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# **Did Slavery Impede the Growth of American Capitalism? Two Natural Experiments Using Farm Values per Acre**

Francis, Joseph A.

University of Birmingham

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# Did Slavery Impede the Growth of American Capitalism?

## Two Natural Experiments Using Farm Values per Acre

Joseph Francis

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(v3.0)

### Abstract

Two natural experiments challenge the view that slavery impeded the growth of American capitalism. An event study shows that farm values fell relative to the national average in slave states following abolition. A spatial regression discontinuity design (RDD) then suggests that any negative effects of slavery's legality on farm values on the free-slave state border were counteracted by the institution's practical utility. An explanation of these results can also be advanced: slavery provided a relatively cheap agricultural labor force in parts of the South where white Americans preferred not to settle. From this perspective, the growth of American capitalism was promoted rather than impeded by slavery.

Keywords: economic history, event study, spatial regression discontinuity design, slavery, United States

JEL codes: J47, N11, N21, N51, O43

The antebellum South's low farm values per acre have been presented as evidence of how slavery impeded the growth of American capitalism. This metric—the value of land and buildings per acre of improved and unimproved farmland—appeals because it provides a fairly unambiguous measure of wealth. "An increase in land value is an appropriate measure of wealth accumulation for a society as well as for private owners," Gavin Wright (2006, 58) explains. High farm values in the North reflected the

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Joseph Francis is an economic historian from Wales. He is an honorary research fellow at the University of Birmingham and can be contacted at [joe francis505@gmail.com](mailto:joe francis505@gmail.com). Adam Zucconi provided guidance on West Virginia's historiography, while Matt Curtis and Philip Hoxie gave helpful feedback on a previous draft. Supplementary materials are available at [https://github.com/joe francis505/Francis\\_Farm-Values](https://github.com/joe francis505/Francis_Farm-Values).

region's success, according to Wright (2006, 64), because the effects of "pure geography" had been "overwhelmed by the development juggernaut sprawling across the countryside." In the South, on the other hand, state governments did not promote immigration or new transportation infrastructure to such a degree. As a result, most of the South "was either passed over or left behind in the process of settlement," as Wright (2006, 65) puts it. In this way, Wright (2006, 58–65; 2022, 132–134) uses the South's low farm values to confirm his version of American economic history. In Wright's telling, the North prospered due to its liberal institutions, while slavery made the South fall behind, turning the region into a drag on growth. Such is the consensus view among economists today (Olmstead and Rhode 2018; Hilt 2020; Wright 2020, 2022).

Yet the two natural experiments presented in this paper challenge this narrative. In the first, an event study is applied to abolition, which Wright (2006, 79) describes as approximating "a controlled experiment in institutional change."<sup>1</sup> Wright's narrative predicts that Southern farm values should have increased after abolition, but they in fact fell relative to the national average. The event study instead suggests that any negative effect from slavery's legality was more than canceled out by its practical utility for planters. These findings are then confirmed by the second natural experiment, which analyzes the effects of slavery's legality at the free-slave state border using a spatial regression discontinuity design (RDD). The results again indicate that any negative effects of slavery's practical utility canceled out the negative effects of its legality—a finding that can be explained by the South's low levels of agricultural productivity and hostile disease environment. The enslaved, this paper suggests, provided planters with a cheap labor force in parts of the South where free Americans preferred not to settle. For this reason, slavery promoted rather than impeded the growth of American capitalism.

## I

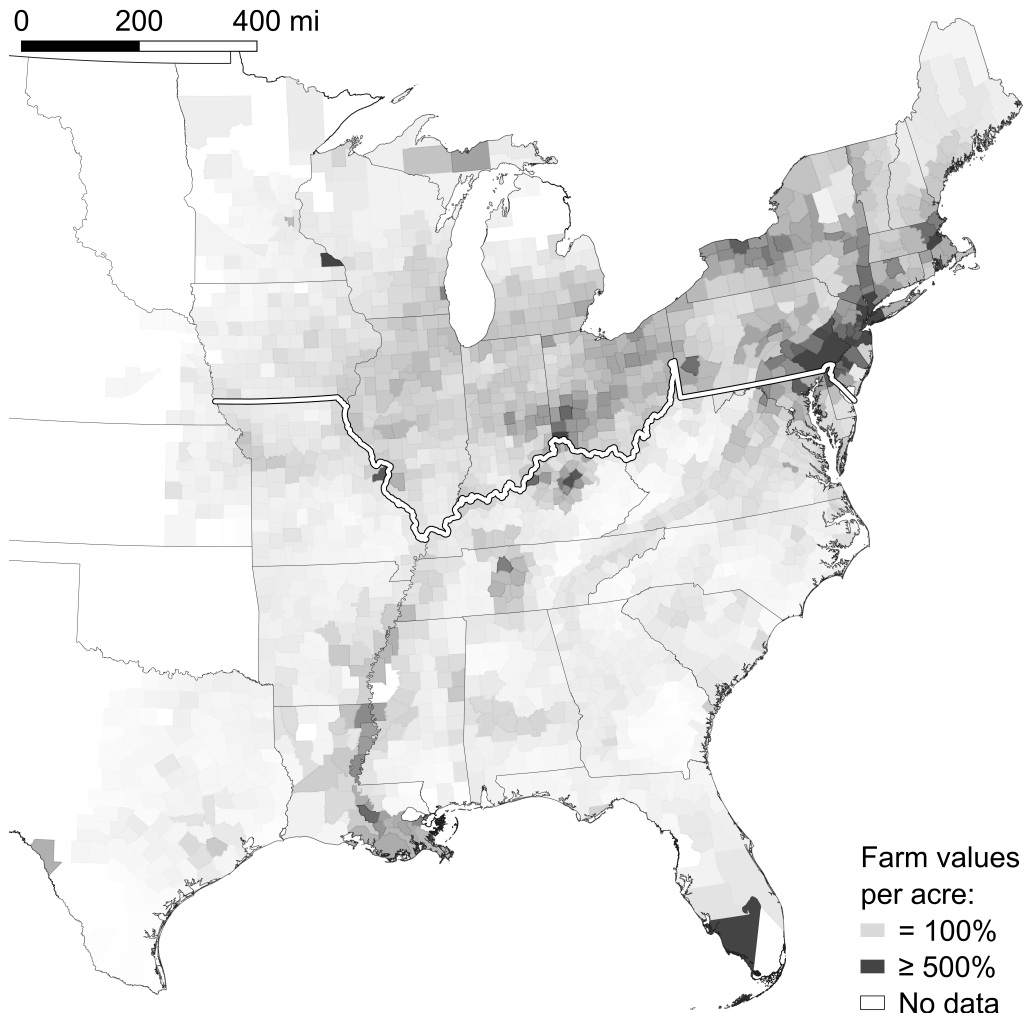
Even a simple visual inspection of the census data reveals significant issues with the consensus view. Wright (2006, 64, Map 2.2; 2022, 133, Figure 1) presents a version of Figure 1 to make his case. It shows farm

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<sup>1</sup> This description is inaccurate from a technical perspective. As Titiunik (2021, 104) puts it, "conceptualizing a natural experiment as a research design that approximates or is akin to a randomized experiment is neither rigorous nor a useful guide to empirical analysis." Given that abolition was neither designed by nor known to researchers when it occurred, it is fundamentally different from a controlled experiment, based on Titiunik's criteria. It nevertheless meets the criteria for being a natural experiment.

