Real Estate Mortgages, Foreclosures, and Midwestern Agrarian Unrest, 1865–1920

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The hypothesis that the fear of foreclosure of farm mortgages provided an important impetus to American agrarian reform movements of the late nineteenth and early twentieth centuries is reconsidered. This hypothesis is consistent with the observation that farm income, although volatile, on average improved over this period. Indeed, despite low average foreclosure rates, the temporary effects of foreclosures on specific regions in which there was unrest appears to have been dramatic. An examination of indebtedness data and measures of unrest both for the period of the Alliance movement and for the era of the Nonpartisan League in North Dakota appears to support the hypothesis linking the fear of foreclosure to agrarian unrest.

THE late nineteenth century and, to a lesser extent, the early twentieth century were times of major farm protest movements in the American Midwest. The causes of this unrest, however, are currently a puzzle for students of this period. It now appears that farmers of the U.S. plains did not suffer prolonged economic distress during this era. Rather, as Douglass North argues, interest rates and railroad tariffs declined, and real prices for farm products rose over this period; evidence presented by Robert Higgs supports this view.[1]

[1] Douglass C. North, *Growth and Welfare in the American Past* (Englewood Cliffs, 1974), pp. 137–48, and Robert Higgs, *The Transformation of the American Economy, 1865–1914* (New York, 1971), pp. 86–102. For reviews of this research and further references, see Susan P. Lee and Peter Passell, *A New View of American Economic History* (New York, 1979), pp. 292–303; Anne Mayhew, "A Reappraisal of the Causes of Farm Protest in the United States, 1870–1900," this JOURNAL, 32 (June 1972), 464–75; and Robert A. McGuire, "Economic Causes of Late-Nineteenth Century Agrarian Unrest: New Evidence," this JOURNAL, 41 (Dec. 1981), 835–52. Several new explanations for this unrest in the absence of continual distress have been proposed. Some of these can be classified as sociological or psychological: Higgs, *American Economy*, p. 101, suggests that the loneliness of farm life could exacerbate difficult circumstances and perhaps lead to activism, while North, *Growth and Welfare*, p. 145, suggests that the disenchantment of the farmers stemmed in part from the drop in farm income relative to nonfarm income. Mayhew, "A Reappraisal," p. 469, proposes that the protest can be seen as a reaction to increasing farm commercialization; that is, that farmers were objecting "to the increasing importance of prices" rather than to the prices themselves. It would be difficult to refute these explanations by statistical analyses of historical data, nor do they shed any light onto the important question of the geographic and temporal distribution of protest during this period. Thus it seems desirable to search for other plausible solutions to this apparent puzzle.

It has also been noted, however, that while farm conditions were on average improving, prices, yields, and farm income were quite volatile.[2] Robert McGuire has recently presented suggestive correlations linking this volatility to the geographical centers of agrarian unrest.[3] A possible explanation of this relationship is that since certainty itself can be considered an economic good, unforeseen variations in income would cause a loss of welfare by farmers and thereby could contribute to unrest. The extent to which income fluctuations actually worsened the condition of the farmer, however, depends heavily upon contemporary institutional arrangements. For example, an individual with access to capital markets (either formal or informal) could have saved when current income was high, and consumed out of savings (or borrowed against further income) when current income was low. This farmer thus could have mitigated the most undesirable consequences of economic fluctuations.[4]

Not all farmers were so fortunate, however. Although mortgages were often used to smooth income fluctuations, such arrangements were generally unavailable to the large group of farmers already heavily in debt. If a mortgage came due after two years of bad harvests, for example, foreclosure generally ensued, often entailing the nearly complete dispossession of a family and its eviction from the land upon which it had toiled for years. This paper examines the contribution of the fear of foreclosure of farm real estate and chattel mortgages to the agrarian unrest of this period.[5]

The proposition that the fear of foreclosure was an important factor in agrarian unrest has several arguments in its favor. First, it provides a mechanism linking income volatility and discontent. Second, it presents a consistent explanation of the proposals advocated by the protesters: Laws restricting foreclosures would address this threat directly; usury laws and railroad rate controls would decrease farm costs and thereby lessen the load on the debtor; and crop insurance and cooperative

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[2] Lee and Passell, *A New View*, p. 301, note that the growing importance of markets and crop specialization, coupled with price and yield variability, intensified farm net income fluctuations. The increasing importance of international markets could also have exacerbated income fluctuations, for as prices grew to reflect global rather than local conditions the correlation between price and yield fluctuations would have become less negative.

[3] McGuire, "Agrarian Unrest," 837–52.

[4] This risk averse farmer would still prefer a certain to an uncertain income stream. The worst effects of "feast or famine" harvests could be overcome, however, by using financial markets to smooth consumption.

[5] Foreclosure did not necessarily entail dispossession, since many states had a statutory period after a foreclosure sale during which the mortgagor could redeem his or her debt. Indeed, these redemption periods can be seen in part as an outcome of agrarian unrest; this point is discussed by Robert H. Skilton, "Developments in Mortgage Law and Practice," *Temple University Law Quarterly*, 27 (Aug. 1943), 315–84. Presumably, it was the fear of dispossession, not of foreclosure, that drove farmers to participate in protest movements. Since a foreclosure sale was the key step towards dispossession, however, the fear of foreclosure and the fear of dispossession generally will be treated as interchangeable in this paper.

programs would serve to stabilize farm income and to decrease the chance of foreclosure. Third, as will be argued below, the proposition is consistent with the geographic and temporal distribution of unrest. Finally, the hypothesis explains agrarian unrest in the absence of any long-term malaise: Short-term distress would result in protest movements with well defined geographical centers (based on the level of distress and potential foreclosures), and these movements would last little longer than the period of distress.[6] According to this view, then, the fear of foreclosure, of the potential loss of much if not all that a farm family owned, was the catalyst by which some or all of the elements of temporarily low prices, bad harvests, and seemingly high costs reacted to fuel the fires of agrarian protest.

