Convicts and Comrades: Coerced Labor's Impact on the First Labor Unions*

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Abstract

What role did coerced labor play in establishing the first labor unions? This paper introduces a model where certain firms employ convict labor, reproducing the empirical patterns observed in the data. As a result, workers face reduced wages and migrate to other firms, while firms see heightened profits. In response, workers organize, form unions, and initiate strikes. I use an instrumental variable approach to demonstrate that, at the turn of the 20$^{\text{th}}$ century, Black convict labor significantly boosted white union growth, strikes, and membership in the Southern United States. My empirical findings further suggest that this influence has persisted as counties with a history of heavy dependence on convict labor continue to display higher rates of union membership in the present day. Finally, the calibrated model presents a novel finding: the role of unions in increasing Black–white wage inequality.

Key words: Wages, Coerced Labor, Labor Unions, Inequality
JEL codes: D5, E2, J3, J47, J5

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1 Introduction

Workers often turn to unions to address power imbalances with employers. Individually, a worker may lack substantial bargaining leverage against an employer. Yet, collectively, they can negotiate better wages and improved working conditions, thereby rebalancing power in their favor. In the United States, the value of this collective strength is evident, with union household members typically earning 10%–20% more than those not in unions, mitigating some aspects of income inequality (Farber et al., 2021).

Certain events, such as the rise of globalization and automation, can further drive workers to unionize due to changes in their working conditions and a decrease in the labor share of income (Acemoglu and Restrepo, 2018; Autor and Salomons, 2018; Autor et al., 2020). In this paper, I identify coerced labor as a novel factor stimulating labor organization through labor income suppression.[1] The post-slavery period in American history, characterized by the emergence of convict labor, offers a unique setting to explore the impact of depressed wages on the unionization of workers.[2]

Convict labor arose in the aftermath of the Civil War as the Southern United States sought alternative labor sources in the wake of emancipation. This practice of using incarcerated individuals for labor, which continued until the mid-20th century, is contentious in United States history; some deem it rehabilitative, others exploitative, undermining free labor (Lichtenstein, 1996).[3] The usage of convict labor posed a challenge for free workers, alarmed by competition from low-cost coerced labor and potential wage impacts (Hiller, 1914). I argue that this concern pushed wage workers to counteract wage suppression collectively. Therefore, the institution of convict labor was a decisive factor in the formation of the first labor unions. Understanding the origins and effects of

[1] Coerced or unfree labor refers to work performed under duress or threats, encompassing all forms of slavery, penal labor, and institutions like debt slavery, serfdom, and labor camps.

[2] This era offers an optimal environment to investigate the influence of suppressed wages on unionization, primarily because it is devoid of minimum wage and numerous other labor policies that might otherwise complicate the analysis.

[3] Historically, free labor denoted work by those not legally bound to serve others, contrasting with roles like serfs, enslaved individuals, and coerced laborers.

unionization unravels the complexities of workers' socio-economic challenges, forming a crucial foundation for today's labor movements and illuminating critical aspects of labor market dynamics.

My paper provides the first theoretical and empirical investigation into the impact of convict labor at the dawn of the 20th century on the development of first labor unions in the American South. Motivated by the observable decline in wage growth and rise in unions coinciding with the introduction of convict labor in the southern United States, I develop a theoretical model illustrating the specific aspects of late 19th-century convict labor employment. This model introduces a novel general equilibrium framework to the literature, capturing the labor market impacts of convict labor and guiding my empirical analysis.

The model differentiates labor into two types: convict and free laborers. In terms of compensation, convict laborers do not receive a salary, whereas free laborers earn wages. Within this framework, convict labor is utilized by what I term 'elite firms'.[4] Convict labor is a limited resource; every convict in prison is employed as a laborer (U.S. Bureau of Labor, 1886). Therefore, the model places a stringent capacity constraint on the elite firm's use of convict labor. This particular constraint is a defining feature of the model's novelty. In this context, an increase in the exogenously set capacity constraint affects the labor market and union formation.

The model predicts that the equilibrium wage for free laborers decreases as convict labor capacity grows. This capacity increase boosts profits for both firms, showing that both types of firms benefit from convict labor employment. Wage reductions and the replacement of free labor by convict labor in elite firms drive free laborers toward regular firms, thereby increasing the physical labor intensity of these firms.[5] Furthermore, convict labor capacity increase leads to reduced industry employment share as free workers migrate to an alternative industry. Finally, the model shows that convict labor intensifies unionization and strike activities among free laborers due to its wage-

[4]An elite firm, due to its political connections, can access low-cost convict labor, whereas regular firms solely employ free labor (Gildemeister, 1977; McKelvey, 1934).

[5]This finding suggests that by increasing firms' labor intensity, convict labor might have delayed technological advancement in the South.

suppressing effects. Calibration of the model produces moments that closely match those in the data. Moreover, this calibration reveals a novel finding where unions contribute to an increase in Black–white wage inequality.

To empirically investigate this relationship, I digitize the Bureau of Labor Reports from 1886 to 1940 for the first time, measuring the extent of convict labor employment across counties to assess its impact on union formation. To address potential unobserved factors that could affect the usage of convict labor and the formation of unions, I use an instrumental variable estimation method in the analysis. In this approach, I use the locations and capacities of prisons constructed before the introduction of convict labor as instruments for exposure to convict labor. I establish that pre-existing prison locations and capacities positively correlate with the number of convict laborers after enacting convict-labor laws.

The instrument's validity relies on the critical assumption that the influence of prisons built before the era of convict labor and their capacities on union formation is solely due to their subsequent effect on convict labor usage. To establish the credibility of this assumption, I provide evidence demonstrating that exposure to pre-convict-labor locations and capacities does not correlate with changes in union formation before convict labor's introduction, indicating that the instruments are not associated with pre-existing trends. Additionally, I demonstrate no connection between these prisons and labor market outcomes before the implementation of convict-labor laws, dispelling concerns that these prisons directly affected local labor markets. Supplementary analyses further reinforce the instrument's validity.

Analyses indicate that a 10% increase in the convict labor share, on average, leads to a 9.5% increase in union assemblies and a 16% rise in strikes between 1886-1905. This surge in convict labor had profound implications for union activity. Not only did it lead to a significant increase in the number of active unions, but it also boosted their longevity. The rise in the establishment of new union assemblies further emphasizes this trend. In essence, as convict labor became more prevalent, the number of new unions grew and their longevity extended. The ripple effect of this dynamic interaction persists;

counties with a historically 10% higher prevalence of convict laborers still witness a 2.2% higher union membership today. This finding, documented for the first time in this paper, highlights the deep-rooted influence of convict labor on the institutional development of unions.

In addition, convict labor has a pronounced impact on local economies, notably affecting the working conditions of free laborers in areas with high convict labor presence. Empirical findings reveal a decline in per-worker wage growth, reduced growth in employment share, increased manufacturing output value and gross profits, and heightened capital-labor cost ratio in their manufacturing industries, aligning with the model's predictions. The escalating disparity between free laborer wages and firm profits confirms the assertions of Alston and Ferrie (1993, 1999) and Althoff and Reichardt (2022) that the American South's oppressive institutions predominantly served the elite's interests. I further explore the dynamics in industries directly in competition with convict labor. Such industries increase their capital-to-labor cost ratios and experience a more pronounced decline in average manufacturing wage growth, which intensifies union activities.

The primary factor driving these results is labor market competition. Convict labor depresses wages, compelling wage workers to unite. Supporting this mechanism, counties without unions experience a statistically significant decrease in average manufacturing wage growth following an increase in convict labor. However, this wage growth does not show a statistically significant change in counties with active unions. A further mechanism is the role of convict labor in fostering employment in crafts and operative roles, which were historically easier to unionize.[6] Nevertheless, this shift towards craftsmen and operative roles is less pronounced in areas with active unions, as unions mitigate wage cuts for laborers.

The calibrated model shows that first unions in the Southern United States may have increased the wage inequality between Black and unionized white workers. It finds that the first Southern unions raised this inequality by 6%.

[6]Unionizing within these occupations in the U.S. was more straightforward, and by the late 19th century, trade unions were well-established in these fields (Friedman, 1998, 1999).

To the best of my knowledge, this is the first paper to highlight a union's potential negative effect on wage equality. Furthermore, this paper presents a fresh perspective on racial segregation in the United States, a persistent issue rooted deeply in the country's post-Civil War history. It emphasizes the substantial damage inflicted by the convict labor system, shedding light on its role in aggravating the conditions for Black convict laborers and inadvertently deteriorating the labor market for white individuals. This system fuelled union formation as a protest against Black convict labor, reinforcing enduring racial divisions and suggesting contemporary U.S. segregation issues may have origins in this historical context.