Figure 1

## Farm Values per Acre, 1860



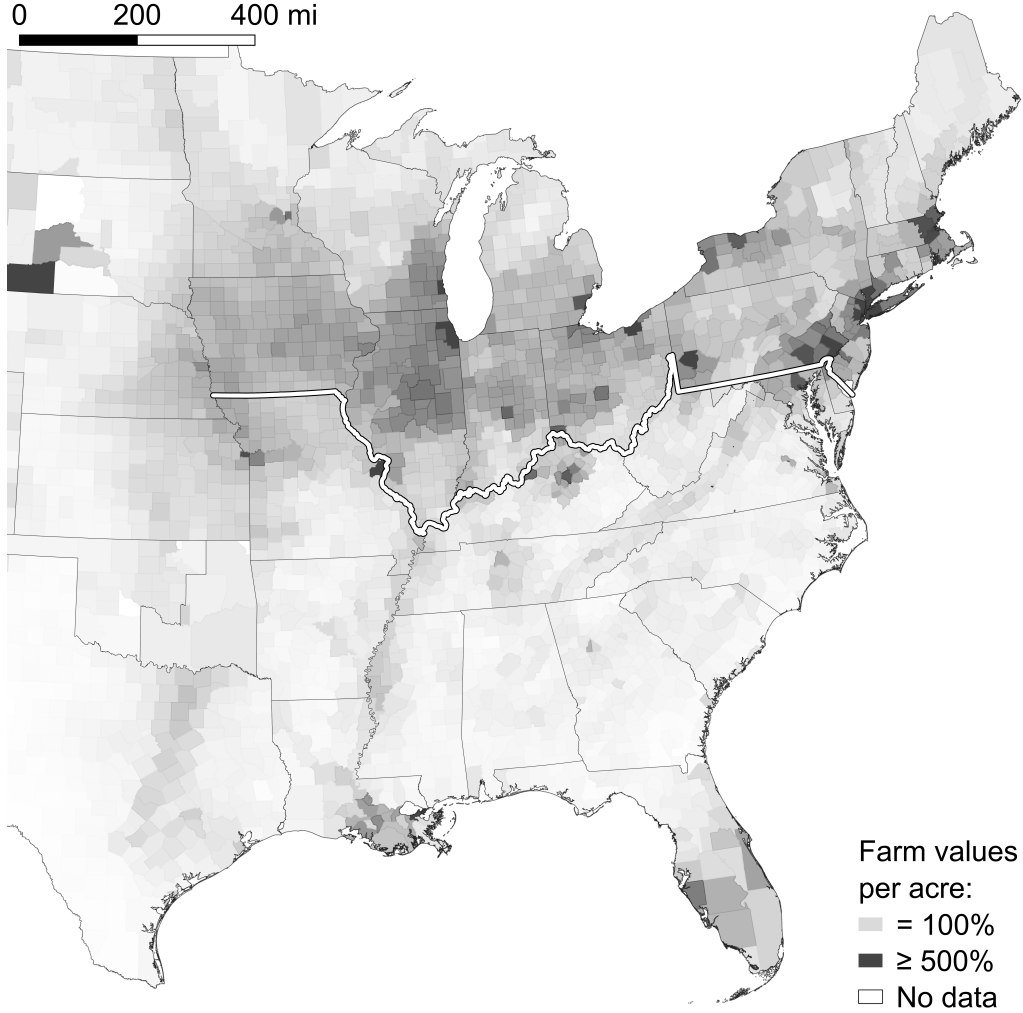
Note: The map shows farm values per acre as a percentage of the national average on a linear scale. Any value of 500 percent or above is treated as the maximum. The white line is the free-slave state border from 1820 to 1860. Calculated from Manson et al. (2022).

values per acre in 1860, normalized so that the national average equals 100, with the free-slave state border marked by the thick white line. As can be seen, farm values were generally lower on the slave side, supporting the consensus view. Nonetheless, Figure 2 shows how the contrast between North and South had become starker by 1900—*after* abolition. Figure 3 then confirms that farm values in the South actually fell relative to the national average from 1860 to 1870. In the Upper South, they would recover, but the divergence persisted until the end of the nineteenth century in the Deep South. This is not consistent with the claim that slavery had depressed farm values, making the South poorer. Rather, it suggests the opposite.



Figure 2

## Farm Values per Acre, 1900



Note: See Figure 1 for details.

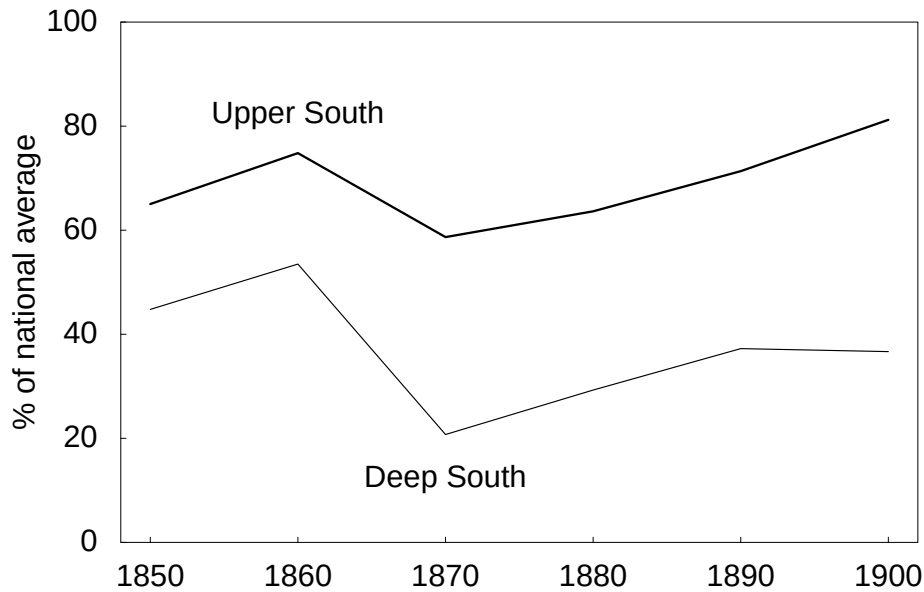
An event study provides a more formal way to test this finding. It is modeled as:

$$Y_{it} = \sum_{t \neq 1860} \text{slavery}_i \cdot \tau_t + \alpha_i + \gamma_t + \varepsilon_{it} \quad (1)$$

in which farm values per acre ( $Y$ ) in a county ( $i$ ) in a particular year ( $t$ ) are the sum ( $\sum$ ) of a binary dummy for slavery's legality before the Civil War multiplied by a dummy for each year ( $\tau$ ), plus fixed effects for each county ( $\alpha$ ) and year ( $\gamma$ ), with the results referenced to 1860, the last census year in which slavery was still legal. It is a dynamic model that provides estimates of how abolition affected farm values in each year relative to the 1860 baseline. The treatment effect is measured by the coefficient of the interaction term ( $\text{slavery} \cdot \tau$ ) and represents the difference in farm values between former slave and non-slave counties relative to 1860. When

*Figure 3*

## Farm Values per Acre in the Slave States, 1850–1900



Note: The series show farm values relative to the national average in census years. The Deep South consists of Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas, while the other slave states (including Missouri) are assigned to the Upper South. Calculated from Manson et al. (2022).

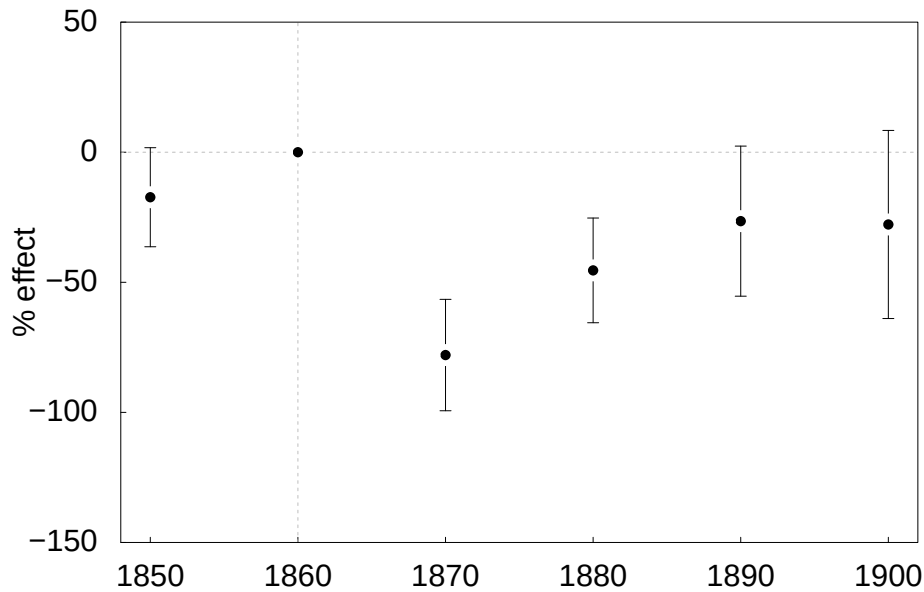
the effect is negative, it indicates that farm values were depressed after abolition.

The test can be applied to census-year data from 1850 to 1900, which allows enough time to separate out the effects of abolition from the more short-term impacts of the Civil War. All the census data are first normalized by projecting them onto the 1900 county boundaries. Farm values per acre are then converted into a percentage of the national average in each census year. Counties in any states west of Minnesota, Iowa, Missouri, Arkansas, and Texas are excluded because slavery's legality was disputed there. A panel dataset is thereby constructed to analyze the effects of abolition on relative farm values per acre in consistent county units across the period.

The results fail to support the consensus view. Wright's narrative predicts that the differences in farm values between the treatment group (counties where slavery was legal) and the control group (free counties) should narrow after slavery was abolished in 1865, but it actually widens. The coefficients for slavery's legality multiplied by year dummies are shown in Figure 4, where the effect in 1860 is treated as the baseline. They indicate that counties in which slavery had been legal in 1860 became associated with lower farm values relative to the national average after the Civil

*Figure 4*

## Effects of Slavery's Legality · Year, 1850–1900

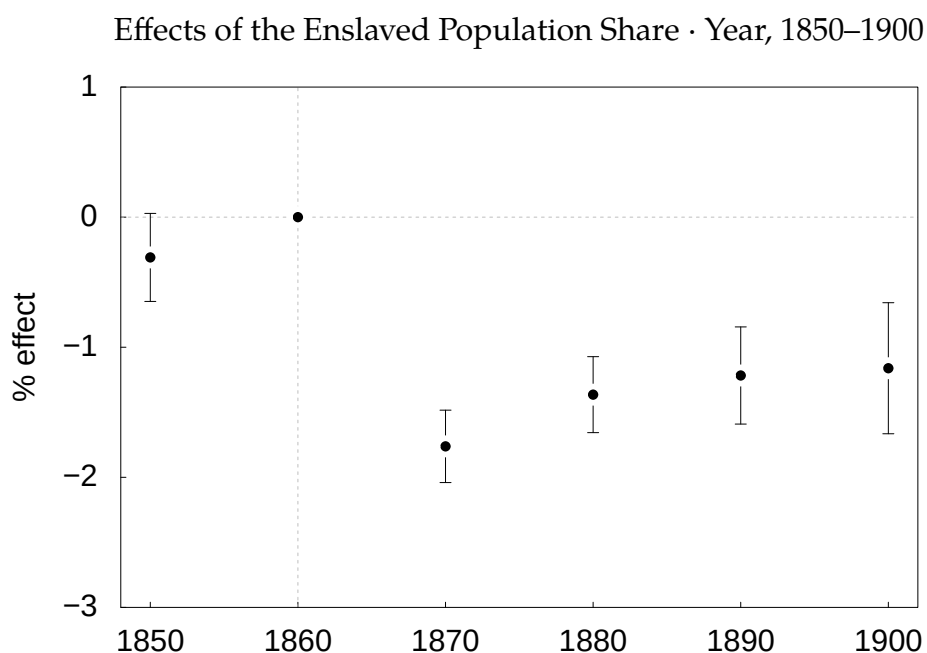


Note: The points are the coefficients for the effect of slavery's legality multiplied by the year dummy interaction term on farm values per acre as percentages of the national average. A percentage effect of minus 50, for example, means that in that year there was a 50 percent reduction of farm values per acre relative to the national average in those counties where slavery had been legal in 1860. The bars are the 95 percent confidence intervals based on standard errors clustered by state. In 1860, the effect is zero and there are no confidence intervals because it is the reference year. Calculated from Manson et al. (2022).

