

The Political Economy of Incarceration in the Cotton South, 1910–1925¹

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A large theoretical literature in sociology connects increases in incarceration to contractions in the demand for labor. But previous research on how the labor market affects incarceration is often functionalist and seldom causal. This article estimates the effect of a shock to the southern agricultural labor market during a time when planters exerted a clear influence over whether workers or potential workers were incarcerated. From 1915 to 1920, a beetle called the boll weevil spread across the state of Georgia, causing cotton yields and the demand for agricultural workers to fall. Using archival records of incarceration in Georgia, the authors find that the boll weevil infestation increased the Black prison admission rate for property crimes by more than a third. The article describes the institutional conditions under which falling labor demand should increase incarceration, clarifies the relationship between incarceration and the economic institutions that replaced slavery, and contributes to a growing literature on incarceration and exploitation in the labor market.

At least since Marx, social theorists have proposed that when the demand for labor falls, the number of people in prison tends to rise. Marx and Engels

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stressed that people expelled from the labor force often had to steal to survive (Engels [1845] 2005, p. 69; Marx [1867] 1990, p. 896). Frankfurt School theorists Rusche and Kirchheimer ([1939] 2003) broadened this argument by claiming that changes in the labor market affect not just crime but punishment as well.² Sociologists inspired by Rusche and Kirchheimer have argued that declining labor demand can increase the incarceration rate even without affecting crime (Chiricos and Delone 1992, pp. 421–26; D'Alessio and Stolzenberg 1995, pp. 350–52).

But efforts to understand the relationship between incarceration and the labor market have faced two challenges—one theoretical and the other empirical. The first challenge is summarized by Garland: “If it is to be argued that economic imperatives are conveyed into the penal realm, then the mechanisms of this indirect influence must be clearly specified and demonstrated” (1990, p. 109). Particularly difficult is documenting precisely how employers, whether individually or as a class, are able to influence the incarceration rate (Wright 1994; Goodman, Page, and Phelps 2017, p. 6). The second challenge is reverse causality: it is difficult to estimate the effect of changes in the labor market on crime and incarceration because the labor market both affects and is affected by crime and incarceration (Western and Beckett 1999; Pfaff 2008, p. 607). Avoiding this problem typically entails finding an exogenous event that transformed the labor market—an event that could not itself have been affected by changes in incarceration.

In this article, we address both challenges. We assemble historical evidence describing two mechanisms through which a decline in the demand for workers might have increased the incarceration rate in the state of Georgia in the early 20th century. And we examine an event—the boll weevil infestation—that had a drastic effect on cotton production, the primary form of work available to rural Black southerners.

We argue that the relationship between labor demand and incarceration depends on three historically specific institutional conditions: (1) whether

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² Rusche and Kirchheimer (2003) focus primarily on the form rather than the scale of punishment, but subsequent research inspired by their work has focused mainly on the latter. For an important exception, see Melossi and Pavarini (2018).

workers have means of survival outside of the labor market, (2) whether employers can obtain the labor of incarcerated people, and (3) whether employers can influence the rate at which the state incarcerates workers or potential workers. Specifying these conditions enables us to explain why the relationship between labor demand and incarceration that we observe may or may not generalize to other times and places. We show that in Georgia in the early 20th century, agricultural workers had few nonmarket means of survival. Moreover, planters could not contract with the state to acquire the labor of people in prison. Instead, planters used several techniques to keep workers or potential workers out of prison rather than in it. For these reasons, a growing demand for agricultural workers should have reduced the incarceration rate, and a fall in the demand for these workers should have increased it.

Beginning in the late 19th century, a beetle called the boll weevil spread eastward from the base of Texas, reaching Georgia in 1915. Boll weevils, which damage and destroy cotton plants, can greatly interfere with the production of cotton. As they infested the South's cotton belt, they dramatically reduced both cotton yields (Lange, Olmstead, and Rhode 2009) and the demand for agricultural workers (Baker 2015).

The infestation's effect on the demand for agricultural workers could have increased incarceration in two ways. First, it could have increased crime. For instance, displaced agricultural workers, with few options for survival, might have turned to property crime or illegal markets as an alternative means of subsistence. If so, the increase in crime in infested counties could have led to an increase in incarceration.

Second, the infestation could have increased incarceration by increasing the likelihood that people accused of crimes would be imprisoned. Before the boll weevil's arrival, planters used several techniques to ensure that workers or potential workers were not imprisoned. Some served as character witnesses, withheld or interfered with prosecutions, or dealt with property crimes informally to keep tenants, sharecroppers, and agricultural wage workers on their land (Du Bois 1904, pp. 44–48; Raper 1936, pp. 293–94; Woofter 1936, p. 32; Raper and Reid 1941, p. 25; Davis, Gardner, and Gardner [1941] 2009; Smith 1982, p. 195; Alston and Ferrie 1999, pp. 28–29). Others secured workers by paying their legal fines. Workers who otherwise would have toiled on chain gangs instead labored in a system of peonage sometimes called the criminal surety system, which bound them to the employers who paid their fines (Du Bois 1935, p. 698; Raper 1936, p. 293; Woofter 1936, p. 32; Daniel 1972; Cohen 1976, p. 53; 1991, p. 244; Novak 1978; Karnes 2000, p. 62; Blackmon 2008). When the boll weevil infestation reduced the size of the cotton harvest, planters' need to keep workers or potential workers out of prison fell with it. Thus, the infestation might have increased incarceration even if it had no effect on crime.

The arrival of the boll weevil was particularly consequential for Black southerners. Slavery had left freedpeople with little wealth (Du Bois 1901a; Higgs 1982; Miller 2011). It also had given rise to a racist ideology that led many white Americans to view Black Americans as a distinct group with interests opposed to their own (Du Bois 1935; Patterson 1982, p. 34; Fields 1990, p. 108; Edwards 1998). On these grounds, white southerners often violently resisted the sale of land to Black southerners (Ransom and Sutch 2001, pp. 86–87). With few resources and with barriers to purchasing the land they could afford, most rural Black southerners had little choice but to become sharecroppers, tenant farmers, or agricultural wage workers (Jaynes 1986, p. 188; Wright 1986, p. 94; Lichtenstein 1998, pp. 134–35; Tolnay 1999, p. 9; Ruef 2014).

Rural Black southerners' concentration in agriculture meant that they were especially affected by the sharp drop in agricultural work caused by the boll weevil. But this was not the only reason they were hardest hit by the infestation. In addition, their low levels of wealth made it hard for them to pay fines to evade chain gangs and peonage (Raper 1936, pp. 292, 294; Daniel 1972, p. 108). Historical research has also shown that crimes committed by Black Americans were much more likely than crimes committed by white Americans to be punished by incarceration when the demand for agricultural labor was low (Du Bois 1901b, 1904; Ayers 1984; Muhammad 2010; Muller 2018).

In the following analysis, we combine 16 years of archival records on incarceration in the state of Georgia with data on the timing of the boll weevil infestation drawn from a map published by the U.S. Department of Agriculture. These data allow us to study how the arrival of the boll weevil affected imprisonment within Georgia counties. We focus on Georgia for three reasons. First, Georgia kept high-quality records of every person admitted to prison in the state in the years surrounding the infestation. Crucially, unlike most data on incarceration, these data include the county where each person was convicted. Data on incarcerated people's county of conviction enable us to link them to labor-market conditions in the counties where they were convicted rather than the counties where they were incarcerated. Second, although the extent of peonage in the South is unknown, historical evidence suggests that it was especially prevalent in Georgia. For instance, of all cases investigating peonage recorded in *The Peonage Files of the U.S. Department of Justice 1901–1945*, more appear in Georgia than in any other state (Daniel 1989). Finally, previous research has shown that the boll weevil sharply reduced cotton production in Georgia, which, before the infestation, had been the second-largest cotton producer in the United States (Baker 2015, p. 1129). The magnitude of the employment shock and the estimated scale of peonage in Georgia make it an advantageous site for studying the effects of a decline in the demand for workers (Merton 1987). In states where cotton production

and peonage were less prevalent, the boll weevil's effect on incarceration should have been weaker.

We find that the boll weevil infestation increased the Black prison admission rate for property crimes by more than a third. It had a similarly large effect on Black prison admissions for all crimes that could be punished with a fine—those crimes that allowed planters to entrap defendants in peonage. In contrast, the infestation's effects on Black prison admissions for homicide or for all crimes that legally had to be punished with a prison sentence were small and not statistically significant. Its effects on white prison admissions for all of these crimes were also small and not statistically distinguishable from zero. Using the timing of the infestation as an instrumental variable for cotton production, we show that Black property-crime admissions increased as cotton production fell. Finally, we document that the boll weevil's effect on Black property-crime admissions was largest in the counties that grew the most cotton and negligible in the counties that grew the least.

Because there are no data on crime or peonage in early 20th-century Georgia, we cannot definitively establish how much of the boll weevil's effect was due to an increase in crimes of survival versus a decline in planters' efforts to keep workers or potential workers out of prison. However, the pattern of our results, combined with the historical evidence we have assembled, suggests that both mechanisms contributed to the infestation's effect on incarceration. Moreover, both mechanisms have been proposed in previous literature on the political economy of punishment, and both illustrate the importance of coercion in the labor market, as we discuss below.