The proposition that the fear of foreclosure was a primary impetus behind agrarian reform movements is not new.[7] Fred Shannon summarizes this view succinctly:

> But it was not the underdogs at the bottom of the heap who organized for revolt. They were too poor and hopeless to exert the effort. Instead, the small freeholders, faced with the prospect of losing their farms to the storekeepers, after 1880 began joining farmers' alliances that later merged into the Populist movement.[8]

This paper reinforces the view of Shannon and others of the crucial role of foreclosures by examining evidence from a variety of sources concerning foreclosures, mortgages, and unrest. I argue that although foreclosures may on average have occurred infrequently, the average farmer would be likely to have had a neighbor who suffered foreclosure. Furthermore, the scattered evidence on foreclosures that exists suggests that simple averages mask the incidence of foreclosure upon particular communities. It appears, rather, that farm indebtedness and foreclosures tended to be geographically and temporally concentrated. The incidence of foreclosures during times of distress is therefore understated by statistics on their average rate.

I then present statistical analyses of the relationship between the geographical centers of specific protest movements and measures of the fear of foreclosure. The extent to which farmers have an immediate and pressing fear of foreclosure cannot be measured directly, so it is necessary to use other variables as proxies for this fear. The proxies used in the paper are based on measures of the extent and level of real

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[6] Evidence of sporadic distress on the plains is provided by Allan G. Bogue, *From Prairie to Corn Belt* (Chicago, 1963), and by John D. Bowman, "An Economic Analysis of Midwestern Farm Land Values and Farm Land Income," *Yale Economic Essays*, 5 (Fall 1965), 316–52.

[7] For example, see Solon J. Buck, *The Agrarian Crusade* (New Haven, 1920), pp. 20–22 and 105–107; H. E. Briggs, "Grasshopper Plagues and Early Dakota Agriculture, 1864–1876," *Agricultural History*, 8 (Apr. 1934), 51–63; and Herbert S. Schell, "The Grange and the Credit Problem in Dakota Territory," *Agricultural History*, 10 (Apr. 1936), 59–83.

[8] Fred A. Shannon, *American Farmers' Movements* (Princeton, 1957), p. 53.

estate mortgages. In itself, the level of indebtedness is not an indicator of distress: Mortgages were taken out to support expansion or to purchase new machinery in anticipation of increasing income, as well as to obtain cash in hard times. Nevertheless, the degree of farm mortgaging is a necessary factor contributing to the fear of foreclosure: foreclosures cannot occur without mortgages, and each mortgage represents a potential foreclosure. The greater is the *extent* of mortgaging (for example, as measured by the fraction of the population with land under mortgage), the greater is the number of individuals who are potentially subject to foreclosure. Similarly, the greater is the *level* of mortgaging (for example, the ratio of debt to value for properties under mortgage), the greater is the risk for those in debt.

Thus, the hypothesis concerning the fear of foreclosure predicts a positive relationship between the extent and level of farm indebtedness and the distribution of protest. Specifically, at a given level of farm profitability, the potential for foreclosure will be greater in regions with more indebtedness; according to the hypothesis, these will be the regions with the greatest agrarian unrest. In other words, the hypothesis predicts a positive correlation between the extent and the level of indebtedness and unrest, conditional on farm profitability. Consequently, the measures of indebtedness will be viewed as proxies for the fear of foreclosure.[9]

Although the discussion so far has focused on the protest movements of the late nineteenth century, the hypothesis concerning the fear of foreclosure should apply to other times of agrarian unrest as well. For this reason, I also examine the relationship between indebtedness and unrest during the era of the Nonpartisan League in North Dakota.[10] This movement developed rapidly during 1915 and 1916. The League succeeded in electing its candidate for governor, Lynn J. Frazier, in 1916 and in reelecting him in 1918 and 1920. The reform movement was decidedly agrarian, and many of its goals were similar to those of the Populists two decades earlier. Although this movement had considerable (if short-lived) success within North Dakota, attempts to establish the Nonpartisan League in neighboring states were far less successful. In the context of the paper, then, two questions arise. First, does the hypothesis linking agrarian unrest to the fear of foreclosure help explain

[9] These proxies for the fear of foreclosure have limitations and would be complemented by actual foreclosure data. Unfortunately, there are two drawbacks to using such data. First, the level of foreclosures is itself an endogenous variable, since some reform movements succeeded in stopping threatened foreclosures (as did, for example, the Farm Holiday Movement in North Dakota in the early 1930s). The second drawback is practical: Data on foreclosures are not readily available and are often untrustworthy. On this latter point, see Allan Bogue, *Prairie to Corn Belt*, p. 180, and footnote 27 below.

[10] The Nonpartisan League is discussed by Carl C. Taylor, *The Farmers' Movement, 1620–1920* (New York, 1953), by Theodore Saloutos and John D. Hicks, *Agricultural Discontent in the Middle West, 1900–1939* (Madison, 1951), and by Shannon, *Farmer's Movements*.

the success of the Nonpartisan League in North Dakota, and its lack of success in other states? Second, does the hypothesis shed light on the geographical distribution of support for the League within North Dakota during this period? The evidence provided suggests an affirmative answer to both questions.

A caveat is in order. The proposition that the fear of foreclosure was associated with agrarian unrest differs from the claim that foreclosure *caused* the unrest. I do not-attempt to determine a single "true cause" of agrarian protest; surely, there were many contributing factors. Rather, I present new evidence on the importance of foreclosure in determining the lot of the frontier farmer and his response to it. In this sense, foreclosure can be seen as a *proximate* cause of agrarian discontent, for it made farmers especially vulnerable to unforeseen price fluctuations, vagaries of the weather, and other events beyond their ken or control.