War, although the effect diminishes over time and becomes statistically insignificant in 1890 and 1900.

The model can then be adjusted to show why abolition's effect on farm values was particularly severe in the Deep South. The dummy for slavery's legality can be replaced by the percentage of the counties' population that was enslaved, frozen at the 1860 level for subsequent years. As the coefficients in Figure 5 demonstrate, this 1860 level had a persistent negative effect on relative farm values that was highly significant in statistical terms up to the end of the nineteenth century. It was, then, where slavery was most intensively practiced that its positive effects on farm values was greatest. And that was why the Deep South was most affected by abolition.

Including both the dummy for slavery's legality and the enslaved share of the population then produces a more nuanced result. Columns (a) and (b) in Table 1 first reproduce the results of Figures 4 and 5, respectively. Column (c) goes on to combine them. This version indicates that the initial

*Figure 5*

Note: As in Figure 4, except the enslaved population share has replaced slavery's legality. This means, for example, that a percentage effect of minus 1.5 indicates that for every percentage point of a county's population that had been enslaved in 1860, there was a 1.5 percent reduction in farm values relative to the national average in that year.

impact of the Civil War was felt across the former slave states, but there was then a kind of sorting in subsequent years. Places where more of the population had been enslaved experienced persistently lower relative farm values, whereas they recovered in those places in which there was little slavery. Indeed, the coefficients for the slavery multiplied by year dummies in Column (c) suggest that a hypothetical county in which slavery was legal but no one was actually enslaved would have seen its relative farm values rise above their 1860 values in the decades after abolition.

These results imply that the practical utility of slavery outweighed the negative effects of its legality before the Civil War. In those places where slavery was useful, a large share of the population was enslaved, which boosted farm values. For this reason, those counties with a large enslaved population share in 1860 tended to see their farm values more adversely affected by abolition. Furthermore, their farm values remained depressed even after the short-term impacts of the Civil War had diminished. The first natural experiment does not support the consensus view.

*Table 1*  
An Event Study of Abolition, 1850–1900

|                         | (a)                  | (b)                  | (c)                  |
|-------------------------|----------------------|----------------------|----------------------|
| Slavery · 1850          | −0.173<br>(0.097)    |                      | −0.174<br>(0.113)    |
| Slavery · 1870          | −0.780***<br>(0.109) |                      | −0.390**<br>(0.133)  |
| Slavery · 1880          | −0.454***<br>(0.103) |                      | −0.016<br>(0.082)    |
| Slavery · 1890          | −0.265<br>(0.147)    |                      | 0.225<br>(0.135)     |
| Slavery · 1900          | −0.278<br>(0.184)    |                      | 0.205<br>(0.182)     |
| % enslaved · 1850       |                      | −0.003<br>(0.002)    | −0.001<br>(0.002)    |
| % enslaved · 1870       |                      | −0.018***<br>(0.001) | −0.012***<br>(0.002) |
| % enslaved · 1880       |                      | −0.014***<br>(0.001) | −0.013***<br>(0.001) |
| % enslaved · 1890       |                      | −0.012***<br>(0.002) | −0.015***<br>(0.002) |
| % enslaved · 1900       |                      | −0.012***<br>(0.003) | −0.015***<br>(0.002) |
| Counties                | 2,199                | 2,195                | 2,195                |
| Observations            | 12,988               | 12,744               | 12,744               |
| Adjusted R <sup>2</sup> | 0.89                 | 0.89                 | 0.90                 |
| Within R <sup>2</sup>   | 0.12                 | 0.17                 | 0.23                 |

Note: The dependent variable is the natural logarithm of farm values per acre as a percentage of the national average. Calculated from Manson et al. (2022).

## II

The free-slave state border is the second natural experiment. This time, a spatial RDD is used. An RDD is an econometric method that aims to measure the effect of a treatment when crossing a cut-off point. Here, the treatment is the legality of slavery and the cut-off point is the free-slave state border.<sup>2</sup> Distance from that border is the running variable that allows the RDD to estimate the effect of crossing from free states to slave states

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<sup>2</sup> Bleakley and Rhode (2024) have previously applied the RDD methodology to the same question, but their attempt ignores most of the best practice in the econometric

on farm values per acre. The basic equation is:

$$Y = \text{slavery} + \text{distance} + \text{slavery} \cdot \text{distance} + \varepsilon \quad (2)$$

in which a county's farm values per acre ( $Y$ ) are a product of a dummy variable for slavery's legality there, its distance from the border, and the interaction between the two. The coefficient for slavery's legality then becomes the treatment effect.

Several tools are used to implement the analysis. The most important is the R package *rdrobust* by Sebastian Calonico et al. (2023; also Calonico, Cattaneo, and Titiunik; 2015), while some elements of the research design are also inspired by Alexander Lehner's (2023; 2024) *spatialRDD* package. The border is first split into 50 points. Equation 2 is then applied to each border point using a sample determined by a mean-square-error-optimal bandwidth selector that attempts to balance the bias that comes from using data too far from the border with the variance that arises from using too little data. When calculating the regressions, a triangular kernel gives greater weight to counties nearer the border point. A quadratic regression is then applied to each side of the border to correct for bias in the linear relation analyzed in the main regression. Robust standard errors are calculated to account for both variability in the original estimate and the additional uncertainty introduced by the bias correction process. Three covariates are also added to Equation 2 to account for geographical differences between counties: the elevation and slope of the land and the pH of the soil. On top of that, the counties directly on the border are excluded to discount any spillover effects from the free to slave side or vice versa. There is, then, considerable complexity built on top of the simple foundations provided by Equation 2.<sup>3</sup>

The results suggest that any negative effects that slavery's legality may have had on farm values were highly localized in the antebellum period. In Figure 6, the color of the points equals the magnitude and sign of slavery's coefficient in Equation 2, while their size indicates their  $p$ -values. When the points are darker, it indicates that slavery's coefficient