Our analysis has three general implications. First, our results help to clarify the much-debated relationship between incarceration and the economic institutions that replaced slavery (Alexander 2010). A central premise of our study is that we can observe the effects of these institutions by examining what happens when exogenous events disrupt them. Because planters could not contract for the labor of incarcerated people, they tried to prevent workers or potential workers from going to prison. Thus, although slavery and imprisonment clearly were related, this was not because imprisonment itself was a straightforward replacement for slavery in early 20th-century Georgia. Instead, when the demand for agricultural workers was high, the Black incarceration rate was low for the same reason it was low during slavery: planters depended on the labor of Black agricultural workers just as slaveholders depended on the labor of enslaved people (Du Bois 1901*b*, p. 738; Sellin 1976, p. 138; Davis 2000, p. 64; White 2001, p. 126; Gilmore 2007, p. 12; Muller 2018, p. 369).³ But slavery's effects on Black Georgians'

³ Slavery in the United States was both a system of racial domination and "a system of labor exploitation" (Hahn 1982, p. 43; see also Cox 1948; Fields 1990). In systems of labor exploitation, "the exploiter *needs* the exploited since the exploiter depends upon the effort of the exploited" (E. O. Wright 1997, p. 11).

exclusion from landownership and nonagricultural work made them especially susceptible to imprisonment when the boll weevil reduced the demand for their labor.

Second, the historical evidence we present suggests that peonage should be given a more prominent place in the sociology of racial and class inequality in the United States. If imprisonment itself did not enable planters to secure a supply of forced labor, the threat of imprisonment that could be wielded against Black workers did. Peonage was one of many techniques that planters used to control agricultural workers in the early 20th-century South (Du Bois 1901*b*; Wiener 1979; Cohen 1991; Davis 1998; Karnes 2000; Naidu 2010). But despite its clear consequences for the social and economic fortunes of Black and poor white people, it has received comparatively little attention from sociologists. In documenting the relationship between peonage and imprisonment in the early 20th-century South, our analysis contributes to a growing body of sociological research showing how the threat of incarceration reinforces the use of coercion in the labor market, both historically and today (Steinberg 2016; Zatz 2016, 2020; Hatton 2020; Reich and Prins 2020). Whereas previous research on the prison as a labor-market institution has focused primarily on the relationship between incarceration and exclusion from the labor market, our work is part of a new literature revisiting the relationship between incarceration and exploitation in the labor market (Smith and Simon 2020).

Finally, in advancing a conditional theory of the political economy of punishment, we offer a framework that scholars can use to study the relationship between labor demand and incarceration in other times and places. This framework specifies when the relationship between labor demand and incarceration that we observe should and should not exist. Describing the institutional conditions under which a fall in the demand for workers should increase the number of people in prison is not just analytically important; it is politically important as well. Doing so demonstrates that the relationship between labor demand and incarceration that we document could have been—and could still be—different.

THE POLITICAL ECONOMY OF PUNISHMENT

Our work falls in a tradition of scholarship on the political economy of punishment. This tradition has produced a rich body of sociological research on how the form and scale of punishment varies with the demand for and supply of labor.⁴ It has also been criticized on both theoretical and empirical grounds.

⁴ See, e.g., Rusche ([1933] 1978), Greenberg (1977), Jankovic (1977), Braithwaite (1980), Chiricos (1987), Myers and Sabol (1987), Chiricos and Delone (1992), D'Alessio and

Critics of theoretical work on the political economy of punishment have noted its tendency to suggest that the form or scale of punishment can be explained by its beneficial consequences for ruling classes (Garland 1990; Melossi 1993). Their objection to this argument stems from a more general recognition of the problems with functionalist explanation in the social sciences.⁵ In functionalist explanation, “one cites the beneficial consequences (for someone or something) of a behavioral pattern in order to explain that pattern, while neither showing that the pattern was created with the intention of providing those benefits nor pointing to a feedback loop whereby the consequences might sustain their causes” (Elster 2009, p. 155). Instead of assuming that the incarceration rate in the period we study simply reflected its beneficial consequences for employers, in the following sections we describe two mechanisms through which changes in labor demand might have affected incarceration. A key aspect of our argument is that the relationship between labor demand and incarceration is not transhistorical but instead depends on historically specific institutional conditions (Savelsberg 1994; Sutton 2004; Steinberg 2016). By identifying three of these conditions, we provide a general framework for studying the mechanisms that link labor markets and punishment in other times and places.

If theoretical work on the political economy of punishment has been criticized for paying insufficient attention to mechanisms, empirical work on unemployment, crime, and incarceration has instead been criticized for paying insufficient attention to causality (Pfaff 2008). A major impediment to estimating the effect of unemployment on crime and incarceration is that crime and incarceration clearly affect unemployment (Western and Beckett 1999; Pfaff 2008, p. 595). This has led scholars in economics to search for sources of variation in unemployment that are not affected by crime or incarceration (Pfaff 2008, p. 607). These studies find that declines in state-level employment rates in the United States at the end of the 20th century either increased both property crime and violent crime (Gould, Weinberg, and Mustard 2002) or increased property crime alone (Raphael and Winter-Ebmer 2001; Lin 2008). The economic shocks used in this research affected a relatively small proportion of all workers within a state. In contrast, in many of the counties we study, a large share of the labor force worked in cotton production. This means that the proportion of workers affected by the economic shock we study was larger. In addition, we show that the boll weevil’s effect on incarceration was negligible in counties that grew little cotton. By studying a shock

Stolzenberg (1995, 2002), Darity and Myers (2000), Melossi (2003), Rusche and Kirchheimer (2003), and De Giorgi (2013).

⁵ For an extended discussion of functionalist explanation, including when it might be permitted, see Cohen (1978, 1980) and Elster (1980, 2007).

to cotton production that transpired county by county over several years, and by examining variation in the effect of that shock across counties that did and did not rely heavily on cotton cultivation, we are able to generate causal evidence about the effect of a large-scale reduction in the demand for workers.

Our work differs from previous research on unemployment, crime, and incarceration in one additional respect: prior work focuses overwhelmingly on urban and industrial labor markets rather than rural and agricultural labor markets. Scholars have traced both the rise in crime in the 1960s and 1970s and the origins of mass incarceration to the decline in manufacturing in the Northeast, Midwest, and West (Wilson 1987; Western 2006; Western, Kleykamp, and Rosenfeld 2006; Wacquant 2009). But the large-scale mechanization of cotton harvesting in the second half of the 20th century may have been equally consequential (Katz, Stern, and Fader 2005, p. 86; Gilmore 2007, pp. 140–41; Gottschalk 2015, p. 85).⁶ Because planters had less direct influence over incarceration in the late 20th century than they had in the early 20th century, the mechanisms connecting labor demand and incarceration following the mechanization of cotton harvesting likely differed from those connecting labor demand and incarceration during the boll weevil infestation.⁷ But our estimates of the infestation's effect nevertheless suggest that this later collapse of agricultural employment could have been an important cause of the historic rise in incarceration in the United States in the late 20th century. We return to this point in the conclusion.

THE BOLL WEEVIL AND THE AGRICULTURAL LABOR MARKET

In 1910, Black Georgians worked predominantly in agriculture (U.S. Department of Commerce 1914, pp. 449–51). More than 93% of Black farmers were tenants, sharecroppers, or wage workers rather than owners (Alston and Kauffman 2001, p. 183). The comparable figure for white farmers was 59%. Black agricultural workers grew an especially large share of the state's cotton crop. In 1910, Black tenants and sharecroppers worked 45% of Georgia's acres devoted to cotton, compared to 32% of its acres devoted to corn (U.S. Department of Commerce 1918*b*, pp. 623–24). White tenants and sharecroppers, in contrast, grew 25% of both corn and cotton acres in Georgia.

Historical scholarship has documented that when the boll weevil infested planters' land, planters "reduced their cotton acreage and chose to give up cotton altogether in favor of livestock or food crops. That in turn decreased

⁶ Between 1950 and 1970, the percentage of U.S. cotton harvested by machine increased from 5% to nearly 100% (Wright 1986, p. 243).

⁷ The less influence planters had, the more likely it is that increases in crime were an important way that mechanization could have increased incarceration.

the demand for black labor, and many field hands, sharecroppers, and tenants found themselves forced off the plantations” (Litwack 1998, p. 177). Subsequent research in economics and sociology has supported these conclusions. Lange et al. (2009) find that cotton yields declined by 50% within five years of the weevil’s arrival. Clay, Schmick, and Troesken (2019) show that the boll weevil prompted farmers to switch from growing cotton to food crops that were rich in niacin, causing rates of death from pellagra to fall. Baker (2015) documents that the infestation reduced the demand for Black child labor in Georgia, which increased Black children’s rate of school enrollment.⁸ Bloome, Feigenbaum, and Muller (2017) find that the weevil reduced the share of farms worked by Black and white tenants.⁹ Ager, Brueckner, and Herz (2017) report that the infestation caused both tenancy and farm wages to decline.

In the wake of the devastation, some agricultural workers fled. Counties infested by the weevil had higher rates of Black and white out-migration between 1910 and 1920 (Fligstein 1981). Lange et al. (2009, p. 714) show that the Black population of counties heavily devoted to cotton production fell sharply a few years after the infestation. Thus, the “large amount of surplus labor” generated by the infestation was temporary (Scott 1920, pp. 59, 14–15). Accordingly, the boll weevil’s effect on Black children’s rate of school enrollment in Georgia peaked in the second year after the infestation, even as its effect on cotton yields continued to increase (Baker 2015, p. 1148).

THE AGRICULTURAL LABOR MARKET AND INCARCERATION

Previous scholarship on the political economy of punishment suggests that falling labor demand can increase crime or increase the rate at which people accused of crimes are imprisoned.¹⁰ But both arguments depend on institutional conditions that often go unstated. In this section, we describe those conditions and explain why their presence in early 20th-century Georgia made it likely that the boll weevil infestation would increase incarceration, particularly among Black Georgians.

⁸ Baker, Blanchette, and Eriksson (2020) extend this analysis by showing that young children living in infested counties spent more years in school.

