African-American Marriage, Migration and the Boll Weevil in the US South, 1892–1920

Deirdre Bloome, James Feigenbaum and Christopher Muller*

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Abstract

The boll weevil disrupted cotton agriculture and threatened farmers’ livelihoods as it spread across the US South, 1892–1922. Some scholars argue that the weevil infestation helped spur African Americans’ first Great Migration to the northern US; others contest this claim. We shed new light on this debate, combining for the first time historical data on the boll weevil’s county-to-county movement with county-level estimates of net migration changes within narrowly-defined demographic groups derived from complete-count census data, 1900–1920. Where the weevil damaged cotton crops, it also may have affected African-American marriage, not only via migration-induced changes to local marriage markets but also via agricultural-production shocks that may have altered tenant farmers’ long-standing incentives to marry early. We provide the first evidence of weevil-infestation effects on both African-American marriage and migration, combining data on the weevil’s movement with population and agricultural census data. We explore connections between economic institutions and demographic change.

*Authorship is alphabetical. Contact information: Deirdre Bloome, Department of Sociology, Population Studies Center, and Survey Research Center, University of Michigan, dbloome@umich.edu; James Feigenbaum, Department of Economics, Harvard University, jfeigenb@fas.harvard.edu; Christopher Muller, Robert Wood Johnson Foundation Health & Society Scholars Program, Columbia University, cm3427@columbia.edu. We thank Scott Walker of the Harvard Map Collection for his assistance digitizing historical maps.
Extended Abstract

The boll weevil was one of the most notorious pests to disrupt US agriculture in the early 20th century. Although an adult boll weevil measured only about a quarter inch, it fed almost exclusively on cotton and its crossing from Mexico into the US South in 1892 was met with considerable dread. Not only did the boll weevil threaten the region’s major cash crop and, consequently, many livelihoods, but local farmers had little power to prevent it from entering their territory. Some successful control measures were developed as the infestation spread throughout the South over subsequent decades (Hunter and Coad 1923), but because the weevil could fly fifty miles to find food, farmers could do little to determine whether and when infestation would begin (Baker 2014:14). The boll weevil thus represents an exogenous shock to agricultural productivity. In this paper, we explore how this shock—and the consequent reorganization of economic institutions in the US South—affected demographic change, focusing on African Americans’ migration and marriage patterns.

For decades, scholars have debated the weevil’s effect on migration in general and the Great Migration of African Americans to the northern US in particular. During the weevil’s eastward spread from Texas to the Atlantic coast between 1892 and 1922, many African Americans worked as tenant farmers in the South’s cotton belt. For tenant farmers, “it could be an advantage not to own land, so that one could move away from the insect invader” (Giesen 2011:34). The weevil’s effect on cotton production consequently may have spurred African Americans to move north in search of non-agricultural work. In contrast, white landowners had more to lose from moving than African Americans and potentially less to gain relative to their positions in the South than African Americans, who were also facing new opportunities in industrial work in the North. The fact that the late years of the weevil infestation coincide with the early years of the first Great Migration lends some credence to the hypothesis that the weevil spurred northward migration among African Americans.

However, the weevil’s impact on the Great Migration is contested. Higgs (1976) conducted the first empirical analysis of the effect of the boll weevil on the Great Migration. Using state-level data, he finds that the correlation between cotton yields and net migration rates is seldom distinguishable from zero. Giesen (2011:72) also casts doubt on the claim that the weevil was a major driver of migration, noting that
“from 1908 to 1912, during the weevil’s foray into northeast Mississippi, there was no mass exodus of labor from the Delta.” The weevil’s effect on migration may have been state-specific, affecting primarily South Carolina and Georgia, the states it hit last (Higgs 1976:345; Osband 1985:628; Giesen 2011:160). The weevil may also have catalyzed a chain migration internal to the South, from farm to farm and county to county (Giesen 2011:173). We shed new light on the boll weevil’s effects on southern African Americans’ migration patterns by bringing new data to bear: using complete-count Census of Population data from 1900 to 1920, we estimate county-level net migration rates within narrowly-defined demographic groups (defined by age, race, nativity and gender) and study how they responded to changes in the boll weevil’s county presence over time.