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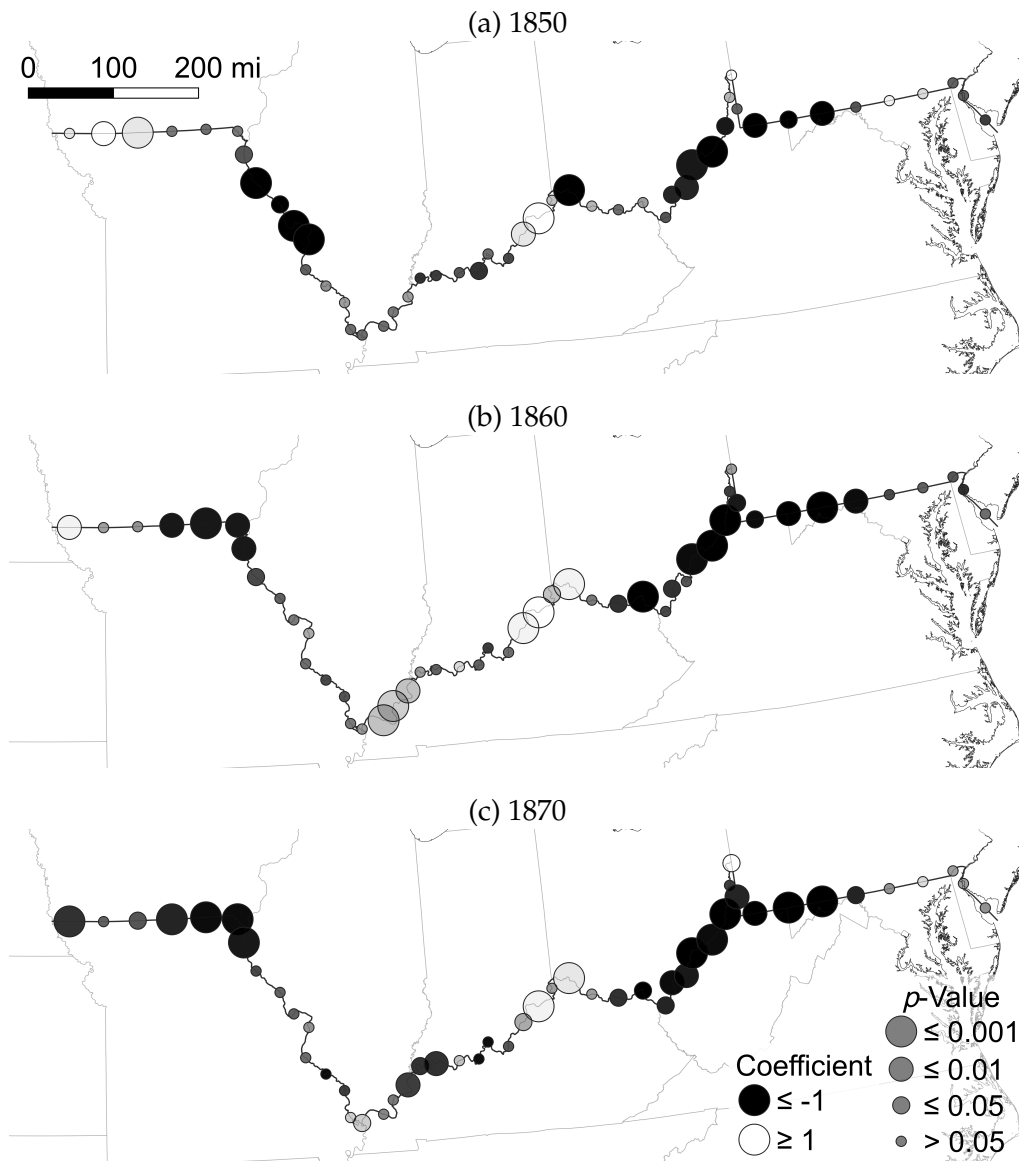
literature, while a replication suggests that some of its results have been misreported (Francis 2025b).

<sup>3</sup> The maps for these covariates were rasterized and converted to county data using zonal statistics in QGIS before being used in the scripts underlying this paper. Robustness tests produced by the scripts show that their inclusion makes the coefficient for slavery's effect on farm values more significant, as does the exclusion of the border counties. In other words, the methodological choices made here tend to bias the results in favor of the consensus view.

was negative, whereas its effect was positive at the lighter points. And the larger the point, the more statistically significant the coefficient. As can be seen, many of the coefficients are statistically insignificant, with  $p$ -values above 0.05. To the extent that slavery had any statistically significant negative effect in 1850 and 1860, Figure 6 suggests that it was mainly concentrated at Virginia's border with Ohio and Pennsylvania and, to a lesser extent, in northeast Missouri, on the border with Iowa and Illinois. Any effect of slavery's legality on farm values was thus highly inconsistent across the border before the Civil War. In the postbellum period, moreover, the same patterns largely persisted, with the exception of the Ohio-West Virginia border, where the coefficients flip to positive. If abolition had any positive effect of farm values at the border, it therefore seems to have been concentrated there. The question then becomes whether that localized transformation was due to abolition or other factors.

The recent historiography of what became West Virginia makes it difficult to infer causality to these results. For the antebellum period, the traditional view was that slavery did play an important role in the origins of the state's relative underdevelopment, but only indirectly. The argument is that the future West Virginia was marginalized in Virginia's legislature, which was instead dominated by the eastern planter class. From this perspective, West Virginia's low farm values were an indirect political result of slavery, rather than a direct consequence of the institution's legality (Adams 2004). But even this indirect causal mechanism has been complicated by Adam Zucconi's (2020) recent work, which has stressed how West Virginia's secession from Virginia was highly contingent upon the Civil War. Many of the region's political demands had already been met, most notably with two new state constitutions, first in 1830 and then another in 1851. Indeed, various prominent western Virginians believed that slavery actually reinforced their democratic rights. At the same time, as John Majewski (2009) has documented, the Virginia state government began a program of state-led development in the 1850s that sought to mimic the policies associated with the growth of the Midwestern states, including Ohio. Ultimately, Scott A. MacKenzie (2023) argues, secession from Virginia in 1863 was more a response to the exigencies of war than any strong desire for independence. For the postbellum period, moreover, Ronald L. Lewis's (1998) argument still seems to hold: the growth of mining and the lumber industry was the result of policies that had begun before the Civil War and continued afterward. Railroads, most notably, had expanded rapidly in the 1850s, and the rate at which they were built in fact fell after