THE INCIDENCE OF INDEBTEDNESS AND FORECLOSURES

The 1890 Census reports four farm state foreclosure rates: .61 percent and .93 percent for Illinois in 1880 and 1888, and 1.38 percent and 1.55 percent for Minnesota in 1881 and 1891.[11] These rates are the estimates by the Census Bureau of the ratio of foreclosures in the given year to the number of mortgages outstanding in that year. Assuming that all mortgages have a life of four years (the approximate average life of a mortgage on the plains in this period), this corresponds to a steady-state fraction of foreclosure (the fraction of mortgages that end in foreclosure) of 2.4 percent to 6.1 percent. These figures are similar to those found by Bogue in three Iowa townships, where the fraction of foreclosures ranged from 1.2 percent to 5.2 percent from 1852 to 1896.[12]

These rates and fractions of foreclosures seem low. There are, however, two reasons to think that these low statewide average foreclosure rates do not fairly represent the foreclosure experience of specific communities. First, the concentration of mortgages—and thus of potential foreclosures—varied considerably within states. As indicated by Table 1, this variation is considerable even at the county level. For example, of the 20 percent of Kansas counties having the most extensive mortgaging in 1890, the average mortgage concentration was 70 percent; the corresponding average for the quintile of counties with the least extensive mortgaging was 23 percent. This regional concentration of mortgaging suggests that foreclosures would have occurred more frequently in particular regions within a state in times of widespread

[11] U.S. Bureau of the Census, *Eleventh Census of the United States, 1890*, v. 12, "Real Estate Mortgages," p. 107.
[12] Bogue, *Prairie to Corn Belt*, p. 179.

TABLE 1

CONCENTRATION OF FARM INDEBTEDNESS BY STATE IN 1890, MEASURED BY PERCENT OF WHOLLY OWNED, OWNER-OPERATED FARMS UNDER MORTGAGE

Item	State							
	Illinois	*Iowa*	*Kansas*	*Minnesota*	*Nebraska*	*North Dakota*	*South Dakota*	*Wisconsin*
Statewide average mortgage concentration	36.7%	53.3%	55.5%	46.4%	61.7%	48.7%	52.3%	42.9%
Statistics by County:								
Number of counties with at least ¼% of farm population	110	98	90	70	82	37	50	59
Percent of counties with mortgage concentration in range:								
0%–10%	—	—	3	—	1	8	—	2
10%–20%	1	—	6	2	2	11	2	2
20%–30%	16	1	4	5	10	8	8	2
30%–40%	52	13	8	17	15	22	10	22
40%–50%	27	24	8	30	18	11	22	58
50%–60%	4	21	22	34	21	22	30	14
60%–70%	—	20	37	12	26	18	24	—
70%–80%	—	21	12	—	7	—	4	—
Median concentration	37%	54%	58%	48%	52%	39%	51%	42%
Mean of lower quintile	27	37	23	29	25	9	29	31
Mean of upper quintile	47	74	70	60	70	64	66	51

Source: U. S. Census Bureau, *1890 Census*, vol. 13, pp. 247–86.

TABLE 2
PROBABILITY OF A NEIGHBOR SUFFERING FORECLOSURE AT VARIOUS
FORECLOSURE RATES

Local Annual Foreclosure Rate[a]	Probability[b] of at least one neighbor suffering foreclosure after:		
	1 year	*2 years*	*3 years*
1%	14%	26%	36%
2	26	45	60
3	37	60	75
5	54	79	90
10	79	96	99

[a] Annual number of foreclosures/total number of mortgages outstanding.

[b] Computed using the binomial distribution assuming that 15 neighboring farms are under mortgage and that the foreclosure of one farm does not affect the probability of a neighboring farm being foreclosed.

distress. Others have noted such a pattern of concentration of foreclosures. For example, Buck discusses the high rate of foreclosures in western Kansas in the early years of the Populist movement.[13] And Bogue presents an example of a township in western Kansas in which 40 of the 88 first mortgages recorded in 1886–1888 ended in liquidation. As he points out, "These last contracts were liquidated between 1889 and 1893—the years when Populism was born and flourished in its greatest vigor."[14]

The second reason that average foreclosure rates could understate the impact of foreclosure is that, even if the foreclosure rate is low, it is quite likely that an indebted farmer would be well aware of the threat of foreclosure. For specificity, suppose that a farmer had 15 indebted neighbors and that the local foreclosure rate was only 2 percent.[15] Then under the assumptions of Table 2, the farmer had a 45 percent chance of a neighbor suffering a foreclosure within two years. Even with such a low foreclosure rate, it is therefore likely that many farmers would have been aware of the danger through the personal experience of their neighbors. When the foreclosure rate was greater, the threat would have been even more immediate. For example, the fraction of foreclosures

[13] Buck, *Agrarian Crusade*, p. 106.

[14] Allan G. Bogue, *Money at Interest* (Lincoln, 1955), p. 256. Bogue notes that, among the mortgagors, "a significant percentage of individuals were not primarily farmers" (p. 257), and he warns that "it is possible to exaggerate both the amount of land mortgage[d] . . . and . . . foreclosed" (pp. 259–61). Taking these points into account, however, the conclusion still remains that the incidence of farm foreclosures would have been great. Lee Alston, "Farm Foreclosures in the United States During the Interwar Period," this JOURNAL, 43 (Dec. 1983), 885-904, presents similar evidence on the geographical concentration of foreclosures during the 1920s and 1930s.

[15] The assumption of 15 indebted "neighbors" is perhaps conservative. For example, Walsh County was typical of the major wheat-producing counties in eastern North Dakota in 1920. Using county averages for farm acreage, the fraction of land in farms, and average reported rates of indebtedness, if a "neighboring farm" is (rather arbitrarily) defined as one within three miles, then a typical farmer would have 22 indebted "neighbors."

reported by Bogue of 45 percent roughly corresponds to a rate in excess of 10 percent. According to Table 2, at this rate the incidence of foreclosures would have been striking indeed.