If the boll weevil disrupted cotton farming in the South, it may also have affected marital relations between tenant farmers. While previous work on the boll weevil has primarily focused on its effects on agriculture and migration (e.g., Higgs 1976; Osband 1985; Lange, Olmsted and Rhode 2009), we also study union formation and dissolution among African Americans. The boll weevil may have delayed marriage initiation and increased marital separations via its effects on migration, which destabilized families and local marriage markets. Further, the boll weevil may have affected marital behavior via its effects on the organization of agricultural work, including the introduction of new crops and farming techniques as well as new dynamics between tenant farmers and white landowners that arose in the wake of the boll weevil’s arrival.

In the late 19th and early 20th century in the US South, family and agricultural work were strongly intertwined. Following emancipation, white landowners refused to sell land to African Americans; family-based labor contracts and tenant arrangements organized around husbands’ patriarchal authority over the labor of their wives and children came to dominate agricultural work in the postbellum South. These arrangements restricted African-American women’s ability to secure independent work in agriculture. Consequently, these arrangements also affected marital relations, because marrying early was one of the few ways that young African-American women could enter the agricultural labor market in counties where tenancy prevailed. Marriage was nearly ubiquitous in the South, but the dominance of tenancy in a county encouraged African-American women to marry earlier than they might have otherwise, while simultaneously creating conditions
that undermined the long-term stability of African Americans’ unions (Tolnay 1984; Landale and Tolnay 1991; Tolnay 1999; Bloome and Muller 2015). Given these interrelationship between marriage and agricultural work in the postbellum South, boll weevil-induced shocks to cotton production may have altered the marriage formation and dissolution decisions of African Americans through several pathways (not only through disruptions induced by migration but also through changes in white landowners’ willingness to sell land and negotiate with African-American laborers, for example).

The boll weevil’s effects on African-American marriage and migration likely varied across time and space. The weevil entered the US from Mexico in 1892 through Brownsville, Texas and spread slowly throughout the cotton-growing South. Peak infestation occurred around 1915 and by 1922 the weevil had spread all the way east through Florida, reaching over 800 counties (see Figure 1). Because of the protracted nature of the weevil’s spread, many farmers anticipated its arrival and altered their behaviors prior to its entry into their territory. “Men and women, particularly rural black southerners, heard of the boll weevil’s history through. . . songs long before the insect had even crossed the Mississippi River” (Giesen 2011:39). Consequently, the boll weevil’s effects likely varied over time, both due to farmers’ anticipation of future infestation and due to their later adaptation to the weevil (creating both lead and lag effects). The weevil’s effects on African-American marriage and migration likely also varied across space, with residents of counties heavily engaged in cotton farming prior to the weevil’s entrance into the US being especially strongly affected (Lange, Olmsted and Rhode 2009). We investigate not only “average” boll weevil effects (pooled across time and space) but also variation in these effects relative to the timing of the weevil’s entry into a county and relative to the county’s prior engagement in cotton farming.

To date, the only empirical studies of the effect of the boll weevil infestation on migration rely on state-level data containing no direct information on the timing of the boll weevil’s movement across the South; further, no quantitative analyses (to our knowledge) examine the effect of the boll weevil infestation on marriage, despite strong historical evidence of the ties between agricultural work and family life. Our analysis combines complete-count data from the Censuses of Population for the years 1900, 1910, and 1920 with several Department of Agriculture Reports on the spread of the boll weevil (Hunter and Pierce 1913; Hunter 1917; Hunter and Coad 1923) as well as data
from the Censuses of Agriculture from 1889, 1899, 1909 and 1919. With county-level data on narrowly-defined population groups and the timing of boll weevil infestation, we can generate causal estimates of the effects of the boll weevil on migration and marriage among African Americans. Our study will contribute to the growing literature on the relationship between economic institutions and demographic change.