Related Literature. This paper is the first in the literature to quantify the impact of convict labor on union formation, contributing to several strands of economic literature. I build upon the existing literature on coercive institutions, including studies on the lasting impacts of forced labor (Dell, 2010; Nunn and Wantchekon, 2011; Lowes and Montero, 2016), and its consequences for institutional development (Nunn, 2008; Acemoglu et al., 2012; Buggle and Nafziger, 2021). This paper extends this research by exploring the previously unexplored relationship between convict labor and union formation. While Acemoglu et al. (2001) argues that skilled workers might depart from unions with technological advancement and rising non-union wages, this paper counters that their leverage for better wages and working conditions diminishes when competing with convict labor. Moreover, it features the lasting path dependence of union membership in these labor markets, even post-era of convict labor. This underscores the lasting impact of historical institutional choices on today's labor market outcomes and institutional development. I enrich this literature by establishing the first causal link between convict labor and unions' rise and enduring presence.

This paper's findings contribute to the literature on labor unions and their effects in several key aspects. First, despite the extensive literature on labor unions, the history of the American labor movement has received less attention. My work bridges this gap, building on studies like Bernstein (1954); Commons et al. (1918); Foner (1978); Friedman (1999); Naidu and Yuchtman (2016);

Schmick (2018); Taft (1964). It offers the first comprehensive theoretical and empirical evidence of a crucial factor driving the formation and development of labor unions. Second, this paper adds to the debate on the drivers of inequality, emphasizing how companies' ability to access low-cost coerced labor contributes to this issue (Card et al., 2013; Song et al., 2019; Autor et al., 2020). Third, it contributes to the debate on the impact of unions in reducing inequality. While the consensus in existing literature suggests that unions generally enhance worker conditions (Card, 2001; Collins and Niemesh, 2019; Farber et al., 2021), there are exceptions. For instance, Alder et al. (2023) highlights how labor unions and strikes can contribute to the decline of the Rust Belt. DiNardo and Lee (2004) indicates that U.S. unions have failed to substantially increase wages during 1984–1999. This paper provides novel evidence that first Southern U.S. unions widened wage inequality between Black and unionized white workers. To the best of my knowledge, this is the first evidence of unions' specific effect on exacerbating wage inequality.

Finally, this paper pioneers an examination of the impact of convict labor on the emergence of labor unions, expanding upon the literature on post-slavery prisoner employment. While a study by Rubio (2022) addresses the racial disparity in incarceration rates and Poyker (2019) studies the short-term economic consequences of prison-made products, this paper emphasizes the broader and enduring influence of convict labor on laborers' strategies and organization. Furthermore, Archibong and Obikili (2020) explores the implications of labor demand shocks on incarceration rates, underlining the value of prison labor to colonial Nigeria's exploitative system. In parallel, I determine that as a post-slavery coercive institution, convict labor predominantly favors the elites at the expense of the working class.

The paper is structured as follows: Section 2 provides the institutional context, Section 3 covers the data and stylized facts, Section 4 introduces the model, Section 5 details the identification strategy and reports convict labor's effects on union formation and the labor market, Section 6 discusses model calibration and unions' role in inequality, and Section 7 concludes.

2 Institutional Context

2.1 Southern Labor Market and Mobility Restrictions

The 13th Amendment to the U.S. Constitution, ratified in 1865, officially abolished slavery nationwide. With emancipation, former slaves controlled their own labor value, posing a challenge for former enslavers and farm owners. Planters, accustomed to the stability of slave labor, found themselves unprepared for the dynamic labor competition that emerged after emancipation (Naidu, 2010). They could no longer count on guaranteed labor during the pivotal planting and harvest times, so they sought ways to secure a steady labor force, often through labor mobility restrictions (Reid, 1973).

The Southern legal framework was instrumental in reinforcing labor mobility restrictions through four key legislative tools. The enticement laws prevented employers from luring workers away from existing contracts, while the contract-enforcement laws ensured that once a labor contract was signed, its terms were strictly followed. The vagrancy laws were designed to deter Black individuals from withdrawing from the labor force. Concluding the set of measures was the convict-labor system, serving as a punitive measure against Black individuals who violated these or other associated rules (Roback, 1984).[7]

In the Southern agricultural sector, some labor mobility persisted despite restrictive laws. However, limited job opportunities outside agriculture posed greater challenges for Black labor mobility (Wright, 2013). Segregation was pervasive in southern industries, even without legal mandates. For example, among thousands of male telegraph operators in states like Florida, Georgia, and Louisiana, none were Black. Similarly, of nearly 15,000 locomotive operators, fewer than 50 were Black, and only four out of 5,600 loom fixers identified as Black (U.S. Bureau of the Census, 1933). The southern textile industries, employing many convict laborers, remained predominantly white for over a century. In South Carolina, for example, Black workers constituted a mere 5% of the workforce until the Civil Rights movement, restricted to manual labor

[7]For detailed information on Jim Crow laws, see Online Appendix Section F.

roles. This indicates that the integration of Black labor into the industrial workforce lagged nearly a century behind emancipation.

2.2 Convict Labor in the United States

The 13th Amendment's provision for slavery or involuntary servitude as a punishment for crime led to the creation of the "Black Codes," local laws and institutions designed to limit the freedom and economic opportunities of free Black people. Black people could be imprisoned for vagrancy or other petty offenses. The imprisonment of Black people provided former enslavers with a way to continue to use cheap labor. This aligns with the theory that Southern elites sought to maintain control through alternative means after losing their political power (Acemoglu and Robinson, 2008). Over time, convict labor also became a significant source of income for state governments.

The use of convict labor grew after the formation of the National Prison Association in 1870. It was widely adopted in almost all states by the end of President Rutherford Hayes' term in 1881 (Wines, 1871). In 1870, approximately 10.6% (3,500 out of 32,901) of the nation's prisoners worked as convict laborers, all located in New York. By 1886, this number had significantly risen to 50,000 prisoners working in the convict labor system.[8]

Laws regarding prisoner labor varied in terms of profitability for the state and other parties involved and the working conditions for prisoners. For example, in Southern states, prisoners worked 16 hours a day, while in the North, the workday was limited to 8 hours. The U.S. Commissioner of Labor reported that prison labor was significantly cheaper than other forms of labor, estimated to be only 19% of the cost of free labor (U.S. Bureau of Labor, 1886, 1906, 1925). As a result, convict labor became a lucrative source of income for state governments, with prisoners working long hours under different systems such as contract, piece-price, state-account, state-use, public-works systems, and convict leasing.[9]

[8]Online Appendix Figure C1 depicts the prison labor utilization from 1870 to 1940 in the Southern United States.

[9]For detailed information on these systems, see Online Appendix Section E.

The convict lease system was widely adopted in the Southern states after the American Civil War and persisted well into the 20th century. Under this system, convicts were rented out to private companies, which were given complete control over the prisoners, including responsibilities for guarding, feeding, and disciplining them. Convict leasing was considered the most profitable form of convict labor for the Southern states (U.S. Bureau of Labor, 1886, 1914).[10] However, convicts were also contracted out to private firms under contract and piece price systems.

As a significant portion of the workforce, the convicts typically worked without pay. The inexpensive nature of prison labor pressured free workers and boosted business profitability. This reliance on prison labor threatened free workers by driving down their wages. Therefore, the relationship between convict labor and free labor competition became increasingly relevant at the end of the 19th century (Mohler, 1925).

2.3 Origins of the American Labor Movement

In the 19th century, American labor unionism emerged, with the Knights of Labor (KOL) becoming the third national labor federation in the United States.[11] While it shared similarities with previous federations, such as the emphasis on political action and independent producers, the Knights differentiated itself by including a broader range of workers. The Knights were the leading labor society of the 1880s, reaching its peak with a fifth of the workforce in 1886 (Friedman, 1988; Voss, 1993). In the aftermath of the Haymarket Affair, the organized labor movement transformed with the rapid decline of the Knights.[12]

Samuel Gompers founded the American Federation of Labor (AFL) in December 1886, consisting of conservative craft unions prioritizing workplace is-

[10] For instance, in 1910, Florida alone secured $346,000 ($10,896,086 in 2023) net profits from the convict lease system (Mohler, 1925).

[11] The National Trades' Union, the U.S.'s first labor federation founded in 1834, collapsed in the 1837 financial crisis. In contrast, the National Labor Union, established in 1866, aimed to unite local trade unions but dissolved by 1873 due to unmet goals.