MORTGAGES AND THE ALLIANCE MOVEMENTS

Here I explore the hypothesis relating the fear of foreclosure to agrarian unrest in the context of the Alliance movement (1883–1890). There are two parts to the analysis. First, I examine the unconditional relationship (heuristically, the correlation) between the geographical center of unrest and the proxies for the fear of foreclosure. Second, this relationship is analyzed conditional on a measure of farm income. In both cases, tests of the hypothesis that the proxies for the fear of foreclosure do not contribute to the explanation of the geographical distribution of unrest are soundly rejected.

The geographical centers of protest during the Alliance period are those proposed by McGuire, with the exception of New York and Pennsylvania. Accordingly, Kansas, Nebraska, North Dakota, and South Dakota were taken to have the highest level of protest activity during this period. Iowa, Minnesota, and Missouri were taken to have the next highest level of unrest, and Illinois, Indiana, Michigan, Ohio, and Wisconsin were taken to have the lowest level.[16]

Since no single proxy can precisely measure the fear of foreclosure, seven proxies for the threat of foreclosure are used in the analysis. The threat of foreclosure can be expected to be greater, the greater the level of indebtedness; similarly, reform movements can be expected to have broader support, the more extensive are farm real estate mortgages. Consequently, measures of the threat of foreclosure are constructed from data concerning levels of indebtedness and the extent of farm mortgages.

The first proxy for the fear of foreclosure is the ratio of farms under mortgage to the total number of farms taxed in 1890 (by state). The remaining six proxies were constructed from observations of per capita new real estate mortgage debt incurred annually from 1880 to 1889 (by state). This variable was selected as the basis for the proxies for two reasons. First, it can be used to construct measures of the *level* of debt. The specific measures of the level of debt considered are the mean and the median of the time series for each state. Second, it enables constructing measures of the *volatility* of new real estate mortgages. If one accepts the conjecture that, on a statewide basis, mortgages taken

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[16] McGuire, "Agrarian Unrest," p. 842. New York and Pennsylvania were excluded because of the belief that industrial and urban mortgages in these states represented such a large fraction of overall indebtedness that the effect of farm mortgages could not be gleaned from aggregate real estate mortgage data.

out to relieve distress would be more volatile than those to support expansion, then these measures of the volatility of new indebtedness can be seen as indicators of farm distress.[17] The specific measures of volatility are the absolute range, the variance, the variance of the first difference, and the variance of a three-period moving average of the new debt series by state.[18]

Since the variable to be explained—the level of protest—is qualitative and takes on only three values, conventional correlation analysis is inappropriate. Instead, the tests were performed using the Mann-Whitney test statistic.[19] The results are presented in the first two columns of Table 3. All tests reject the null hypothesis at the 1 percent significance level.[20]

These results suggest that there is a very strong unconditional relationship between (1) the extent, (2) the level, and (3) the variability of indebtedness and the geographical location of the protest activity. This is consistent with the fear-of-foreclosure hypothesis. The hypothsis predicts, however, that, conditional on farm profitability, higher levels of unrest will be associated with greater vulnerability to foreclosure. Thus I now turn to such a conditional analysis.

A direct approach to analyzing farm distress during the Alliance period would be to examine the deviation of profits from expected

[17] This follows from supposing that mortgages taken to relieve distress would be subject to the variability of the weather, pests, and global prices, while mortgages taken to support plans of expansion would be based on long-term expectations and thus might be somewhat stable (or following a trend) from year to year.

[18] These two groups can be viewed as reflecting the rapidly changing, or "high frequency," components and slowly changing, or "low frequency," components of new mortgages. The variance of the three-period moving average is an intermediate statistic between these two extremes, since very rapid changes in mortgages will be smoothed by the moving average.

[19] The Mann-Whitney statistic tests the hypothesis that the means of the cells are the same against the alternative that they increase in a specific order. This test is described by E. L. Lehmann, *Nonparametrics: Statistical Methods Based on Ranks* (San Francisco, 1975), pp. 232–38. The asymptotic distribution of this statistic was used to compute the marginal significance levels reported in Table 3. This test has two advantages over that based on the Spearman rank correlation coefficient. First, it is hoped that its asymptotic distribution more closely approximates its exact distribution than would be the case for the Spearman test applied to this data set, since the approximation to the distribution of the rank correlation assumes the number of cells to grow without bound. Second, the null and alternative hypotheses of the Mann-Whitney test correspond exactly to those of this theory, while the null and alternative hypotheses of the Spearman test are complicated relationships between the distribution of the two random variables and are difficult to interpret precisely.

[20] It can be argued that these results understate the effect of the fear of dispossession (as opposed to the fear of foreclosure) in the regions of greatest protest during this period, since the older states generally had longer debt redemption periods than the younger states. According to Robert H. Skilton, "Mortgage Law and Practice," during this period Illinois, Indiana, Michigan, Iowa, and Missouri had statutory redemption periods of one year; Wisconsin and Minnesota had redemption periods of two and three years, respectively. In contrast, Kansas and South Dakota had no statutory redemption periods, while in Nebraska, the law only set an upper limit of nine months. Of the four states in which the Alliance movement was most active, only North Dakota had a redemption period of a full year after sale.

profits over this period. Unfortunately, expected profits cannot be observed directly, so a more circuitous route must be taken to construct such a variable. Such a route is provided by the hypothesis that farm values incorporate market expectations of the present discounted value of the net income stream that the farm could generate. Under this hypothesis, land values reflect expected net income.[21] Consequently, the ratio of farm income to farm value provides a measure of the relationship of current income to its expected long-run value. Thus, the ratio of the total value of farm production in 1889 to the total value of farmland by state (as reported in the 1890 Census) is used as a proxy for farm profitability during the Alliance period.[22]

The Mann-Whitney test statistic used in the unconditional analysis is inappropriate for tests of the hypothesis conditional on profitability. Instead, a discrete-choice logit model was estimated.[23] The hypothesis that the proxies for the threat of foreclosure are unrelated to the level of unrest, conditional on the ratio of income to value, was then tested using the likelihood ratio statistic.

