Economic Depression and Labor Union Formation: Evidence from the Panic of 1873*

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Abstract

Why do labor unions emerge? I investigate union formation during and after the Panic of 1873 and the ensuing Long Depression (1873–1879) in the U.S. I construct a new measure of depression exposure by combining county-level bank loan data with newly digitized industry-level wage data to capture the severity of local economic contractions. Union formation was more prevalent in counties experiencing larger economic shocks. This relationship is particularly strong when the monopsony power is high. In these counties, larger wage reductions and higher firm profits are observed after the Long Depression. These findings support the hypothesis that unions are more likely to form when the expected surplus of collective action exceeds its costs.

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1 Introduction

Under what conditions do labor unions emerge? In environments with weak unions and low union density, workers must overcome substantial collective action problems as well as employer resistance, often in the absence of established organizing infrastructure. A standard economic perspective conceptualizes union formation as arising when the expected surplus from collective bargaining exceeds the costs of coordination among workers. This surplus depends critically on the existence of economic rents and on how those rents are distributed between firms and workers, which in turn is shaped by the degree of employer monopsony power in the labor market. Economic downturns can shift this margin by weakening workers' outside options, compressing wages, or altering rent-sharing arrangements, thereby increasing the potential gains from collective action. Consequently, large negative shocks may create conditions under which unionization becomes viable, particularly in labor markets where firms possess greater market power. More broadly, this logic suggests that periods of widespread economic disruption can facilitate collective organization when they expand the surplus that workers can potentially capture through collective bargaining.

This paper examines the conditions under which collective action becomes viable by studying a historical episode of severe economic distress. I focus on the wave of union formation following the Panic of 1873 and the subsequent Long Depression, and show that large economic shocks can facilitate the emergence of labor market institutions by increasing the surplus from collective action, particularly in environments characterized by employer market power. To measure local exposure to the downturn, I construct two complementary proxies based on contractions in credit supply and sectoral wage shocks. I find that union formation increases significantly in areas more exposed to the depression, with effects concentrated toward the end of the downturn and during the early recovery. The relationship is substantially stronger in labor markets with higher pre-existing monopsony power, consistent with a framework in which economic shocks raise the surplus from collective action and thereby facilitate union emergence when firms possess labor market power. These findings suggest that similar mechanisms may also operate during more recent episodes of widespread economic disruption, such as the resurgence in labor organizing following the COVID-19 pandemic.

The late nineteenth-century U.S. provides a particularly useful setting for examining the relationship between economic distress and union formation. Because union activity prior to this period was limited and largely localized, concerns about reverse causality—where preexisting labor organizations influence the local impact of economic downturns—are substantially reduced. Moreover, as this episode represents a pivotal turning point in the development of the American labor movement, focusing on the onset of unionization helps mitigate concerns related to path dependence. The relative absence of modern labor market institutions further allows the relationship between economic distress and union formation to be examined in a comparatively clean institutional environment. A central empirical challenge, however, is the absence of reliable local unemployment statistics during the Long Depression. To address this limitation, I construct two complementary measures of local exposure to economic distress based on contractions in bank lending and sectoral wage shocks.

The first measure captures contractions in credit supply using county-level loan information from annual bank balance sheets (Carlson et al., 2022). This "loan shock" reflects changes in local access to finance during the downturn. The second measure uses industrial wage data to construct a weighted-average "wage shock," a Bartik-style exposure measure that captures differential sectoral impacts of the depression across counties. By combining variation in credit conditions with sectoral wage dynamics, these measures provide complementary proxies for local economic distress in the absence of reliable unemployment statistics.

To examine how economic distress affects union formation, I measure unionization using granular data compiled by Garlock (1974) on the development of the Knights of Labor (KOL), the largest labor organization in the U.S. during the late nineteenth century. The dataset records all local assemblies founded between 1869 and 1899 and captures the vast majority of union activity during this period. This setting provides a unique opportunity to study the large-scale emergence of unions in an environment with initially low levels of labor organization.

Implementing an event-study design, I find that union formation was more prevalent in counties that experienced more severe economic distress, particularly toward the end of the depression and during the early years of recovery. At its peak, between 1878 and 1881, a one standard deviation increase in the loan shock

is associated with a 0.2 standard deviation increase in union density. Estimates based on the Bartik-style wage shock are qualitatively similar. I further show that the initial wave of union formation was concentrated among relatively skilled workers in industries such as mining, manufacturing, and construction, before expanding more broadly across the labor force during the 1880s.

To interpret these patterns, I examine the mechanisms underlying union formation by focusing on manufacturing and construction industries. Heterogeneity analyses indicate that the relationship between the Long Depression and union formation is stronger in counties with higher levels of pre-depression monopsony power, proxied by county-level Herfindahl-Hirschman Index (HHI). These counties experienced larger wage declines during the downturn, while firms tended to be larger and more profitable. These patterns are consistent with a framework in which unionization arises when the expected surplus from collective bargaining exceeds the costs of organizing. In labor markets characterized by high monopsony power, firms pay wages below workers' marginal product, generating rents that may potentially be captured through collective action. A severe economic downturn can increase this surplus by weakening workers' outside options, compressing wages, or shifting activity toward firms with greater market power. In this setting, both the initial level of monopsony and the magnitude of the shock jointly determine whether workers cross the threshold for union formation. Higher initial monopsony implies a larger baseline rent wedge, placing such markets closer to the point at which organizing becomes profitable even prior to the downturn. The recession then further increases the available surplus, pushing these markets beyond the participation threshold, while more competitive markets remain below it due to the limited rents available for redistribution.

This paper contributes to three strands of literature. First, it relates to research on the determinants of unionization. A large body of work models union participation as a collective action problem, emphasizing workers' incentives to join unions in the presence of coordination frictions and free-riding (Booth, 1985; Farber, 1983; Naylor and Cripps, 1993; Corneo, 1995). While this literature provides important insights into the microfoundations of union participation, it typically takes the existence of unions as given and focuses on workers' membership decisions rather than on the conditions under which unions themselves emerge.

By contrast, this paper studies the determinants of union formation, examining the conditions under which unions arise in the first place rather than workers' decisions to join already-established organizations.

Second, the paper relates to a growing literature on the economic consequences of major downturns. Recent empirical work examines how depressions affect labor markets, employment trajectories, and long-run economic outcomes (Hershbein and Kahn, 2018; Yagan, 2019). This paper complements that literature by focusing on the endogenous response of labor market institutions. Rather than examining how downturns affect workers or firms directly, I study how severe economic shocks shape the emergence of collective organization. In doing so, the paper highlights a channel through which depressions may generate persistent effects by altering the structure of labor market representation and bargaining, rather than affecting wages and employment alone.

Third, by constructing a novel index of depression severity, this paper contributes to the literature on the economic crises of the late nineteenth century and their long-run consequences for economic development and labor markets. Existing work in this area has been constrained by limited data availability, particularly with respect to local economic conditions. By combining information on credit and wage dynamics, I develop new measures of local exposure to economic distress that enable a more systematic analysis of the Long Depression. This approach allows for a quantitative assessment of how variation in economic shocks translates into differences in institutional development across locations.

2 Background

2.1 Labor Unrest in Postbellum Economy

2.1.1 Panic of 1873 and the Long Depression

The conclusion of the Civil War in 1865 inaugurated a period of rapid expansion in railroad construction, driven by the intersection of sustained political commitment, favorable economic conditions, and significant technological progress. During the late 1860s and early 1870s, the sector experienced an exceptional, and in many respects speculative, boom, which was closely intertwined with broader

patterns of economic growth. This trajectory was abruptly reversed in September 1873, when the insolvency of Jay Cooke & Co.—one of the nation's preeminent investment banks—precipitated a widespread financial panic and a cascade of corporate failures. The ensuing contraction was both deep and protracted; macroeconomic recovery was not observable until mid-1878 and proceeded only gradually thereafter. While systematic labor market statistics, including unemployment rates, were not compiled at the time, contemporary observers recognized the episode as the most severe economic downturn in the nation's history to that point, designating it the "Great Depression." After the actual Great Depression in 1929, this earlier crisis came to be known retrospectively as the "Long Depression," reflecting both its duration and its structural impact on the postbellum U.S. economy.

The economic shock was unevenly distributed across sectors, with the most pronounced disruptions concentrated in heavy industries. One group of industries was affected through its reliance on speculative, investment-led expansion, most notably railroads, along with related activities such as railroad construction and iron production. A second group experienced distress through dependence on bank financing for working capital and commercial credit; many manufacturing establishments, particularly producers of consumer and intermediate goods, fell into this category. Mining, including coal extraction, occupied an intermediate position, as it was closely linked to both infrastructure investment and industrial production and was therefore exposed through multiple channels during the downturn. Although these sectors appear to have borne the brunt of the contraction, the effects of the crisis were not confined to them, and economic distress spread more broadly across the industrial economy.

2.1.2 Strikes and Unions in the 1870s

Although labor organizations expanded modestly in the years following the Civil War, these early efforts remained fragmented, localized, and largely craft-based. Most were initiated by relatively skilled workers and lacked national coordination, durable organizational capacity, or a coherent political strategy. This organizational fragility became especially evident with the onset of the Long Depression following the Panic of 1873. As unemployment surged and employers intensified

resistance to collective action, union activity declined sharply, and many existing organizations collapsed.[1] In some cases, the economic dislocation of the 1870s also reoriented worker activism away from exclusively workplace-based struggles and toward broader systemic concerns, as illustrated by the rise of Greenbackism. The movement framed labor distress as a consequence of monetary contraction and financial instability rather than solely the product of industrial relations, channeling worker grievances into demands for currency reform and electoral action alongside, rather than in place of, direct confrontation with employers.[2]

As economic conditions continued to deteriorate, worker discontent increasingly manifested in open conflict. The mid-1870s witnessed a rising wave of strikes, particularly in sectors most exposed to the downturn—including transportation, construction, manufacturing, and mining—where wage cuts, layoffs, and intensified labor discipline were most severe. Many of these actions were localized, spontaneous, and short-lived, and often failed to secure lasting concessions. Nonetheless, they reflected a growing willingness among workers to mobilize collectively and challenge managerial authority. These tensions culminated in the Great Railroad Strike of 1877, widely regarded as the first major nationwide strike in American history. Despite its unprecedented geographic scope and intensity, the strike did not immediately generate a stable or institutionalized labor movement; union density remained low, and organized labor struggled to secure durable

[1] Per Perlman (1922), p. 47: "Of a total of about eighty local leagues in existence from 1865 to 1877, about twenty were in Massachusetts, eight elsewhere in New England, at least twenty-five in Michigan, four or five in Pennsylvania, about seven in Illinois, as many in Wisconsin, and smaller numbers in Missouri, Iowa, Indiana, and California. Michigan, Illinois, Iowa, and Pennsylvania had each a Grand Eight-Hour League. Practically all of these organizations disappeared soon after the panic of 1873."

[2] Contemporary socialist thought also provides a useful interpretive lens on labor unrest in the 1870s. Marx viewed trade unions and strikes as necessary expressions of class conflict under capitalism, but ultimately limited in their capacity to transform economic relations unless connected to broader political struggle; episodic and defensive labor actions, such as those prevalent in the postbellum U.S., would therefore have appeared to him as fragmented and incomplete rather than fully emancipatory. Lassalle, by contrast, was more skeptical of trade unionism as a vehicle for lasting improvement in workers' conditions, emphasizing instead political reform and state intervention—particularly through universal suffrage and publicly supported cooperative production. From a Lassallean perspective, labor unrest that remained centered on wage bargaining and workplace conflict would have seemed misdirected and insufficiently institutionalized. Despite their differences, both Marx and Lassalle would likely have regarded the labor movements of the 1870s as transitional: expressive of genuine social antagonisms, yet falling short of a coherent or stable path toward structural reform.

political alliances or sustained public support in the years that followed.