[12] The Haymarket Affair, a bombing in Chicago on May 4, 1886, occurred during a rally for an 8-hour work day, following deadly violence at McCormick Harvesting Machine Company.

sues over social reform. The formation of the AFL was driven by the discontent of several trade union leaders with the Knights, which had a significant presence in major strikes and comprised multiple trade unions. The AFL quickly became the dominant American labor movement (Mohler, 1925). However, the AFL-CIO currently represents a smaller percentage of American workers compared to the Knights of Labor in 1886, when as many as 20% of all workers were affiliated with the Knights of Labor (Kaufman, 2001).[13]

Throughout this period, one of the biggest challenges free labor faced was competition with convict labor, as it burdens their wages and job security. In the words of one union representative, "The prison labor system has unquestionably been the means of lowering the wage rate for thousands of wage-earners, and in some instances, its competition has practically driven an industry from the field. It is because of this competition and for humanitarian reasons that trade unions have been opposed to its existence" (Frey, 1913). During that period, free laborers grappled with rising merchant capitalists who aimed to cut costs, especially labor wages, using cheap prison labor. This reliance on convict labor posed an economic challenge for free laborers. They saw it as not only threatening their livelihoods but also as the government's abuse of trust. Consequently, free labor sought to limit the impact of convict labor on fair competition by restricting their employment (Mohler, 1925).

Qualitative evidence suggests that labor unions advocated protecting the rights and wages of free workers by supporting restrictions on convict labor and working to ensure fair wages and conditions for the free workers. Specifically, the Knights made a strong statement against convict competition at their 1886 assembly in Richmond, where they called for states to enact laws limiting the employment of convicts. The Knights' demands also included preventing the shipment of prison-made goods, branding such goods, limiting convicts' access to powerful machinery, abolishing the contract, lease, and piece-price systems. Their aim was to shield free labor from this unfair competition (U.S. Bureau of Labor, 1886). The preamble of the KOL "declared to the world" that its

[13]The AFL-CIO is the largest union federation in the United States today, representing over 12 million members, which is approximately 7% of the country's labor force.

main objective is "to prohibit the hiring out of convict labor" (Ely, 1886). The AFL also aimed to unify the efforts of free labor and direct the campaign against convict competition (American Federation of Labor, 1890, 1897). They staunchly opposed the contract and lease systems, initiating state and national campaigns against these practices via their legislative committees.

3 Data and Stylized Facts

3.1 Novel Data on Convict Labor in the U.S.

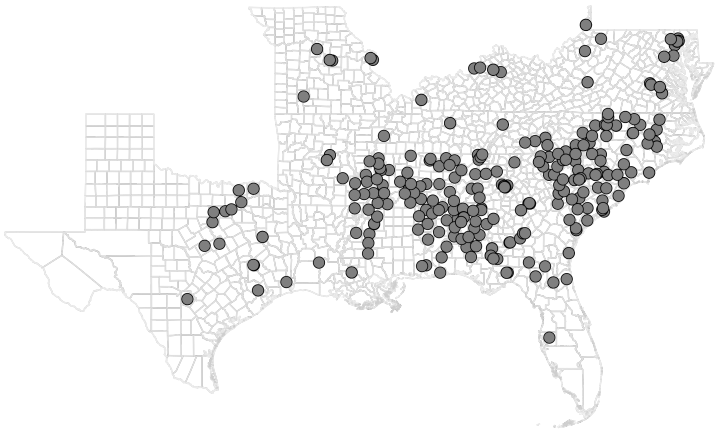
To investigate empirically the effect of convict labor on the formation of first labor unions, I gathered data from several sources. First is a series of reports published by the U.S. Bureau of Labor on convict labor. To tackle the debate over convict and free labor competition, the Bureau of Labor surveyed penal institutions roughly every decade, producing reports on convict labor that detailed prisoner employment numbers and U.S. correctional facility outputs. Bureau of Labor staff conducted on-site surveys using prisons' accounting records. The data encompassed various penal institutions, from prisons and labor camps to juvenile reformatories and county jails employing prisoners. It also detailed the prison's name, location, employment practices, and inmate breakdown by gender and responsibilities.

I digitized seven Bureau of Labor reports from 1886, 1895, 1905, 1914, 1923, 1932, and 1940.[14] Notably, my paper is the first to digitize this dataset comprehensively. I first geographically map all prisons and labor camps from the data.[15] Then, I link all facilities across the years to their 1880 counties using their geographic coordinates. In counties with multiple prisons, I aggregated the convict numbers. The data lack specific industry codes but do include the types of goods produced. I attribute two-digit Standard Industrial

[14]Post the 1941 convict labor abolition, the Bureau stopped collecting data. Despite collecting data from these seven reports, I focus my analysis on 1886-1905 due to the outcome variable data constraints.

[15]I initially identified prisons using historical documents for current/historical addresses and then sourced GPS coordinates from Google Maps.

Figure 1. Geographic Distribution of Convict Labor Prisons



Note: The figure is generated using data from the Bureau of Labor reports spanning the years 1886, 1895, 1905, 1914, 1923, 1932, and 1940. Each dot in the figure represents a prison in this time frame.

Classification (SIC) codes to each item based on the 1987 SIC System, then aggregate the values to generate industry-level output.[16] Convict labor was used across various industries, significantly focusing on manufacturing.[17]

The analysis concentrates on the Southern states where convict labor was most prevalent following the Civil War.[18] Figure 1 shows the geographic distribution of convict labor prisons in the Southern U.S. The data encompass 266 correctional facilities employing convict labor and details nearly 700,000 employed convicts for the available years. [19]

3.2 KOL Assemblies, Strikes, and Membership

The outcome variables of interest that I utilize to measure union formation are (i) the number of Knights of Labor assemblies, (ii) union membership, and (iii) the number of strikes. I use data on the Knights of Labor assem-

[16] All dollar amounts are normalized to 1880 dollars.

[17] Online Appendix Figure C2 details industry-wise convict labor totals, 1886-1940.

[18] The Southern states include Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

[19] Online Appendix Figure C3 shows average convict counts per prison, 1886-1940.

blies from 1869-1919 from Garlock (1982) and Garlock (1984). Garlock (1982, 1984) sourced information on the Knights of Labor's local assemblies from the Journal of United Labor and General Assembly proceedings. These data reveal the location, operation years, and some membership stats.[20] I geocoded assembly locations to 1880 counties and tallied the assemblies per county annually.[21] The Online Appendix Figure C4 displays the local Knights of Labor assemblies' spatial distribution in the southern United States. The data cover more than 6,600 assemblies across 472 counties.

I utilize strike data from the *Third Annual Report of the Commissioner of Labor* (U.S. Bureau of Labor, 1888) and the *Tenth Annual Report of the Commissioner of Labor* (U.S. Bureau of Labor, 1896). The *Third Report*, a second nationwide strike survey, covers 1881-1886, while the *Tenth Report* spans 1886-1894. The Bureau of Labor sourced these data from trade journals, newspapers, and direct on-site visits, interacting with managers, workers, and union officers. This rich dataset details each strike's location, industry, dates, causes, outcomes, union involvement, and worker impact—like occupation, wages, and affected worker numbers. It also provides establishment information, such as size, wages, working hours, closures, and financial losses. The report further breaks down pre- and post-conflict employment, wage, and work-hour data by gender.[22] I geocoded the strike locations by their 1880 counties and tallied the annual cumulative strikes per county. The data, merged with prison information based on report year and county, covers approximately 1,400 strikes across 172 counties in the southern United States from 1881 to 1894.[23]

[20]Local chapters regularly reported membership, summarized annually (Kaufman, 2001).

[21]Data gaps on assemblies post-1919 and missing convict employment data from 1914 restrict my analysis to Bureau of Labor reports from 1886-1905.

[22]The Tenth Report lacks wage data and differs in observation unit from the Third. Later reports only offer aggregate data, which I omit.

[23]See Online Appendix Figure C5 for the geographical distribution of these strikes.

3.3 Other Data Sources

The 2020 U.S. labor union membership data comes from SimplyAnalytics, derived from the MRI-Simmons LOCAL consumer survey.[24] This survey assesses American consumer behaviors, including labor union memberships. MRI-Simmons then refines the data using geo-behavioral modeling to estimate union memberships by county. I merge this with their respective 1880 counties using an 1880-2010 FIPS code crosswalk (Eckert et al., 2020) and combine it with prison data based on 1880 county boundaries.