The results of the conditional analysis appear in the final two columns of Table 3. The estimated coefficients in the logit model are not reported since they multiply proxy variables having an arbitrary scale. All of the coefficients on the proxies for the fear of foreclosure are positive, as predicted by the hypothesis of this paper. Furthermore, the likelihood ratio statistics are all large. As the marginal significance levels indicate, the null hypothesis of no relationship can be rejected at the 5 percent level for all the proxies using a one-sided test.

[21] This hypothesis is weaker than that usually used in relation to asset pricing, specifically, that the price reflects *rational* expectations. The assumption here is simply that the prospective buyer acts on a consideration of future net income from the farm. Thus, the ratio of current net income to land value measures the degree to which current farm profitability exceeds, or falls short of, the market assessment of future profitability. Whether this assessment is either *ex ante* or *ex post* rational is inconsequential for this conclusion.

[22] This proxy has two obvious shortcomings. First, it examines farm income only in one year, 1889. Second, it is based on gross rather than net farm income. Although income measures could be constructed for earlier years using an approach such as McGuire's ("Agrarian Unrest"), it would be inappropriate to use the farm value data from the 1890 Census. Furthermore, the level of farm income per acre in 1889 is negatively correlated with the centers of unrest, as expected under the simple (unconditional) hypothesis that regions with low income can be expected to have greater discontent. This latter point suggests that this proxy is appropriate for purposes of this section.

[23] The logit model assumes there to be a "true" continuous measure of the degree of unrest in the i-th state, Z_i, and that this measure can be written as a linear function of the proxy variables p_{1i} and p_{2i} and an independent error term; that is, $Z_i = b_0 + b_1 p_{1i} + b_2 p_{2i} + u_i$. Only Z_i^* is observed, however, where $Z_i^* = 1$ if $Z_i \leq a_0$, $Z_i^* = 2$ if $a_0 < Z_i \leq a_1$, and $Z_i^* = 3$ if $a_1 < Z_i$, where a_0 and a_1 are constants. If u_i has a logistic distribution with scale parameter c, then this becomes the logit model with three possible outcomes. The parameters $(b_0, b_1, b_2, a_0, a_1, c)$ are not all identifiable; the estimated values of the functions of the parameters which are identifiable are not particularly meaningful in the analysis at hand and therefore are not reported. For an introduction to the logit model, see George G. Judge, R. Carter Hill, William E. Griffiths, Helmut Lutkepohl, and Tsoung-Chao Lee, *Introduction to the Theory and Practice of Econometrics* (New York, 1979), Ch. 18. For a broader treatment, see Takeshi Amemiya, "Qualitative Response Models: A Survey," *Journal of Economic Literature*, 19 (Dec. 1981), 1483–1536.

TABLE 3
GEOGRAPHICAL CENTERS OF PROTEST AND MEASURES OF MORTGAGES DURING
THE ALLIANCE PERIOD
(D_t = Annual per capita real estate debt incurred, by state, 1880–1889)

	Unconditional Tests		Conditional Tests	
Proxy Variable	Mann-Whitney t-ratio	Marginal Significance Level[a]	Likelihood Ratio Statistic[b]	Marginal Significance Level[a]
1. Ratio of farms mortgaged in 1890 to farms taxed	2.44	.007	8.99	.001
Measures of level of new debt:				
2. Mean (D_t)	2.88	.002	5.42	.010
3. Median (D_t)	3.17	.008	6.42	.006
Measures of volatility of new debt:				
4. Absolute range (D_t)	3.03	.001	3.97	.023
5. Variance (D_t)	3.03	.001	6.52	.005
6. Variance ($D_t - D_{t-1}$)	3.03	.001	3.50	.030
7. Variance ($D_{t-1} + D_t + D_{t+1}$)	3.03	.001	5.79	.008

[a] The marginal significance level is the smallest significance level for which the test would reject the null hypothesis.

[b] The logit model upon which these statistics are based is discussed in the text. Under the null hypothesis, the likelihood ratio statistic is asymptotically distributed as a chi-square random variable with one degree of freedom.

Source: Data for D_t from U.S. Census Bureau, *1890 Census*, vol. 12, p. 161.

There are two statistical warnings to keep in mind when analyzing the results in Table 3. First, since the techniques used in the conditional and unconditional analyses differ, the corresponding marginal significance levels are not directly comparable. Second, the tests are based on the asymptotic distributions of the statistics; the marginal significance levels therefore ought not to be interpreted literally. Even with these caveats, however, it seems safe to conclude that the results of both the conditional and unconditional analyses are consistent with the hypothesis that the fear of foreclosure was an important factor in the agrarian unrest during the Alliance period.

THE NONPARTISAN LEAGUE AND INDEBTEDNESS

I now turn to the two questions concerning the Nonpartisan League posed in the introduction. First, does the hypothesis concerning the fear of foreclosure shed any light on the success of the League in North Dakota relative to its experience in other states? Second, does the hypothesis help explain the geographical distribution of support for the league within North Dakota?

