, \{m_{t,j}\}, t_j^*)$, $t_j^{**} = t^{**}(\theta_j, \{m_{t,j}\}, t_j^*)$ and $\bar{t}_j = \bar{t}(\theta_j, \{m_{t,j}\}, t_j^*)$ defined in Proposition 1 will also depend on the parameters. Clearly $\bar{\alpha}_{t,j}$ and $\bar{a}_{t,j}$ follow similar paths as $\bar{\alpha}_t$ and \bar{a}_t , characterized in Proposition 1, except that their magnitudes are scaled by k_j/n . Then, immediately, we have the following result.

PROPOSITION 2: Consider two counties, 1 and 2, with the same parameters, $(\theta_1, \{m_{t,1}\}, t_1^*) = (\theta_2, \{m_{t,2}\}, t_2^*) = (\theta, \{m_t\}, t^*)$ for each former slaveholding precinct, which satisfy the hypothesis of Proposition 1. Suppose the two counties have different numbers of former-slaveholding precincts, $k_1 > k_2$. Then $\underline{t}_1 = \underline{t}_2 = \underline{t}$ and $\bar{t}_1 = \bar{t}_2 = \bar{t}$. Moreover, the average violence is greater in county 1 than in county 2 in periods $t < \underline{t}$ (i.e., $\bar{\alpha}_{t,1} > \bar{\alpha}_{t,2}$, for all $t < \underline{t}$) and equal to 0 in both counties in periods $t \geq \underline{t}$. The average attitude is higher in county 1 than in county 2 in periods $t < \bar{t}$ (i.e., $\bar{a}_{t,1} > \bar{a}_{t,2}$, for all $t < \bar{t}$) and equal to 0 in both counties in periods $t \geq \bar{t}$.

This result is straightforward, and follows immediately from Proposition 1 and the assumption that $k_1 > k_2$. The proposition has two main empirical implications. First, it implies that, conditional on county characteristics that determine the parameters $(\theta, \{m_t\}, t^*)$, we should expect to see greater racial violence against blacks in the decades after Reconstruction in counties that had high slave concentrations before emancipation. In [Acharya, Blackwell and Sen \(2013\)](#), we confirmed this prediction by showing that the black lynching rate between 1882 and 1930 was higher in counties that had higher slave proportions in 1860. We also showed that blacks who lived in such counties did not fare as well on a number of economic dimensions than blacks in other counties. In particular, the share of black tenant farms in 1925 was higher in counties that had high slave proportions in 1860, while the share of black owned farms was lower. Also, the average monetary value of black farms was lower. This evidence, though very indirect, is consistent with the theory of labor coercion that we have developed here.

Second, Proposition 2 also implies that we should expect to see more racially hostile attitudes (among whites, towards blacks) over a longer time horizon in counties that had higher slave proportions in 1860. In [Acharya, Blackwell and Sen \(2013\)](#), we find strong evidence for this prediction as well. We show that whites who currently live in high slave proportion counties on average express greater “racial resentment” towards blacks (as operationalized by [Kinder and Sears, 1981](#)) than whites who currently live elsewhere in the South. We also show that whites who currently live in these former slave-holding counties are on average more conservative, according to partisan identification as well as their reported views on affirmative action policies, than whites who live elsewhere. On the other hand, white attitudes on other issues such as gay marriage, abortion, and protecting the environment at the cost of jobs, do not vary with slave proportions in 1860. All in all, we have strong, though somewhat indirect, evidence confirming the predictions of Proposition 2.

Our model of labor coercion also implies a new testable prediction that we call the “mechanization hypothesis,” and derive as follows. Suppose that there are two counties, $j = 1, 2$, whose parameters satisfy the following assumption.

ASSUMPTION 5: $\theta_1 = \theta_2$, $k_1 = k_2$, and $m_{t,1} > m_{t,2}$ for all t .

According to this assumption, the two counties have the same proportions of former slaves, and are otherwise identical except that county 1 mechanizes quicker than county 2. Then, we have the following prediction.