The set of control variables are obtained from the decennial Census records from the Integrated Public Use Microdata Series and the Historical, Demographic, Economic, and Social Data (Haines et al., 2005). The county-level data on manufacturing wage growth, employment share, capital-labor cost share, output, profits, and the agricultural sector come from the ICPSR 2896 (Haines et al., 2005). For calculating migration outcomes, I utilize the linked full-count census (Helgertz et al., 2023; Ruggles et al., 2021). To quantify the shift in labor distribution, I use the linked full-count census data, focusing on the occupation variable (Helgertz et al., 2023; Ruggles et al., 2021). The data for the county-level vote shares in presidential elections are from ICPSR 08611 (Clubb et al., 1987). The Online Appendix Section B details the remaining data and the construction of variables.

3.4 Stylized Facts

The implementation of convict labor intensified the competition within the local labor market, which could potentially have a negative impact on the overall demand for industry labor. Hiring out of convict labor was a privilege exclusive to elite firms with political connections (Gildemeister, 1977; McKelvey, 1934).[25] These connected firms gained a competitive edge by exploiting

[24] I am utilizing 2020 data due to the absence of county-level union data from the Bureau of Labor Statistics. Currently, I am in the process of digitizing historical records from the AFL archives, which include details about the location and industry of unions up to 2020.

[25] In political and sociological theory, the elite refers to a small, influential group wielding disproportionate political power.

the cost-efficient convict labor, which was cheaper than free labor as there was no obligation to pay inmates. This competition often forced regular firms to lower wages (U.S. Bureau of Labor, 1925). As a result, the equilibrium wages for labor across all firms have experienced a downturn, as formalized by my general equilibrium model discussed in Section 4.

Later in Section 5.4.3, I show that the introduction of convict labor did not significantly impact local labor supply, as migration trends remained unaffected, neither attracting nor driving away residents.[26] However, with the introduction of convict labor, there was a decline in labor demand, while supply remained unchanged (as indicated by the lack of migration). Consequently, this dynamic applied a downward force on the per-worker local wage.

I start by examining the link between convict labor and local economies. Upon the introduction of convict labor, I observe a decline in the average wage and manufacturing employment growth, focusing on the southern parts of the United States that heavily relied on this type of labor. This change is paralleled by a rise in the formation of unions within these counties, a sign of escalating labor unrest. I present the details of these stylized facts next.

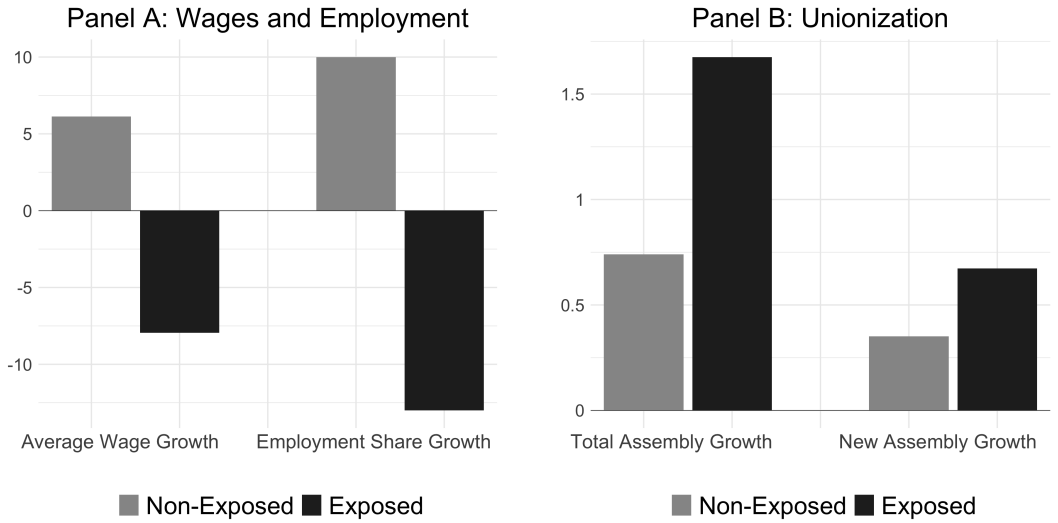
3.4.1 Wages and Employment Share

The primary catalyst driving the research outlined in this paper is the observation that the Southern United States experienced a continuous decrease in labor demand following the implementation of convict labor laws. This systemic shift reverberated throughout the economy, leading to depressed average wage growth. Simultaneously, these regions experienced a decline in the manufacturing employment share. Figure 2 demonstrates this interplay, mapping the cross-sectional expansion of convict labor alongside trends in average wage growth and employment share growth.

Panel A of Figure 2 illustrates the trends in average wage growth and employment share growth in the Southern United States manufacturing industries. The figure focuses on two key regions: the Exposed South (in black),

[26] Online Appendix Table 42 confirms that migration trends remained stable, unaffected by convict labor.

Figure 2. Post-Legislation Growth: Average Wages, Employment Share, Total and New Knights of Labor Assemblies



Note: The figure shows growth in average wages, employment share, and total and new Knights of Labor Assemblies post-convict labor introduction (1880), compared to their level before slavery's abolishment (1860). Panel A, using data from ICPSR 2896 (Haines et al., 2005), shows average wage (Bars 1-2) and employment share (Bars 3-4) growth post-convict labor legislation in Exposed and Non-Exposed counties. Panel B, using data from Garlock (1982, 1984), presents growth rates of total (Bars 1-2) and new (Bars 3-4) assemblies post vs. pre-convict-labor in Exposed and Non-Exposed counties of the Southern U.S.

where industries faced competition from convict labor, and the Non-Exposed South (in gray), unaffected by such competition. After the introduction of convict labor, the Exposed South experienced a 10% decline in average manufacturing wage growth from its pre-legislation levels. In contrast, the Non-Exposed South saw over a 5% rise. This trend hints at a correlation between diminished wage growth and the onset of convict labor in exposed counties. Regarding employment share growth, the Exposed South witnessed a significant decline, while the Non-Exposed South experienced an increase post-legislation.

Collectively, these trends show that the introduction of convict labor paralleled a marked shift in the local labor market dynamics of Southern United States counties affected by this competitive labor market shift.

3.4.2 Union Formation

Next, I will depict the patterns related to labor discord and the progression of unionization in the United States. Panel B of Figure 2 shows the escalation in the quantity of total and newly formed Knights of Labor assemblies (per 100,000 of the population) mapped across the era of convict labor implementation. It distinguishes between the Exposed South, where industries contended with convict labor, and the Non-Exposed South, which remained unaffected. Post-legislation, the Exposed South saw over double the growth in total KOL assemblies and new assemblies compared to Non-Exposed counties. This indicates that the introduction of convict labor laws paralleled a surge in union formation, particularly in areas of the South competing with convict labor.

During this period, labor unions, especially the Knights of Labor, played a pivotal role in orchestrating strikes, thereby underlining the intricate connection between these organizations and collective labor actions. As the most prominent union of the time, the Knights helmed most of these protests, emphasizing their central role in mobilizing labor forces (Bittarello, 2019).

4 A Model of Convict Labor and Unions

To formalize the effect of convict labor on labor market outcomes and unionization, I introduce a novel general equilibrium framework capturing the labor market impacts of convict labor. I construct a dual-industry model in which the main industry utilizes convict labor, while the alternative industry operates without it. In the main industry, there are two firms with two types of labor wherein convict labor is employed within one of these firms, referred to as the elite firms.[27] The model reveals that an increase in convict laborers leads to lower wages for free laborers, a reallocation of free laborers from elite

[27] I employ a two-firm framework within the main industry to underscore labor reallocation and to show that firms unable to use convict labor also benefit from this policy. Given the Census data indicating multiple firms in a county during this period, this model effectively represents both firm types within a county. For insights into a representative firm, one can examine the elite firm component of the model; when isolated, it provides predictions of a representative firm.

to regular firms and from the main industry to the alternative industry, along with an increase in union and strike activities. This model's broad framework is robust to general firm-type distribution for elite and regular firms and the free workers' endogenous labor supply.[28]

4.1 Convict and Free Labor

This paper examines an era in the Southern U.S. when "black codes" led to Black individuals constituting most convict labor while white individuals dominated free labor. These coercive local laws and institutions allowed former slaveholders to exploit imprisoned Black individuals as a source of cheap labor. Consequently, these coercive laws segregated the two labor groups and prohibited unionization among convict laborers (Hiller, 1914).[29]

During the period in question, convict labor is a limited resource—there are no convicts in prisons who are not contributing labor (U.S. Bureau of Labor, 1886). This introduces a stringent capacity constraint, and any exogenous increase in prison capacity may significantly impact the wages of free labor and stimulate union formation, among other effects. The model's introduction of this capacity constraint represents a novel approach to understanding convict labor employment during this period. In terms of compensation, convict laborers do not receive salary payments, denoted as $w_c = 0$ in the model. On the contrary, free labor in the main industry receives a wage denoted by $w_f > 0$, while those in the alternative industry earn $w_a > 0$. Before the introduction of convict labor, it is assumed that the wage relationship $w_f > w_a$ is in effect.