Figure 6  
A Spatial RDD, 1850–1900 (Version 1)



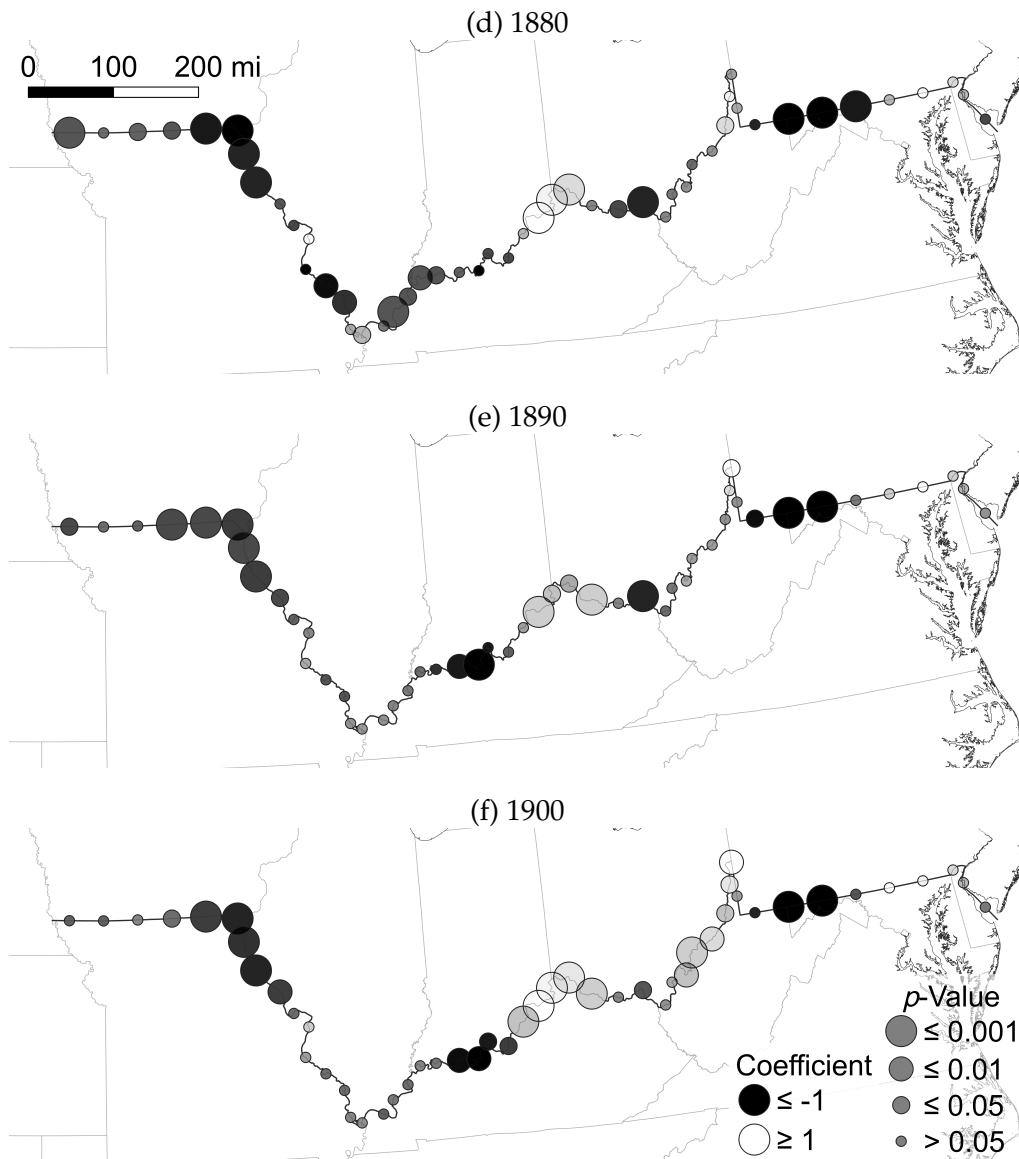
abolition—a common pattern in the South (Atack 2023). For this reason, it is hard to see the shifting coefficients on the Ohio-West Virginia segment of the border in Figure 6 as evidence of slavery’s negative effect on farm values disappearing in the postbellum period. As such, this initial iteration of the natural experiment again fails to support the consensus view.

There is, however, an important caveat. When the percentage of the population that was enslaved is added to the spatial RDD as a covariate, the picture changes, as seen in Figure 7. Panels (a) and (b) imply that in a hypothetical county in which the enslaved share of the population was zero, slavery’s legality would have had a more consistently negative effect at the border. It also seems to have become more negative from 1850 to