The hypothesis relating the fear of foreclosure to unrest suggests that the first question can be answered in part by examining the extent of farm indebtedness by state. Such data for 1910 and 1920 are presented in Table 4. In 1920, North Dakota had the greatest fraction of owner-

TABLE 4
PERCENT OF FARMS REPORTED AS MORTGAGED IN 1910 AND 1920 FOR SELECTED
STATES

State	1910	1920
North Dakota	50.2%	71.9%
South Dakota	37.4	57.0
Iowa	51.2	54.2
Minnesota	46.0	52.4
Nebraska	38.9	50.5
Kansas	44.3	45.4

Source: U.S. Census Bureau, *1920 Census*, v. VI:1, p. 46. The data are for wholly owned, owner-operated farms.

operated farms under mortgage of any state in the Union. Furthermore, Table 5 indicates that harvests in North Dakota were significantly worse over the period of 1916 to 1920 than in any other major wheat-producing state. Given the high level of indebtedness, this suggests that a much larger fraction of farm owners were under the immediate threat of foreclosure than in any other major wheat-growing state.

Writings of the time verify that 1915–1920 was a particularly difficult period for the North Dakota farmer. It was estimated that the state lost at least 100 million bushels of wheat before harvest to rust in 1916, a year when the actual harvest was only 58,580,000 bushels.[24,25] Also, the weather during this period was even more inclement than usual; for example, the Dickenson Substation of the North Dakota Agricultural Experiment Station reported killing frosts in every month of 1917 except July.[26] Finally, the scattered available data indicate a sharp rise in foreclosure during this period: in Cass County, the ratio of Sheriff's deeds to total deeds filed was 4.2 percent, 2.0 percent, 1.3 percent, and 14.1 percent in 1890, 1900, 1910, and 1920.[27] In summary, this evidence

[24] North Dakota, *1919 Legislative Manual* (Bismark, 1919), p. 372.

[25] U.S. Department of Agriculture, Agricultural Marketing Service, "Wheat . . . ," p. 10.

[26] North Dakota Agricultural Experiment Station, "Report of the Dickenson Substation for the Years 1914 to 1918 Inclusive," Bulletin #131 (Oct. 1919), p. 10.

[27] Sheriff's deeds were the instrument used by the sheriff to pass title on land used to secure a delinquent mortgage. These percentages are taken from John W. Porter, "Land Transfers in Cass County, North Dakota, 1865–1935, a period of Sixty-One Years," mimeograph, North Dakota Agricultural College Experiment Station, Department of Agricultural Economics (Aug. 1936), p. 11, which summarizes Porter's examination of 33,430 deeds filed over these years in Cass County. The absolute number of sheriff's deeds filed in each of these years was 25, 14, 7 and 105, respectively. Unfortunately, Porter presents only decennial data on sheriff's deeds. Furthermore, these statistics should be viewed cautiously since the data on foreclosures during this period appear to be inconsistent. For example, Porter reports a total of 744 transfers of farm deeds during 1920 in Cass County, North Dakota, for a total of 215,074 acres. However, the U.S. Department of Agriculture, Bureau of Agricultural Economics (BAE), "Transfers of Farm Real Estate" (August 1939), reports only 474 transfers for a total of 112,461 acres in Cass County that year. The total number of voluntary transfers reported by the BAE is 448, while Porter reports 536 Warranty Deeds, 48 Quit Claim Deeds, and 14 Patents (transfers of land from the government) for a total of 598 voluntary transfers. Interestingly, the two sources agree on the number of administrative and

TABLE 5
CHANGING WHEAT YIELDS FOR SELECTED STATES, 1915–1920

State	"Average" Yield 1901–1917[a]	Percent Deviation from "Average"						Average Deviation 1916–1920
		1915	1916	1917	1918	1919	1920	
N.D.	12.45	36%	−52%	−40%	−8%	−51%	−30%	−36%
S.D.	11.88	35	−43	17	50	−32	−23	−6
Iowa	16.71	19	−10	6	14	−14	4	0
Minn.	14.35	18	−47	12	39	−34	−31	−6
Neb.	17.23	6	7	−27	−34	−23	−3	−16
Kansas	12.94	−3	−7	−11	4	2	21	2

[a] Estimated using a 12 percent trimmed mean to minimize the influence of particularly bad or good years. For the 17 observations of this data set, this estimator is the average of the 13 innermost observations.
Source: U.S. Department of Agriculture, Agricultural Marketing Service, "Wheat Acreage, Yield, and Production by States, 1866–1943." Statistical Bulletin #158 (Feb. 1955), pp. 2–11. Yield is bushels per acre.

suggests that North Dakota wheat farmers were considerably more vulnerable to foreclosure during 1915–1920 than were their peers in neighboring states or than they themselves had been in earlier years.

The second question can be addressed by examining the relationship between the geographical dispersion of protest activity during the period and proxies for the fear of foreclosure. As already noted, the Nonpartisan League participated in the established political system during this time and its candidate, Lynn Frazier, won the 1916, 1918, and 1920 gubernatorial elections. This provides a ready measure of the unrest during this period: the fraction of individuals voting for Frazier by county.

The proxies for the fear of foreclosure used, like those of the previous section, are based on measures of the level and extent of indebtedness. The particular measures considered are: the ratio of debt to reported value of farms that are wholly owned by their operators (DVR); the ratio of the number of mortgaged farms that are wholly owned by their operators to the total number of farms (MTR); and the ratio of the number of mortgaged farms that are wholly owned by their operators to the total number of owner-operated farms (MOR). These variables were computed by county for 1920 (data are unavailable for 1916 or 1918).

Assuming prices to be constant throughout the state, farm income in wheat-producing counties is approximately determined by the yield of wheat per acre. Excepting land costs, this is also a rough proxy for profits of wheat farmers, under the assumption that labor, seed, fertilizer, and miscellaneous costs were constant throughout the state.

executive sales (13). The greatest discrepancy occurs in the reporting of foreclosures. Porter reports 105 transfers by sheriff's deed, while the BAE reports only six involuntary transfers (including foreclosures, sales for taxes, assignment to creditors, and bankruptcies and other distress transfers). Similar discrepancies occur for other years as well.