2.1.3 The Rise of the Knights of Labor

It was within this volatile economic and political environment that the Knights of Labor (KOL) emerged as a prominent force in American labor activism. Founded in 1869 as a secret organization among skilled urban workers, the Knights initially gained traction in regions experiencing acute industrial strain, particularly the mining districts of Pennsylvania. Their early expansion coincided with the labor conflicts surrounding the Long Strike of 1875 and the repression of the Molly Maguires, developments that simultaneously heightened worker militancy and employer hostility. Although the Knights abandoned secrecy and became a public organization after 1877, their practical organizing efforts during the late 1870s and early 1880s remained concentrated among skilled workers, reflecting continuities with earlier craft-based movements.[3]

At the same time, the Knights articulated an unusually expansive vision of labor organization. Unlike traditional craft unions, the KOL sought—at least in principle—to unite workers across occupations, skill levels, and, to a limited extent, gender and race. Their program emphasized broad social reforms, including the eight-hour workday, the abolition of child and convict labor, and the promotion of cooperative enterprises as alternatives to wage labor. This agenda reflected a belief that labor's grievances were rooted not merely in unfavorable contracts or working conditions but in the structure of industrial capitalism itself. While strikes under the Knights' banner were often triggered by immediate concerns such as wage cuts or deteriorating workplace conditions, particularly in railroads and mining, these conflicts were embedded within a broader moral and political critique of economic inequality, monopoly power, and the prevailing organization of production.

[3] According to Perlman (1922), p. 84: "From 1879 till 1882 the labor movement was typical to skilled workmen... Even the Knights of Labor, the organization *par excellence* of the solidarity of labor, was at this time, in so far as practical efforts went, merely a faint echo of the trade unions."

2.2 Comparison To Modern Labor Market

Labor unrest in the postbellum decades differed in important respects from later, more institutionalized forms of unionism, yet it was driven by economic grievances that remain central to labor movements today. Organizations such as the Knights of Labor articulated demands in sweeping, moralistic terms, envisioning a fundamental reorganization of economic life rather than narrow bargaining over wages and benefits. Calls for cooperative commonwealths, the curbing of monopolies, and the transformation of industrial relations reflected a utopian impulse largely absent from modern labor movements. At the same time, the core sources of conflict were strikingly familiar: workers protested wage cuts, mass unemployment, and excessive working hours, most prominently through the eight-hour movement. These concerns closely resemble those motivating contemporary strikes and organizing campaigns, where picketing over pay, job security, and work intensity remains central.

Where the 1870s diverge most sharply from the modern era is in the form and intensity of labor conflict and the surrounding legal environment. In the absence of formal collective bargaining mechanisms, strikes were frequently treated as criminal conspiracies and escalated into violent confrontations involving strikebreakers, private security forces, state militias, and federal troops. Union membership itself entailed substantial personal risk, including blacklisting and physical repression. Over the course of the twentieth century, however, labor conflict was progressively institutionalized. Legislation such as the Wagner Act of 1935 established collective bargaining as a protected activity and shifted labor relations away from open coercion toward legal and administrative forms of dispute resolution. Although these protections have weakened over time, the transition from repression to conditional recognition marked a fundamental change in how labor conflict was mediated.

The structure of the labor market has also changed substantially since the 1870s, even as underlying vulnerabilities persist. Late nineteenth-century industrial employment was characterized by long hours, minimal regulation, and extreme exposure to business cycle fluctuations, with no system of social insurance to buffer workers against unemployment or wage loss.[4] In contrast, modern la-

[4] See Fishback (1998) for me discussion.

bor markets operate within a framework of labor law, minimum wage standards, unemployment insurance, and workplace safety regulations that partially mitigate economic risk. Yet contemporary workers face new challenges—deindustrialization, globalization, fragmented workplaces, and declining union density—that limit collective leverage despite stronger formal protections. The comparison thus underscores a central continuity: while the institutional terrain of labor conflict has changed dramatically, the fundamental struggle over wages, hours, and economic security remains remarkably consistent across time.

3 Data

3.1 Union Data

The union data used in this paper are drawn from Garlock (1974), which provides the most comprehensive dataset on the KOL. As the largest labor organization in the US during the 1880s, it accounted for up to 80 percent of all affiliated union members in some years, making it central to understanding labor mobilization in this period. Garlock digitized records for 11,957 local assemblies of the KOL between 1869 and 1899. These records contain information on each assembly's geographic location, founding and dissolution years, and organizational type (mixed or trade union). Although some additional details on race, gender, and membership are available, their coverage is limited; the dataset's primary strength lies in its detailed information on organizational structure and timing.

Given limited information on assembly-level membership, I measure "union density" as the number of union assemblies per 1,000 workers. As an alternative, I also construct a measure of union assemblies per manufacturing firm, with results reported in the robustness section.

3.2 Measuring Economic Depression

Although the Panic of 1873 and the subsequent Long Depression represent an unprecedented economic crisis in US history, much of the existing scholarship has concentrated on identifying its causes rather than assessing its broader consequences. A central challenge lies in quantifying the severity of the downturn across

the nation. Prior to the establishment of the federal Bureau of Labor Statistics in 1884, systematic and reliable unemployment statistics—on which modern labor economists typically rely—were largely unavailable[5], thereby complicating empirical assessments of the magnitude of the contraction.[6] In this paper, I propose two complementary approaches to measuring the depth of the depression and evaluate the robustness of each. The subsequent sections elaborate on these methodological contributions.

3.2.1 Calculate Economic Shock with Bank data

The first dataset I use is the historical bank balance sheet data assembled by Carlson et al. (2022). This dataset is built from the Annual Reports of the Comptroller of the Currency and covers all U.S. national banks between 1867 and 1904. The reports provide detailed annual balance sheets, which include granular information on the amount of loans, securities, and reserves held by each bank, along with regulatory capital, surplus equity, undivided profits, interbank claims, and deposits. Each observation is at the bank-year level, identified by charter numbers that allow banks to be tracked over time.

The format of the data makes it particularly useful for constructing local measures of financial shocks. Since loans are reported for each individual bank, I can directly observe the lending exposure of banks and use this as the key variable to construct a measure of depression shocks. Because the balance sheet data also contain information on bank locations, I can aggregate individual banks' loan variables up to the county level. This aggregation enables me to link county-level financial shocks—measured by fluctuations in local lending capacity—directly to unionization activity and other real outcomes.

[5] Before 1884, two exceptions that document relatively well on some degree of unemployment rate and wage rate are from the State Bureau of Labor Statistics in Massachusetts and Ohio in 1878.

[6] Rezneck (1950) points out the data insufficiency: "Inadequate statistical data hamper any attempt at precise measurement of the scope of the depression of the 1870s and its accompanying distress. The most comprehensive estimate available, calculated on the basis of six major series, including pig-iron and coal production, cotton consumption, railroad revenues, merchandise imports, and bank clearings, indicates a decline of 32 percent between 1873 and 1878, second only in size to a comparable decline of 55 percent between 1929 and 1932."

3.2.2 Calculate Economic Shock with Wage Data

To measure wage dynamics during the late 19th century, I rely on three major historical sources: Clarence Long's (1960) review of the Aldrich Report, the Weeks Report (1886), and Bureau of Labor Statistics (BLS) Publication No. 604. Long's work is particularly valuable because it systematizes the Aldrich Report, which contains detailed payroll-based wage series from 1860 to 1890, mostly concentrated in the manufacturing sector in the Northeast and Middle Atlantic. The Aldrich data provide continuous wage series for specific occupations within firms, making them one of the most consistent records of wage trends over three transformative decades. Despite limitations in geographic scope and representativeness, the Aldrich Report remains the cornerstone for understanding skilled and semi-skilled labor wages in the period.

To complement this, I draw on the Weeks Report, which was compiled for the 1880 Census. Like the Aldrich Report, it is based on firm payrolls and reports continuous wage series by occupation, but it extends coverage geographically and sectorally. The Weeks Report includes firms from the South and West in addition to the Northeast, and its industry coverage spans over 600 establishments across 50 sectors, with consistent series available for around 18 industries between 1860 and 1880. This breadth makes it especially useful for capturing regional and sectoral variation that the Aldrich data alone cannot provide, even if its coverage ends earlier and is somewhat less detailed in methodology.

Finally, I incorporate BLS Publication No. 604, which offers another systematic summary of wages compiled by the Bureau of Labor Statistics. By combining these three datasets, I construct a wage series spanning 1867 to 1880. This merged series balances the depth of occupational detail from the Aldrich Report with the regional and industrial breadth of the Weeks Report and the official aggregation in the BLS publication. The resulting dataset allows me to track wage shocks at the national and industry levels, which I then use both as outcomes of interest and as inputs for constructing Bartik-style measures of local economic shocks.

3.3 Census Data

This study relies extensively on census data in 1870 and 1880 at both the individual level (Ruggles et al., 2022) and the county level (Haines, 2010). These sources permit the calculation of county-level employment shares, which are used to construct the Bartik shock, and provide key covariates for the event-study specification, including demographic composition and industrial structure. In addition to population censuses, I also draw on the Census of Manufacturing at both the county and establishment levels to investigate underlying mechanisms.

3.4 Summary Statistics

Table 1 reports the pattern of newly formed KOL assemblies between 1869 to 1886. In early years during the Long Depression, we can see that a lot of emphasis is put on the mining industries. This is because miners faced harsh conditions in isolated company towns, had strong traditions of solidarity, and were at the center of visible strikes during the economic downturn after 1873. This made them natural early recruits. But by the 1880s, the KOL shifted toward railroads, factories, and other industries: mining proved difficult to organize sustainably, while industrialization was rapidly expanding elsewhere. To pursue their "One Big Union" vision and grow their influence, the KOL broadened beyond mining into larger and more urban sectors of the economy.

Another defining feature of the KOL was the emergence of mixed unions, which encompassed workers across multiple occupations. Following Terence Powderly's leadership in the early 1880s, the KOL actively encouraged the inclusion of unskilled workers, women, and other previously excluded groups. As a result, the number of mixed unions increased sharply, eventually comprising nearly 50 percent of all new assemblies. This inclusiveness was distinctive in the late nineteenth century, when craft unions continued to dominate, and it likely contributed to the KOL's rapid expansion and becoming the largest labor organization at the time, with membership peaking at nearly one million in 1886.

Table 1: Newly Formed KOL Assembly By Year

		The Long Depression			Post-Depression			
Established Year in 19C	69–73	74–75	76–77	78–79	80–81	82–83	84–85	86
Mixed Union	1	0	3	9	11	446	872	1,980
Trade Union								
Mining	1	33	168	169	144	126	127	225
Construction	10	0	2	5	12	75	87	178
Transportation	0	0	4	1	2	36	113	226
Manufacturing								
Metal	13	8	5	10	15	79	74	275
Non-metal Durable	5	1	6	7	12	70	77	251
Non-metal Non-durable	14	1	5	11	21	219	328	606
Service	0	0	1	0	0	8	36	114
Agricultural	0	0	0	0	0	22	28	175
Unknown	41	23	65	132	119	37	66	162
Total Union	85	66	259	344	336	1118	1808	4192

4 Empirical Strategy

4.1 Shock Construction

Since systematic unemployment statistics were unavailable for the US in the 1870s, I construct my primary measure of local exposure to the Long Depression at the county level using bank loan data derived from annual balance sheets. As a complementary approach, I also construct a Bartik-style wage shock. This section elaborates on the construction of both measures and provides a comparative discussion between the two.