⁹ In addition to peonage, planters used the patriarchal family to control their labor force (Jaynes 1986; Mann 1989; Lichtenstein 1998; Tolnay 1999; Hill 2006; Bloome and Muller 2015). When the boll weevil reduced planters’ demand for workers, the share of Black southerners who married at young ages fell accordingly (Bloome et al. 2017). For discussions of the interrelations between marriage, slavery, and labor history, see Tomlins (1995) and Stanley (1998).

¹⁰ See, e.g., Thompson (1963, p. 61), Rusche (1978, p. 4), Kelley (1990, p. 161), Marx (1990, p. 896), Chiricos and Delone (1992, pp. 421–26), D’Alessio and Stolzenberg (1995, pp. 350–52), Davis (2003), Linebaugh (2003, p. xxiii), Rusche and Kirchheimer (2003, pp. 12, 14, 95–96), Engels (2005, p. 143), and De Giorgi (2013).

The likelihood that a fall in the demand for workers will increase crime depends on the extent to which people thrown out of work have other means of survival. In Georgia in the early 20th century, displaced agricultural workers had few ways of sustaining themselves other than through the labor market (Alston and Ferrie 1999).¹¹ As a result, after the boll weevil arrived, they may have turned to criminalized forms of appropriation, such as theft or illegal markets.¹² If so, the infestation could have increased the rate at which agricultural workers were imprisoned for property crimes.¹³

The likelihood that falling labor demand will increase incarceration, independent of crime, depends instead on whether employers can obtain the labor of incarcerated people and whether employers can influence the rate at which workers or potential workers are incarcerated. Incarceration entails a person's removal from the formal labor market. From the perspective of workers who view other workers—or other groups of workers—as competitors, such incarceration may appear desirable (Pope 2010, p. 1548; Muller 2012).¹⁴ But employers want to exploit—not exclude—workers (E. O. Wright 1997, p. 11; 2009). Unless employers can exploit the labor of people in prison, they have an interest in preventing workers or potential workers from being imprisoned.

Until 1908, private employers in Georgia were able to use the convict lease system to secure the labor of state prisoners. The convict lease system involved a contract between the state and a “contractor who took whole blocks of workers” (Novak 1978, p. 24). However, people caught in the convict lease system performed primarily industrial labor rather than agricultural labor (Lichtenstein 1996; Muller 2018). Agricultural workers sent to the convict lease system “were taken away from the area for a long stretch, not returned to the planter as a farm laborer” (G. Wright 1997, p. 459). After Georgia's convict lease system was abolished in 1908, state prisoners were sent to chain

¹¹ Hahn notes that postbellum “game and stock laws greatly narrowed use rights in landed property, further circumscribing access to the means of subsistence and threatening ownership of livestock and draft animals among the poor” (1982, p. 51; see also Reidy 1992, p. 226).

¹² Because in sharecropping contracts “the crop belonged to the landlord until he divided it, a cropper could be convicted of theft if he removed or sold any part of it before the division was made” (Woodman 1979, p. 333).

¹³ In a study with a similar design to ours, Bignon, Caroli, and Galbiati (2017) show that the spread of phylloxera, an aphid that destroyed French vineyards in the 19th century, increased the rate at which people were accused of property crimes in affected *départements*.

¹⁴ Research on lynching suggests that declines in the demand for labor may have increased the extent to which white agricultural workers viewed Black agricultural workers as competitors (Tolnay and Beck 1995, pp. 122–23). If so, white workers may have been more likely to accuse Black workers of crimes after the boll weevil infestation. However, planters could override the effect of such accusations by preventing accused Black workers from being incarcerated.

gangs to build roads, not to work for planters (Lichtenstein 1993). Thus, both before and after the abolition of convict leasing, planters interested in acquiring or retaining workers tried to keep them out of prison.

Planters had several ways of ensuring that workers or potential workers were not imprisoned. Some punished property crimes themselves—often using violence—without appealing to the formal legal system (Woofter 1936, p. 32; Smith 1982, p. 195; Davis et al. 2009, pp. 46, 404, 512). Others served as character witnesses or intervened in prosecutions to prevent accused workers from being sent away to chain gangs (Du Bois 1904, pp. 44–48; Raper 1936, pp. 293–94; Raper and Reid 1941, p. 25; Lichtenstein 1993).

But planters also acquired workers at local courthouses. Georgia's Superior Courts had the discretion to reduce felonies to misdemeanors and did so frequently (Myers 1998, p. 29). A study of four Georgia Superior Courts in 1916 and 1921 found that a majority of people pleading guilty to or convicted of felonies had their crimes converted to misdemeanors (Edens 1925, pp. 197–98). When a felony was reduced to a misdemeanor, it could be punished with the option of a prison sentence or a fine. This allowed planters to pay workers' or potential workers' legal fines, then force them to work off the debt (Du Bois 1935, p. 698; Woofter 1936; Daniel 1972; Cohen 1976, 1991; Novak 1978; Lichtenstein 1996, p. 29; Karnes 2000; Blackmon 2008). The courts thus became a kind of "employment agency for the planter" (Novak 1978, pp. 34–35).

This form of peonage was distinct from the convict lease system: rather than a contract between an employer and the state, it involved a contract between an employer and a defendant "to work out an indebtedness caused by the employer's payment of the felon's fine and costs" (Novak 1978, p. 24). Convicted people faced the impossible dilemma of choosing between the brutality of the chain gang and the brutality of peonage (Wilson 1933; Lichtenstein 1996; Blackmon 2008, pp. 82–83; Childs 2015, p. 86; Haley 2016). In one of the most haunting peonage cases investigated by the Department of Justice, John Williams, a white planter in Jasper County, attempted to avoid prosecution by viciously murdering or ordering the murder of 11 Black men he held in peonage (Daniel 1972, pp. 110–31; Blackmon 2008, pp. 360–64). Historical evidence suggests that many people entangled in peonage had committed no crime (Terrell 1907; Daniel 1972; Blackmon 2008).¹⁵

Courts, whose officials were compensated with funds arising from convicted people's legal fines, "helped to make the 'fine-cost' system function effectively" (Novak 1978, p. 35; see also Edens 1925, p. 216).¹⁶ They reduced

¹⁵ Our estimates capture the effect of the infestation on those defendants who would have been imprisoned if not for planters' efforts to acquire their labor—not those who were accused solely so that planters could ensnare them in peonage. For this reason, they likely underestimate the scale of peonage in Georgia.

¹⁶ According to Karnes (2000, p. 79), planters sometimes "used 'dark and ulterior means' to secure the release of the prisoner. The planter would often give the Solicitor General

felonies to misdemeanors so that defendants “could be paid out and put to work picking cotton” (Matthews 1970, p. 152; see also Baker 1908, p. 99). They offered defendants the option of a fine “to protect the landlords against the loss of their tenants’ labor, rather than to be lenient with the defendants” (Raper 1936, p. 293; see also Lichtenstein 1995, p. 183). Baker (1908, p. 96) describes witnessing a Black defendant brought into court for stealing cotton. The judge asked whether anyone knew the defendant. After two white men stepped up, he fined the defendant, and one of the men—the defendant’s employer—paid the fine.

Although there are no systematic data enabling us to estimate the scale of peonage in the South, historical evidence suggests that it was widespread (Cohen 1991, p. 292; Blackmon 2008). For instance, in 1907, A. J. Hoyt, special agent of the Department of Justice, claimed that in Georgia, Alabama, and Mississippi, “investigations will prove that 33 1/3 percent of the planters operating from five to one-hundred plows, are holding their negro employees to a condition of peonage” (Daniel 1972, p. 22). Baker (1908, p. 96) noted that in the courts he visited there were “many white men to stand sponsor for Negroes who had committed various offences.” In a survey W. E. B. Du Bois distributed to Black Georgians in the early 20th century, one respondent attributed low rates of Black incarceration to “the demand of labor in this county and the means employed by the large land owners to secure it” (1904, p. 47).

After the infestation, planters’ need to keep workers out of prison fell along with cotton yields. In 1921, the *News and Farmer* reported that in many counties planters were not paying defendants’ fines “as freely as in the past,” due in part to their reduced “demand for labor” (1921, p. 1). In Hancock County, the option of paying a fine went from being the most common sentence for property crimes in the five years before the infestation to being the least common in the five years after. The trend for prison sentences, in contrast, was the reverse.¹⁷ Karnes’s (2000) study of peonage in Oglethorpe County concluded that the boll weevil infestation was a major reason for its decline. Raper, who studied two counties in Georgia’s Black Belt, reported that peonage persisted there until the boll weevil arrived:

At times when laborers have been in greatest demand in Greene and Macon counties, certain landlords have made it a practice to pay fines and get out on bail, when possible, any defendants who seemed to be desirable workmen. This practice has been virtually abandoned in Greene since 1923, in Macon since 1925. Prior to the weevil depression, in a county adjoining Greene an

(prosecutor for the state) a note for a sum that fulfilled the Judge’s fee and earned the Solicitor a bit of money.”

¹⁷ Authors’ tabulations, minutes of the Superior Court: Hancock County, Georgia, 1913–1923. To ensure that we compare sentences for property crimes that were eligible to receive a prison sentence, we include in these tabulations only those property crimes that ever received a prison sentence during the 10-year period.

understanding existed between certain court officials and two or three big planters whereby Negroes lodged in the county jail were bonded out to them; other laborers were obtained by them through the payment of court fines. (1936, p. 293)

Just as the arrival of the boll weevil reduced the likelihood that Black agricultural workers would keep their children out of school to work the cotton harvest (Baker 2015), it reduced the likelihood that planters would attempt to keep workers or potential workers out of prison. Thus, the infestation should have increased the prison admission rate even if it had no effect on crime.