PROPOSITION 3: Consider two counties, 1 and 2, whose parameters $(\theta_1, \{m_{t,1}\}, t_1^*)$ and $(\theta_2, \{m_{t,2}\}, t_2^*)$ satisfy the hypothesis of Proposition 1, as well as Assumption 5.

Then, average violence is lower in county 1 than in county 2 in periods $t = 1, \dots, \bar{t}_2 - 1$ (i.e., $\bar{\alpha}_{t,1} < \bar{\alpha}_{t,2}$ for all $t = 1, \dots, \bar{t}_2 - 1$), and equal to 0 in both counties in periods $t \geq \bar{t}_2$. Average attitudes are lower in county 1 than in county 2 in periods $t = 1, \dots, \bar{t}_2 - 1$ (i.e., $\bar{a}_{t,1} < \bar{a}_{t,2}$ for all $t = 1, \dots, \bar{t}_2 - 1$), and they are equal to 0 in both counties in periods $t \geq \bar{t}_2$.

Proof: See Appendix C. \square

According to Proposition 3, the county that mechanizes quicker will have lower average anti-black attitudes among whites, for a sustained period of time after violence peaks. The intuition for this is as follows. Faster mechanization implies a reduced demand for black farm labor, since machines, such as tractors, more quickly replace farm workers. In particular, the benefits to white plantation owners from suppressing black farm wages through violence are more quickly diminishing. This in turn implies that the incentives for violence are lower. Thus, counties that mechanize quicker see less violence against blacks. In turn, according to our theory, less violence produces less anti-black attitudes in both the short run and the medium run. We refer to this hypothesis as the “mechanization hypothesis.” We provide some new empirical evidence for this prediction in the next section.

4.5 Evidence for the Mechanization Hypothesis

Our theory of labor coercion rests in large part on the fact that, historically, cotton was a labor intensive crop. Large plantations were economically feasible in several Southern precincts, particularly those of the “Black Belt,” primarily because slaves provided labor at very low costs. As we have argued, once emancipation ended the ready supply of cheap labor for white planters, these landowners were pressed to find new ways to keep labor costs as low as possible. For the cotton business model to survive, in other words, white elites quickly had to find access to low-cost labor. This was particularly the case in the decades after the Civil War.

By the 1930’s and 1940’s, however, technological advancements and environmental shocks (like the Mississippi flood of 1927) led to the start of rapid mechanization in Southern agriculture (Hornbeck and Naidu, 2013). Mechanization made agriculture a less labor-intensive economic activity, driving down the demand for farm-labor and, thus, the need for labor coercion and the threat of violence against blacks that whites used to support it (Alston and Ferrie, 1993; Street, 1972; Day, 1967). Consequently, mechanization eroded the original socio-economic rationale for anti-black attitudes that were produced under the previous social order. Given that our theory rests on

	Prop Democrat	Affirm. Action	Racial Resentment
	(1)	(2)	(3)
Prop. Slave, 1860	-0.176** (0.063)	-0.136* (0.057)	0.684** (0.230)
Tractors, 1940	0.290 (0.411)	0.971** (0.373)	-3.487* (1.496)
Prop Slave × Tractors 1940	1.722** (0.513)	1.125* (0.466)	-6.422** (1.852)
State Fixed Effects	✓	✓	✓
1860 Covariates	✓	✓	✓
New Deal & Log 1930 Pop.	✓	✓	✓
Tractors, 1925 & 1930	✓	✓	✓
N	777	777	672
R ²	0.312	0.225	0.236

*p < .05; **p < .01

Table 1: How the effect of slavery varies by the degree of mechanization, as measured by the number of tractors per 100,000 acres of land in 1940. All three models are weighted least squares, with the within-county sample size as the weights. Standard errors in parentheses.

the economic need for labor coercion, this means that we should see differential degrees of decay in anti-black attitudes depending on the time that mechanization took place in various parts of the South. Specifically, the effect of slave prevalence on white attitudes should be weaker in counties that mechanized earlier; in those areas, there were weaker reasons for racially hostile attitudes because of the diminished demand for inexpensive black labor brought about by the mechanization of agriculture. This is exactly our “mechanization hypothesis” formalized in Proposition 3 above.