4.1.1 Main Shock Construction - A Loan Shock

I begin by motivating the use of loan data as a proxy for economic activity through comparisons with both national output and the unemployment rate. As shown in Figure A.1, Panel A, aggregate loan issuance closely tracks national output over the period 1867–1904. Moreover, the right-hand panel illustrates an inverse relationship between unemployment and aggregate loan activity. In particular, during the two major depression episodes of the late nineteenth century, declines in output and rising unemployment coincided with a pronounced slowdown in loan issuance. The close correspondence between these patterns suggests that

loan activity provides a meaningful proxy for broader economic conditions.[7]

Next, I construct a loan shock at the county level. Beginning in 1867, 462 counties had at least one operating bank in a given year, which enables the construction of a shock measure defined as deviations from a long-run trend. I apply an HP-filter to extract the long-run trend in lending activity for the period 1867–1904. Given that the Long Depression extended from late 1873 to early 1879, I define the depression shock as the maximum deviation from this trend during that interval. For instance, in New York County—the largest county at the time—the trough occurred in 1878, with the largest deviation observed between 1873 and 1879 (Figure A.1 panel B). I normalize this deviation by the long-run trend, yielding a percentage-based measure of the shock (e.g., 16% in New York County).

In rare instances, counties with a very limited banking presence experienced mechanically large shocks when one or more banks failed during the depression. For example, in counties with only a single bank, a collapse would mechanically generate a loan shock of 100%. To mitigate such distortions, I restrict the sample to counties with shock values between 0% and 50%, thereby excluding cases of mechanical exaggeration. In addition, to ensure comparability across space, I impose a minimum population threshold of 20,000, yielding a final sample of 370 counties with both a banking presence and sufficient population size. The distribution of shocks, with a median of 19.8%. While most counties in the sample are concentrated in the industrial North, the severity of the depression does not appear to be geographically clustered within specific states.

4.1.2 Complementary Shock - A Bartik-style Wage Shock

As a complementary measurement, I approximate depression severity by constructing a weighted average wage shock using newly digitized industrial wage data at the national level, or a Bartik shock,

$$\text{BartikShock}_c = \sum_{i=1}^{I} \text{Share}_{c,i}^{1870} \times \Delta\text{Wage}_i,$$

[7] Because county-level data on output and unemployment are unavailable, these relationships can only be demonstrated at the national level. I discuss this limitation and further assess the validity of the loan shock measure in the robustness section.

Here, $\text{Share}_{c,i}^{1870}$ denotes the employment share of industry i in county c in 1870, measured prior to the onset of the depression, while ΔWage_i captures the national-level wage shock in industry i. As illustrated in Figure A.2, wages began to decline with the onset of the Panic of 1873 and continued to follow a relatively smooth downward trajectory throughout the Long Depression. Accordingly, I define the wage shock as the difference between the average daily wage in 1870–1872 and the wage observed in the trough year between 1873 and 1879. The summation covers $I = 31$ industries, excluding retail, agricultural, and service sectors, both due to data limitations and because unions in these categories accounted for less than 5% of all local assemblies.

4.1.3 Shock Comparison

Conceptually, the two shocks are constructed in different ways and are designed to capture distinct dimensions of economic distress during the Long Depression. I evaluate these measures and compare the two shocks in this section. First, I show that the two shocks are positively correlated. As illustrated in Figure A.2, when counties are divided into deciles based on the loan shock, the Bartik shock displays a positive relationship. The moderate correlation coefficient (0.3) between the Bartik and loan shocks suggests that industrial exposure and credit contractions were interrelated yet analytically distinct channels of distress. This pattern possibly suggests that the Long Depression cannot be reduced to a purely industrial shock, but rather encompassed multiple, overlapping sources of economic dislocation.

In addition to the shared component and the correlation, I argue that the two can be complementary in terms of interpretation. Loan shock captures general economic conditions mediated through the financial system and informs how financial contractions affected local outcomes, regardless of whether they came from textiles, iron, or farming. On the other hand, a Bartik shock emphasizes the heterogeneous exposure to national demand-side disturbances and is more industry- and structure-driven.

I adopt the loan shock as my primary specification, shown in Figure A.3, because it offers a more generalizable interpretation, rather than one more narrowly confined to industrial dynamics. Nevertheless, in contexts where the loan shock

faces limitations, the Bartik shock serves as a valuable complementary measure. This arises in two principal cases. First, when supply-side factors drive variation in county-level credit issuance—for example, if banks restrict lending due to interbank frictions rather than firms' demand for credit—the loan shock may not fully capture underlying economic conditions. In contrast, the Bartik shock, which leverages wage declines at the national level, is less sensitive to such supply-side distortions. Second, when loan issuance responds with a lag and thus fails to contemporaneously reflect local economic conditions. As illustrated in Figure A.2, the trajectories of total loan issuance and wage declines are not fully aligned during the initial years of the depression. Because the Bartik shock is constructed from wage data, it is less susceptible to these timing discrepancies.

4.2 Sample and Descriptive Evidence

As outlined in the preceding section, this study focuses on 370 counties where depression severity is more precisely measured. Table B.1 presents a division of counties into groups above and below the median level of loan shock severity. Descriptive statistics suggest that counties experiencing more severe loan shocks tend, on average, to be smaller in scale, with relatively lower population levels, smaller labor forces, and fewer manufacturing establishments. One might expect the industrial composition of these counties to differ substantially, given that areas facing tighter credit constraints could be those with industries disproportionately affected by the Long Depression. However, this pattern is not strongly evident: aside from the mining sector, where differences are more pronounced, the relative industrial shares appear broadly comparable across counties. This might hint toward the fact that the Long Depression shock is only somewhat industrial.

To further explore the connection between post-depression dynamics and unionization, I pool data on all KOL assemblies between 1880 and 1886 and report summary statistics in Panel C. In Figure A.4, a simple descriptive comparison indicates that counties experiencing larger loan shocks exhibit, on average, a greater propensity for union formation. Figure A.3 bottom panel illustrates the geographic spread of union activity during this period, showing that by the time of the economic revival, the KOL had already achieved significant expansion across the industrial North. At a more granular level, I examine the correlation between

loan shocks and union density. As depicted in Figure A.4 top panel, there is a negative association between loan shocks and union density, measured as the number of unions per 1,000 workers.

The primary objective is to investigate patterns of union formation and their interaction with depression-era shocks across time. To extend the analysis, I consider the period from 1871 to 1886, dividing counties into two groups—those experiencing above- and below-median loan shocks. This classification provides a broader perspective while simultaneously motivating a more tractable difference-in-differences framework. As illustrated in Figure A.4 bottom panel, counties subject to larger loan shocks generally exhibit a greater propensity to form unions. The divergence in union activity becomes particularly evident toward the end of the depression and persists throughout the early 1880s.

4.3 TWFE specification

To establish a causal interpretation, I employ an event-study framework and account for selection on observables by incorporating a range of covariates. Building on the patterns observed in Figure A.4 bottom panel, it is natural to implement a dynamic event-study design using 1873 as the baseline year. This specification enables the analysis of the temporal dynamics of union formation during and after the Long Depression. For interpretability, the loan shock measure is standardized such that the coefficient of interest, β_s, captures the effect of a one–standard deviation increase in loan shock on the number of unions per 1,000 individuals (also expressed in standard deviation units). My main empirical strategy is the following regression, for county c and $t = 1871,1872,...,1886$:

$$\begin{aligned} \text{UnionRate}_{ct} = \gamma_c + \delta_{s(c),t} + \sum_s \theta_s \, \mathbb{1}\{t = s\} \, X_{c,1870} \\ + \sum_{s \neq 1873} \beta_s \, \mathbb{1}\{t = s\} \, \text{LoanShock}_c + \varepsilon_{ct}. \end{aligned} \tag{1}$$

where $UnionRate_{ct}$ is the standardized rate of KOL per 1000 workers at county c and year t. $LoanShock_c$ is the standardized loan shock at county c. There exists an inherent trade-off between employing a continuous measure of shock and

adopting a simple treatment–control dichotomy. A binary classification facilitates a more direct interpretation when assessing pre-trends and the parallel trends assumption, but it complicates the interpretation of β_s while the cutoff might be arbitrary. Conversely, a continuous specification renders the evaluation of parallel trends less straightforward, yet it provides a clearer interpretation of β_s, which can be understood as the effect of a one–standard deviation increase in the loan shock. For this reason, I adopt a continuous treatment specification while supplementing the analysis with further examination on parallel pre-trends.

A set of covariates is incorporated to address potential confounding factors. First, I include δ_{st}, state-by-year fixed effects, to absorb state-specific shocks in union development.[8] For instance, unions may have expanded more rapidly in Pennsylvania due to economies of scale, path dependence, or changes in state-level legislation; more generally, this specification captures any contemporaneous state-level events. Once these fixed effects are introduced, identification relies primarily on within-state variation across counties. Second, I include interactions between baseline county characteristics, $X_{c,1870}$, and year dummies to account for analogous concerns at the county level. For example, $X_{c,1870}$ includes population size and average loan size in 1870; when interacted with year dummies, these controls allow counties with similar initial characteristics to follow comparable development trajectories.[9]

5 Result

Within an event-study framework, this section examines the dynamics of union formation during and after the Long Depression. I use the loan shock as the primary measure of exposure to the depression, as it captures broad disruptions to local credit markets and economic activity. I begin by presenting the main results relating union formation to the loan shock. I then complement this analysis with a Bartik-style wage shock, which places greater emphasis on industrial composi-

[8] Take Pennsylvania, for example, this would also take care of the fact that KOL started out in the state in 1869, and that there might be more indictments of Molly McGuires; similarly, it also addresses issues of development momentum or information dissemination at the state level.

[9] In the main specification, I exclude industrial composition from $X_{c,1870}$, reserving this discussion for later sections focused on the role of industry.

tion. Finally, I comment on the role of industrial structure in interpreting the estimated treatment effects. Throughout the analysis, I report the dynamics of the coefficients of interest, β_s, within the event-study framework over the period 1871–1886. Because the Panic of 1873 unfolded in September of that year, 1873 is used as the baseline year in the event-study specification.

5.1 Union Formation During and After Long Depression

In Section 4.2, I document descriptive evidence suggesting that, between 1880 and 1886, unions were more prominent in counties more severely affected by the Long Depression. In this section, I move from correlation toward a causal interpretation using the event-study framework. Figure 1 Panel B illustrates that union formation began to increase in the latter half of the Long Depression, with a notable upward trend emerging around 1875. The effect intensified toward the end of the depression, peaking around 1880.

A further pattern emerges when unions are classified into occupation-specific unions (trade unions) and unions encompassing multiple occupations (mixed unions). As shown in Panel B of Figure 1, the dynamics for trade unions (left panel) closely resemble those in Panel A, although the estimates are less precise and the confidence intervals are somewhat wider. This pattern is consistent with historical accounts of union development during the late stages of the Long Depression and the subsequent recovery period. Labor historians document that early union activity was initially concentrated among trade unions composed of relatively skilled workers, as discussed in Section 2.1.3.