Thus, yield per acre provides a rough measure of profits and the ability to make mortgage payments.

The statistical tests were computed using data for the major wheat-producing counties in the state. Since the fear-of-foreclosure hypothesis relates to farmers, not merchants, the counties containing the three major population centers (Bismark, Grand Forks, and Fargo) were excluded from the data set. Furthermore, although the wheat yield data might be a reasonable proxy for income in major wheat counties, it is inappropriate for counties in which the primary economic activities are mining or ranching. Hence, the data set was chosen to contain the 28 counties planting at least 150,000 acres of wheat in 1920, excluding the counties with major urban centers. These 28 counties account for 68 percent of the acres of wheat planted that year in the state.

The correlations between the proxies (DVR, MTR, and MOR) and election returns, presented in the first row of Table 6, indicate a strong positive relationship between the fraction voting for Frazier in 1920 and the various measures of indebtedness. Indeed, all three correlations are large enough to reject the null hypothesis of no relationship at the .005 level using a one-sided test. These conclusions appear statistically robust in the sense that they do not depend upon the assumption of normality: equally strong results obtain when the Spearman rank correlation coefficient is computed.[28]

Since controlling for farm income ought not to vitiate the effect of indebtedness according to the fear-of-foreclosure hypothesis, several regressions were performed. Three different statistical techniques were employed to analyze the conditional correlations. First, ordinary least squares (OLS) linear regressions were performed. Second, since the fraction voting for Frazier in 1920 necessarily falls between zero and one, OLS regressions were computed after transforming this variable to be the logarithm of the "odds ratio." This technique is appropriate if the fractions voting for Frazier are modeled as independent draws from a logistic distribution function.[29] Finally, because of the ambiguity concerning the specification of the model, the regressions were computed

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[28] These and other unreported statistical results are available from the author upon request. It should be mentioned that the correlations are weaker between the indebtedness data and 1918 voting patterns, and are weaker still (or even negative) with the 1916 voting data. Since mortgages generally had short durations, however, there is no strong reason to believe that 1920 indebtedness data would be a good proxy for the indebtedness data of 1916. As a result, these correlations are difficult to interpret and are not reported here.

[29] Suppose that the fraction voting for Frazier in the i-th county, V_i, can be expressed as $V_i = F(X_i b + u_i)$ where F is a cumulative distribution function, b is a parameter vector, X_i is the vector composed of a constant, the yield variable, and the proxy for the fear of foreclosure, and u_i is an independent and identically distributed error term. This can be rewritten as $F^{-1}(V_i) = X_i b + u_i$. If F is assumed to be logistic, then $F^{-1}(V_i) = \log(V_i/(1 - V_i))$, that is, $F^{-1}(V_i)$ is the natural logarithm of the odds ratio $V_i/(1 - V_i)$. Thus this model can be estimated by regressing $\log(V_i/(1 - V_i))$ on X_i using ordinary least squares.

TABLE 6
RELATIONSHIPS BETWEEN ELECTION RESULTS, WHEAT YIELDS, AND LEVELS
OF INDEBTEDNESS FOR NORTH DAKOTA COUNTIES IN 1920

Item	Yield	DVR	MTR	MOR	R^2
Correlations between election returns and indebtedness	—	.604	.644	.502	—
Marginal Significance Level	—	0.1%	0.1%	0.3%	—
Regression Results[a]					
Technique					
1. OLS	−1.24**	1.19**	—	—	.505
	(2.66)	(3.04)			
Odds Ratio	−.051**	.049**	—	—	.503
	(−2.64)	(3.04)			
M	−1.24**	1.26**	—	—	.598
	(−2.81)	(3.37)			
2. OLS	−1.14**	—	41.8**	—	.529
	(−2.47)		(3.31)		
Odds Ratio	−.046**	—	1.74**	—	.531
	(−2.44)		(3.36)		
M	−1.23**	—	40.6**	—	.555
	(−2.96)		(3.28)		
3. OLS	−1.30**	—	—	31.7*	.381
	(−2.28)			(1.53)	
Odds Ratio	−.053**	—	—	1.32*	.379
	(−2.25)			(1.55)	
M	−1.43**	—	—	29.9*	.420
	(−2.57)			(1.49)	

[a] The dependent variable is the fraction voting for Frazier in 1920 by county. All regressions included an intercept term; t-statistics appear in parentheses. See the text for a discussion of the estimators. One-sided rejection at level: * 10% and ** 1%.
Sources: The data sources are given in the Appendix. The measures of indebtedness are described in the text.

using a robust estimator, an M-estimator with a redescending influence curve.[30]

The results of these statistical procedures are presented in Table 6. Evidently the results change little from one technique to the next: all of the relevant coefficients are significant at the 10 percent level, and most are significant at the 1 percent level. The first two measures of indebtedness, the ratio of debt to value of farms owned by their operators and the fraction of farms under mortgage, both indicate very strong positive correlations, conditional on yield. In these regressions, between 50 and 60 percent of the variance in voting patterns in these

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[30] The particular influence curve (IC) used was the "Tukey bi-square": $IC(z) = z(1 - (z/k)^2)^2$ if $|z| < k$, and $IC(z) = 0$ otherwise, where k was set at six times the median absolute value of the estimated residuals. For a discussion of this and some other robust regression estimators, see Richard Hill, "Robust Regression When There are Outliers in the Carriers," *Communications in Statistics—Theory and Methods*, 11 (1982), 849–67. For a more theoretical discussion, see Peter Huber, *Robust Statistics* (New York, 1981), pp. 153–198. A critical introduction to the subject robust estimation with historical references is given by Stephen M. Stigler, "Do Robust Estimators Work with *Real* Data?," *Annals of Statistics*, 5 (Nov. 1977), 1055–98.

wheat-producing counties is explained by the yield of wheat in those counties and these measures of mortgage indebtedness. The correlation of the third proxy variable is not as strong as that of the previous two, suggesting a more important role for the extent of indebtedness among the entire community rather than among only those farmers who own and operate their farms. The relevant coefficients, however, are positive and significant at the 10 percent level. Since the marginal significance levels are computed using asymptotic distribution theory, care should be taken in their interpretation. Still, these results lend support to the proposed hypothesis.[31]

<div align="center">SUMMARY</div>

There may be hypotheses other than that concerning the fear of foreclosure which explain the empirical results presented here. Since a variety of statistical techniques were used on diverse data, however, it seems safe to conclude that any alternative explanations cannot be based upon arguments that the correlations are spurious or that the results arise from arbitrary parametric or distributional assumptions. Rather, it seems that alternative explanations must be based on economic or historical reasoning.