Data and Methods

To study the boll weevil’s effects on marriage and migration among African Americans in the US South, we draw on three data sources. First, we use a set of three maps contained in US Department of Agriculture reports from 1913, 1917, and 1923 that chart the boll weevil’s spread across southern counties from 1982–1922 (Hunter and Pierce 1913; Hunter 1917; Hunter and Coad 1923). We digitized the maps and coded for each county the year when the weevil entered, the year when it had infested all of the county area, and the share of land infested in each year. We used three maps (rather than the 1923 map alone) in order to obtain the greatest accuracy possible in coding when the boll weevil entered each county; we built our data sequentially from the map with the fewest lines tracing the weevil’s progression across the US (from 1913) to the image with the most lines (from 1923). Figure 2, Panel A contains the 1923 map and Figure 2, Panel B contains a version of the 1913 map illustrating our georeferencing approach. We combine this county-level information on the boll weevil with county-level information on people and the economy as captured through the Censuses of Population (1900, 1910 and 1920) and the Censuses of Agriculture (1889, 1899, 1909, and 1919). From the Censuses of Agriculture, we draw a variety of covariates that help us understand the processes linking boll weevil infestation and marriage and migration outcomes, including the share of county acres devoted to cotton production. From the Censuses of Population, we create our outcome measures of interest.

Because we have access to the complete-count microdata from the Censuses of Population, we have the (until very recently) rare ability to study county-level marriage and migration outcomes within very refined demographic groups (defined by race, nativity, gender, and age) and to capture rare events difficult to observe in smaller databases (like divorce in the early 20th century US South). We study four primary measures of family structure: the share of each demographic group
in each county that is currently married to a spouse present in the household; the share ever married; the share currently divorced; and the share currently divorced or married to an absent spouse. We prefer the more conservative measure of “currently married, spouse present” because of concerns that single African-American women overreported marriage (Preston et al. 1992). We explore both current marital status and lifetime exposure to marriage because we hypothesize that the boll weevil’s shocks to the agricultural system in the US South likely affected the timing of marriage rather than the probability of ever marrying (given that marriage was a near-universal life course event for our population of interest). We explore both a more and less restrictive measure of union dissolution (shares currently divorced and shares either currently divorced or married to an absent spouse) to address concerns that some union dissolutions might either be misreported as marriage to an absent spouse or accurately so-reported if the dissolution was not formalized through the law.

In addition to these family structure outcomes, we study one migration outcome: the net migration rate of each demographic group in each county. We calculate these county- and group-specific rates using a forward survival method, wherein the net number of migrants is estimated as the difference between the population at time $t$ and the population at time $t - 10$ adjusted for the survival ratio (to account for the fact that the number of people in each population subgroup will change over time not only due to migration but also due to mortality; we do not worry about change due to fertility because we are interested in studying the boll weevil’s effects on adult migration). We calculate survival ratios separately for each demographic group at the national level and rest our migration estimates on the assumption of equal survival ratios across places, as well as the assumption of consistent enumeration across censuses. We will explore some sensitivity analyses to test the robustness of our estimates to violations of these assumptions, while noting that these methods have long been employed to estimate internal migration in the US (e.g., Lee et al. 1957).

We begin our analysis of the boll weevil’s effect on marriage and migration using a simple within-county fixed-effects model of the form

$$y_{ict} = \tau BW_{ct} + \sum_{j=1}^{J} \gamma_j X_{j,ict} + \alpha_c + \delta_t + \epsilon_{ict} \quad (1)$$

where $y_{ict}$ is the outcome variable of interest (e.g., logged population shares married, divorced, or migrating) at time $t$ in county $c$ among
demographic group $i$, where demographic groups are defined by race (white or African American), gender (male or female) and age (15-19, 20-29, 30-39, 40-49, and 50+). We focus on native-born individuals only, because it is impossible to calculate internal migration rates for foreign-born individuals without very strong assumptions that, given the available information, do not seem wise to make. Rather than parameterize demographic group differences within a single model, we leave these differences unconstrained by estimating the model separately for each group. Our key predictor is BW$_{ct}$, which is a dummy variable that equals zero prior to the boll weevil’s arrival in county $c$ and one in the arrival year and every year thereafter. If $t^*_c$ represents the year of boll weevil entry in county $c$, then BW$_{ct} = 0$ if $t < t^*_c$ and 1 if $t \geq t^*_c$.