The strongest treatment effects among trade unions occur toward the end of the depression and during the early recovery years, 1878–1881. Over this period, the increase in union formation appears to be driven primarily by trade unions, consistent with the historical interpretation discussed above. To better understand the sources of this growth, I examine the composition of trade unions in greater detail by distinguishing between mining unions and those in manufacturing and construction. It is shown that the estimated effects are broadly similar across these groups, both in magnitude and in their temporal patterns. Overall, there is little evidence of substantial heterogeneity in the treatment effects across

these industries.[10]

By contrast, beginning in the early 1880s, the leadership of the KOL began to actively encourage broader membership across occupations. This shift toward more inclusive organizing is reflected in the emergence of mixed unions, as shown in the right panel of Figure 1 Panel B. Notably, even among mixed unions, there is evidence that formation was more prevalent in counties more severely affected by the Long Depression. Overall, there is little evidence of a pre-trend, which mitigates concerns that counties more severely affected by the downturn were also characterized by unobserved factors influencing union formation.

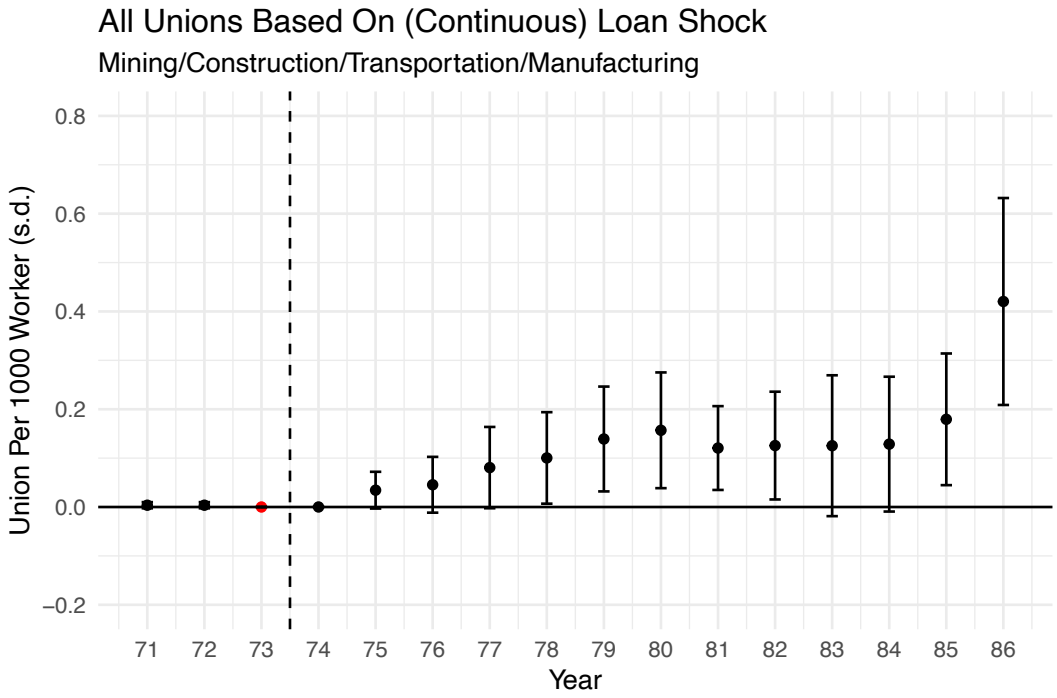
5.2 Treatment Effect Under Bartik Shock And The Role Of Industrial Mix

Thus far, the analysis has relied on the loan shock measure, which, as discussed in Section 4.1.3, may be affected by supply-side factors and lagged responses. To address these concerns, the main event-study specification is re-estimated using the same framework but substituting the loan shock with a Bartik shock. As shown in Figure A.5, Panel A, the overall pattern and magnitude remain broadly similar. Both specifications indicate that union formation was relatively subdued during the depression, began to rise toward its conclusion, and peaked around 1880. This qualitative consistency strengthens confidence that the main results are not merely an artifact of potential limitations in the loan shock measure.

While the county-level loan shock captures local financial distress following the Panic of 1873, the Bartik wage shock reflects counties' differential exposure to the industrial downturn of the Long Depression. In particular, the Bartik measure weights national wage changes by counties' baseline industrial employment shares, implying that counties specialized in industries experiencing larger national wage declines were more exposed to local labor market shocks. Comparing the estimates across the two specifications helps explain the difference in the magnitude of treatment effects. In particular, between 1878 and 1881 the estimated effect

[10] Before 1881, trade union formation was largely concentrated in four industries—mining, construction, transportation, and manufacturing. Together, these industries accounted for more than 95% of all unions during this period, making them central to any assessment of unionization patterns. Although transportation, particularly the railroad sector, was also severely affected by the depression, union formation in that sector did not accelerate until after 1882.

Panel A: Overall Effect



Panel B: Union Type Breakdown



Notes: Panel A presents dynamic coefficients under the event-study specification; Panel B further breaks down the treatment effect by union type. A trade union refers to unions that include only one occupation, whereas a mixed union can incorporate multiple occupations. Dash lines are the 95% confidence interval of the estimates.

Figure 1: The Effect of Loan Shock on Union Density

under the Bartik shock approaches 0.4 standard deviations—nearly double the magnitude of its counterpart in Figure 1, Panel B. This pattern suggests that the industrial component plays an important role in interpreting the relationship between depression severity and unionization. In other words, counties whose

industrial structures were more heavily concentrated in industries hit hardest by the Long Depression tended to experience stronger union formation.

An important question is whether the relationship between economic distress and unionization operates solely through industrial composition, or whether a non-industrial component remains. To examine this, I revisit the loan-shock specification while explicitly controlling for the "industrial component." Specifically, I incorporate industrial mix into $X_{c,1870}$, allowing counties with different baseline industrial structures to follow distinct trends. As shown in Figure A.6, the overall pattern remains qualitatively similar to that in Figure 1, although the magnitude of the estimated effect is attenuated. This attenuation suggests that part of the relationship between the loan shock and union formation operates through industrial exposure: counties whose industrial structures were more heavily concentrated in industries affected by the Long Depression experienced both larger economic shocks and greater union activity. At the same time, the persistence of a positive and qualitatively similar effect after accounting for industrial composition indicates that economic distress continued to matter even among counties with comparable industrial structures, suggesting that the depression influenced union formation not only through industrial exposure but also through broader local economic conditions.

Taken together, the evidence points to an important industrial component in the depression–unionization relationship. But even among counties with comparable industrial mixes, those experiencing deeper economic contractions were still more likely to see union formation during and after the Long Depression.

6 Mechanism

So far, I have shown that union formation was more prevalent in counties more severely affected by the Long Depression. Standard economic theory predicts that unions emerge when the expected surplus from collective action exceeds the costs of organizing. In this section, I discuss the mechanism by exploring two key margins that shape this cost–benefit calculation. First, I investigate the role of economic rents—specifically their existence and distribution—in labor markets characterized by high monopsony power, and show that severe economic down-

turns can create conditions conducive to union emergence in such environments. Second, I examine the role of firm size and coordination frictions, demonstrating that changes along this margin alone are insufficient to account for the observed rise in union formation following the depression.

For the remainder of this section, I focus on the manufacturing and construction sectors for three reasons. First, as discussed in Section 5.1, the majority of unions formed prior to the early 1880s were concentrated in mining, manufacturing, and construction, and these sectors continued to account for the majority of trade unions even as late as 1886. Second, I further exclude the mining sector from the analysis because mining workers represent a relatively small share of the overall labor force and are geographically concentrated, which may introduce potential selection concerns. Third, the Census of Manufacturing provides detailed establishment- and county-level information that is particularly valuable for examining firm behavior and its interaction with local labor market conditions. Although the census primarily covers manufacturing activities, it also includes several closely related construction industries, such as producers of building materials, making it well-suited for analyzing these sectors jointly. Accordingly, for the remainder of this section, UnionRate_{ct} is defined using only trade unions in the manufacturing and construction industries.

6.1 Economic Rent and Union Formation

In labor markets characterized by monopsony power, firms may pay wages below workers' marginal product, generating rents that can potentially be captured through collective action. When monopsony power is higher, this rent wedge becomes larger, increasing the potential gains from worker coordination and thereby raising the likelihood of union formation. To examine how severe economic downturns interact with labor market concentration in shaping unionization, the analysis adopts a triple-difference framework. County-level monopsony power is approximated using the HHI, constructed from establishment-level data in 1870. Counties are then divided into terciles based on this measure, with *TopTercile* defined as an indicator for counties whose HHI lies in the top tercile of the distribution. This indicator is incorporated into the event-study specification through interactions with the shock-by-year variable, allowing the effect of economic distress on

union formation to vary with the degree of pre-existing monopsony power.[11] The heterogeneous treatment effects are estimated using the following regression, for county c and t = 1871,1872,...,1886:

$$\begin{aligned}\text{UnionRate}_{ct} = \gamma_c + \delta_{s(c),t} + \sum_{s\neq 1873} \beta_s \mathbb{1}\{t=s\} \times \text{Shock}_c \\ + \sum_s \phi_s \mathbb{1}\{t=s\} \times X_{c,1870} + \sum_s \kappa_s \mathbb{1}\{t=s\} \times \text{Shock}_c \times \text{FirmSize}_{c,1870} \\ + \sum_{s\neq 1873} \theta_s \mathbb{1}\{t=s\} \times \text{Shock}_c \times \mathbb{1}\{\text{HHI}_{c,1870} \in \text{TopTercile}\} + \varepsilon_{ct}.\end{aligned} \tag{2}$$

where $UnionRate_{ct}$ is the standardized rate of KOL trade unions in manufacturing/construction per 1000 workers at county c and year t. β_s now measures the relationship between depression and union formation in the bottom two terciles. Our interested coefficient θ_s captures whether the effect of the shock differs in counties in the top tercile group of monopsony power. These terms test whether union formation responded more strongly to economic distress in labor markets where employer concentration was higher.

The vector $X_{c,1870}$ includes pre-depression county characteristics measured in 1870, such as demographic and socio-economic variables (1870 population, 1872 loan level decile), baseline firm characteristics (e.g., firm size, capital-labor ratio, and an HHI top tercile dummy), and industrial composition. Interacting these characteristics with year indicators through the coefficients ϕ_s allows counties with different baseline conditions to follow distinct time trends. This specification accounts for differential pre-existing trajectories across counties and allows union development to evolve differently across years depending on initial local conditions. The term involving κ_s interacts the shock with baseline firm size, $\text{FirmSize}_{c,1870}$, allowing the effect of the economic shock to vary with the scale of firms present in the county prior to the depression. This term alleviates concerns about colinearity between firm size and HHI.

In Figure A.9, I first plot θ_s and show that the relationship between the de-

[11] The index is defined as $\text{HHI}_{c,1870} = \sum_{e\in c} s_{ec}^2$, where s_{ec} is the employment share of establishment e in county c. Alternatively, the shares can be constructed using establishment-level production values instead of employment. The results are similar.

pression and union formation is stronger in counties with higher levels of pre-depression monopsony power. The difference is statistically significant, particularly during 1878–1881, when the depression was ending, and economic conditions began to recover. I then plot β_s (blue line) and $\beta_s + \theta_s$ (red line) to illustrate that the previously identified relationship between depression and union formation is primarily concentrated in counties with higher initial monopsony power. In the bottom two terciles, where the rent wedge is relatively small, even a severe economic downturn is insufficient to trigger union emergence.