The evidence presented is consistent with the hypothesis that the threat of foreclosures was the proximate cause of much of the agrarian unrest that the United States experienced during 1865–1920. Perhaps the strongest argument for this view is neither statistical nor discursive, but is instead simple and intuitive. Protest requires time and risks reprisal from those whose policies are besieged. For farmers to bear these costs willingly when their return is so unsure must have required a threat of major proportions. Such a threat could have been the possibility of foreclosure, of eviction from the source of their livelihood. The "cause" of agrarian unrest need not have been high railroad tariffs or high interest rates. Rather, the "cause" was a confluence of economic

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[31] The tests were also performed for the subsample of the fifteen counties planting over 200,000 acres of wheat in 1920. Not surprisingly the marginal significance levels were lower in the larger sample than the smaller one. The estimated coefficients were essentially unchanged, however, by dropping the counties with smaller wheat planting, adding confidence to the conclusions stated in the text. The statistics of Table 6 were also computed for another debt proxy, obtained by subtracting the number of wholly owned farms reporting debt in the 1920 census from the total number of farms and dividing by the total number of farms. A typical value of this variable is 85 percent. Of course, many mortgaged farms were partially rented and thus not wholly owned. Also, the fraction of wholly owned farms not reporting mortgage data to the Census Bureau was substantial—up to 10 percent of all wholly owned owner-operated farms in some counties. Not surprisingly, this proxy performed poorly relative to the other measures of indebtedness. Although the signs of the relevant statistics based on this variable always agree with the theory, the estimators have considerably larger standard errors than do their counterparts for the other proxies.

and natural events which threatened the inhabitants of entire regions with loss of property and self respect. In the end, what mattered to most farmers was not the broad issues debated by politicians, but rather the ability to continue their way of life. When this ability was threatened, protest ensued.

APPENDIX

DATA SOURCES

1. Ratio of farms under mortgage, 1890. Source: U.S. Census Bureau, *Eleventh Census of the United States*, 1890, v. 13, "Proprietorship and Indebtedness," Table 94, "Number and Percentage of Families Occupying Owned and Hired and Free and Incumbered Farms, by Counties, 1890," pp. 247–86, col. 11.
2. Grouping of protest activity, 1880–1890. Source: McGuire, "Agrarian Unrest," p. 842.
3. D_t = Annual per capita real estate debt incurred 1880–1889 in current dollars, as estimated by the Census Bureau. Source: *1890 Census*, v. 12, Table 60, p. 161.
4. Number of forms mortgaged in 1890 divided by the number of farms taxed, for acres, by state. Source: *1890 Census*, v. 12, p. 123, col. 1.
5. Value of farms by state in 1890. Source: *1890 Census*, v. 13, "Proprietorship and Indebtedness," Table 32, "Value and Average Value of Farms, of Owned and Incumbered Farms, and of Farms that are Hired and are Owned Free of Incumbrance, by States and Territories: 1890," p. 69, col. 1.
6. Total value of farm products by state, 1889. Source: *1890 Census*, v. 3, "Statistics of Agricultures," Table 6, "Number, Average, and Valuation of Farms and Products, with Cost of Fertilizers, by Counties: Census of 1890," pp. 204–35, col. 8.
7. Percent of wholly owned farms operated by owners which were reported as mortgaged in 1910 and 1920 for selected states. Source: U.S. Census Bureau, *Fourteenth Census of the United States, 1920*, v. VI:1, "Agriculture: Report for the States: The Northern States," Table 57, "Mortgaged Farms, by Divisions and States: 1920 and 1910," p. 46, col. 11 and 12.
8. Wheat yields by state and by year. Source: U.S. Department of Agriculture, Agricultural Marketing Service, "Wheat . . .," Statistical Bulletin #158, pp. 2, 8–11.
9. Percentage voting for Frazier in 1916, 1918, and 1920. Source: North Dakota, *Compilation of Election Returns, 1914–1928* (Bismark, 1930), pp. 18, 26, and 42.
10. Wheat yields for North Dakota counties, 1920. Source: 1920 Census, v. VI:1, pp. 626–640. Computed as the ratio of row 15 (bushels of wheat harvested in 1920 per county) to row 14 (acres of wheat harvested in 1920 per county).
11. DVR, MTR, and MOR. These proxies were computed using the following data from the 1920 Census, v. VI:1, "Agriculture: Reports for North Dakota, County Table V: Mortgage Debt Reports: 1920," pp. 641–42.

  DVR = Ratio of debt to value of farms consisting of owned land only (row 7).
  FND = Of all farms operated by their owners, number of farms reporting no mortgage debt (row 2).
  FD = Of all farms operated by their owners, number of farms reporting nonzero mortgage debt (row 1).
  The total number of farms per county is taken from:
  FT = Number of farms, 1920, by county in North Dakota. Source: 1920 Census, v. VI:1, "Agriculture: Report for North Dakota, County Table I," pp. 626–30, row 1.
  Using these data, MTR = FD/FT and MOR = FD/(FD + FND).