In sum, in early 20th-century Georgia, agricultural workers had few means of survival outside of the agricultural labor market. As a result, when the boll weevil reduced planters' demand for their labor, they may have turned to theft or illegal markets to survive. But the infestation also could have affected the extent to which crimes were punished by imprisonment. Because planters could not contract for the labor of state prisoners, they had an interest in preventing workers or potential workers from being sent to prison. They did so by punishing crimes informally, withholding or interfering with prosecutions, and paying workers' or potential workers' legal fines. As their demand for agricultural workers fell because of the infestation, so did their need to engage in these practices.

The extent to which the relationship between labor demand and incarceration in early 20th-century Georgia generalizes to other times and places depends on the presence or absence of similar institutional conditions. For instance, strong welfare states or income supports can weaken the relationship between labor demand and crime (Sutton 2004, p. 171; Lacey 2008, p. 50; Fishback, Johnson, and Kantor 2010; Calnitsky and Gonalons-Pons 2021). If employers can exploit the labor of people in prison, they may try to increase, rather than decrease, the incarceration rate. Finally, in other periods, employers' ability to affect the inner workings of the criminal justice system may have been less direct than it was in ours.

EMPIRICAL IMPLICATIONS

The decline in the demand for agricultural labor caused by the boll weevil should have been most consequential for Black Georgians. Owing to the economic and ideological effects of slavery, Black Georgians had few resources to purchase land or pay legal fines and few work options outside of agriculture (Raper 1936, pp. 292, 294; Landale and Tolnay 1991, p. 36). Although "no thorough investigation of peonage ever revealed even an approximate estimate of black peons," historical scholarship suggests that Black Americans "bore the major burden of Southern peonage" (Daniel 1972, p. 108; Huq 2001). Moreover, even if the infestation increased Black and white Georgians'

involvement in crime equally, crime among Black Georgians was more likely to be punished by incarceration when the demand for their labor was low (Du Bois 1901*b*, 1904; Ayers 1984; Muhammad 2010; Muller 2018).

We begin our analysis by estimating the effect of the boll weevil infestation on both Black and white prison admissions for property crimes. However, our conclusions do not depend on whether the infestation's effects on Black and white prison admissions are statistically different from each other. Although the infestation should have had an especially strong effect on Black prison admissions, a large share of white people also worked in cotton production, and white people were not exempt from peonage (Daniel 1972, pp. 35–36). But because there were so many fewer white than Black prison admissions, our estimates of the effect of the infestation on white prison admissions are comparatively underpowered, which undermines our ability to test the difference.¹⁸

Because we cannot directly observe property crime or peonage, we cannot definitively determine how much of the effect we estimate is attributable to the infestation's effects on crimes of survival and how much is attributable to its effects on planters' efforts to acquire the labor of defendants. The historical evidence we have assembled suggests that our estimates almost certainly reflect a combination of these two ways the infestation could have increased incarceration. Given the scale of the economic shock, it is unlikely that no person turned to property crime or illegal markets after losing a job or that planters continued to pay workers' or potential workers' fines with the same frequency as they had before the infestation. However, three additional types of evidence can inform our judgment about whether the increase in prison admissions reflected both an increase in crime and a decrease in peonage or whether it exclusively reflected an increase in crime.

First, we estimate the infestation's effect on prison admissions for homicide as well as property crimes. Because homicides are hard to conceal, criminologists typically consider homicide rates to be a more reliable signal of crime rates than rates of other crimes. Further, because there was less discretion about whether to prosecute cases of homicide than cases of other crimes, the homicide admission rate should be a relatively good proxy for the homicide rate. Homicides also had to be punished with a prison sentence, whereas property crimes could be converted to a misdemeanor and punished with the option of a fine. For these reasons, an increase in admissions for homicide after the infestation would more likely reflect an increase in crime than a change in planters' use of peonage. If we observe that the infestation increased admissions for homicide, this would lend more support to the argument that

¹⁸ From 1910 to 1925, there were 10,324 Black prison admissions and 3,253 white prison admissions for all crimes, and the cross-county variation in the rate of Black prison admissions was more than seven times higher than the cross-county variation in the rate of white prison admissions.

the primary effect of the boll weevil infestation was to increase crime generally.¹⁹

Second, rather than divide prison admissions into those for property crimes and those for homicide, we divide them into those for crimes that could be reduced from felonies to misdemeanors and those for crimes that could not. In addition to property crimes, there were several violent crimes that could be reduced to misdemeanors and consequently punished with the option of a fine: among Black prison admissions, "assault with intent to murder" was the second most common crime eligible to be reduced.²⁰ If we observe a postinfestation increase in admissions for crimes that had to be punished with a prison sentence, this, too, would provide evidence to support the idea that the main effect of the infestation was to increase crime.

Finally, the argument that the fall in labor demand caused by the boll weevil increased crime implies that high labor demand kept crime low before the infestation. But what evidence we have suggests otherwise (Du Bois 1904, pp. 45–47; Baker 1908, p. 97). Lichtenstein argues that "what postbellum planters regarded as the unbreakable habit of pilfering carried over from slavery was, for black plantation workers, a distinctive tool of resistance to sharecropping and other inequitable forms of postbellum land tenure and labor" (1995, p. 177; see also Jaynes 1986, p. 248). If high labor demand did not lower crime in the cotton belt, then the infestation's effect on Black prison admissions was more likely driven by a decrease in the extent to which planters tried to prevent workers or potential workers from being imprisoned.

Although it is important to distinguish between the boll weevil's effect on crime and its effect on planters' efforts to acquire the labor of defendants, the difference between these two mechanisms is one of degree rather than kind. Both highlight the role of coercion in the labor market: one type of worker was compelled to labor in exchange for the payment of their legal fines; other types were compelled to labor by the threat of starvation (Marx 1990, p. 899; Wood 2002; Harcourt 2011, p. 194; Gourevitch 2015, p. 81; Zatz

¹⁹ As discussed above, the evidence that changes in labor demand affect only property crime—and not violent crime—is mixed (Raphael and Winter-Ebmer 2001; Gould et al. 2002; Lin 2008).

²⁰ Edens (1925, p. 194) lists those felonies that could not be reduced to a misdemeanor: "treason, insurrection, murder, manslaughter, assault with intent to rape, rape, sodomy, foeticide, mayhem, seduction, arson, burning railroad bridges, train-wrecking, destroying, injuring, or obstructing railroads, perjury, false swearing, and subornation of perjury and false swearing." Because peonage in the cotton belt was "a confusing mass of customs, legalities, and pseudo-legalities" (Daniel 1972, p. 25), it is possible that some courts departed from the penal code and allowed crimes like homicide to be punished with a fine. However, even if so, an increase in admissions for fineable crimes after the infestation would more likely reflect a decline in planters' use of peonage than an increase in admissions for crimes that legally had to be punished with a prison sentence.

2016, p. 951; 2020). Both resisting peonage and preferring “stealing to starvation” (Engels 2005, p. 143) could result in imprisonment, which imposed its own form of forced labor. By both weakening planters’ interest in paying defendants’ fines and reducing workers’ options for survival, the infestation increased the likelihood that affected workers would be incarcerated.

DATA AND METHODS

To study the effect of the boll weevil infestation on prison admissions in Georgia, we gather data from several historical sources. Data on imprisonment come from the *Central Register of Convicts, 1817–1976*, housed at the Georgia Archives in Morrow, Georgia. These data consist of a series of handwritten ledgers listing every person imprisoned for a felony in the state, along with the offense for which they were convicted, their county of conviction, their racial classification, and the date they were received. Data on prisoners’ counties of conviction are especially important because they enable us to study the effect of changes in the labor market in the counties where prisoners were convicted rather than the counties where they were incarcerated. Most data on incarceration, including census data, count incarcerated people where they are confined rather than where they were convicted (Lotke and Wagner 2004). We focus on the years 1910–25 so that we can study imprisonment several years before the weevil infested the first county in Georgia and several years after it infested the last county.

We use 10 volumes of the *Central Register of Convicts*.²¹ These volumes often cover overlapping time periods. To ensure that a single admission appearing in separate volumes is not counted more than once, we identify duplicate records by matching each record on prisoners’ name, offense, county of conviction, and admission date. We split prisoners’ names into first, middle, and last, then discard middle names and any prefixes or suffixes. We sort crime descriptions into 40 distinct crimes. We then use approximate string matching to match admission records by first name, last name, crime, and county.²² We consider admission dates to match if they are within 30 days

²¹ All volumes are titled “Prisons—Inmate Administration—Central Register of Convicts.” The volumes we use have the following subtitles: “1869–1923, A–Z (VOL2 12962),” “1886–1914, A–Z (VOL2 12957),” “1902–1951 (VOL2 12960),” “1910–1914, A–Z (VOL2 14569),” “1913–1952 (bulk 1930–1938), P–Z (FLAT 1291),” “1913–1952 (bulk 1930–1938), A–G (VOL2 12965),” “1913–1952 (bulk 1930–1938), H–O (VOL2 12964),” “1914–1924, A–Z (VOL3 8982),” “1914–1930, A–Z (VOL2 12961),” and “March 1940 thru March 1941 (VOL3 9643).”

²² We manually examined the quality of our matches using different thresholds to classify a Jaro-Winkler distance score as a match. A threshold of 0.44 provided the best balance between false positives and false negatives, but any threshold between 0.3 and 0.5 produced results that differed by only a small number of matches. For a formal definition of the Jaro-Winkler distance score, see van der Loo (2014).

of one another. Matching records in this way enables us to identify and discard 682 duplicate admission records.

In the remaining sample, 13 prisoners have a racial classification other than Black or white. Because our analyses focus on Black and white admissions, we drop these admissions. We also exclude 83 admissions (0.6%) with missing racial classification data, 16 admissions (0.1%) with missing offense data, and 64 admissions (0.4%) with missing county of conviction data.