To further elucidate this pattern, I examine additional outcomes to investigate how local labor markets and firms in counties with greater monopsony power responded when the depression began. Specifically, I extend equation 2 by replacing the outcome variable with measures of firm characteristics and production outcomes drawn from the Census of Manufacturing. The variables of interest include wages, firm size, the number of firms, and firm profits. Because the Census of Manufacturing is available only at decennial intervals, I modify equation 2 into a static difference-in-differences specification. Following the same logic as the triple-difference framework, I estimate the following regression. For county c and $t = 1870, 1880$:

$$\begin{aligned} \text{Outcome}_{ct} = \gamma_c + \delta_{s(c),t} + \beta\, \mathbb{1}\{t = 1880\} \times \text{Shock}_c \\ + \psi' \text{FirmStructure}_{ct} + \mathbb{1}\{t = 1880\} \times X'_{c,1870}\lambda \\ + \gamma\, \mathbb{1}\{t = 1880\} \times \text{Shock}_c \times \text{FirmSize}_{c,1870} \\ + \theta\, \mathbb{1}\{t = 1880\} \times \text{Shock}_c \times \mathbb{1}\{\text{HHI}_{c,1870} \in \text{TopTercile}\} + \varepsilon_{ct}. \end{aligned} \tag{3}$$

where $Outcome_{ct}$ can be wage, firm size, firm number, or firm profit. $X_{c,1870}$ and $Shock_c \times FirmSize_{c,1870}$ are defined identically as in equation 2. The coefficient of interest, θ, captures whether the effect of the shock differs in counties belonging to the top tercile of monopsony power. One important modification is the inclusion of the term $FirmStrure_{ct}$ (firm capital and firm production value) to control for changes in firm composition over time. With this control, θ should be interpreted as the effect of the depression on these outcomes in counties with

high monopsony power, conditional on firm structure.[12]

I present the coefficient of interest, θ, in Figure A.10. The results show that in counties with higher levels of monopsony power, when a severe economic downturn occurs, wages are 6% lower, firm size is 9% larger, and firm profits are 9% higher, while the number of firms shows little change. These estimates are obtained while holding firm capital and firm production value constant. This combination of findings suggests that in counties with stronger monopsony and wage-setting power, firms respond to the depression by further reducing wages while simultaneously expanding in size and earning higher profits. In other words, firms appear to increase profitability while sharing a smaller portion of these gains with workers. Consistent with this interpretation, the post-depression period shows evidence of even higher monopsony power, potentially driven by changes in firm composition.

The empirical patterns align closely with a standard framework in which unionization arises when the expected surplus from collective bargaining exceeds the costs of organizing. In labor markets characterized by monopsony power, firms pay wages below marginal product, generating rents that can potentially be captured through collective action. A severe downturn can increase this surplus by weakening workers' outside options, compressing wages, or shifting economic activity toward larger and more productive firms with greater market power. In this setting, both the initial level of monopsony and the magnitude of the shock jointly determine whether workers cross the threshold for union formation. Higher initial monopsony implies a larger baseline rent wedge, placing such markets closer to the point where organizing becomes worthwhile even before the downturn. The recession then raises the surplus further, pushing these markets past the participation constraint, while more competitive labor markets remain below it due to more limited rents.

6.2 Cost of Collective Action

Alternative to the hypothesis economic rent and monopsony power at play, I further test if increasing firm size can play a role in union formation. I modify equation 2 and swap the triple interaction term, now the regression becomes. For

[12] Although including potentially endogenous variables may introduce bias, the patterns remain qualitatively similar when these controls are excluded.

county c and t = 1871,1872,...,1886:

$$\begin{aligned}\text{UnionRate}_{ct} = \gamma_c + \delta_{s(c),t} + \sum_{s \neq 1873} \beta_s \mathbb{1}\{t = s\} \times \text{Shock}_c \\ + \sum_s \phi_s \mathbb{1}\{t = s\} \times X_{c,1870} + \sum_s \kappa_s \mathbb{1}\{t = s\} \times \text{Shock}_c \times \text{HHI}_{c,1870} \\ + \sum_{s \neq 1873} \theta_s \mathbb{1}\{t = s\} \times \text{Shock}_c \times \mathbb{1}\{\text{FirmSize}_{c,1870} \in \text{TopTercile}\} + \varepsilon_{ct}.\end{aligned} \tag{4}$$

While the specification is similar to equation 2, the margin of interest here is $FirmSize_{c,1870}$ rather than $HHI_{c,1870}$. In this specification, I control for HHI instead of firm size. The results, presented in Figure A.11, show that there is little difference in union formation between counties with larger firms in the top tercile and those in the bottom two terciles when the depression occurred. Within this framework, firm size can be interpreted as a proxy for the difficulty of coordination among workers. As a result, this finding suggests that changes in coordination costs alone—that is, shifts in the cost margin of the cost–benefit calculation for collective action—are not sufficient to trigger union formation.

7 Conclusion

This paper examines how severe economic downturns can facilitate the emergence of labor market institutions by increasing the potential gains from collective action. Using the Panic of 1873 and the subsequent Long Depression as a historical setting, I construct new measures of local economic distress based on bank lending contractions and industry-level wage shocks. The results show that union formation was more prevalent in counties experiencing deeper economic shocks. The effects were most pronounced toward the end of the depression and during the early recovery, when workers faced prolonged wage pressure and deteriorating outside options. Importantly, the relationship between economic distress and unionization is concentrated in labor markets characterized by higher levels of preexisting monopsony power. In these environments, the depression was associated with larger wage declines, increasing firm size, and higher firm profits, suggest-

ing that firms captured a greater share of economic rents during the downturn. These patterns are consistent with a framework in which unions emerge when the expected surplus from collective bargaining exceeds the costs of organizing. More broadly, the findings highlight how large macroeconomic shocks can reshape labor market institutions by altering the distribution of economic rents and workers' incentives to coordinate.

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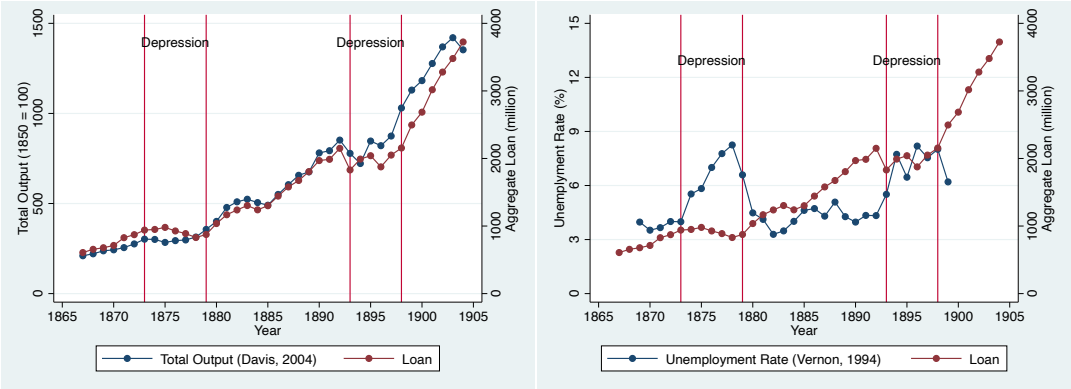
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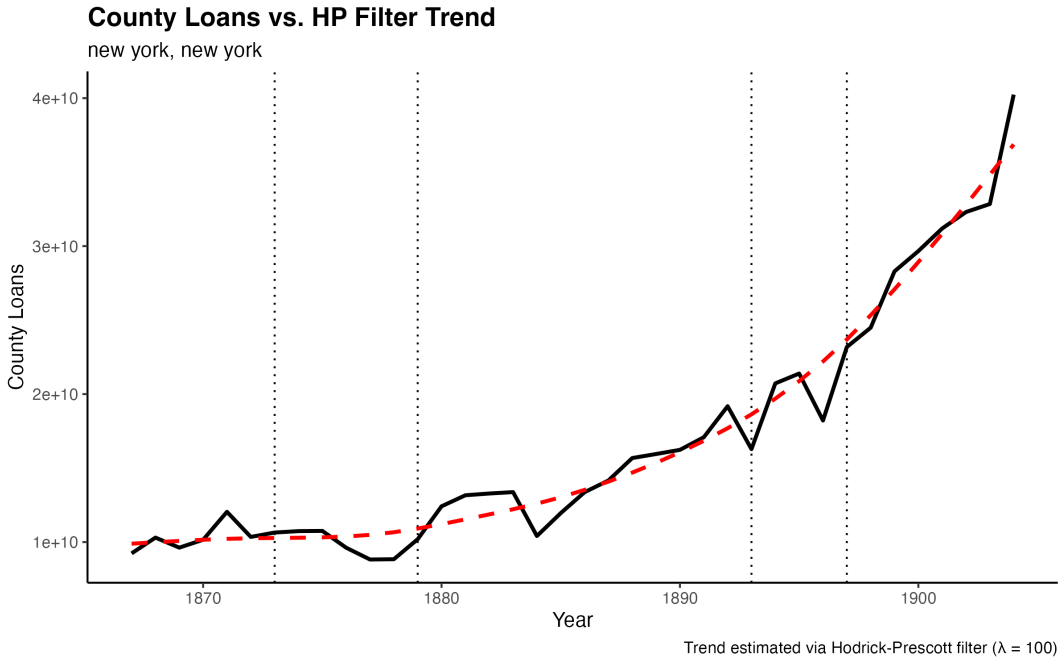
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A Appendix Figure