The model posits that convict and free laborers are perfect substitutes, an assumption supported by Bureau of Labor reports (U.S. Bureau of Labor,

[28] In the model's extension with endogenous labor supply, a wage reduction decreases free labor supply. This indicates that convict labor lowers both the equilibrium wage rate and work hours of free labor. For additional details, refer to the Online Appendix Section A.2. Refer to the Online Appendix Section A.1 for detailed proofs pertaining to the model section.

[29] As explained in Section 2.1, restrictive laws and limited opportunities hindered Black labor mobility, with many industries, like manufacturing, remaining predominantly white. Thus, the model omits a free Black labor force in the main industry, acknowledging their limited representation even a century post-emancipation, while allowing for their employment in the alternative industry.

1886, 1925). These reports indicate that employers could use convict labor in any role generally occupied by free labor. Nevertheless, there may be concerns about specific tasks where convict labor does not perfectly substitute free labor. To address this, in the Online Appendix Section A.3, I introduce a constant elasticity of substitution model, theoretically and empirically exploring this case. The findings from this model qualitatively align with the predictions of the model presented here.

4.2 Elite and Regular Firms

There are two types of firms: elite and regular. Elite firms employ both types of workers—convict and free labor— while regular firms only hire free labor.[30] Both types of firms produce a homogeneous product without quality differentiation and compete in the labor market.

The elite firm's (e) production function is:

$$y_e = z_e(\lambda h_{c,e} + h_{f,e})^{\alpha} k_e^{\beta}, \tag{1}$$

where y_e is the output of the elite firm and $\alpha + \beta < 1$. The elite firm hires $h_{c,e}$ units of convict labor and $h_{f,e}$ units of free labor and acquires capital in the measure of k_e. The total factor productivity of the elite firm is denoted by z_e. The model permits the potential for productivity disparity between free and convict laborers through the λ multiplier preceding $h_{c,e}$. The elite firm independently determines the quantity of each labor type to employ and the capital to procure. The number of convict laborers hired, $h_{c,e}$, is subject to a capacity constraint $h_{c,e} \leq \bar{h}$. As the wage rate for convict labor is zero, the elite firm's convict labor capacity constraint always binds, i.e., $h_{c,e} = \bar{h}$.[31]

[30] An elite firm is one with political connections that grant access to low-cost convict labor.

[31] I assume $w_c = 0$ without loss of generality. If $w_c = c$, the convict labor capacity constraint of the elite firm still binds as long as c is sufficiently small. In this case, the total labor cost of the elite firm would become $c\bar{h}$, and the optimization program would remain unaltered since $c\bar{h}$ is a constant lump sum. The Bureau of Labor reports (U.S. Bureau of Labor, 1886, 1925) implies that the unit convict labor costs (w_c) were sufficiently small by that time, such that convict labor supply was employed in production to its full extent.

The regular firm's (r) production function is:

$$y_r = z_r h_{f,r}^{\alpha} k_r^{\beta} \tag{2}$$

where y_r is the output of the regular firm and $\alpha + \beta < 1$. The regular firm hires $h_{f,r}$ units of free labor and acquires capital in the measure of k_r. The total factor productivity of the regular firm is denoted by z_r.

Wages of free labor, w, will be determined endogenously in general equilibrium. Rental rate $r > 0$ of capital is exogenous, with full depreciation of capital. Solving the maximization problem of the elite firm, demands for $h_{f,e}$ and k_e become:

$$h_{f,e} = \left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} - \lambda\bar{h} \tag{3}$$

$$k_e = \left(\frac{r}{\beta}\right)^{\frac{\alpha-1}{1-\alpha-\beta}} \left(\frac{\alpha}{w}\right)^{\frac{\alpha}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} \tag{4}$$

By solving the optimization problem for the regular firm, the demands for $h_{f,r}$ and k_r are derived as:

$$h_{f,r} = \left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \tag{5}$$

$$k_r = \left(\frac{r}{\beta}\right)^{\frac{\alpha-1}{1-\alpha-\beta}} \left(\frac{\alpha}{w}\right)^{\frac{\alpha}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \tag{6}$$

4.3 Alternative Industry

The alternative industry in the economy has a representative firm. This firm does not utilize convict labor, and its free labor workforce is non-unionized.

The alternative firm's, denoted by a, production function is:

$$y_a = Al \tag{7}$$

where y_a is the output of the representative firm in this alternative industry. The alternative firm hires l units of free labor, and does not acquire capital.

The total factor productivity of the alternative firm is denoted by A.

4.4 Households and General Equilibrium Wages

There are N households in the economy whose total labor supply equals $\bar{H}$, and they inelastically supply their labor services for the elite and regular firms and the alternative firm.[32] The total demand for free labor is expressed as $h_{f,e}+h_{f,r}+h_a$, where $h_a = l-l_a$. Here, l_a denotes the existing workforce in the alternative firm, and h_a represents those who shift from the main industry as a result of convict labor employment. The general equilibrium of the economy is determined by:

$$\bar{H} = \left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right) - \lambda\bar{h} + h_a, \tag{8}$$

which characterizes the equilibrium wage:

$$w = \alpha \left(\frac{\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)}{\bar{H} + \lambda\bar{h} - h_a} \right)^{\frac{1-\alpha-\beta}{1-\beta}} . \tag{9}$$

Equation (9) shows that an increase in the capacity constraint for convict labor results in a corresponding decrease in the wages of free labor $\left(\frac{\partial w}{\partial \bar{h}} < 0\right)$. Furthermore, when $\bar{h}$ is sufficiently large, the productivity of convict labor and its capacity become strategic complements. As a result, enhancing convict labor productivity further depresses equilibrium wage level $\left(\frac{\partial^2 w}{\partial \bar{h}\partial\lambda} > 0\right)$. This leads to the following proposition:

Proposition 1: *Increasing the capacity constraint of convict labor reduces the equilibrium wage rate. Furthermore, if $\bar{h}$ exceeds a threshold $\bar{h}^*$, an increase in λ further lowers the equilibrium wage rate.*

[32] In Section A.2.2, I relax this assumption to permit endogenous labor supply. In this extension, a wage reduction due to convict labor decreases the free labor supply, lowering equilibrium wage and work hours.

Furthermore, as the equilibrium wage rate decreases and ultimately equals w_a, the employment share in the main industry will decrease. Let us redefine the total demand for free labor, $h_{f,e} + h_{f,r} + h_a = \bar{H}$, as $\bar{H} = \gamma\bar{H} + (1 - \gamma)\bar{H}$, where $h_{f,e} + h_{f,r} = \gamma\bar{H}$ and $h_a = (1 - \gamma)\bar{H}$. In this formulation, γ denotes the employment share in the main industry. The employment share is characterized by the following equation when $w = w_a$:

$$\gamma = \frac{\left(\frac{\alpha}{A}\right)^{\frac{1-\beta}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right) - \lambda\bar{h}}{\bar{H}} \tag{10}$$

Equation (10) shows that, when $w = w_a$, an increase in the capacity constraint for convict labor leads to a decline in the main industry's employment share. This results in the subsequent proposition:

Proposition 2: *Increasing convict labor's capacity constraint reduces the main industry's employment share.*

4.5 Labor Reallocation and Profits

A direct implication of equations (4) and (6) is that a decline in wages is associated with an increased demand for capital across all firms. However, diminishing wages for free labor and elite firms employing convict labor reallocates free laborers from elite to regular firms. The physical capital intensity of the regular firm:

$$\frac{k_r}{h_{f,r}} = \left(\frac{\beta}{r}\right)\left(\frac{w}{\alpha}\right), \tag{11}$$

decreases in equilibrium with the capacity constraint of convict labor, i.e., $\frac{\partial \frac{k_r}{h_{f,r}}}{\partial \bar{h}} < 0$. This decrease aligns with the reduced wage rate of free labor tied to the growing capacity of convict labor. Based on this, I formalize the following:

Proposition 3: *Increasing the capacity constraint for convict labor causes*

a reallocation of free labor from the elite to the regular firm and reduces the regular firm's physical capital intensity.