In our first analysis, we divide crimes into three categories: property crimes, homicide, and other crimes. Property crimes (51% of the sample) include all forms of burglary, larceny, robbery, and other forms of theft, such as forgery and embezzlement. Homicides (29% of the sample) include murder and manslaughter. Other crimes include all offenses that do not fit into the first two categories. The most common were assault with intent to murder, rape, shooting, arson, and bigamy. Other crimes make up about 20% of the sample. In our second analysis, we instead divide crimes into those that could and could not have their sentences reduced from imprisonment to the option of a fine. We exclude 185 admissions for crimes that could not be classified as fineable or not, leaving a total sample of 13,577 admissions. Table 1 shows the number of Black and white prison admissions for each type of crime from 1910 to 1925.

Data on the timing of the boll weevil infestation come from a map published by the U.S. Department of Agriculture (Hunter and Coad 1923, p. 3). The map charts the boll weevil's path as it migrated northward and eastward across the South, using lines to indicate its farthest extent in a given year. This enables us to assign a year of infestation to each county. With information on the year each county was infested, we can compare the prison admission rate in the years before and after the infestation.

We adopt the same coding scheme as Baker (2015), who uses annual data to study the boll weevil's effect on Black children's school enrollment in Georgia. In nine counties, the boll weevil first arrived in 1916 but disappeared by 1917 without causing significant damage. We follow Baker in assigning these counties the year the boll weevil reentered rather than the year it first appeared (see p. 2 of online app. A of Baker 2015). The boll weevil migrated across Georgia from 1915 to 1920. Figure 1 depicts the year each

TABLE 1
BLACK AND WHITE PRISON ADMISSIONS BY TYPE
OF CRIME, GEORGIA, 1910–25

	Black	White
Property crimes.	5,017	1,906
Homicide.	3,187	818
Other crimes (fineable)	1,530	327
Other crimes (nonfineable)	590	202

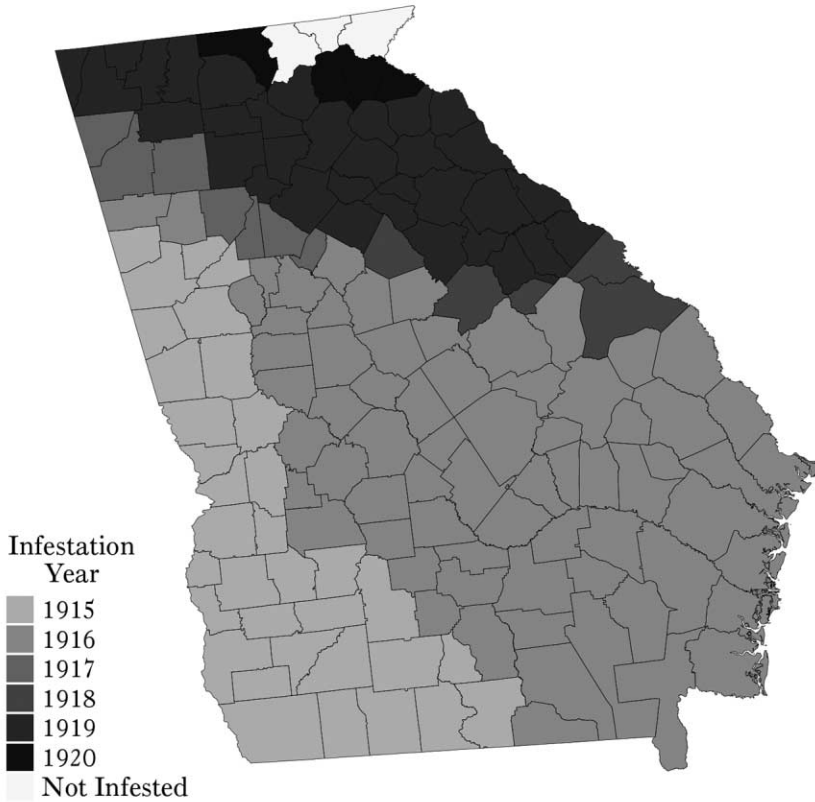


FIG. 1.—Boll weevil infestation in Georgia, 1915–20. The map depicts Georgia counties, using 1920 borders from Manson et al. (2018). Darker shades indicate later infestation years. Data on the timing of the infestation come from Hunter and Coad (1923, p. 3).

county was infested, using 1920 county borders drawn from the National Historical Geographic Information System (Manson et al. 2018).

The boll weevil migrated late in the growing season and thus primarily affected the following season's harvest. Consequently, like Baker (2015), we study the boll weevil's effect starting in the year after its arrival. The boll weevil indicator we create equals 1 in the year after the infestation and every year thereafter.

Because the boll weevil was attracted primarily to rural counties, which typically had lower incarceration rates than urban counties (Muller 2018), we adjust all of our estimates for the population density of each county.²³ Data on the area and population of Georgia counties are available in the

²³ Our results are unchanged if we do not control for population density or if we control instead for the proportion of the county population living in an urban area.

1910, 1920, and 1930 censuses (Haines and ICPSR 2010). We divide the total population of each county by its land area and linearly interpolate population density in the intercensal years.

Between 1910 and 1925, 15 new counties were created in Georgia. To ensure that we study units that are consistent over time, we create “super-counties” that include the new counties and the counties out of which they were carved.²⁴ This reduces our sample from 161 counties to a combination of 131 counties and supercounties. For simplicity, in what follows we refer to both counties and supercounties as “counties.” We assign the 13,577 unique prison admissions from the *Central Register of Convicts* to county-years. After excluding seven county-years with zero Black residents, our primary sample includes 2,089 county-year observations.

Our primary outcome y_{it} measures the number of annual prison admissions in each Georgia county, where i indexes counties and t indexes years. This is a count variable, and it is overdispersed with a large number of zeros, so our main analyses use negative-binomial regression to model the conditional mean μ_{it} of the outcome y_{it} , taking the form

$$y_{it} \sim \text{Negative binomial}(\mu_{it}, \theta) \quad (1)$$

$$\mu_{it} = N_{it} \times \exp(\beta_1 \text{BW}_{it} + \beta_2 \text{PD}_{it} + \gamma_i + \delta_t), \quad (2)$$

where BW_{it} indicates the presence of the boll weevil in a county, PD_{it} represents population density, θ is an overdispersion parameter, and γ_i and δ_t are county and year fixed effects.²⁵ The county population, N_{it} , acts as an “exposure” term that accounts for the fact that larger counties will typically have more prison admissions. Because we examine the effect of the infestation on Black and white Georgians separately, when y_{it} is the Black prison admission rate, N_{it} is the Black population, and when y_{it} is the white prison admission rate, N_{it} is the white population. Dividing both sides of equation (2) by N_{it} shows that this is equivalent to modeling the prison admission rate (μ_{it}/N_{it}) for each group in a given county-year.

Our key parameter of interest is β_1 , the regression coefficient on the arrival of the boll weevil. Because there was little farmers could do to prevent the damage caused by the weevil, β_1 should represent the causal effect of the

²⁴ Specifically, we created eight supercounties out of the following 38 counties: (1) Bleckley and Pulaski; (2) Bulloch, Candler, Emanuel, Evans, Montgomery, Tattnall, Treutlen, and Wheeler; (3) Appling, Atkinson, Bacon, Berrien, Brantley, Charlton, Clinch, Coffee, Cook, Lanier, Lowndes, Pierce, Ware, and Wayne; (4) Barrow, Gwinnett, Jackson, and Walton; (5) Lamar, Monroe, and Pike; (6) Liberty and Long; (7) Decatur and Seminole; and (8) Houston, Macon, and Peach.

²⁵ Below we introduce annual data on cotton production in each county. We do not control for cotton production in this model because it is a posttreatment mediator of the effect of the boll weevil on prison admissions. County fixed effects control for the extent to which counties depended on cotton before the infestation.

infestation on the prison admission rate (Lange et al. 2009, p. 689). The conditional mean, μ_{it} , is exponentiated in equation (2), so we can interpret β_1 and the other regression coefficients in the same way as we would in a linear model with a log outcome. County fixed effects control for all stable characteristics of counties. Thus, β_1 captures the within-county effects of the boll weevil: each county, in the years before the boll weevil arrived, acts as its own control case to compare with the years after the boll weevil arrived.

Given assumptions we discuss below, including county and year fixed effects in our regressions makes the interpretation of β_1 equivalent to a differences-in-differences estimate of the effect of the boll weevil infestation. In the results section, we address a new literature showing that stronger assumptions than previously recognized are required to interpret our results as differences-in-differences estimates and that two-way (i.e., county and year) fixed effects can produce biased estimates of the treatment effect (Borusyak and Jaravel 2017; Abraham and Sun 2018). We show that our findings are robust and do not change under alternative models designed to avoid this potential bias.

In studies in which people choose whether to receive a treatment, individual fixed effects can fail to control for key confounders because the circumstances that cause a person to select into a treatment at a particular time often affect their outcomes as well. This is not true of the boll weevil infestation, because counties had no way to avoid it. This fact greatly reduces the likelihood that there are time-varying county-level confounders not captured by our model. Year fixed effects control for time-varying confounders that affected all counties at the same time, such as the United States' entry into World War I or changes in state or national laws.

