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The boll weevil plague and its effect on the southern agricultural sector, 1889–1929 ☆

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ABSTRACT

In the early 1890s, cotton fields in the American South were ravaged by the boll weevil. Using a model that controls for differences in the intensity of cotton production at the county level, we show how the boll weevil significantly changed southern agricultural labor arrangements and labor market outcomes. The boll weevil significantly reduced the number of tenant farms, decreased farm wages, and female labor force participation, particularly in counties with a higher intensity of cotton production.

1. Introduction

The boll weevil is the most well known agricultural pest in the American South (Giesen, 2004; 2011). With its arrival in 1892 near Brownsville (Texas), the boll weevil started to impair cotton production, the South's dominant cash crop and main economic engine (Alston, 1990; Lange et al., 2009; Ransom and Sutch, 2001).[1] Since the spread of the boll weevil was determined by geographic conditions, mainly prevailing wind and weather conditions, the variation in the timing of the boll weevil is plausibly exogenous to local economic conditions.[2] By 1922, the whole Cotton Belt was almost completely infested (Hunter and Coad, 1923, Figure 1).

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[1] The southern economy relied heavily on cotton (Ransom and Sutch, 2001, pp. 188–193), especially after the Civil War when production increased from 6.6 million bales in 1880 to 11.6 million bales in 1910 compared to 3.8 million bales before the Civil War in 1860 (U.S. Bureau of the Census, 1975, pp. 517–518). Ransom and Sutch (2001, pp. 318–319) show that, in 1880, 75 % of southern farms planted some acreage in cotton, over 90 % did so in the Cotton South, indicating the high degree of specialization in cotton production of southern farmers during the postbellum period.

[2] The boll weevil's life revolves around the cotton plant, which is its main source of food and host of reproduction. A female boll weevil deposits her eggs – 100 to 300 per generation – into the growing squares or bolls of the cotton plant during the growing season resulting in a rapid infestation of the surrounding cotton fields. During one growing season, a single pair of boll weevils can account for over a quarter million offspring (Giesen, 2004, pp. 20–22). Mild, wet summers and frost free winters lead to massive reproduction and heavy infestation, whereas very hot, dry summer months impede the infestations of cotton fields and mortality increases during cold winters (Fenton and Dunnam, 1929; Hunter and Coad, 1923; Lange et al., 2009). Overall,

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The arrival of the boll weevil caused large declines in cotton yields and cotton acreage (Ransom and Sutch, 2001). During 1909–1935 the average reduction from full yield in the American South was 10.9 %, ranging from 0.8 % in Missouri to 17.8 % in Louisiana (Hyslop, 1938, Table 1).[3] The estimated loss from full yield per acre of cotton reached its peak of 31 % in 1921 (U.S. Department of Agriculture, 1951, Table 52). The United States Department of Agriculture (USDA) estimated the average annual loss due to boll weevil infestation for the four years preceding 1920 to about 200–300 million US dollars (Hunter and Coad, 1923).

There is a rich literature on the impact of the boll weevil on the southern economy, much of which exploits state-level variation to understand the pest's effects (Higgs, 1976; Osband, 1985; Ransom and Sutch, 2001; Street, 1955; Wright, 1986). More recent studies have begun to exploit disaggregate data. Lange et al. (2009) find a detrimental effect of the boll weevil on local economies within the Cotton Belt of the American South using county level data.[4] In particular, Lange et al. (2009) find that the boll weevil caused a persistent decline in cotton production, reduced land values, and triggered internal migration. More recently, Baker (2015) shows for counties within the state of Georgia that school enrollment rates of blacks increased in response to the adverse impact of the boll weevil on cotton production.

One issue that has received comparatively less attention in empirical analysis is the boll weevil's effects on local labor markets. This is of particular interest since it contributes to the discussion among economic historians whether rural labor markets in the postbellum South were competitive (Daniel, 1990; Higgs, 1977; Mandle, 1978) and the extent to which there was mobility up and down the agricultural ladder (Alston and Ferrie, 2005; Alston and Kauffman, 1998). As the boll weevil disrupted the southern cotton economy, one might expect that wage workers, tenants, and landowners would have responded by migrating, adopting contractual arrangements, and changing landownership. We thus explore how the boll weevil affected labor arrangements and labor market outcomes in the Cotton Belt of the American South using county level data. In particular, we show the boll weevil's impact on a peculiar southern institution – the farm tenancy system: it eroded the number of fixed-rent tenants while the number of other tenants (mainly croppers and share tenants) remained unaffected. After the boll weevil's arrival, the share of owned farms and other tenant farms increased while fixed-rent tenant farms declined in counties with an average intensity of cotton farming. These effects are quantitatively stronger in counties with a higher intensity of cotton farming. The decline in fixed-rent tenant farms due to the boll weevil infestation is compatible with the view that movements along the agricultural ladder can be triggered by increased agricultural risk and income losses in the agricultural sector and hence adds to the discussion about mobility in the agricultural sector in the postbellum South (Alston and Kauffman, 1997; Shlomowitz, 1979; Wright, 1986).

In addition, we find that the boll weevil had a negative effect on labor force participation and farm wages, with the effects strongest in counties that relied heavily on cotton production. We further show that the boll weevil's arrival led to a sharp decline in female labor force participation, in particular of black women. The greater sensitivity of black female labor force participation to unfavorable economic conditions indicates a more elastic labor supply curve of black women. This is in line with the view that black women responded more sensitive to negative income shocks[5] and that the labor supply of white married women between 1890 and 1930 was inelastic (Goldin, 1990). The decline in female labor force participation is also consistent with anecdotal evidence that (black) females had a comparative advantage within the southern agricultural sector in cotton cultivation (Goldin and Sokoloff, 1984; Metzer, 1975). These changes in local labor markets are consistent with Lange et al. (2009) who suggest that the boll weevil triggered a wave of internal migration.

Finally, we reevaluate the boll weevil's impact on agricultural production and population movements using an improved estimation approach which explicitly accounts for heterogeneity in cotton dependency across counties. While the majority of our findings are in line with Lange et al. (2009), we go beyond what these authors have already documented by showing that the number of farms and agricultural land use declined more strongly in counties with a higher initial cotton intensity. Overall, our findings show that the boll weevil not only had a detrimental effect on local agricultural production, but it also changed southern agricultural labor arrangements and labor market outcomes at the beginning of the 20th century.

2. Data and econometric model

2.1. Data

This section discusses the data used to assess the impact that the boll weevil had on the tenancy system, the labor market, and agricultural production. We use county level data from the United States Censuses of Agriculture on cotton and corn production (acres and quantities), total acres in farms, farms by operator, farms by size, and the average value of

(*footnote continued*)
depending on prevailing wind and weather conditions, the boll weevil could cover from 40 to 160 miles a year (Hunter and Coad, 1923).

[3] Ransom and Sutch (2001, Table 9.2) compare cotton acreage and yield before and after boll weevil infestation for the cotton states Louisiana, Mississippi, Alabama, Georgia, and South Carolina during 1889–1924. Their estimates reveal a decline in cotton acreage of 27.4 % and in cotton yield of 31.3 % in the four years after complete boll weevil infestation.

[4] We refer to Lange et al. (2009), who summarize the findings of the earlier studies, for further details.

[5] For example, Sundstrom (2001) documents that during the Great Depression a substantial number of black women left the labor force as "discouraged workers."