As the capacity for convict labor expands and equilibrium wages decrease, it is reasonable to anticipate a corresponding impact on firms' profits. The profits of the elite firm are given by:

$$\Pi_e = \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(\frac{r}{\beta}(1-\alpha-\beta)\right) + \alpha\lambda\bar{h}\left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{1-\alpha-\beta}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{1-\beta}}. \quad (12)$$

The capacity constraint of convict labor positively influences the equilibrium profits of the elite firm, i.e., $\frac{\partial \Pi_e}{\partial h} > 0$, because the elite firm can access convict labor input at no cost.

The profits of the regular firm are given by:

$$\Pi_r = \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(\frac{r}{\beta}(1-\alpha-\beta)\right). \quad (13)$$

The equilibrium profits of the regular firm increase with the capacity constraint of convict labor, i.e., $\frac{\partial \Pi_r}{\partial h} > 0$. This occurs as free labor shifts from the elite firm to the regular one due to the elite's advantage of accessing convict labor without incurring any costs. This gives rise to the ensuing proposition:

Proposition 4: *An increase in the capacity for convict labor increases profits for both elite and regular firms.*

This rise in firm profits, captured by my model, formalizes the argument why convict labor found such a high demand by elite firm owners and overall support by all firm owners, including those who do not hire convicts, in counties where convict labor became available. The model suggests that regular firm owners also benefited from convict labor due to reduced free labor wages and

the general equilibrium reallocation of free labor from elite firms.

The labor reallocation dynamic in my model parallels that of Hubmer and Restrepo (2022). The authors find that larger firms automate more, reducing the overall labor share. Consequently, the median firm sees a rise in labor share due to workers migrating from large to median firms. In this model, elite firms replace free labor with convict labor – free labor shifts to regular firms as wages decline, amplifying their labor intensity. The key distinction from Hubmer and Restrepo (2022) lies in the underlying substitution mechanism: while Hubmer and Restrepo (2022) focus on labor substitution with capital, my model emphasizes the substitution of free labor with convict labor.

4.6 Capital-Labor Cost Ratio

Next, I explore the effects of convict labor on the capital-labor cost ratio, assessing its impact across the entire county, encompassing elite and regular firms. The capital-to-labor cost ratio for the county is denoted as $CI \equiv \frac{rk_e+rk_r}{w_f\gamma\bar{H}+w_c\bar{h}}$. Since $w_c = 0$, the ratio simplifies to:

$$CI \equiv \frac{rk_e + rk_r}{w\gamma\bar{H}}. \tag{14}$$

The capital-to-labor cost ratio rises with the capacity constraint of convict labor, as both k_e and k_r are increasing in $\bar{h}$, and γw is decreasing in $\bar{h}$. The underlying rationale is that increased capital demand by all firms in a county raises total capital costs, while fixed free labor supply and falling wages lower overall labor costs. Drawing from this, I formalize:

Proposition 5: *A rise in convict labor capacity increases the capital-to-labor cost ratio throughout the region.*

4.7 Union Membership and Strikes

Suppose that N households, whose inelastic labor supply adds up to $\bar{H}$, are able to address their collective action problem by investing a total amount

J to establish a union. This union offers free laborers of an elite firm the opportunity to initiate a strike at the beginning of a production cycle against the hiring of convict laborers, which will also be supported by a strike by free laborers at the regular firm — as their wage rate also falls due to the hiring of convicts at the elite firm. It compels the elite firm to curtail convict labor employment to zero with some probability. Should the strike succeed, the value or benefit (Ω) accrued by the employee is as follows. I now write $w(h)$ to emphasize the dependence of the equilibrium wage on the capacity constraint:

$$\Omega = \left(w(h_c = 0) - \gamma w(h_c = \bar{h})\right) \bar{H}, \tag{15}$$

and this value determines the free laborer's willingness to coordinate and pay the joint unionization cost J.[33] A clear insight from equation (15) suggests that as $\bar{h}$ grows, the likelihood of joining the union also rises. This is because the wage gap, $w(h_c = 0) - w(h_c = \bar{h})$ is increasing in $\bar{h}$, a conclusion that aligns with findings from the earlier section.

Free labor's willingness to form a union, requiring the payment of cost J, should align with equilibrium beliefs that strikes stand a chance of succeeding. Assume that the owner of the elite firm can prevent a strike with a probability of $1 - p$, and with a probability of p, the strike succeeds. In such an instance, free labor fulfills its demands, and the employment of convict labor in the elite firm is completely eliminated. However, if the strike proves unsuccessful, the laborers suffer a lump sum utility loss, L. This suggests that free labor would opt to join the union and initiate strikes if and only if:

$$J < p\Omega - (1-p)L = p\left(w(h_c = 0) - \gamma w(h_c = \bar{h})\right) \bar{H} - (1-p)L. \tag{16}$$

Considering the right-hand side of equation (16) rises with $\bar{h}$, we can infer that a greater capacity for convict labor directly spurs increased unionization and strike activities. This leads to the following proposition:

[33] Equation (15) initially takes the form $\left(w(h_c = 0) - w(h_c = \bar{h})\right) \gamma \bar{H}$, yet when γ is distributed within the parentheses, the γ preceding $w(h_c = 0)$ assumes a value of 1, reflecting the absence of a decrease in employment share prior to the introduction of convict labor.

Proposition 6: *An increase in the capacity for convict labor results in heightened unionization and strike actions.*

The growth in the number of union assemblies is embodied in the probability of unionization within this model. Notably, the effects on the extensive and intensive margins move in tandem. These dual channels are currently encapsulated within the J term. The model reveals that the presence of convict labor exerts a downward pressure on the wage rates of free labor while concurrently amplifying their unionization and strike actions.

Furthermore, when $\bar{h}$ reaches a significant magnitude, the productivity of convict labor and its capacity begin to function as strategic complements. This implies that a boost in convict productivity leads to a further drop in the equilibrium wage. Consequently, the right-hand side of equation (16) amplifies with increased convict labor productivity, thereby heightening the impact of convict labor capacity on unionization.

This model guides the empirical analysis and illuminates the core mechanism underlying the results: the intensified labor market competition free labor faces due to convict labor.

5 Effect of Convict Labor on Union Formation

To quantify the impact of introducing convict labor on the process of union formation, I employ the following regression equation:

$$y_{cst} = \beta Convict_{cst} + \boldsymbol{X}_{cs,1860}\gamma + \delta_{st} + \varepsilon_{cst} \tag{17}$$

where, y_{cst} denotes union formation metrics: Knights of Labor assemblies, strikes, and union members for county c and state s in year t. $Convict_{cst}$ denotes prisoners employed per hundred thousand residents for county c and state s in year t. Given the skewed distribution of $Convict_{cst}$, I use an inverse hyperbolic sine transformation. $\boldsymbol{X}_{cs,1860}$ are pre-determined control variables for county c and state s measured in 1860.

More specifically, I consider several factors that could be linked to county-

level convict labor utilization. Economically, I control for variables like population density, enslaved population share, average farm output value per acre, and improved farmland acres, as affluent or populated counties might differ in convict labor use. For trade aspects, I control for coastal proximity, elevation, railway access, water body navigability, and distance to the nearest large urban center. I also include in the Democratic Party's vote share to reflect regional perspectives on race and convict labor. I employ state $\times$ year fixed effects, δ_{st}, to partial out time-invariant and aggregate trend variables. Standard errors are clustered at the county level. The key parameter, β, estimates the link between the share of convict labor and union formation metrics.

5.1 Identification

The estimation, as delineated in equation (17), alongside the specified set of controls and fixed effects, potentially accounts for a significant proportion of conceivable endogeneity sources. Yet, we cannot fully affirm causality if convict labor correlates with unobserved variables, which could concurrently exert influence over union formation measures.

An endogenous independent variable, correlated with the error term of the regression equation, can introduce bias into OLS estimates. For example, during this period in the Southern United States, areas with a higher prevalence of convict labor had a higher share of previously enslaved populations. These areas displayed a heightened capacity and inclination for oppression, effectively curbing labor organization. Policies, such as employing convicts as strikebreakers, were strategically used in these areas to hinder labor initiatives (Friedman, 2000). In this case, the underlying economic context would suggest that the correlation between the outcomes of union formation and convict labor understates the true effect (Jiang, 2017).