Previous research has shown that Black and white out-migration rates were higher in counties hit by the boll weevil in the 1910–20 decade (Fligstein 1981). We cannot study migration directly because it can only be measured over decades using census data. Because our study uses annual variation in the boll weevil infestation and in prison admissions, any cross-sectional differences in migration across counties within a decade will be absorbed by the fixed effects. But if annual changes in migration affect our results, they will bias the effect toward zero: agricultural workers who moved away in response to the boll weevil should have reduced the infestation's effect on the prison admission rate by shrinking the excess supply of labor. For this reason, the infestation's effect on Black property crime admissions should have weakened over time, even as cotton yields in infested counties remained comparatively low. Our results thus represent a conservative estimate of the effect of falling labor demand on incarceration.²⁶

²⁶ It is possible that after the infestation planters falsely accused their workers in an attempt to have them imprisoned so that they could not migrate, although we have not

In some generalized linear models such as logistic regression, fixed effects estimates can be inconsistent because of the incidental-parameters problem: the number of fixed effects that must be estimated grows as the sample size increases, so their estimates do not converge to the true parameter values. Fortunately, this is not true of Poisson or negative-binomial regression models (Allison and Waterman 2002, p. 249). However, the standard confidence intervals in fixed effects negative-binomial regressions can be too small. To correct this, we use the nonparametric bootstrap to compute our confidence intervals, clustering on counties. For the instrumental variables estimates discussed below, the sampling distributions of our estimated coefficients are skewed, so for all models we use Efron's (1987) bias-corrected and accelerated (BC_a) bootstrap confidence intervals, which produce intervals with correct coverage for skewed and other nonnormal sampling distributions.

In the next analysis, we use the timing of the boll weevil infestation as an instrumental variable for changes in cotton production.²⁷ Like Lange et al. (2009) and Baker (2015), who show that the infestation markedly reduced cotton production, we use data on the number of bales of cotton ginned, available in annual U.S. Department of Commerce reports (1911, 1916, 1917, 1918a, 1919, 1920, 1921, 1923, 1924, 1927).²⁸ For the infestation to be a valid instrumental variable, it needed to have a strong effect on cotton production and to have affected prison admissions only through its effect on cotton production. As discussed above, the boll weevil affected outcomes ranging from education to health, but all of these were consequences of its effect on cotton production. Moreover, the infestation should be uncorrelated with other unobserved causes of cotton production or prison admissions, conditional on population density and county and year fixed effects. Because farmers could neither stop the spread of the boll weevil nor mitigate its effects (Lange et al. 2009, p. 689), the timing of the infestation depended only on a county's location, its suitability for cotton production, and the boll weevil's gradual spread—all factors accounted for by county and year fixed effects.

found evidence of this practice. Black Georgians who attempted to migrate north from Georgia's cities were sometimes arrested and jailed (Wiener 1979), but records of these incidents suggest that those arrested typically were released without prosecution (Scott 1920).

²⁷ Using state-level time-series data on incarceration in Georgia from 1868 to 1936, Myers (1991) shows that the incarceration rate of both Black and white men increased when the price of cotton fell.

²⁸ Data on cotton production are missing in 182 county-years. In addition, cotton production is zero in 14 county-years. Because we model the natural logarithm of cotton production, we drop these observations, although all results are robust to alternative log transformations. The resulting sample size for models including data on cotton production is 1,893.

Because we use negative-binomial regression to model our outcome, standard two-stage least squares approaches are not appropriate for estimating instrumental variable models. Instead, we use a control-function approach (Cameron and Trivedi 2013, p. 401), which has two stages. The first stage is a linear regression of the treatment (the log of the number of cotton bales ginned) on the instrument (the arrival of the boll weevil) controlling for population density and county and year fixed effects. We then use the residuals from this first-stage regression as controls in the second-stage regression, which takes a form identical to equations (1) and (2), with the cotton-production treatment taking the place of the boll weevil treatment. The first-stage residuals represent the variation in cotton production that is not explained by the arrival of the boll weevil and controls—in other words, the remaining endogeneity in cotton production. Including these residuals in the second stage controls for this endogeneity. The estimated residuals are referred to as the control function.

Because our estimation procedure has two stages, the standard errors reported for the second-stage negative-binomial regression do not account for the estimation uncertainty in the first-stage regression. To properly estimate the uncertainty from both stages, we use the BC_a bootstrap to produce appropriate confidence intervals, as described above.²⁹

The boll weevil infestation should have had a smaller effect in counties that produced less cotton. To check this, we interact the boll weevil indicator with each county's share of improved acres devoted to growing cotton in 1909. We choose 1909, the year before our other time series begin, to ensure that our measure of cotton cultivation is unaffected by the boll weevil or by later prison admission rates. Data on cotton cultivation come from the 1910 Census of Agriculture (U.S. Department of Commerce and Labor 1913), the last agricultural census before the infestation began in Georgia (Haines and ICPSR 2010). In this model, we are interested in the marginal effect of the boll weevil on prison admissions at different levels of cotton cultivation (Brambor, Clark, and Golder 2006). We expect the effect of the infestation on imprisonment to be small in counties that grew little cotton. We test the linearity of the interaction using the binned estimator of Hainmueller, Mumolo, and Xu (2019).

²⁹ Because the nonparametric bootstrap resamples counties from the observed data, a handful of bootstrap samples exhibit no correlation between the instrument and the treatment, which produces extreme values in the second-stage regressions because of the weak-instrument problem. This creates a heavy-tailed sampling distribution, which is why we report BC_a bootstrap confidence intervals, which are robust to nonnormality. In the observed data, the arrival of the boll weevil is a strong instrument for cotton production, as shown in col. 2 of table 2. This issue appears only in a small number of bootstrapped samples, and our confidence intervals account for it.

RESULTS

The boll weevil infestation sharply increased the rate at which Black Georgians were admitted to prison for property crimes. We report our estimate of the infestation's effect in figure 2. The leftmost point estimate (0.31) implies that the boll weevil increased the Black prison admission rate for property crimes by 36% ($100 \times [\exp(\beta_1) - 1]$).

The boll weevil's effect on the Black admission rate for homicide, in contrast, was negative (-0.08) and not statistically significant. The difference between this effect and the boll weevil's effect on Black admissions for property crimes is itself statistically significant. These results could mean that the decline in agricultural work caused by the boll weevil increased property crime but not violent crime or that it reduced planters' use of peonage and thus only increased prison admissions for those crimes that could be punished with a fine. In figure 3, we instead divide crimes into those that could and could not be punished with a fine. Consistent with the argument that planters were less likely to pay defendants' fines after the infestation, the boll weevil had a large effect on Black admissions for crimes that could be punished with a fine, whereas its effect on Black admissions for crimes

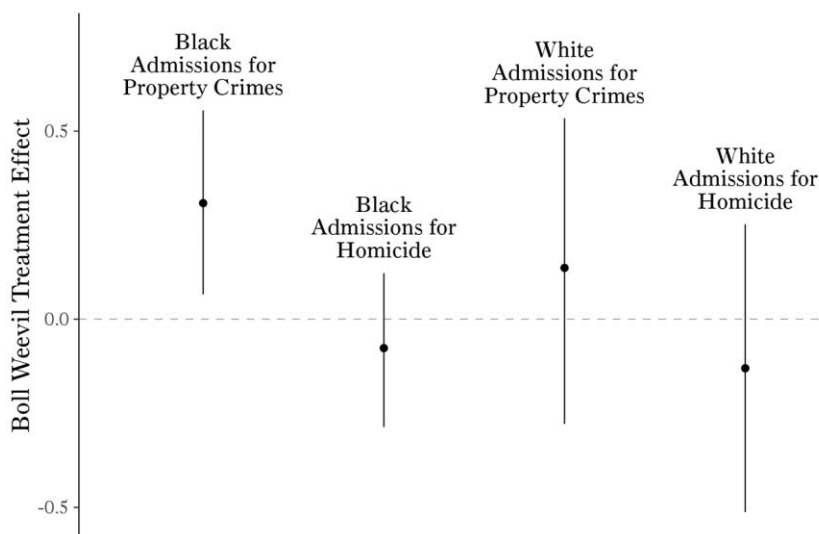


FIG. 2.—Effect of the boll weevil infestation on prison admissions for property crimes and homicide in Georgia. Dots represent point estimates from negative-binomial regressions, controlling for population density and county and year fixed effects. Bars represent 95% BC_a bootstrap confidence intervals, clustered by county. The difference between the boll weevil's effect on Black admissions for property crimes and Black admissions for homicide is statistically significant.

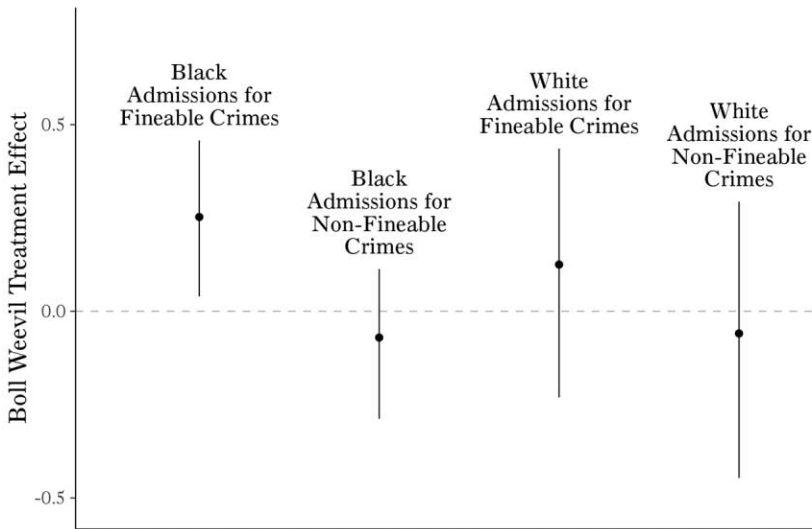


FIG. 3.—Effect of the boll weevil infestation on prison admissions for fineable and nonfineable crimes in Georgia. Dots represent point estimates from negative-binomial regressions, controlling for population density and county and year fixed effects. Bars represent 95% BC_a bootstrap confidence intervals, clustered by county. The difference between the boll weevil's effect on Black admissions for crimes that could be punished with a fine and Black admissions for crimes that had to be punished with a prison sentence is statistically significant.

that had to be punished with a prison sentence was negative and not statistically significant. Here too, the difference between these effects is itself statistically significant.