Panel A: Aggregate Loan Shock Comparison

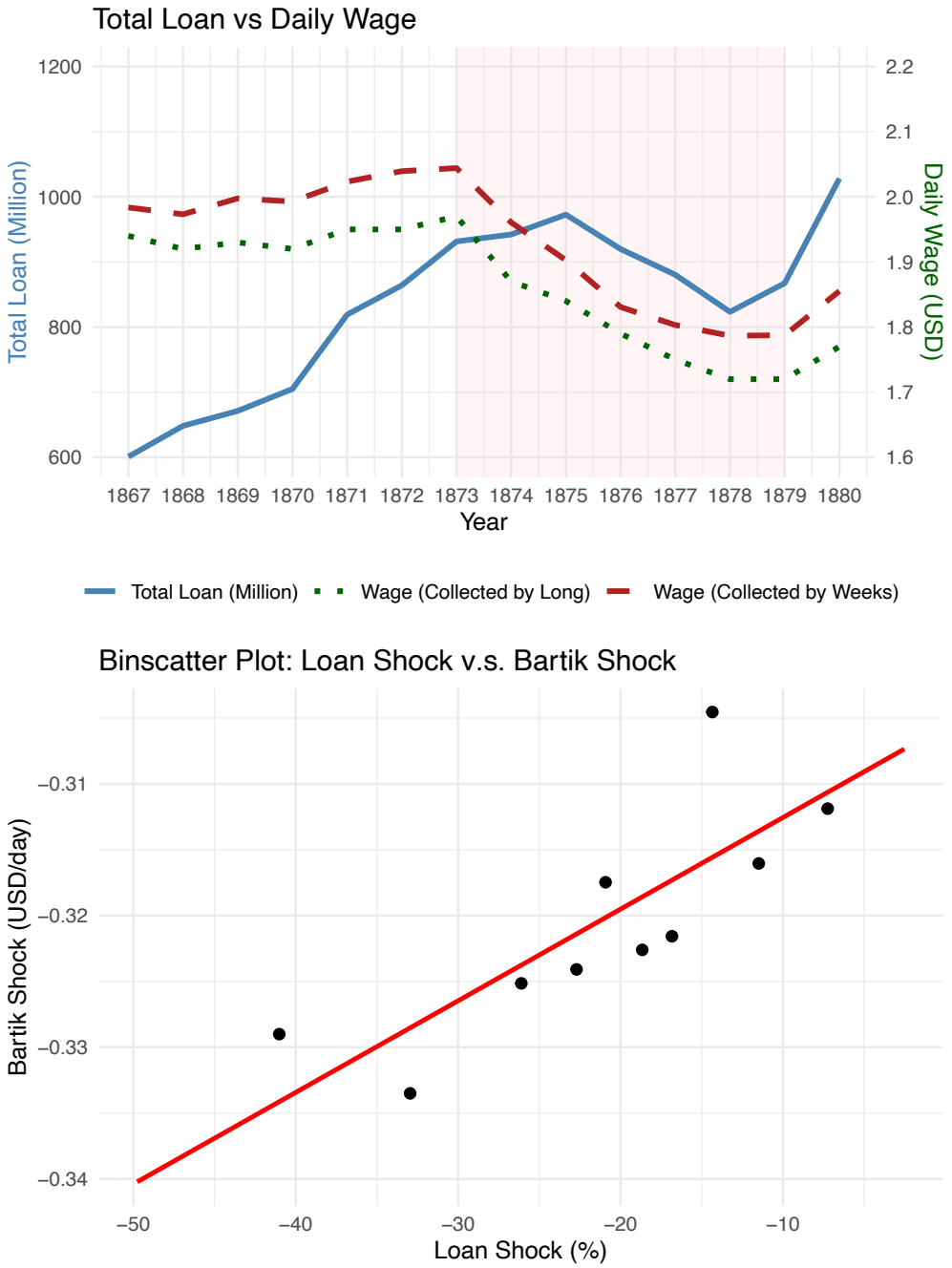


Panel B: Loan Shock Calculation In New York County



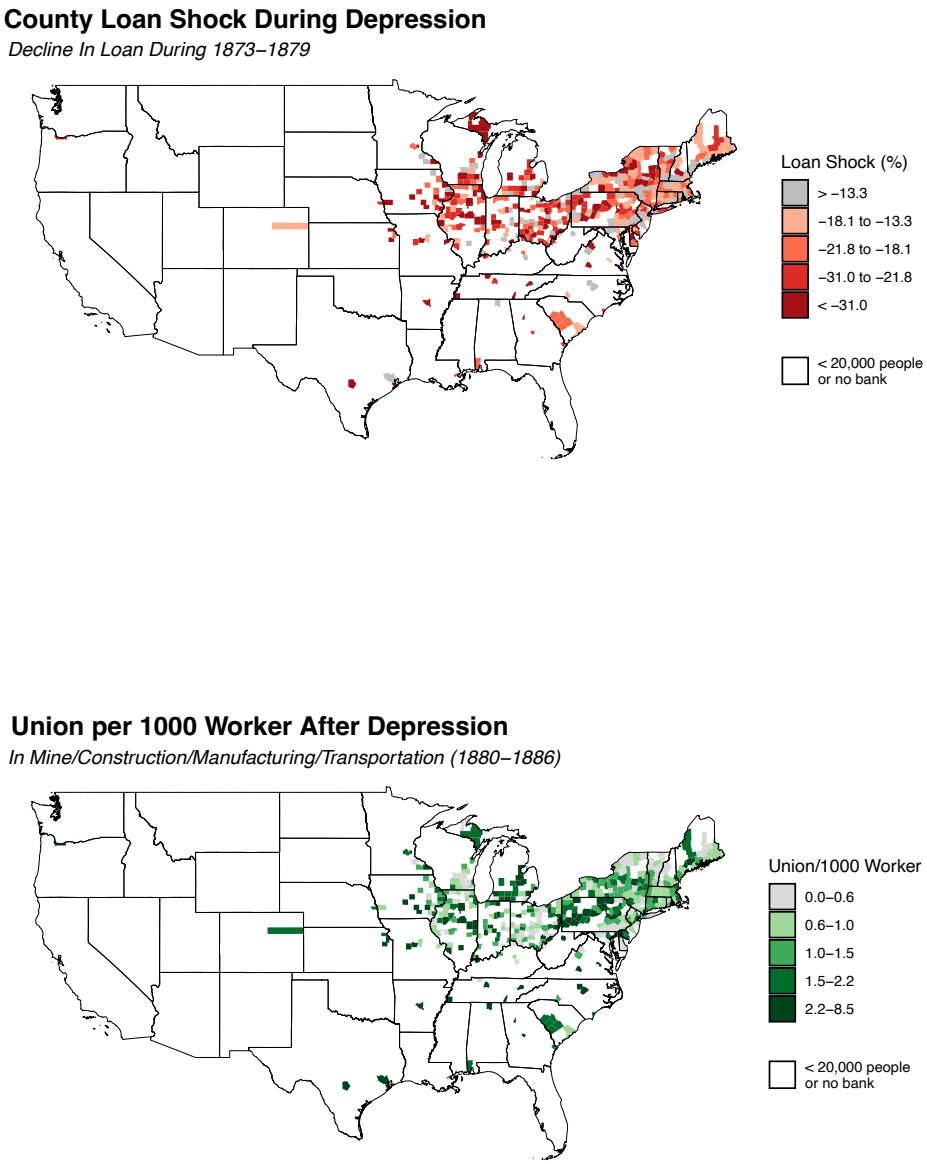
Notes: Panel A presents comparisons between national loan and total output, unemployment rate; Panel B provides an example of how loan shock is calculated in New York County. The "maximum deviation from the long run HP-filter trend" is the numerator, with the "long run HP-filter trend" being the denominator; loan shock in New York County is 16%.

Figure A.1: Loan Shock Comparison and Calculation



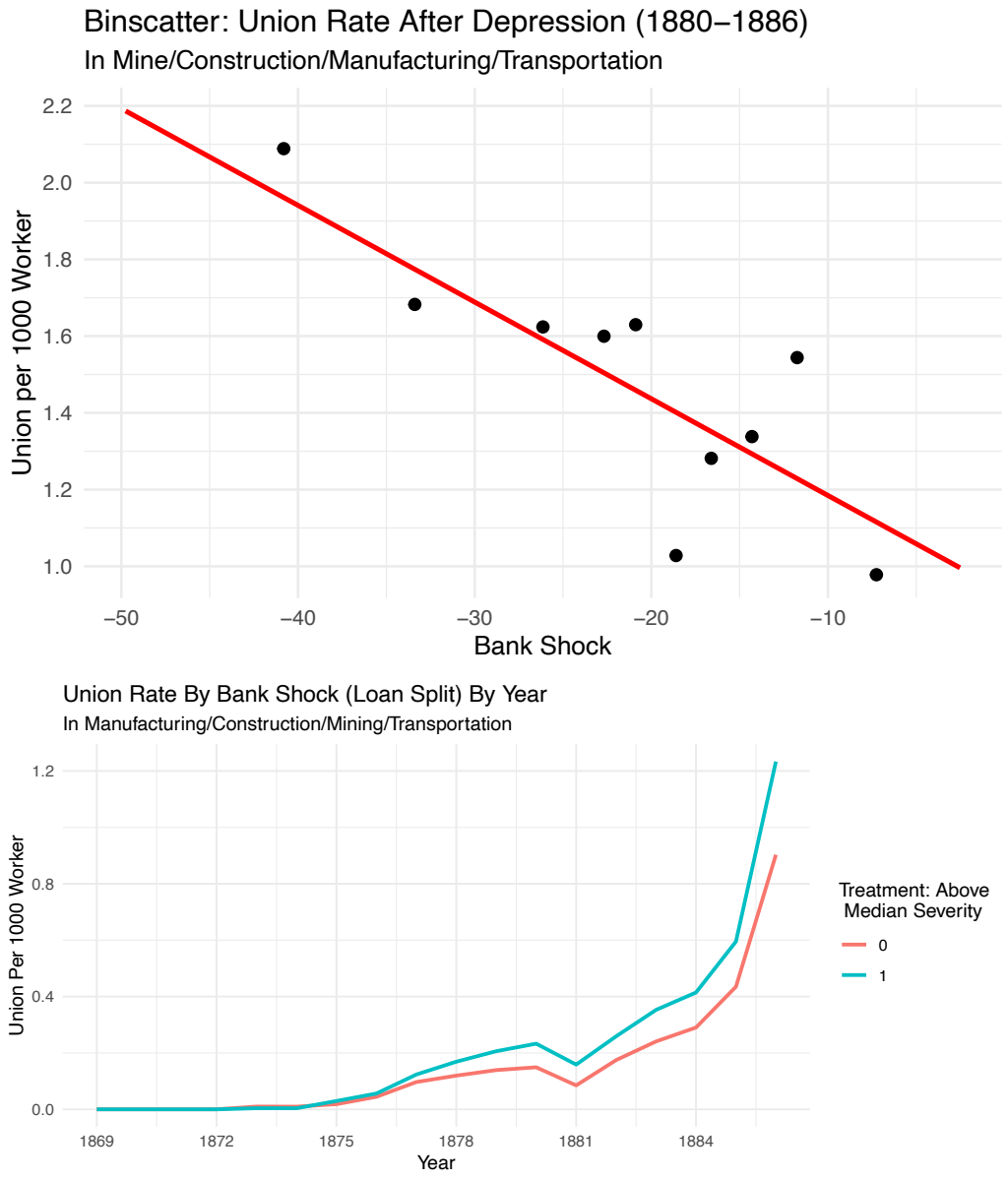
Notes: The top figure compares raw patterns in loan and wage at the national level. The bottom figure shows the correlation between loan shock and Bartik shock.

Figure A.2: Loan Shock vs. Bartik Shock



Notes: The top figure shows loan shock distribution of the Long Depression. The bottom figure shows cross-sectional union density in 1880-1886.

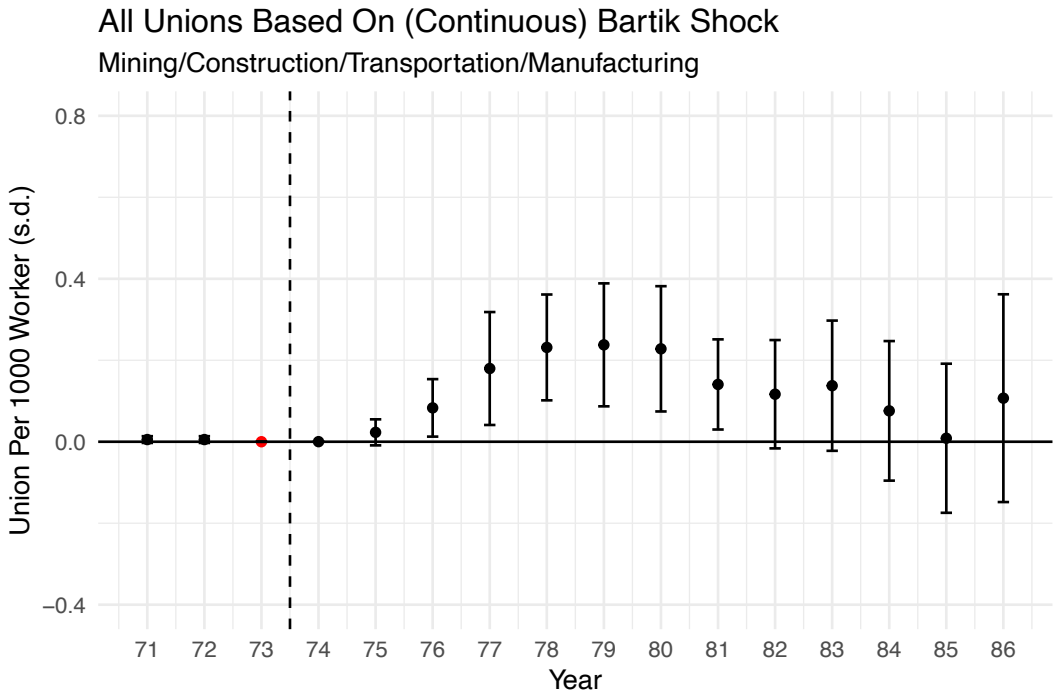
Figure A.3: County-level Loan Shock and Union Density



Notes: The top panel presents a binscatter plot of union density against the loan shock. The bottom panel divides counties into treatment and control groups and reports the raw statistics. Counties with a loan shock above the median are classified as the treatment group, while those below the median constitute the control group.