I leverage an instrumental variable approach to address this potential pitfall, capitalizing on the variation within a county's interaction with pre-convict-labor prisons and their respective capacities. This approach finds a plausibly exogenous cross-sectional variation from the prisons that were built

before the enactment of the convict labor legislation in 1870.

The data required for this analysis, which includes information on the locations of pre-convict labor prisons, the years of their establishment, and prisoner populations, were collected from references like North American Review (1866), Prison Association of New York (1870), Wines (1871), and 1870 U.S. Population Census.[34]

Subsequently, I utilize the locations and capacities of pre-convict-labor prisons as instruments for the number of prisoners employed per hundred thousand inhabitants in a county. The equation for the first stage is as follows:

$$Convict_{cst} = \bar{\beta} IV_{cs} + \boldsymbol{X}_{cs,1860}\bar{\gamma} + \bar{\delta}_{st} + \epsilon_{cst} \tag{18}$$

where IV_{cs} is either a binary indicator for exposure to a pre-convict-labor prison or the capacity of the pre-convict-labor prison in county c and state s.

The estimation equation for the second stage takes the following form:

$$y_{cst} = \beta \widehat{Convict}_{cst} + \boldsymbol{X}_{cs,1860}\gamma + \delta_{st} + \varepsilon_{cst} \tag{19}$$

where the instruments measure the exposure of each county to a pre-convict-labor prison or the capacity of the pre-convict-labor prison.

The instrumental variable approach assumes that a county's exposure to pre-convict-labor prisons and the number of convicts in those prisons are valid predictors for the number of convicts after 1886. The validity of this assumption is supported by Online Appendix Table 7, which demonstrates a positive correlation between the presence of pre-convict-labor prisons and their capacities and higher levels of prisoner employment (per hundred thousand inhabitants) after the introduction of convict labor laws.[35] The robustness of the results to the addition of controls confirms the strength and relevance of the instrument. Throughout the columns, the coefficients display the anticipated

[34] I assign geographic coordinates to these prison locations and merge with their corresponding counties. Online Appendix Figure C6 shows the geographic distribution of these prisons for the southern United States.

[35] Online Appendix Tables 8 and 9 show positive correlations between pre-convict-labor prisons (and capacities) and increases in the number of prisons and convicts employed following the introduction of convict labor laws.

signs and are statistically significant. The coefficients presented in columns (3) and (6) with the complete set of control variables and fixed effects demonstrate that counties with exposure to pre-convict-labor prisons (and capacities) exhibit higher levels of prisoner employment. The Kleibergen-Paap F-statistics also surpass the commonly accepted threshold for weak instruments (Kleibergen and Paap, 2006).

The exclusion restriction requires that the impact of pre-convict-labor prisons (and their capacities) on union formation can only be mediated by their effect on the number of convict laborers after the implementation of convict laws. Therefore, the identification assumption relies on the absence of potentially unobserved variables that are correlated with pre-convict-labor prisons (and their capacities) and the formation of labor unions.

The estimation results would be biased if pre-convict-labor prisons were strategically built in locations with a higher likelihood of future union formation. Historians list several factors that were considered when selecting prison locations before 1870, including proximity to urban centers, access to railroads or navigable rivers, and proximity of materials for construction of a prison (Lewis, 1922; McKelvey, 1936). To account for these factors, I control for population density, proximity to the coast, elevation, access to railway transportation and navigable water bodies, and the distance to the nearest urban center. Online Appendix Tables 10 to 13 show the estimation results where I gradually add these control variables.[36] The outcome remains unchanged even with the gradual inclusion of controls, and the effect sizes across all columns are similar in magnitude and statistically significant.

Moreover, I regress the instruments on an extended set of population, economic, trade and commerce, geographic and climate, and socio-political control variables in Online Appendix Table 14. Apart from access to railways and population density, I find no statistically significant correlations between pre-

[36]The comprehensive set of control variables are population density, the share of enslaved individuals, the average value of farm output per acre of farmland, number of improved acres of farmland, distance to the coast, elevation, access to railway transportation, and navigable water bodies, distance to the nearest urban center with over 100,000 inhabitants, and the Democratic Party's vote share.

existing characteristics and pre-convict-labor prisons' presence and capacities (I control for these variables). This suggests that the location of these prisons was not systematically related to observable county characteristics, which makes the selection on unobservables less likely.

To address concerns that the findings could be attributed to selection bias due to unobserved variables, I adopt a method suggested by Oster (2019) to strengthen the robustness of the results. Oster (2019) emphasizes the significance of coefficient stability and movements in R^2. Using her recommended bounding value of 1.3 times increase in R^2, beyond which the results can be considered robust, I apply this criterion to the preferred specifications in the main tables. The analysis indicates that to explain away the findings, there needs to be a substantial degree of selection bias on both observed and unobserved variables, with a relative degree of selection δ between 2.79 and 34.39. The results indicate that the estimated selection on unobservables is substantially larger than the suggested upper bound of $\delta = 1$ in empirical studies. This finding indicates that unobserved selection needs to be excessively large to explain the results. The analysis supports the relevance assumption and the exclusion restriction, reinforcing the instrument's validity.

In Section 5.3, I execute further checks to mitigate any lingering concerns regarding factors that might have influenced the locations of prisons before the introduction of convict labor. Further additional analysis aims to demonstrate that these pre-convict labor prisons did not impact local labor market outcomes through channels unrelated to the application of convict labor.

5.2 Results

5.2.1 Unions, Strikes, and Membership

Table 1 exhibits the outcomes of estimating equation (19), with each column representing a distinct regression with a different set of control variables. The table demonstrates the 2SLS estimations of convict labor per 100,000 inhabitants, transformed via inverse hyperbolic sine, regressed on local Knights of Labor assemblies and strikes in a given county, respectively. Panel A displays

estimations instrumenting convict labor with pre-convict-labor prison locations, while Panel B utilizes pre-convict-labor prison capacities as instruments. Controls for pre-existing economic conditions, geography, and socio-political variables are incrementally added across columns (1) and (4), (2) and (5), and (3) and (6) respectively, for both outcome variables. The derived results hinge on the control variables discussed previously, considered as key factors influencing pre-convict-labor prison placements. Both panels show similar and statistically significant effect sizes across columns (1)-(3) and (4)-(6).

The more conservative and preferred specifications in columns (3) and (6) incorporate a complete set of controls and state $\times$ year fixed effects. From Panel A, I find that a 10% rise in convict labor share results in about a 9.5% surge in local KOL assemblies and a 16% increase in strikes. Likewise, Panel B results reveal a similar pattern; a 10% growth in convict labor triggers a 9.2% increase in local KOL assemblies and a 17% rise in strikes. Notably, the instruments yield remarkably similar estimates, despite exploiting different margins (extensive vs. intensive).[37]

In Online Appendix Table 15, I demonstrate that the introduction of convict labor not only increases the count of Knights of Labor assemblies but also extends their longevity and catalyzes new assembly initiations. The layout of this table mirrors Table 1, with each column signifying a separate regression analysis featuring distinct control variables. Columns (1)-(3) detail the assemblies' average survival rate, while columns (4)-(6) record the expansion in new assembly establishments. The findings suggest that with every 10% rise in convict labor, there is a 3% increment in the average duration of an assembly's survival and a 7% surge in the number of newly formed assemblies.

Finally, I investigate if firms strategically positioned convict labor in union-active areas to suppress unionization following the enactment of convict labor

[37] As Tables 1 and 2 show, the IV coefficients are magnified, ranging from 1.5 to 4.5 times the size of the OLS coefficients. This amplification is attributed to the potential downward bias due to areas with a higher share of enslaved having a higher capacity for oppression (Section 5.1). The results from the OLS regression analyses can be found in the Online Appendix, as referenced in Tables 1 to 6. These tables present various outcome variables, supplemented by several robustness checks. This includes analyses with transformed variables, alternate measurements of convict labor, and Conley standard errors.