Figures 2 and 3 also show that the infestation's effects on white prison admissions for property crime and for all crimes that could be punished with a fine were smaller and less precisely estimated than its effects on Black admissions for the same crimes, although the differences between the estimates for white and Black admissions are not significant. The imprecision of the estimates for white admissions is attributable to the fact that, although there were many white agricultural workers, there were many fewer white than Black prison admissions, and there was much less cross-county variation in white than Black prison admissions. Our analysis of white prison admissions consequently has less statistical power than our analysis of Black prison admissions.³⁰ Like the infestation's effects on Black admissions

³⁰ Our expectation that the infestation's effect on white property-crime admissions should be smaller than the comparable effect on Black admissions compounds the small-sample problem because smaller effects require greater statistical power to detect. If we instead estimate the infestation's effect on Black and white property-crime admissions combined,

TABLE 2
REGRESSIONS OF BLACK PRISON ADMISSIONS FOR PROPERTY CRIMES,
GEORGIA COUNTIES, 1910–25

	NEGATIVE BINOMIAL (1)	CONTROL-FUNCTION IV	
		OLS First Stage (2)	IV Negative Binomial (3)
Boll weevil		-.14** [-.25, -.04]	
Cotton bales ginned (log)	-.14* [-.27, -.02]		-2.33* [-8.23, -.46]
Akaike information criterion	5,271.47		5,267.61
Bayesian information criterion.	6,047.90		6,039.58
First-stage <i>F</i> -statistic		84.14	

NOTE.—Columns 1 and 3 model the relationship between cotton production and prison admissions. The negative coefficients imply that declines in cotton production increased Black prison admissions. Model 2 is the first-stage regression of cotton yields on the boll weevil infestation. We use the timing of the boll weevil infestation as an instrumental variable (IV) in model 3. Values in square brackets below each point estimate are 95% BC_a bootstrap confidence intervals, clustered by county. OLS = ordinary least squares. *N* = 1,893.

* *P* < .05.

** *P* < .01.

*** *P* < .001.

for homicide and for all crimes that had to be punished with a prison sentence, its effects on white admissions for the same crimes were negative and not statistically significant.

The infestation reduced the demand for agricultural workers because of its effects on cotton production. Table 2 reports the effect of the decline in cotton production on Black property-crime admissions. In column 1, we show that the number of cotton bales ginned—our measure of cotton production—was inversely related to the Black prison admission rate for property crimes. As the size of the cotton harvest fell, the Black property-crime admission rate rose. A 10% decrease in cotton production increased the rate at which Black Georgians were admitted to prison for property crimes by 1.4%.³¹

In columns 2 and 3, we report the results of an instrumental variable analysis that treats the infestation as an exogenous shock to cotton production. Both the coefficient and the first-stage *F*-statistic in column 2 show that the

we find that, as expected, it increased admissions by 32%, which is significantly different from zero and significantly greater than its small negative effect on homicide admissions.

³¹ Because cotton production is in log form, and because the conditional mean of a negative-binomial regression is exponentiated, the coefficient (−0.14) is an elasticity as in a log-log regression: $-10\% \times -0.14 = 1.4\%$.

infestation drastically reduced cotton yields. The instrumental variable estimate shown in column 3 remains positive and statistically significant and is much larger than the baseline negative-binomial estimate shown in column 1. This could be because the number of cotton bales ginned is an imperfect measure of changes in the agricultural labor market. It is also possible that counties with high crime or incarceration rates produced less cotton. The instrument corrects for both of these potential issues.

As discussed above, the infestation's effect should have been smaller in counties that relied less heavily on cotton cultivation before the infestation began. In figure 4, we plot the marginal effect of the boll weevil infestation on the Black prison admission rate for property crime as a function of counties' share of improved acres devoted to cotton cultivation in 1909. The figure shows that the infestation had the largest effect in counties that grew a relatively large share of cotton in 1909, whereas its effect in counties that

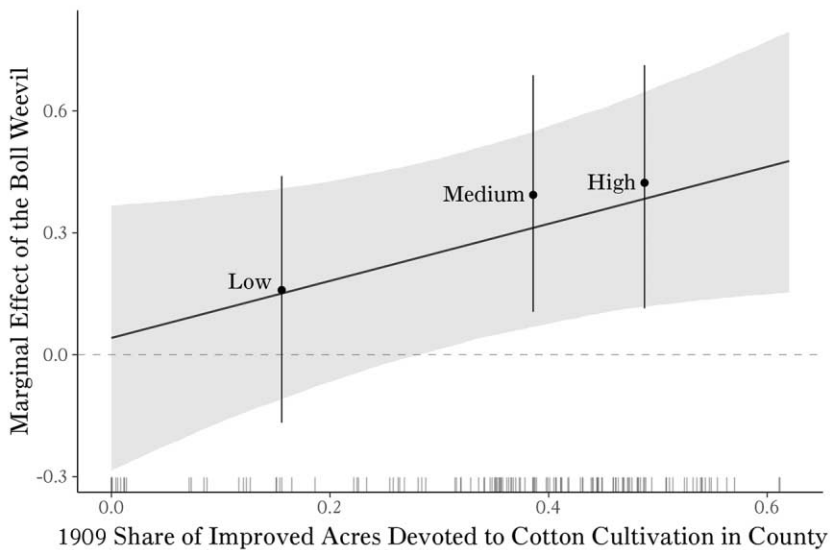


FIG. 4.—Marginal effect of the boll weevil infestation on Black property-crime admissions in Georgia. The thick line plots the linear marginal effect of the boll weevil at different levels of cotton cultivation in 1909. The gray band depicts the 95% confidence interval around the marginal effect. Along the *X*-axis, the rug plot shows the distribution of counties' share of improved acres devoted to cotton cultivation in 1909. The three dots labeled "low," "medium," and "high" show point estimates for conditional marginal effects evaluated at the median of the three terciles of the cotton-production distribution. Lines around each dot represent 95% confidence intervals for each conditional marginal effect. The fact that all three conditional marginal effects lie close to the line representing the linear marginal-effect estimate indicates that the linearity assumption is reasonable. The interaction term itself is also positive and statistically significant.

grew little cotton was close to zero.³² Figure 4 also shows the conditional marginal effects for each tercile of cotton production—low, medium, and high. This provides a test of whether the interaction effect is linear, as our model assumes (Hainmueller et al. 2019). All three conditional marginal effects lie close to the line representing the linear marginal effect estimate, indicating that the linearity assumption is reasonable. If anything, our linear interaction model understates the effect of the boll weevil in counties in the medium and high terciles of cotton production.

ROBUSTNESS OF THE DIFFERENCES-IN-DIFFERENCES ESTIMATES

Here, we demonstrate the robustness of our findings to potential biases in our model estimates. Borusyak and Jaravel (2017) show that differences-in-differences estimates using two-way fixed effects are weighted averages of the treatment effect in each year relative to the start of the treatment. The weights for these effects can vary widely and even be negative, leading to biased results that cannot be straightforwardly interpreted as differences-in-differences estimates. Kropko and Kubinec (2020) also point out this problem and propose using one-way fixed-effects estimates instead, because one-way fixed effects are not susceptible to this bias. In our case, we can omit county fixed effects because the timing of the infestation depends only on the year and a county's location and reliance on cotton production. Instead of using county fixed effects for identification, we can control for counties' latitude, longitude, and share of acres devoted to cotton cultivation in 1909, in addition to year fixed effects and population density from the original model specification.³³ Our results are robust to using this alternative model: the infestation led to a significant 45% increase in Black prison admissions for property crimes—even larger than our main estimates.

Borusyak and Jaravel (2017) offer another solution. They propose using a dynamic treatment specification that estimates the trajectory of the treatment effect in each year following its onset. To do this, we fit a single event-study model that adds indicator variables capturing leads and lags for four years before the infestation and four years after as well as two binned indicator variables that capture observations five or more years before and five or more years after the infestation. The indicator for the year of infestation is left out as the reference year.³⁴ We plot estimates from this model in figure 5.

³² The interaction term itself is positive and statistically significant.

³³ The point estimates and confidence intervals are nearly identical and remain statistically significant if we do not control for counties' location and reliance on cotton production and instead control only for population density and year fixed effects.

³⁴ Borusyak and Jaravel (2017) suggest omitting an additional pretreatment indicator due to a potential underidentification problem. Our findings do not change when we do this.

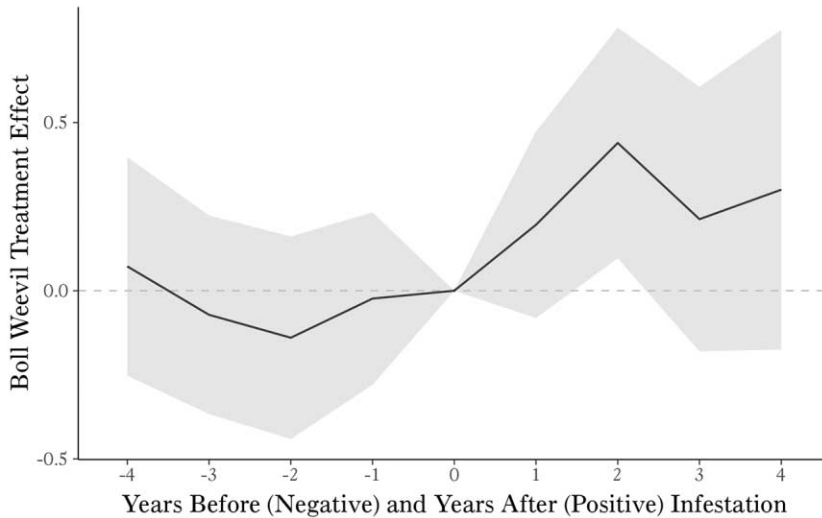


FIG. 5.—Effect of the boll weevil infestation on Black property-crime admissions one to four years before and one to four years after the year of infestation. These estimates represent the average within-county change in the admission rate for each year relative to the year of infestation. All estimates come from a single event-study model that includes leads and lags for four years before the infestation and four years after as well as two binned indicator variables that capture observations five or more years before and five or more years after the infestation.

