For Whom the Boll Weevil Tolls: Causal evidence on religiosity and the business cycle

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Abstract

This paper asks whether religiosity is pro or countercyclical with the business cycle using plausible exogenous variation in the boll weevil infestation of the US cotton belt between 1890 and 1930. Theory offers ambiguous predictions about the cyclicality of religiosity depending on whether it is a normal good or a club good, which remains ambiguous in largely descriptive empirical work. In this paper, I leverage that the boll weevil led to short-run local downturns followed by long-run local economic growth as it led to increased education. I track the change in religiosity using Census data on religious bodies from 1890, 1906, 1916, 1926, 1936, and 1952. I find that religiosity increases in the short-run and decreases in the long-run, suggesting that religiosity is countercyclical and consistent with a normal goods model of religiosity.

1 Introduction

Is religiosity a countercyclical or procyclical behavior? On one hand, if religiosity is leisure and a normal good, then we would expect it to be procyclical with religious participation increasing during economic booms and decreasing during economic busts. On the other hand, in the club goods model

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of religion (Iyer, n.d.; Carvalho, n.d.), religion authorities curb free riding by putting costs on secular activities, like drinking and dancing, effectively making religion more attractive when people are poor, and consequently suggesting religiosity is countercyclical.

Despite this ambiguity, there is relatively little empirical evidence on the cyclicality of religion and what exists suggests it varies by tradition and whether measuring by religiosity in attendance or giving. Attendance at conservative, evangelical Protestant denominations was countercyclical, while attendance at more progressive, mainline Protestant denominations was procyclical throughout the late 20th and early 21st centuries (Beckworth, n.d.b; Sales, n.d.; Harris and Medcalfe, n.d.). Religious giving on the other hand, seems to act as a substitute with attendance in Seventh-Day Adventist churches (Beckworth, n.d.a) and align with the stock market in United Methodist churches (Harris and Medcalfe, n.d.), indicating it is potentially procyclical.

Complicating this analysis is the fact that the local business cycle may not be exogenous to religiosity. For example, churches provide social insurance provision (Ferrara and Testa, n.d.; Hungerman, n.d.; Gruber et al., n.d.) and take-up (Auriol et al., 2020), consumption (Elsitasari and Ishak, n.d.), and many other economic behaviors (Bryan et al., 2021). This endogeneity is such that some authors instead estimate the effect of religiosity on the business cycle (Petach and Powell, n.d.). This paper seeks to fill this gap by providing causal evidence on the cyclicality of religiosity using the boll weevil infestation of the US cotton belt between 1890 and 1930 as an instrument for the local business cycle.

The boll weevil infested and killed cotton crops throughout the south east United States between 1890 and 1930, spreading in a plausibly random way linked to wind patterns. The pests' arrival lead to short-run economic downturns (Lange et al., n.d.; Baker et al., n.d.), especially among black tenant farmers (Bloome et al., n.d.). In the long run, these same areas saw increased long-run economic performance due to a variety of factors including increased education and reduced fertility (Ager et al., n.d.a) and a shift towards more nutritious crops and better public health outcomes (Clay et al., n.d.b,n).

Due to the unique characteristic that boll weevil shock generates a specific bust, then boom within the local business cycle, this makes it an ideal candidate to assess the cyclicality of religiosity. I use Census data on religious bodies from 1890, 1906, 1916, 1926, 1936, and 1952 to track the change in religiosity in the affected areas. I find that religiosity increases in the short-run and decreases in the long-run, suggesting that religiosity is countercyclical and consistent with a normal goods model of religiosity.

The rest of the paper is organized as follows. Section 2 reviews the data I will use. Section 3 describes the methodology. Section 4 presents the results. Section 5 discusses the implications of the results. Section 6 concludes.

2 Data

The data in this paper come from a variety of historical sources and courtesy of several authors who have published in this space. First, I use data on the spread of the boll weevil, first compiled by Lange et al. (n.d.) and provided courtesy of Paul Rhode. These data show the spread of the boll weevil as mapped by United States Department of Agrticulture in 1927, 1938, and 1952. The maps track the spread from the initial start in 1892 near Brownsville, Texas throughout the southeast – going roughly 40 to 160 miles per year.

I then match these data to the 1890 Census of Religious Bodies, which provides data on the number of religious bodies in each county in the United States. I use this data to construct a measure of religiosity in each county in 1890. I then track the change in religiosity in each county in 1906, 1916, 1926, 1936, and 1952. For each county, I measure the share of the population reported as religious in a given year. I report as the share of population so as to note misattribute a change in the overall population as a change in the number of religious adherents. To account for the fact that county boundaries change over time during this period, I create 44 super-counties that aggregate bordering counties that experienced border shifts during this period.[1]

Figure **??** shows the change in religiosity based on the timing of the boll weevil shock in each county among counties that experienced in boll weevil shock. These results underscore one challenge in this analysis: the data are extremely noisy through this period. Furthermore, a boll weevil shock does not necessarily equate to a meaningful change in the share religious. This unclear relationship is partially due to the fact that not all areas experienced the boll weevil shock equally. The shock was worst in areas that actually grew cotton as a major crop.