In columns (1), (2) and (3) of Table 1, this is exactly what we see. Here, we take our unit of analysis to be the county, and study the cross-section of Southern counties, regressing three outcome variables of interest from [Acharya, Blackwell and Sen \(2013\)](#) on the proportion of that county’s 1860 population that were slaves, the number of tractors per 100,000 acres of agricultural land in the county in 1940, an interaction term, and various controls. The outcome variables are modern era (i.e., post-2000) measures of the proportion of a county’s population identifying as Democrat, the proportion of the county’s population that opposes affirmative action policies, and the proportion of the county’s population that expresses “racial resentment” towards blacks. The sources and precise definitions of these outcome measures are described in [Acharya, Blackwell and Sen \(2013\)](#). Given the fact that after the realignment of the

1960’s, the Democratic Party became the party supporting Civil Rights legislation and affirmative action—policies seen as favoring African Americans—the first two outcome measures serve as imperfect political proxies for racial attitudes, while the third measure of racial resentment is more direct.

To help identify the effects of slavery and mechanization, our models include state fixed effects and a number of “1860 Covariates” described in detail in [Acharya, Blackwell and Sen \(2013\)](#).⁵ We also control for the log of New Deal spending per capita in the county, the log of the county’s 1930 population, and the number of tractors per 100,000 acres of agricultural land in the county in 1925 and 1930. All of these controls are from the U.S. Census or U.S. Agricultural Census ([Haines and ICPSR, 2010](#)). Proportion slave in 1860 by modern county is from [O’Connell \(2012\)](#).

Our method follows [Hornbeck and Naidu \(2013\)](#) in using the number of tractors as a proxy for mechanization in 1940, which we collect from the 1940 Agricultural Census ([Haines and ICPSR, 2010](#)). Note that this is an early form of mechanization since 1940 slightly pre-dates the period that saw the most rapid mechanization of Southern agriculture.⁶

Our results indicate that the effect of slavery in 1860 is smaller for counties that were relatively more mechanized in 1940. This result is the same across each of our three outcome measures. Though we cannot infer the controlled direct effect of slavery from the regression coefficients in Table 1, due to post-treatment bias, we can use the sequential g-estimator approach of [Vansteelandt \(2009\)](#) described in [Acharya, Blackwell and Sen \(2013\)](#) to estimate the effect of slavery at various levels of mechanization.⁷ For example, where mechanization is low in 1940 (i.e., below 0.018 tractors per 100,000 acres of land, which is the first quartile of counties according to tractors), a 10 percentage-point increase in proportion slave leads to a 2.62 percentage-point drop in the percent of whites who identify as Democrat today. Where mechanization is high (i.e., above 0.17 tractors per 100,000 acres, which is the fourth quartile), the same change in proportion slave leads to a 0.12 percentage-point *increase* in percent Democrat. Furthermore, the effect of slavery is insignificant at the typical levels for the most mechanized counties in 1940. This comports with our

⁵Briefly, they include 1860 county-level measures of the log of total population, the percent of farms that were smaller than 50 acres, the log of total farm value per capita, the proportion of church seats in the county that are in Methodist churches, the proportion of total population that was mixed-race, and indicators for access to rails and waterways. They also include the proportion of the county voting Democrat in the 1856 election, and flexible controls for latitude and longitude.

⁶According the U.S. Agricultural Census the number of tractors in the South almost quadrupled between 1940 and 1975 ([Haines and ICPSR, 2010](#)).

⁷Obviously, here we use the modified version of the sequential g-estimator that allows for interactions between the treatment and the intermediate variable ([Vansteelandt, 2009](#)).

expectations, as these are exactly the counties that lost their economic imperative for labor coercion, and racism.

Of course, our estimates here should be interpreted with caution. Although we have controlled for tractors in 1925 and 1930 and other covariates to account for confounding differences between counties, it might still be the case that counties that saw differential growth in mechanization in the 1930's are distinct for reasons that may directly affect our outcome measures. Nevertheless, it is reassuring to us that we see the expected correlation between our proxy for the timing of mechanization, and our three measures of political and racial attitudes.