$X_{ict}$ is a vector of $J$ covariates; some vary only by county and year while others also vary by demographic group (such as sex ratios by age). $\alpha_c$ is a county fixed effect capturing heterogeneity across places that is invariant across time while $\delta_t$ is a year fixed effect capturing temporal change that is common across counties; $\epsilon_{ict}$ captures the remaining within-county variation over time for demographic group $i$.

We cluster these errors at the county level and also adjust for spatial autocorrelation using a spatial autoregressive error model. We weight our analyses by population size to ensure that areas more populous in each demographic group receive greater weight in our estimates.

We expand on this simple analysis in four ways. First and most importantly, we explore how the effects of the boll weevil are distributed around the timing of its arrival. Rather than using a single dummy variable as in equation (1)—and therefore considering boll weevil entry to be a single discrete event with a single discrete impact on marriage and migration—we include a series of dummy variables indicating time to and since the boll weevil’s arrival in order to assess the dynamic development of the boll weevil’s effects over time:

$$y_{ict} = \sum_{p=-9}^{10+} \tau_p BW_{p,ct} + \sum_{j=1}^J \gamma_j X_{j,ict} + \alpha_c + \delta_t + \epsilon_{ict}$$

(2)

where the coefficients on BW$_{p,ct}$ (the $\tau_p$’s) capture lead and lag effects of the boll weevil, setting BW$_{p,ct} = 1$ if $t = t^*_c + p$ and 0 otherwise. The reference period is 10 or more year prior to boll weevil entry (all of these observations are treated as a single category); ten years or more after entry are also treated as a single category (10+). On the assumption that $\tau_p$ is zero for $p \leq -10$, we identify a profile for how our
marriage and migration outcomes develop before and after boll weevil entry. Versions of this model, often called “distributed fixed effects,” have been used to study how marriage affects men’s and women’s wages (Dougherty 2006; Dribe and Nystedt 2013; Dribe and Nystedt 2015). In those applications, observing “effects” of marriage before it occurs on wages is interpreted as reflecting endogenous selection into marriage based on time-varying traits (that are not controlled in a typical fixed-effects framework). However, in many scenarios in which people have foresight, they may anticipate future “treatments” (in this case, future treatment is future boll weevil entry) and change their behavior in advance accordingly. These “anticipation effects” cannot technically be separated from endogeneity, but theory strongly suggests that they exist in certain circumstances (and that ignoring them biases typical treatment effect estimates). For example, Malani and Reif (2015) document that physician supply was affected by reforms to punitive damage caps even before the caps were officially enacted because people anticipated their enactment and altered their behavior in advance. Relevant to our current application, Lange, Olmsted and Rhode (2009) find that in anticipation of the boll weevil’s approach, farmers increased their cotton production. Although farmers could not control when the boll weevil arrived, they were aware of its progress across the US South and made decisions based on that knowledge. It is also important to explore time since the boll weevil’s arrival (not only time until arrival) in order to understand how enduring the boll weevil’s effects were; shocks beginning at time $t^*$ may continue to reverberate through time $t^* + p$.

Second, we explore heterogeneity in the boll weevil’s effects by each county’s reliance on cotton production prior to the boll weevil’s arrival in the US. To do so, we measure the share of total farm acres in a county devoted to cotton (following Lange, Olmsted and Rhode 2009) using data from the 1889 agricultural census (the last such census before the weevil’s arrival in Texas in 1892). Expanding equation (2), this generates the model

$$y_{ict} = \sum_{p=-9}^{10} (\beta_p\text{cotton}_c + \tau_p)\text{BW}_{p,ct} + \sum_{j=1}^{J} \gamma_j X_{j,ict} + \alpha_c + \delta_t + \epsilon_{ict}. \quad (3)$$