[1]Thank you to Paul Rhode for sharing these boundaries.

Given the importance of cotton to explaining boll weevil exposure, I follow Ager et al. (n.d.b) and proxy exposure to the boll weevil shock using the 1889 cotton acreage share in each county. This measure is constructed by taking the share of cotton acreage in each county in 1889 and demeaning it by the mean share of cotton acreage in the United States in 1889. This measure is used to proxy the exposure to the boll weevil shock as areas with more cotton acreage were more affected by the boll weevil.

3 Methodology

In this paper, I use a fixed effects model to assess the effect of the boll weevil on religiosity in the short and long-run. While a staggered difference-in-difference model would be ideal, the lack of consistent timing of the boll weevil infestation makes this difficult. As such, I perform a simplified version of this model shown in equation 1, y_{ct} is a measure of religiosity in county c at time t, α_c is a fixed effect for county c, α_t is a fixed effect for time t, and ϵ_{ct} is the error term. The key independent variables are the boll weevil in the last 20 years and the boll weevil in the last 21+ years. The interaction terms with the demeaned 1889 cotton acreage share are included to assess the effect of the boll weevil on religiosity in the short and long-run in areas as areas with more cotton acreage were more affected by the boll weevil.

$$\begin{aligned} y_{ct} = \alpha_c + \alpha_t &+ \beta_1 \text{Boll Weevil in Last 20 years}_{ct} + \beta_2 \text{Boll Weevil in last 21+ years}_{ct} \\ &+ \beta_3 \text{Boll Weevil in Last 20 years}_{ct} \times \text{Demeaned 1889 Cotton Acreage Share}_c \\ &+ \beta_4 \text{Boll Weevil in last 21+ years}_{ct} \times \text{Demeaned 1889 Cotton Acreage Share}_c + \epsilon_{ct} \end{aligned} \quad (1)$$

This estimation equation comes from Lange et al. (n.d.) and Ager et al. (n.d.b). The key difference is that I am using religiosity as the dependent variable rather than economic outcomes.[2] Standard errors are clustered at the multicounty level.

[2] Additionally, I do not control for weather shocks at this time, but I will in future iterations of this paper.

4 Results

I present preliminary results in table 1 for the outcomes: Share religious, log of total members, and log of population. The results show that after boll weevil shock, religiosity drops overall in areas with more cotton acreage as share of population. Furthermore, the log of members falls by a greater amount than population, consistent with these results.

When I look at the short vs long-run effects, I find that this negative effect is concentrated in the long run, with the short-run effect being positive, but imprecisely estimated in areas with a greater share of cotton acreage in 1889. Overall, this result is consistent with religiosity being countercyclical – that is increasing during economic downturns and falling during economic booms – and therefore a club good that is less attractive when people can enjoy secular activities.

Meanwhile, the long-run effects show that religiosity increases after more than 20 years since the boll weevil shock by 6.201 percentage points. However, this effect is ameliorated and overall reversed in areas with a large share of cotton acreage in 1889. This result is consistent with the idea that the boll weevil shock led to a long-run increase in the economy, and as such, a relative decline in religiosity.

5 Conclusion

Overall, the results suggest that the religiosity is causally countercyclical, though results are noisy due to the historical nature of the data. This result is consistent with a club goods model of religiosity. Future work will include controlling for weather shocks and other potential confounders. I will also assess the religious cyclicality by protestant denomination to see if the results are consistent across different religious traditions or vary based on the level of prohibitiveness of the religion.

Additionally, I will use sample construction that adheres closer to Ager et al. (n.d.b) to ensure that the results are robust to different sample constructions. Furthermore, I will use the newspaper index in (Ferrara et al., n.d.) that adds further robustness to the estimates by leveraging headlines that report local boll weevil spread. Last, I will use alternative ways to aggregate historical counties to present as presented in Eckert et al. (n.d.) and Hornbeck (2010).