5 Conclusion

We have proposed a theory of how violence shapes attitudes over an extended period of time. We applied this theory to the context of the postbellum U.S. South, and argued that violence may have spread in former slaveholding precincts in some part due to the underlying incentives for white farmers to suppress black wages. We now conclude the paper with a discussion of the model's limitations and strengths, and directions for future research.

First, our paper provides a theory of how violence can spread, but we do not provide an explanation for how it starts. More precisely, for violence to spread in our model, we require a small concentrated mass, λ_0 , of individuals to adopt violence in the first period. We did not give an explanation for why these individuals adopt violence. One possible explanation could be that a small community of individuals occasionally have individual-level incentives to engage in violence, for reasons unmodeled. Another possibility is that sparks of communal violence emerge after major shocks, like the Civil War and the consequent abolition of slavery. This would also explain why [Voigtländer and Voth \(2012\)](#) found that anti-semitic violence rose during the Black Death, and after Germany's defeat in World War I. Our theory does not provide a mechanism for how such shocks can spark violence in small communities (though we consider this to be an interesting and important question for future research). Instead, we focused on providing a theory of how violence spreads once it starts, how and when it might begin to decline, and how it leaves a lasting impact on attitudes. Our model provides new insights into these dynamics.

Second, our model does not deal with how violence towards the target group B shapes the attitudes of group B members, or with situations in which group B may also choose violence against group A . Moreover, it does not deal with situations in which violence shapes attitudes, and attitudes in turn impact the incentives for

future violence, possibly leading to longer-term impacts of historical violence. These are important questions for future extensions that build even richer dynamics into our model of attitudes shaped by violence.

In our model, the act of threatening violence against a particular group creates negative attitudes towards that group because of “cognitive dissonance.” Attitudes shaped by violence in this way may last for some time even after the incentives for violence diminish. More generally, attitudes that are supported by profitable actions may last in our framework because each successive generation is likely to imitate such actions. On the other hand, attitudes supported by actions that yield low payoffs more quickly erode, but may still last for long periods. Indeed, there is a body of empirical evidence within the political science, starting with the work of [Campbell et al. \(1980\)](#) and [Jennings and Niemi \(1968\)](#), which shows that political attitudes are shaped by inter-generational socialization. This lends some motivation for our assumption that the attitudes of successive generations are loosely constrained by the attitudes of previous generations.

After developing our theory, we used it to explain how violence towards blacks in the U.S. South in the decades after Reconstruction might have produced racially hostile attitudes that have lasted to the present. We argued that the incentives for violence in this period might have arisen in some part due to the incentives of the Southern white elite to replace slavery with new forms of labor coercion, such as paternalistic wage contracts, peonage, and convict-leasing. Broadly, our theory is one in which powerful individuals respond to the abrupt and forced abolition of an entrenched social institution like slavery by seeking to establish other local and informal institutions that serve a similar purpose to that of the previous, forcibly abolished, formal institution. This idea is also discussed briefly in [Acemoglu et al. \(2011\)](#), who explain that when Napoleon’s armies forcibly removed seigniorial institutions in Western Germany, local elites tried to set up informal institutions that served the same roles as the ones that were forcibly abolished.

Our model explained the core findings of our previous empirical paper, [Acharya, Blackwell and Sen \(2013\)](#), and generated a new prediction, which we called the “mechanization hypothesis.” Under this prediction, the effects of slavery’s historical prevalence on modern day attitudes should be smaller in Southern counties that mechanized their agriculture quicker. We showed that this prediction has empirical support in the fact that the effects of 1960 slave prevalence on contemporary attitudes tempered by measures of mechanization in 1940. Indeed, this important observation presents a silver lining in our research: although the incentives produced by historical forces and institutions may have lasting effects, these effects are likely to diminish over

time if the original incentives that generated them are changed. This idea is consistent with previous findings such as those of [Alesina and Fuchs-Schundeln \(2007\)](#), who show that East and West Germans continued to hold different beliefs about redistribution and government intervention even 15 years after unification, but that these beliefs have been converging. Under our theory, postbellum violence produced racial hostility among whites beginning in the late 1870s and lasting at least until the start of agricultural mechanization around 1930. It is difficult to assess how long it will take for the effects of this period to dissipate, but if our theory is compelling, then we have good reason to believe that these effects are not permanent.