Figure A.4: Descriptive Evidence of Loan Shock on Union Rate

Panel A: Overall Effect

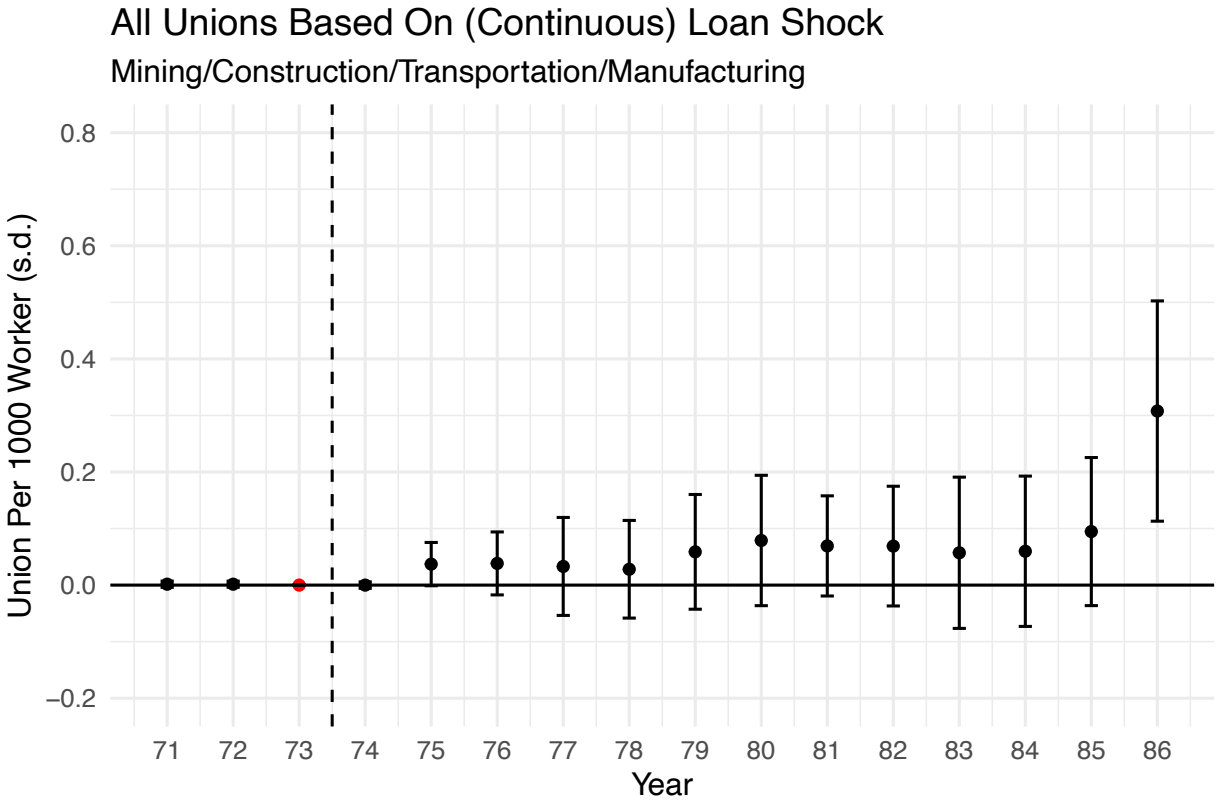


Panel B: Union Type Breakdown



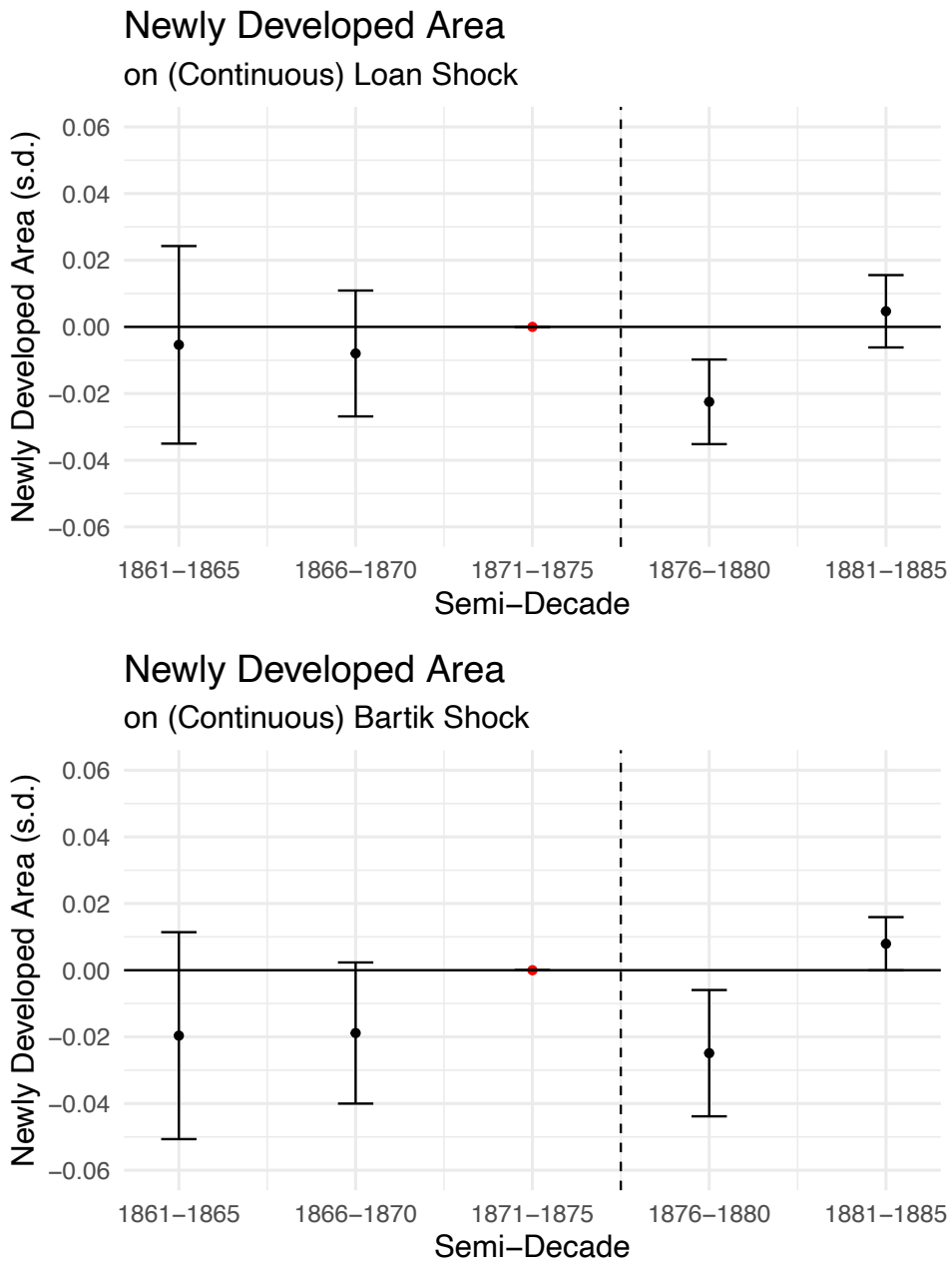
Notes: Panel A presents dynamic coefficients under the event-study specification; Panel B further breaks down the treatment effect by union type. A trade union refers to unions that include only one occupation, whereas a mixed union can incorporate multiple occupations. Dash lines are the 95% confidence interval of the estimates.

Figure A.5: The Effect of Bartik Shock on Union Development



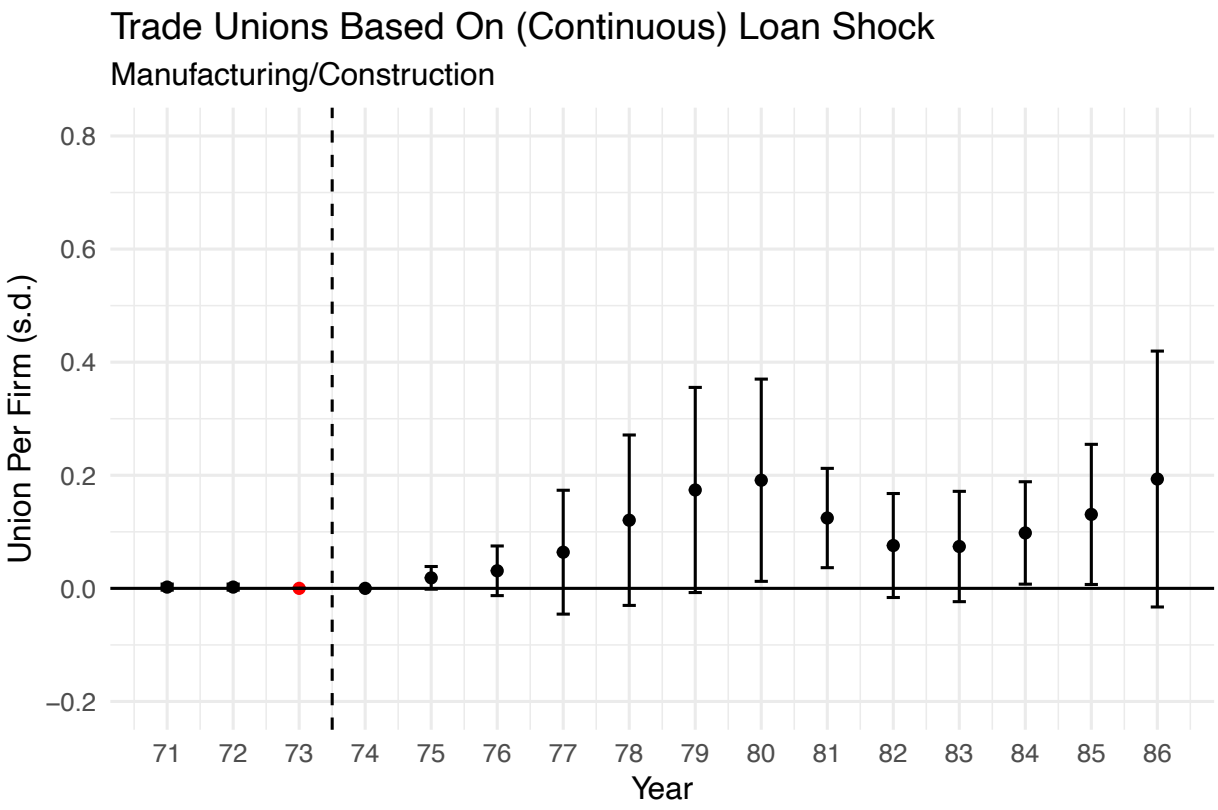
Notes: This figure resembles Figure 1 in the event-study specification; the only difference is now industrial share is included in $X_{c,1870}$. Dash lines are the 95% confidence interval of the estimates.