Table 1: Effect of Boll Weevil on Religiosity in Long and Short Run

Dependent Variables:	totalmembers_pct		log(totalmembers+1)		lo
Model:	(1)	(2)	(3)	(4)	
Variables					
after_bwTRUE	0.91		0.03^{*}		
	(0.76)		(0.02)		
after_bwTRUE × cotton_acre_share_demean_bw	-6.2^{***}		-0.37^{***}		-
	(2.3)		(0.08)		
bw20TRUE		0.21		-0.007	
		(0.94)		(0.02)	
bw_after20TRUE		6.2^{***}		0.25^{***}	
		(1.4)		(0.03)	
bw20TRUE × cotton_acre_share_demean_bw		3.6		0.007	
		(2.3)		(0.07)	
bw_after20TRUE × cotton_acre_share_demean_bw		-17.4^{***}		-0.84^{***}	
		(3.1)		(0.10)	
Fixed-effects					
year	Yes	Yes	Yes	Yes	
multicountyfips	Yes	Yes	Yes	Yes	
Fit statistics					
Observations	6,046	6,046	6,046	6,046	
Within R^2	0.00195	0.01625	0.01160	0.05524	0
R^2	0.37611	0.38505	0.85528	0.86167	0
Dependent variable mean	39.904	39.904	8.6885	8.6885	9

Clustered (multicountyfips) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Standard errors are clustered at the multicounty level. Fixed effects for year and multicounty. Logarithms are natural logs plus one to omit zeroes. Shares calculated as the amount of religious adherents divided by the population in the closest census. Cotton Acre Share is demeaned. Boll Weevil data provided by Paul Rhode. Sample restricted to counties with exposure to the boll weevil.

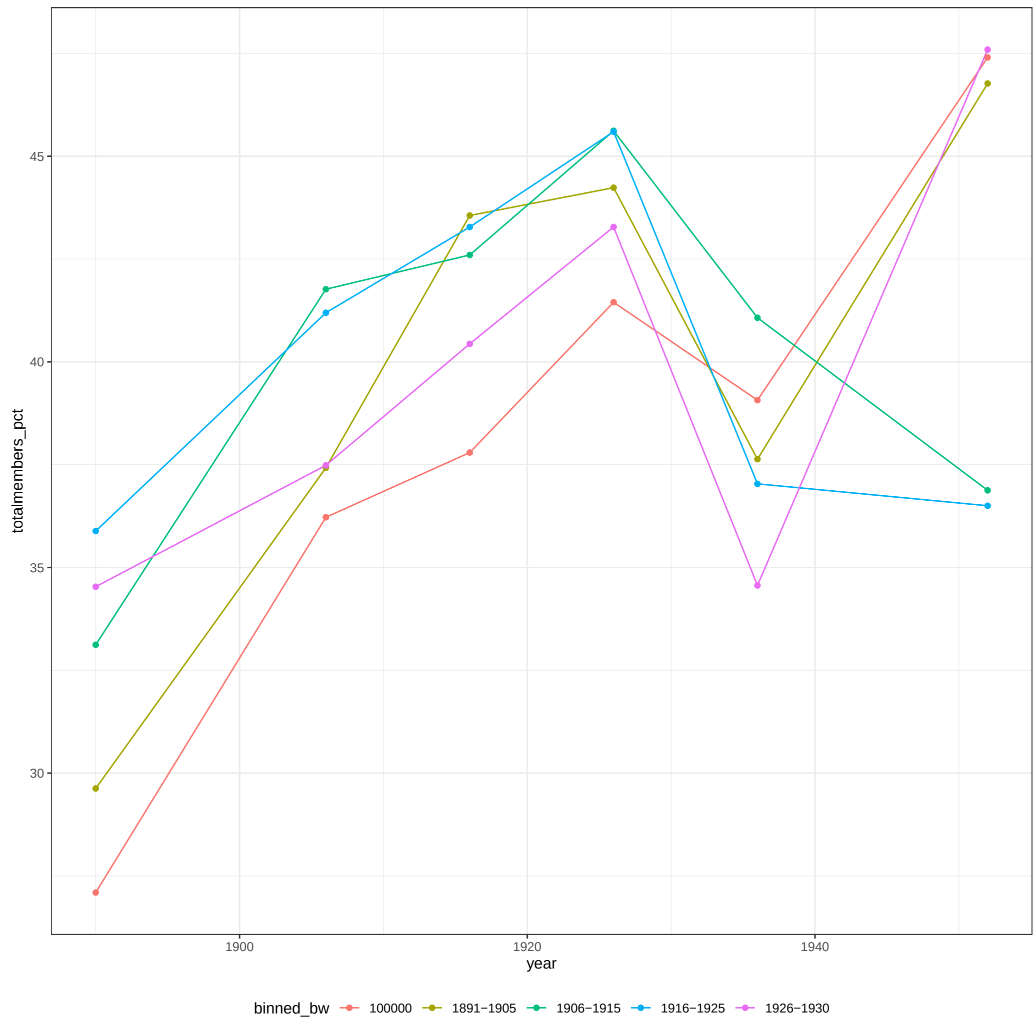

Figure 1: Share religious by timing of boll weevil shock from 1890 to 1952. The caption is share religious calculated as the total number of adherents normalized by the closest census population estimate. Estimates grouped by shocks that fall between each data point from 1890 to 1952.

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