Appendix

A. Proof of Theorem 1

The proof is by induction. Since the set of individuals that engage in violence in the first period is an interval $[-\frac{\lambda_0}{2}, \frac{\lambda_0}{2}]$ (by Assumption 2) the theorem can be proven by showing that if the set of individuals that engage in violence in period t is an interval $[-\frac{\lambda_t}{2}, \frac{\lambda_t}{2}]$ then the set that engage in violence in period $t + 1$ is $[-\frac{\lambda_{t+1}}{2}, \frac{\lambda_{t+1}}{2}]$, where λ_{t+1} is given by (†). The path of attitudes $a_t(r)$ described in (*) is then a immediate implication of this result.

Note that in periods $t < t^*$, we have $\lambda_t \geq \mu$ along the conjectured path. We focus on values of $r \geq 0$, since the argument for values of $r < 0$ will be symmetric. For every individual located at $r \in [0, \frac{\lambda_t}{2} - \frac{\mu}{2}]$, $\mathcal{A}_t^0(r) = \emptyset$, so $\alpha_{t+1}(r) = 1$. For individuals located at $r > \frac{\lambda_t}{2} + \frac{\mu}{2}$, $\mathcal{A}_t^1(r) = \emptyset$, so $\alpha_{t+1}(r) = 0$. For individuals $r \in (\frac{\lambda_t}{2} - \frac{\mu}{2}, \frac{\lambda_t}{2} + \frac{\mu}{2}]$, we have

$$\sup u_t(\mathcal{A}_t^1(r)) = u_t(\max\{0, r - \frac{\mu}{2}\}) = \begin{cases} \pi_t \left(1 - \frac{r - \lambda_t/2}{\mu}\right) - v & \text{if } r > \lambda_t/2 \\ \pi_t(1) - v & \text{if } r \leq \lambda_t/2 \end{cases} \quad (12)$$

The first equality follows from the fact that $\pi_t(\rho)$ is strictly increasing in ρ (by Assumption 1), so $u_t(\tilde{r})$ is highest for $\tilde{r} = \max\{0, r - \frac{\mu}{2}\}$ in the set $\mathcal{B}(r)$. The second follows from noting that $\rho_t(\max\{0, r - \frac{\mu}{2}\})$ equals 1 for $r \leq \lambda_t/2$, and equals $1 - \frac{r - \lambda_t/2}{\mu}$ for $r > \lambda_t/2$; and then substituting $u_t(r)$ from (1).

On the other hand, for these individuals we also have

$$\begin{aligned} \sup u_t(\mathcal{A}_t^0(r)) &= \lim_{\varepsilon \rightarrow 0^+} \pi_t(\rho_t(\frac{\lambda_t}{2} + \varepsilon)) \\ &= \lim_{\varepsilon \rightarrow 0^+} \pi_t\left(\frac{1}{\mu} \left(\left(\frac{\lambda_t}{2} + \varepsilon\right) - \left(\frac{\lambda_t}{2} - \frac{\mu}{2}\right)\right)\right) = \pi_t\left(\frac{1}{2}\right) \end{aligned} \quad (13)$$

which follows from the continuity of $\pi_t(\cdot)$ (by Assumption 1). Since $v < \pi_t(1) - \pi_t(\frac{1}{2})$ for all periods $t < t^*$, these results imply that $\sup u_t(\mathcal{A}_t^1(r)) \geq \sup u_t(\mathcal{A}_t^0(r))$ for all $r \leq \lambda_t/2$. For $r > \lambda_t/2$ we have $\sup u_t(\mathcal{A}_t^1(r)) \geq \sup u_t(\mathcal{A}_t^0(r))$ if and only if

$$\pi_t \left(1 - \frac{r - \lambda_t/2}{\mu} \right) - v \geq \pi_t \left(\frac{1}{2} \right) \quad (14)$$

At $r = \lambda_t/2$, the left side is bigger than the right side (by Assumption 1), and at $r = (\lambda_t + \mu)/2$ it is smaller (since $v > 0$). Since $\pi_t(\rho)$ is increasing in ρ , there is a critical r_t^* such that the two sides are equal. By definition, we have

$$1 - \frac{r_t^* - \lambda_t/2}{\mu} = \rho_t^* \quad \implies \quad r_t^* = \frac{\lambda_t}{2} + \mu(1 - \rho_t^*) \quad (15)$$

Since we need $r_t^* = \lambda_{t+1}/2$, the result obtains for periods $t < t^*$.