Whereas the estimates shown in figure 2 represent average treatment effects across all posttreatment years, the estimates in figure 5 are dynamic treatment effects representing the average within-county change in the admission rate for each year relative to the year of infestation. Figure 5 shows that the treatment effects are positive and consistent in magnitude with our main result. Our sample of counties is too small to adequately power a fully dynamic model of year-by-year treatment effects, which is why we focus on the average treatment effect over the posttreatment period. However, our event-study estimates closely resemble those of Baker (2015), who shows that the infestation's effect on Black children's rate of school enrollment in Georgia was largest in the second year after the infestation. Both sets of results are consistent with the argument that the surplus population created by the infestation dwindled as displaced agricultural workers migrated away from their counties.

Abraham and Sun (2018) show that the dynamic treatment specification proposed by Borusyak and Jaravel (2017) can be biased when the treatment dynamics differ by treatment “cohorts,” where a cohort denotes all units treated in the same time period. They show that an alternative model, which they call interaction-weighted regression, avoids this bias. Interaction-weighted regression is based on the same dynamic specification we use above,

but it interacts each treatment lead and lag with an indicator variable for every treatment cohort, yielding estimates of cohort-specific dynamic treatment effects. These effects are then weighted by the proportion of observations from each cohort in each time period relative to the onset of treatment. Using this model shows that our findings are robust to potential heterogeneity in the treatment dynamics. As in figure 5, the treatment effect grows in the first two years: the effect in year 2 is substantially larger in the interaction-weighted regression model than in the event-study model. Then the treatment tapers off—more slowly in the third year after treatment but more sharply in the fourth year after treatment.

Another key assumption of differences-in-differences models is the parallel-trends assumption: in the absence of the boll weevil infestation, changes in prison admissions in infested counties would have been the same as changes in prison admissions in not-yet-infested counties. For each county, we have at least five years of pretreatment data, so we can check the plausibility of this assumption by examining whether counties show any pretreatment time trends. One way to do this is to examine the pretreatment dynamics in figure 5, which exhibit no significant deviations from zero in the years before the infestation. Another way is to compare two different dynamic models: first, a fully dynamic model that includes all leads and lags modeling the effect of the treatment before and after its onset and, second, a semidynamic model that omits the pretreatment indicators (Borusyak and Jaravel 2017). If these models are statistically indistinguishable, then there is no evidence that pretreatment trends affect estimates of the posttreatment effects. When we conduct a likelihood ratio test between the two dynamic models, we find no significant difference. This suggests that the parallel-trends assumption is reasonable in our case.

CONCLUSION

In the U.S. South in the early 20th century, planters depended on the labor of agricultural workers to produce cotton. When the boll weevil interfered with cotton production, their demand for these workers temporarily declined. Agricultural laborers rendered economically redundant may have resorted to theft or illegal markets to survive. Planters' need to prevent workers or potential workers from going to prison fell with reductions in cotton yields.

The boll weevil infestation was most consequential for Black Georgians. The economic and ideological effects of slavery had left Black Georgians with few resources for purchasing land or paying legal fines and few work options outside of agriculture. Black Georgians were also more likely than white Georgians to be entangled in peonage before the infestation and to be punished by incarceration after it.

We find that the boll weevil infestation increased the rate at which Black Georgians were admitted to prison for property crimes by more than a third. The infestation's effect on white Georgians' property-crime admission rate was weak and not statistically significant. Its effect on both Black and white admissions for homicide was negative and not statistically distinguishable from zero. The boll weevil also increased Black prison admissions for all crimes that could be punished with the option of a fine. In contrast, we find no evidence that it increased Black or white admissions for crimes that legally had to be punished with a prison sentence.

Although we cannot definitively determine how much of the boll weevil's effect was due to an increase in crimes of survival versus a decrease in planters' efforts to keep workers or potential workers out of prison, this evidence, combined with the historical evidence we have assembled, suggests that the effect was likely driven by both mechanisms. Even if declines in the extent to which planters paid defendants' legal fines accounted for only a small portion of the increase in imprisonment that we document, this would provide further evidence that the practice held the cotton belt's Black incarceration rate down (Muller 2018, p. 372). Moreover, both mechanisms highlight the inescapability of work for Black Georgians in the early 20th century: Black Georgians labored to avoid starvation, they labored to avoid imprisonment, and they labored while imprisoned.

The literature on the political economy of punishment is vast, but few studies have been able to identify and measure large-scale changes in the labor market and relate them to local changes in incarceration. With an exogenous shock to one of the primary forms of employment in the U.S. South in the early 20th century, we are able to estimate the causal effect of changes in the demand for workers on the rate of imprisonment. Using the boll weevil infestation as an instrumental variable for cotton production, we show that declines in cotton yields increased the Black property-crime admission rate. We also find that the infestation had the largest effect on Black prison admissions in the counties that grew the most cotton and a negligible effect in the counties that grew the least.

The extent to which our results generalize to other times and places depends on the institutional conditions we have described. For instance, the relationship between incarceration, crime, and the labor market should be weaker in times and places with stronger unions and welfare states (Platt 1982; Sutton 2004, p. 171; Lacey 2008, p. 50; Fishback et al. 2010). Where unemployment does not entail economic ruin, declines in labor demand need not lead to increases in crime or incarceration (Calnitsky and Gonalons-Pons 2021). In other settings, increases in labor demand may lead employers to increase rather than decrease the rate of criminal prosecution. For example, Naidu and Yuchtman (2013) find that in 19th-century Britain, prosecutions for labor-market-related criminal offenses, which typically resulted in

workers being returned to their employers, rose with the demand for labor (see also Steinfeld 2001, pp. 72–82). Finally, when employers have less direct control over the incarceration rate, it is more likely that the relationship between labor demand and incarceration will be driven by illegal markets and crimes of survival (Greenberg 1977, p. 650). The work of Raphael and Winter-Ebmer (2001), Gould et al. (2002), and Lin (2008) suggests that some of the effect of unemployment on U.S. imprisonment in the last three decades of the 20th century may have been due to its effect on crime.

Previous scholarship has shown how incarceration, in the form of southern chain gangs, closely resembled slavery (Childs 2015; Haley 2016). However, this claim is different from the claim that incarceration was a functional replacement for slavery (Adamson 1983). In early 20th-century Georgia, planters could not contract for the labor of people in state custody. Instead, they secured a forced-labor supply by keeping workers or potential workers out of prison and using the threat of incarceration to ensure that workers stayed on their land. These facts help to explain why the Black incarceration rate was lower in the South than in the North during this period (Muller 2012) and why it was lowest in the South's cotton-growing regions (Muller 2018).

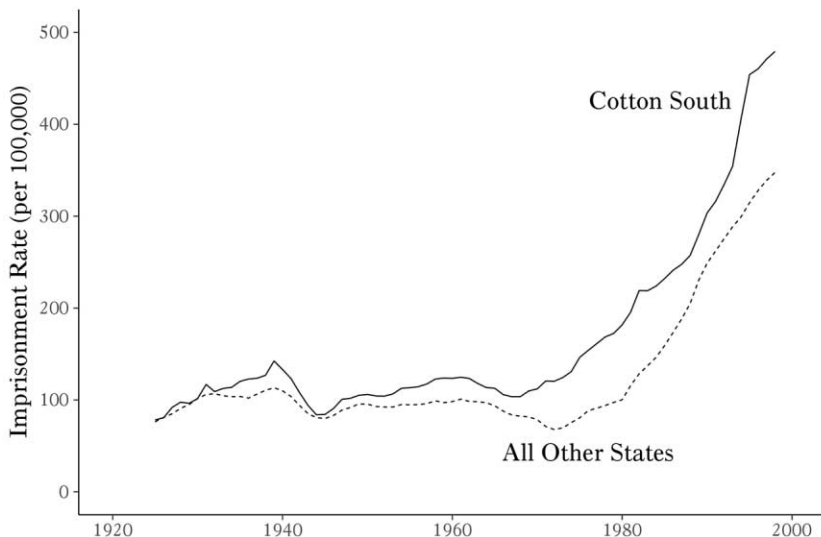


FIG. 6.—Imprisonment rate, 1925–98. Uptick in imprisonment in the late 20th century began earlier in cotton-producing southern states than elsewhere in the United States. Cotton-producing southern states include Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia (Lange et al. 2009, p. 697). Sources: Hill and Harrison (2000) and U.S. Department of Justice, Office of Justice Programs, and Bureau of Justice Statistics (2005).

The continual demand for agricultural workers in the South may be one reason why the region's Black incarceration rate remained comparatively low from slavery through the mid-20th century. That demand collapsed with the introduction of the mechanical cotton harvester at midcentury (Wright 1986, pp. 241–49; Grove and Heinicke 2003). Although mechanization had begun earlier in some parts of the South, “with the successful breakthrough in mechanical cotton harvesting, the character of the labor market radically changed in the 1950s from ‘shortage’ to ‘surplus’” (Wright 1986, p. 243). In 1940, 32% of young Black men in the United States were employed in agriculture; by 1970, that figure had fallen below 3% (Fitch and Ruggles 2000, pp. 75, 79). Katz et al. note that the resulting decline in Black men's labor force participation “coincided with a stunning rise in their rates of incarceration” (2005, p. 82; see also Myers and Sabol 1987; Harding and Winship 2016). Consistent with this observation, the uptick in imprisonment in the late 20th century began earlier in cotton-producing southern states than elsewhere in the United States, as shown in figure 6. Future research should study the relationship between agricultural mechanization and mass incarceration in closer detail.

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