Figure A.6: The Effect of Loan Shock on Union Density (After Controlling for Industrial Mix)



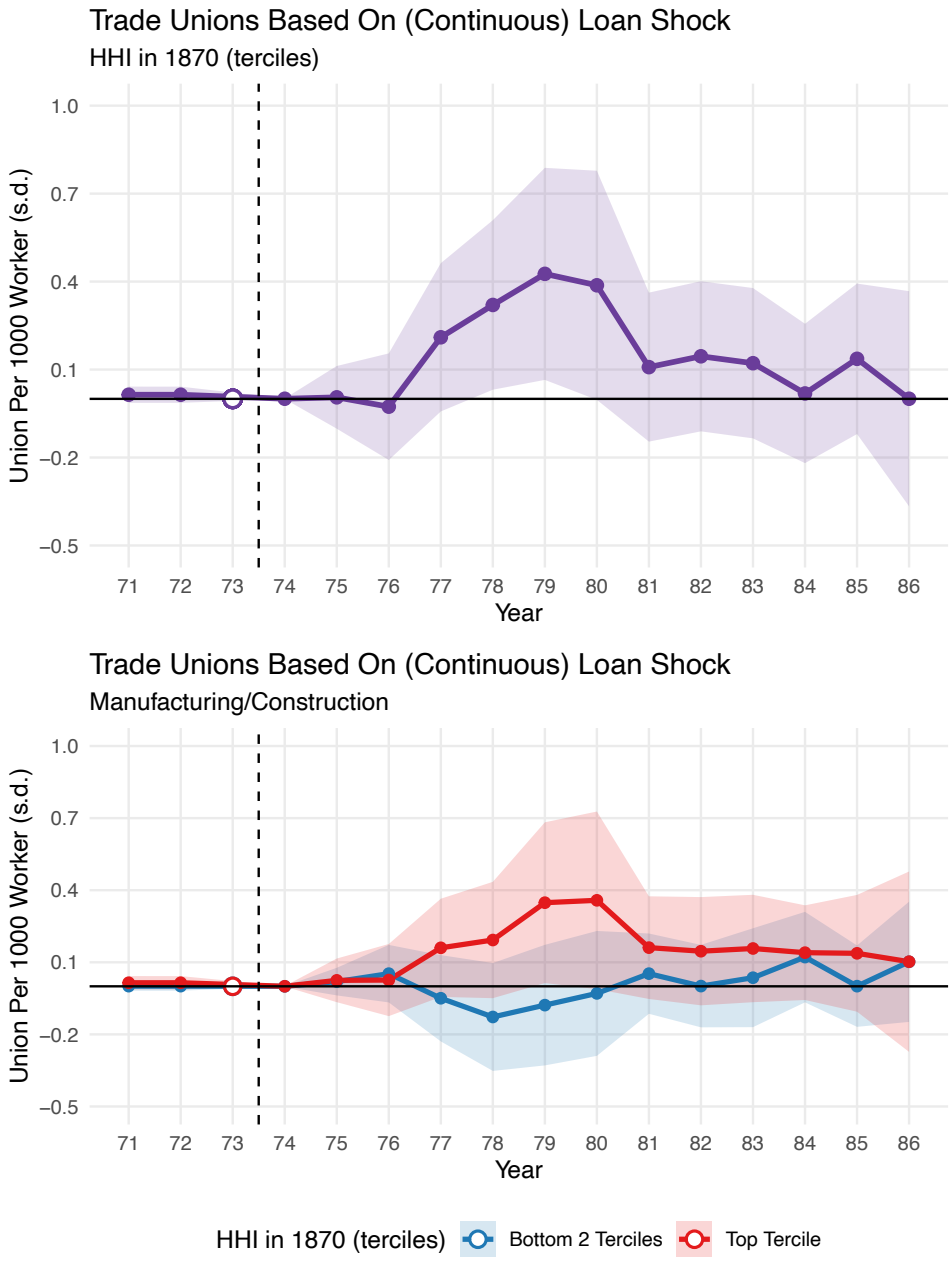
Notes: This figure presents dynamic coefficients under the event-study specification. A newly developed area is defined if a 250m × 250m grid has any building at all. Dash lines are the 95% confidence interval of the estimates.

Figure A.7: Loan Shock Verification



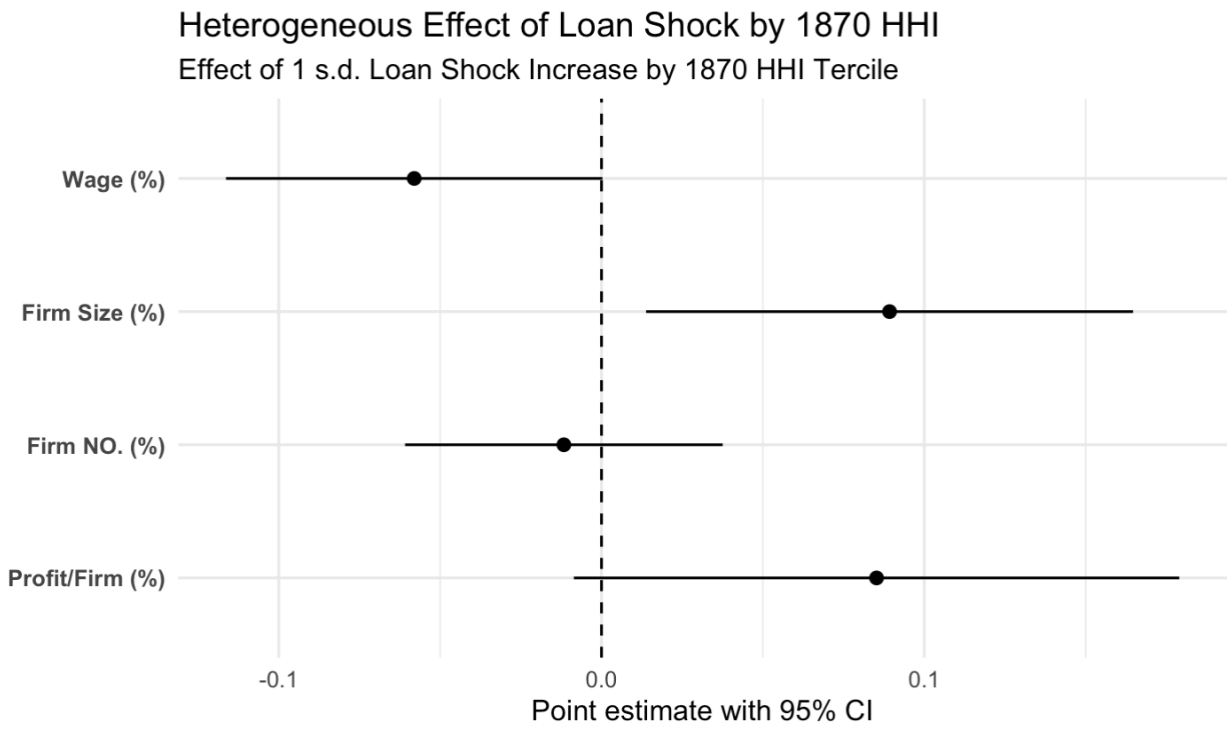
Notes: This figure resembles Figure 1 in the event-study specification; the only difference is now industrial share is included in $X_{c,1870}$. Dash lines are the 95% confidence interval of the estimates.

Figure A.8: Alternative Union Density Measure



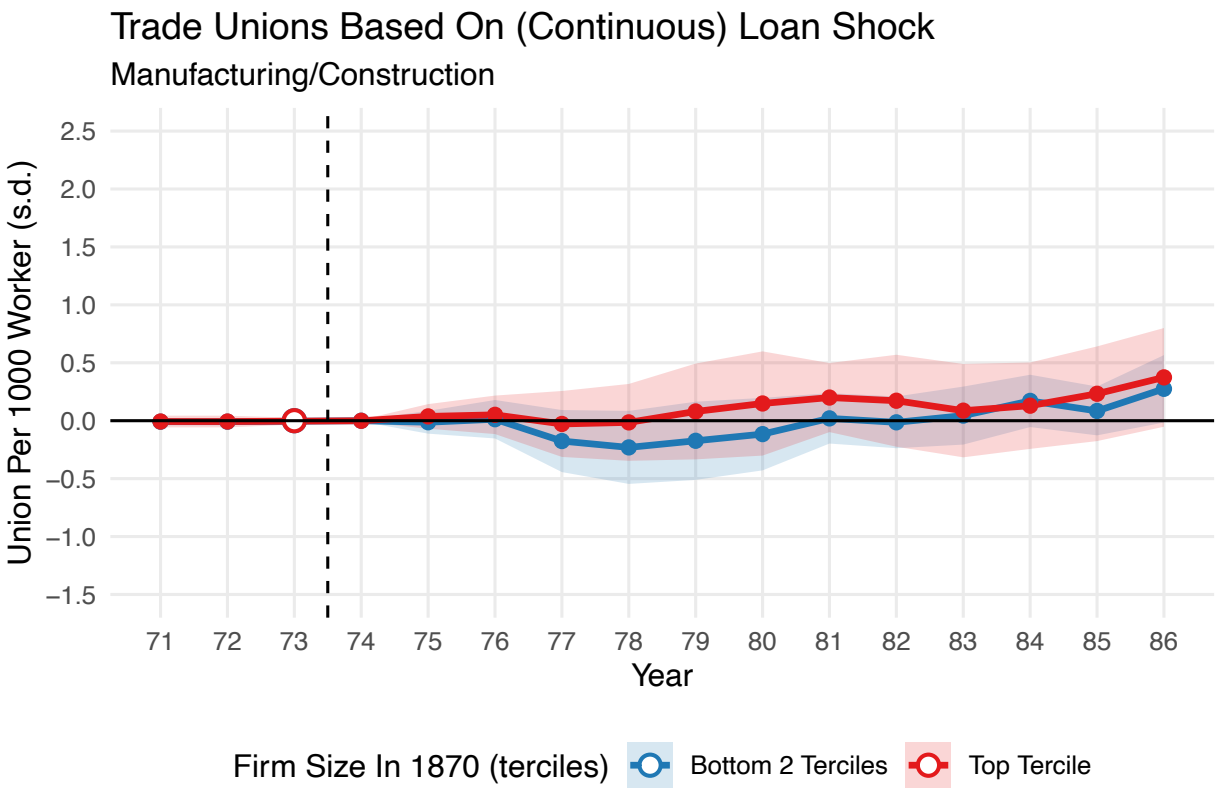
Notes: The top figure shows the difference between the top tercile and the bottom two terciles (θ_s). The bottom figure presents dynamic coefficients (β_s) under the event-study specification based on the HHI tercile. Dash lines are the 95% confidence interval of the estimates.

Figure A.9: Heterogeneity By HHI



Notes: This figure plots θ from the simple difference-in-differences regression. They present the impact of the Long Depression on different outcomes with the presence of high monopsony power. Dash lines are the 95% confidence interval of the estimates.

Figure A.10: The Effect of Depression Shock on Different Outcomes Under Monopsony Power



Notes: This figure presents dynamic coefficients (β_s and $\beta_s + \theta_s$) under the event-study specification based on the firm size tercile. Dash lines are the 95% confidence interval of the estimates.

Figure A.11: Heterogeneity By Firm Size