Now consider periods $t \geq t^*$, and suppose that $\lambda_t \geq \mu$. Again, for all $r \in [0, \frac{\lambda_t}{2} - \frac{\mu}{2}]$, $\mathcal{A}_t^0(r) = \emptyset$, so $\alpha_{t+1}(r) = 1$; and for all $r > \frac{\lambda_t}{2} + \frac{\mu}{2}$, $\mathcal{A}_t^1(r) = \emptyset$, so $\alpha_{t+1}(r) = 0$. For all $r \in (\frac{\lambda_t}{2} - \frac{\mu}{2}, \frac{\lambda_t}{2} + \frac{\mu}{2}]$, the expressions for $\sup u_t(\mathcal{A}_t^1(r))$ and $\sup u_t(\mathcal{A}_t^0(r))$ are given by (12) and (13) above, so $v > \pi_t(1) - \pi_t(\frac{1}{2})$ and the fact that $\pi_t(\rho)$ is strictly increasing in ρ (both by Assumption 1) imply that $\sup u_t(\mathcal{A}_t^1(r)) < \sup u_t(\mathcal{A}_t^0(r))$ for all $r \in (\frac{\lambda_t}{2} - \frac{\mu}{2}, \frac{\lambda_t}{2} + \frac{\mu}{2}]$. Thus, the set of farmers who engage in violence in period $t + 1$ is $[-\frac{\lambda_t}{2} + \frac{\mu}{2}, \frac{\lambda_t}{2} - \frac{\mu}{2}]$.

Now suppose $0 < \lambda_t < \mu$. Again, since $\mathcal{A}_t^1(r) = \emptyset$ for all $r > \frac{\lambda_t}{2} + \frac{\mu}{2}$ we know that $\alpha_{t+1}(r) = 0$ for all $r > \frac{\lambda_t}{2} + \frac{\mu}{2}$. On the other hand, for all $r \in [0, \frac{\lambda_t}{2} + \frac{\mu}{2}]$, we have

$$\sup u_t(\mathcal{A}_t^0(r)) = \lim_{\varepsilon \rightarrow 0^+} \pi_t \left(\frac{\lambda_t}{2} + \varepsilon \right) = \begin{cases} \pi_t(1/2) & \text{if } \lambda_t \geq \mu/2 \\ \pi_t(\lambda_t/\mu) & \text{if } \lambda_t < \mu/2 \end{cases} \quad (16)$$

For all $r \geq 0$, $\sup u_t(\mathcal{A}_t^1(r))$ is bounded above by $u_t(0) = \pi_t(\lambda_t/\mu) - v$. So if $\lambda_t < \mu/2$, then for all $r \geq 0$ we have $\alpha_{t+1}(r) = 0$, since $v > 0$ implies $\sup u_t(\mathcal{A}_t^1(r)) < \sup u_t(\mathcal{A}_t^0(r))$ in this case. If, instead, $\lambda_t \geq \mu/2$, then we also have $\sup u_t(\mathcal{A}_t^1(r)) < \sup u_t(\mathcal{A}_t^0(r))$, since

$$\pi_t(1/2) > \pi_t(1) - v > \pi_t(\lambda_t/\mu) - v \quad (17)$$

where the first inequality follows by Assumption 1, and the second follows by our hypothesis that $\lambda_t < \mu$ and the fact that $\pi_t(\rho)$ is strictly increasing in ρ (also by Assumption 1). Consequently, we have $\alpha_{t+1}(r) = 0$ for all $r \geq 0$. Finally, if $\lambda_t = 0$ then $\mathcal{A}_t^1(r) = \emptyset$, so $\alpha_{t+1}(r) = 0$ for all r . \square

B. Proof of Proposition 1

Part (i) follows immediately from Theorem 1, since the mass of individuals who undertake violence, λ_t , is increasing in t until period t^* and then decreasing afterwards until a period \underline{t} after which it is constantly equal to 0.