*Figure 6 (continued)*

## A Spatial RDD, 1850–1900 (Version 1)

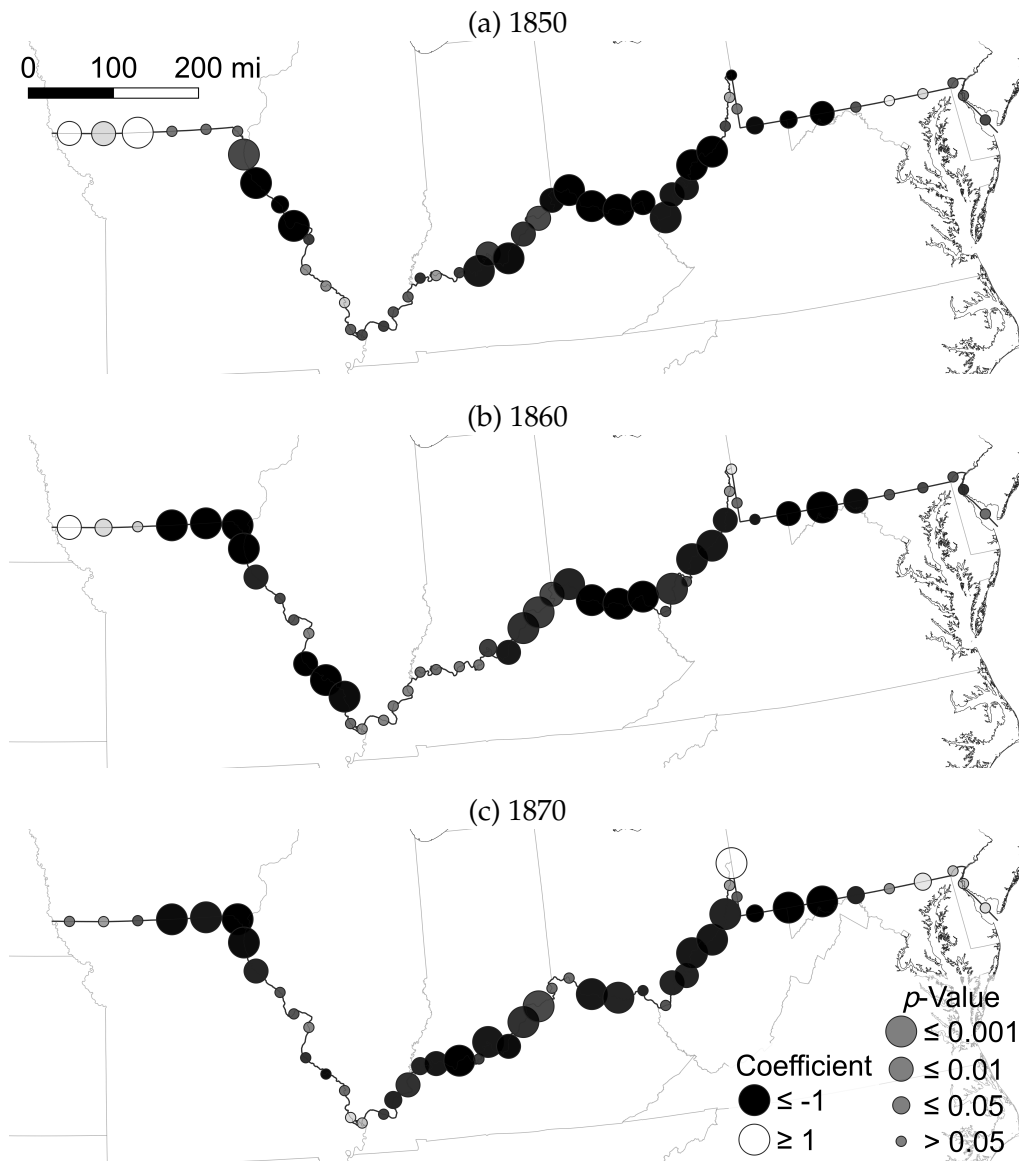


Note: The color of each border point denotes the magnitude and direction of the coefficient for slavery in Equation 2, while the size indicates the statistical significance. Where a point is darker, it indicates that slavery's legality had a more negative effect on farm values per acre, and that effect was more statistically significant where the point is larger. See the text for further details. Calculated from USGS (2011; 2012), Manson et al. (2022), and ISRIC (2024).

1860, possibly reflecting how anti-slavery sentiment had hardened due to the Free Soil movement and the emergence of the Republican Party. This suggests that slavery's legality did have a negative impact on farm values that became stronger in the buildup to the Civil War, but even on the border, it was generally counterbalanced by the institution's practical utility. Panels

Figure 7

## A Spatial RDD, 1850–1900 (Version 2)

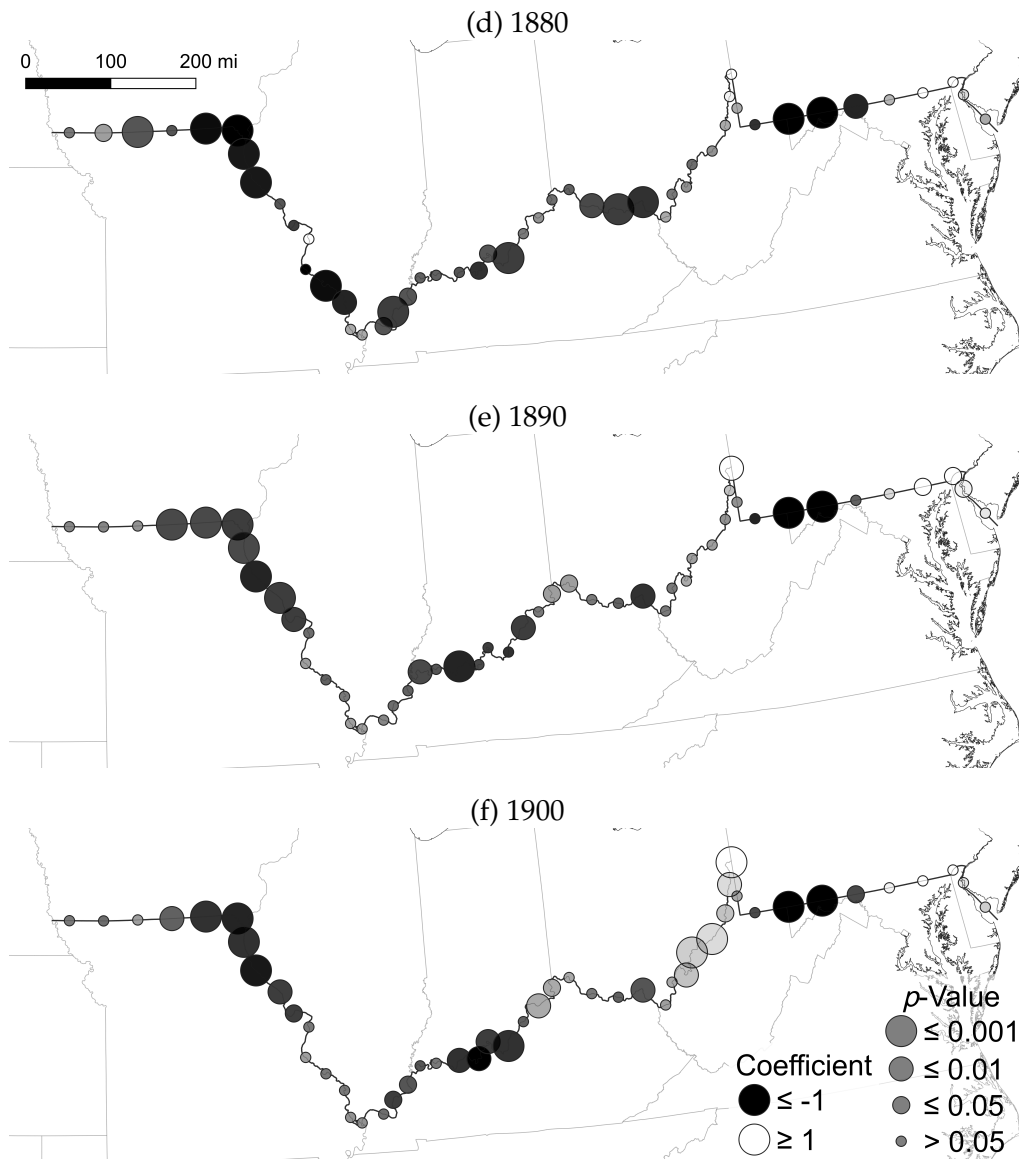


(c) to (f) of Figure 7 then use the black share of the population as a covariate to demonstrate how negative effect of slavery's legality disappeared after abolition, once the free-slave state border ceased to exist. Crucially, the presence of black Americans in this period no longer had a positive effect on farm values, presumably because they could not be exploited to the same extent as the enslaved had been.