Third, we move beyond dummy-variable codings of the boll weevil’s presence in a county toward exploring its degree of penetration (the share of total county land infested) and its speed of penetration (the
time between its entry in a county and its infestation of all county land; unfortunately due to data constraints, this time is measure in years). These measures are much more likely to be endogenous than the timing of boll weevil entry; although famers could not stop the boll weevil from entering a county and although many methods used to try to slow the degree and speed of infestation proved useless or even counter-productive, some methods had some success (Hunter and Coad 1923), and the probability of adopting successful methods may be correlated with factors also related to marriage and migration. Nevertheless, it is of interest to explore a dose-response function to understand how marriage and migration trends developed in response to different levels of exposure to boll weevil-induced agricultural destruction.1 Fourth and finally, we explore an instrumental variables approach wherein we instrument the boll weevil’s arrival with the county’s distance from Brownsville, Texas (the boll weevil’s point-of-entry into the US from Mexico). This approach helps us guard against the possibility of omitted variables, wherein counties with more successful cotton industries both attracted the boll weevil at different times than their less successful counterparts and, possibly as a consequence of the traits driving this success (rather than the boll weevil itself), also experienced different marital and migration trends (Lange, Olmsted and Rhode 2009).

**Expected Results and Next Steps**

The boll weevil’s unstoppable infestation through the US South sparked fears among residents because the weevil was an unwelcome shock to agricultural production and, therefore, to residents’ economic well-being. However, we expect that weevil-induced cotton destruction not only precipitated reorganizations of local economic institutions but also shaped family life. We expect that boll weevil entry into a county increased net out-migration on average (particularly among African Americans, who were both less likely to own land and facing increasing opportunities off the plantation, making them more mobile than whites), as residents sought earnings opportunities in areas less reliant on cotton production (including cities within their home state

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1 We do not use the boll weevil’s entry as an instrument for agricultural “treatment” variables because we do not believe that it meets the exclusion restriction required for an instrument; for example, the boll weevil could affect marriage not only via its effects on cotton production but also via its effects on migration.
as well as other states). We also expect that, on average, boll weevil entry into a county decreased the shares of the population currently married, particularly at the youngest and oldest ages (although not lifetime rates of marriage), and increased the shares currently divorced, because the reorganization of farm life likely disrupted family life and altered marriage markets both via migration and via the changing incentives for young African-American women, in particular, to marry early in order to participate in family-based tenant farming.

However, we expect to observe substantial heterogeneity in the boll weevil’s effects (both across space and time) as well as several offsetting responses that may mute the boll weevil’s impact. The boll weevil’s effects should be stronger in areas historically more reliant on cotton production. The effects should also build over time before declining; we expect anticipatory responses to the boll weevil (particularly in terms of migration), as planters first increase cotton production to obtain as much value from their crops as possible before they are attacked by the weevil and then suffer from the attacks and adjust their production accordingly (including by switching crops). The weevil’s effects are likely to be largest at the time of entry but they will likely persist for a few years after entry, as residents work to reach a new equilibrium. However, a variety of offsetting dynamics may also mute the weevil’s impact on family life. For example, as cotton became more scare its price may have increased enough to keep many employed in their pre-weevil agricultural work (Osband 1985). Likewise even if opportunities in cities or other less cotton-reliant states became increasingly enticing after the boll weevil’s entry into a county (perhaps increasing migration and family dissolution), white planters’ economic fears may have caused them to try to tighten their control over labor (including via attempts to quell migration and promote the patriarchal family in which African-American men controlled the labor of their wives and children). The combination of offsetting dynamics and heterogeneous effects may result in relatively small weevil effects on marriage and migration on average despite large underlying changes in several domains. The next steps for our project are to explore these dynamics in our data and work to understand our findings in light of the historical literature on the boll weevil’s effects on the US South.
References


Figure (1)

Year Boll Weevil Enters County

Cumulative # of Counties Boll Weevil Has Entered by Year
Figure (2)

(a) 1923 map

(b) 1913 map, georeferencing initiated