For part (ii), note that if v is small in comparison to $m_t/\bar{w}Y$ for sufficiently many periods $t \leq t^*$ then $(\frac{1}{2} - \frac{vm_t}{\bar{w}Y})$ is nearly equal to $1/2$ in these periods. Then given that in this application $\rho_t^* = \frac{1}{2} + \frac{vm_t}{\bar{w}Y}$ for all $t < t^*$, this implies that all of these t periods, the mass of farmers engaging in violence grows by an amount less than but nearly equal to μ . In t periods, then, it has grown by an amount less than, but nearly equal to μt . If κ is small, then no farmer r has reached the maximum anti-black attitude $a_t(r) = 1$. This means that if t is large enough, then $\lambda_{t^*} - \mu > \mu$. In period $t^* + 1$ the attitude of a mass μ of farmers declines by κ , but the attitude of a mass $\lambda_{t^*} - \mu$ of them rises by κ (while everyone else's attitude remains 0). So, the net change in average attitude is $(\lambda_{t^*} - \mu)\kappa - \mu\kappa > 0$. Since average attitudes must be strictly decreasing after period \underline{t} when all violence disappears, there must be a period t^{**} between t^* and \underline{t} at which average attitude peaks. Since for every farmer r that has a positive attitude $a_t(r) > 0$, attitudes decrease by κ each period after period \underline{t} , there must be a period $\bar{t} > \underline{t}$ after which all farmer's attitudes are forever 0. \square

C. Proof of Proposition 3

First note that Assumption 5 implies $t_1^* \leq t_2^*$. The same assumption implies that $\rho_{t,1}^* > \rho_{t,2}^*$, since $\rho_{t,j}^* = \frac{1}{2} + \frac{vm_{t,j}}{\bar{w}Y}$ for all $t < t_j^*$. This implies that for all $t < t_1^*$, $\lambda_{t+1,1} < \lambda_{t+1,2}$. Moreover, $\lambda_{t+1,1}$ is decreasing in periods t_1^*, \dots, t_2^* , while $\lambda_{t+1,2}$ is increasing in these periods (so obviously we have $\lambda_{t+1,1} < \lambda_{t+1,2}$ for all $t = t_1^*, \dots, t_2^*$). Next, because $\lambda_{t+1,1} = \max\{\lambda_{t,1} - \mu, 0\}$ while $\lambda_{t+1,2} = \lambda_{t,2} - \mu > 0$ for all $t = t_2^*, \dots, \underline{t}_2 - 1$, we know that $\lambda_{t+1,1} < \lambda_{t+1,2}$ for all $t = t_2^*, \dots, \underline{t}_2 - 1$. For $t \geq \underline{t}_2$, we have $\lambda_{t+1,1} = \lambda_{t+1,2} = 0$.

The argument above establishes that $t_1^* \leq t_2^*$ and $\underline{t}_1 \leq \underline{t}_2$. The argument above also implies that $\bar{t}_2 \geq \bar{t}_1$. Then, note that under Lemma 2, the only attitudes that any farmer holds in period t attitudes in the set $\mathcal{K} = \{0, \kappa, 2\kappa, \dots, 1\}$. Since κ is small, the above argument implies that in all periods $t = 1, \dots, \bar{t}_2$, for every non-zero level of attitude in the set \mathcal{K} , the mass of farmers who hold that level of attitude in county 2 is weakly larger than the mass of farmers who hold that attitude in county 1, and *strictly* larger for at least one non-zero level of attitude. This implies that average attitudes are greater in county 2 than in county 1 for all $t = 1, \dots, \underline{t}_2 - 1$ and equal to 0 in both counties for all $t \geq \underline{t}_2$. \square

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