The results of the RDD are thus consistent with those of the event study. Slavery's legality had a negative effect on farm values, but it was counteracted by the institution's practical utility—even near the border, where relatively few people were enslaved. Again, this does not support the narrative that slavery impeded the growth of American capitalism.

*Figure 7 (continued)*

## A Spatial RDD, 1850–1900 (Version 2)



Note: The maps show the same coefficients as in Figure 6, but the enslaved population share has been added as a covariate.

Further away from the border, where slavery was more prevalent, its practical utility would have been greater, leading to the overall net positive effect on Southern farm values.

## III

Explaining the results of these natural experiments is simple. Klas Rönnebeck (2021) has found that the enslaved were a cheaper source of labor than economists have previously recognized—considerably cheaper than free labor. By providing cheap labor, then, slavery made possible the exploita-

tion of Southern land in a way that would not have been feasible without it. Southern cotton, most notably, required the South's cheap captive labor to be competitive on the world market. As late as the Panic of 1819, it seemed as though India would become the world's dominant cotton producer. Imports of Indian cotton into Britain had surged, leading to a collapse in prices that helped trigger the financial crisis in the United States. Indian cotton even began to arrive at New York (Ellison 1886, 87n1). In response, some protectionists called for a tariff to be placed on it (Rothbard 1962, 160–162), thereby threatening to make American cotton uncompetitive on the world market. But slavery then intervened. In the 1820s, the cotton boom could continue thanks to the enslaved, who were made to grow the crop despite the lower prices. Their labor was cheap, while planters could also pass the risks of cotton production onto enslaved children by cutting their rations as a way to maintain profit margins (Steckel 1986, 2007; Rathbun and Steckel 2002). Slavery had distinct practical advantages for the planter class, which was reflected in farm values.

This was how the Deep South could be settled. Contemporary accounts suggest that free farmers were not perturbed from settling there by slavery's legality. Farmers were, for instance, happy to settle in the Upper South, regardless of whether slavery was legal. In the late eighteenth century, the politician Benjamin Rush (1951, 1:405), for example, wrote that "the migrants from Pennsylvania always travel to the southward. The soil and climate of the western parts of Virginia, North and South-Carolina, and Georgia," he continued, "afford a more easy support to lazy farmers than the stubborn but durable soil of Pennsylvania." They thus moved from a state in which slavery was prohibited to one where it was legal because the land was better in the latter. And this was why they would have avoided the Deep South if there had been no captive laborers to exploit.

The difference was that the Upper South was well-suited to the mixed farming that yeoman farmers were used to. "Here," Rush explained, referring to his native Pennsylvania, "our ground requires deep and repeated plowing to render it fruitful—there, scratching the ground once or twice affords tolerable crops." Livestock, moreover, could prosper over the border. "In Pennsylvania the length and coldness of the winter make it necessary for the farmers to bestow a large share of their labor in providing for and feeding their cattle, but in the southern states cattle find pasture during the greatest part of the winter in the fields or woods." In this way, Rush illustrates how settlers prioritized practical concerns relating to soil and

climate above institutions. The Upper South was attractive to them, irrespective of slavery being legal there (Otto 1989, 48–50).<sup>4</sup> The Deep South, on the other hand, did not pull them due to its soil and climate.

The enslaved boosted farm values in the Deep South because they could be forced to live and work there. Slavery condemned them to be laborers in the region's low-productivity agricultural sector. William N. Parker and Judith L.V. Klein's (1966, 545, Table 13) estimates suggest that corn yielded about 12 bushels an acre in the Deep South, compared to 22 bushels in the Upper South, 33 bushels in the Midwest, and 34 in the Northeast in the antebellum period. Even achieving those yields, moreover, required considerable amounts of labor, given how the Deep South's hot and humid climate encouraged the growth of weeds: it took six hours of labor to grow a bushel of corn, compared to three in the Upper South and Northeast, and just two in the Midwest, according to Parker and Klein. Cotton could not compete, either. Parker (1979, 237) estimates that it would have required 0.74 hours to grow a pound of cotton in the antebellum period. In 1860, cotton sold for 9.3 cents per pound, while corn cost 53.9 cents per bushel (Towne and Rasmussen 1960, 297, 308). As such, it still required almost six hours of labor to grow enough cotton to purchase a bushel of corn.<sup>5</sup> Even the incredible productivity improvements in cotton growing that Alan L. Olmstead and Paul W. Rhode (2008; 2011) have documented were not enough to make the Deep South's agriculture competitive with the Midwest in terms of output per hour worked. For this reason, the annual output of the average captive laborer was less than half the level of the free labor force in 1860 (Francis 2025a).

The disease environment then compounded the region's agricultural shortcomings. Karen Ordahl Kupperman (1979; 1984; 2007, Ch. 5) documents how widespread the fear of the Southern climate was in the seventeenth century, and it persisted subsequently. And the fear was well-founded, given the far greater risk of disease. As Elena Esposito (2022) argues, Africans' greater resistance to malaria helps to explain why slavery became so important to the South's settlement in the colonial era. Sok Chul Hong's (2007; 2011) estimates confirm that the risk of malaria was higher precisely in those areas where the enslaved share of the population was greatest in the late antebellum period.

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<sup>4</sup> Wright (2006, 77–79) makes the mistake of generalizing from Rush's description of the Upper South to the whole South.

<sup>5</sup> The calculation is 53.9 divided by 9.3, multiplied by 0.74.

It is likely, then, that some of the consensus view of American economic history needs to be revised. According to Wright's narrative, the United States' liberal institutions were the principal source of growth, whereas slavery only brought poverty to the South. But the two natural experiments presented here both refute the second part of this story. The analysis of farm values per acre suggests that slavery made the United States wealthier. Far from impeding the growth of American capitalism, slavery probably promoted it because the enslaved could be forced to live and work in the Deep South. Whatever negative effect slavery's legality may have had on farm values per acre was outweighed by its practical utility for King Cotton.

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