Table 1: Effect on KOL Assemblies and Strikes 1886–1905

	Dependent variable:					
	Number of KOL Assemblies			Number of Strikes		
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)
Convict Labor per 100,000 (IHS)	1.232***	1.154***	1.166***	0.466**	0.449**	0.450**
	(0.433)	(0.417)	(0.418)	(0.206)	(0.202)	(0.201)
KP F-stat	128.85	129.3	126.59	128.85	129.3	126.59
Panel B: Early Prison Capacities IV						
Convict Labor per 100,000 (IHS)	1.187***	1.114***	1.126***	0.503**	0.487**	0.488**
	(0.442)	(0.430)	(0.431)	(0.238)	(0.234)	(0.234)
KP F-stat	192.25	191.08	186.55	192.25	186.55	192.25
Economic Controls	×	×	×	×	×	×
Geographic Controls		×	×		×	×
Socio-political Controls			×			×
State × Year FE	×	×	×	×	×	×
OLS coefficient	0.253***	0.232**	0.236***	0.114***	0.109***	0.108***
	(0.094)	(0.092)	(0.091)	(0.041)	(0.040)	(0.039)
Mean Outcome	1.23	1.23	1.23	0.28	0.28	0.28
Clusters	1,302	1,302	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906	3,906	3,906

Note: Equation (19) displays regression results with coefficients and standard errors (in parentheses) for each column. The unit of observation is the 1880 county. Outcome variables encompass local KOL assemblies and strikes, with the convict labor presence, measured as convicts per 100,000 inhabitants (IHS), serving as the independent variable. Economic controls include population density, the share of enslaved individuals, average farm output value per acre, and improved farmland acreage. Geographic controls capture distance to the coast, elevation, railway and water body access, and proximity to the nearest urban center. The Democratic Party's vote share acts as the socio-political control. Early prison locations (Panel A) and capacities (IHS) (Panel B) serve as instrumental variables. The model incorporates state × year fixed effects and clusters standard errors at the county level.

laws. If shifts in union formation directly affect the number of convict laborers between report years, it hints at this strategy. However, the analysis in the Online Appendix Table 16, examining the link between union formation and convict labor changes, does not support such strategic effect.

Table 2 displays the analysis results examining the impact of convict labor on 19$^{\text{th}}$ century and 2020 union membership. In Panel A, pre-convict-labor prison locations instrument convict labor, while Panel B utilizes pre-convict-labor prison capacities for the same. The incremental inclusion of control variables mirrors Table 1. Columns (3) and (6) showcase the most comprehensive specifications incorporating a complete control set and state × year fixed effects for both panels.

Panels A and B's third column results suggest a 10% convict laborer increase prompts a 1.8% surge in 19$^{\text{th}}$ century union membership. Simultane-

Table 2: Effect on Membership 1886–1905 and 2020

	Dependent variable:					
	Early Membership (IHS)			Membership 2020 (IHS)		
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)
Convict Labor per 100,000 (IHS)	0.195***	0.185***	0.187***	0.269***	0.214***	0.225***
	(0.051)	(0.049)	(0.049)	(0.040)	(0.038)	(0.040)
KP F-stat	128.85	129.3	126.59	128.7	129.21	126.29
Panel B: Early Prison Capacities IV						
Convict Labor per 100,000 (IHS)	0.189***	0.179***	0.181***	0.263***	0.211***	0.222***
	(0.049)	(0.048)	(0.048)	(0.037)	(0.036)	(0.038)
KP F-stat	192.25	191.08	186.55	191.98	190.87	186.04
Economic Controls	×	×	×	×	×	×
Geographic Controls		×	×		×	×
Socio-political Controls			×			×
State × Year FE	×	×	×	×	×	×
OLS coefficient	0.052***	0.049***	0.050***	0.142***	0.133***	0.144***
	(0.019)	(0.018)	(0.018)	(0.023)	(0.022)	(0.023)
Mean Outcome	20.83	20.83	20.83	3,541	3,541	3,542
Clusters	1,302	1,302	1,302	1,296	1,296	1,296
Observations	3,906	3,906	3,906	3,888	3,888	3,888

Note: Equation (19) displays regression results with coefficients and standard errors (in parentheses) for each column. The unit of observation is the 1880 county. Outcome variables encompass KOL membership in the 19th century and in 2020, with the convict labor presence, measured as convicts per 100,000 inhabitants (IHS), serving as the independent variable. Economic controls include population density, the share of enslaved individuals, average farm output value per acre, and improved farmland acreage. Geographic controls capture distance to the coast, elevation, railway and water body access, and proximity to the nearest urban center. The Democratic Party's vote share acts as the socio-political control. Early prison locations (Panel A) and capacities (IHS) (Panel B) serve as instrumental variables. The model incorporates state × year fixed effects and clusters standard errors at the county level.

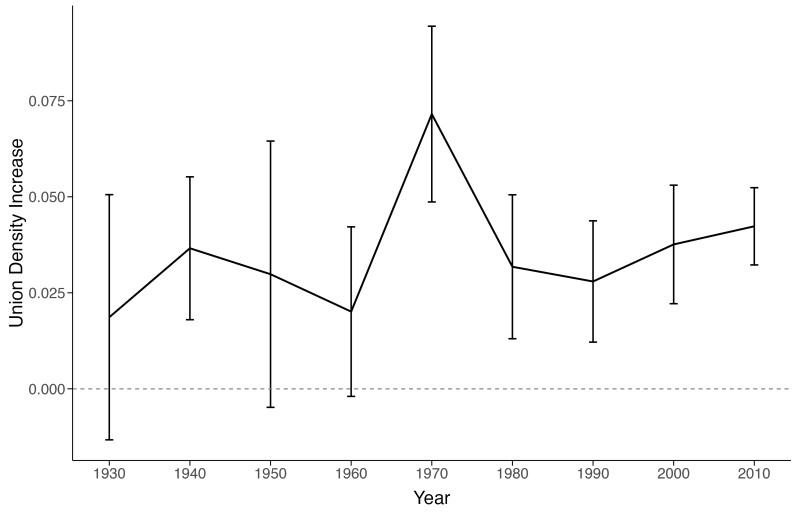
ously, column (6) from both panels indicates that a 10% increase in convict laborers equates to 2.2% more union members, underlining convict labor's enduring impact on current union membership, thus emphasizing its critical role in institutional development.[38]

Table 2 provides evidence of the relationship between convict labor and union membership across the 19th century and in 2020. In Figure 3, I analyze data from Farber et al. (2021) to explore the association between state-level convict labor share and union density for each decade between 1930 and 2010. The regression coefficients reveal a positive association, indicating that the convict labor consistently influenced union density over the 20thcentury.[39] This

[38]Interacting convict labor share with prior enslavement rates (Online Appendix Table 17) shows unchanged or slightly reduced impacts on union formation.

[39]To causally establish this link for this period, I am digitizing extensive AFL archive data, including union locations, numbers, and industry affiliations, between 1880 and 2020.

Figure 3. Effect on Union Membership at State Level 1930–2010



Note: The figure presents the coefficients of a regression analysis, where the dependent variable is the union density for each decade, and the independent variable is the state-level share of convict labor in 1886. This analysis is based on the following regression equation: $y_{sd} = \beta Convict_{s,1886} + \boldsymbol{X}_{s,1860}\gamma + \delta_d + \varepsilon_{sd}$, where y_{sd} denotes union density for state t in decade d. Union density data is obtained from Farber et al. (2021).

section confirms Section 4's predictions: increased convict labor boosts union activities; memberships, and strikes.

5.2.2 Wages, Employment, Output, and Cost Ratios

The model in Section 4 postulates that an increase in convict labor leads to decreased wages and employment share, a corresponding rise in profits, and a capital-labor cost ratio. To delve deeper into these propositions, I will examine the effects of convict labor on free labor conditions.

The influence of convict labor extends substantially across local economies, particularly impacting the working conditions of free labor in counties where convict labor is widespread. As illustrated in the Online Appendix Table 18, counties with convict labor presence show a decline in per-worker wage growth, reduced growth in employment share, increased manufacturing output value and gross profits, and heightened capital-labor cost ratio in their manufacturing industries. The capital-labor cost ratio is likely to increase due to surging capital demand and declining wages, influenced by the presence of convict

labor as depicted in the model. Furthermore, the decrease in wages for free laborers and the surge in firms' output value and gross profits suggests that convict labor exacerbates income disparity between workers and the elites.[40] As the model predicts, wage suppression appears to be the key mechanism driving the correlation between convict labor and the increase in union formation. Convict labor puts downward pressure on wages, which then spurs wage laborers to rally together, forming unions to counter this impact. Section 5.4.1 will delve further into this mechanism.

Moreover, consistent with declining manufacturing employment, there is a notable migration of workers from manufacturing and convict labor-employing industries (mainly manufacturing and, to a lesser extent, mining and construction) to agriculture and other industries (i.e., trade). The Online Appendix Table 19 demonstrates this statistically significant shift of employees due to increased convict labor share.[41] On the other hand, I observe no statistically significant shifts in farming outcomes. This lack of substantial changes, detailed in the Online Appendix Table 20, is noteworthy for two main reasons: first, prisoners engaged in agriculture did not utilize pre-convict labor prison facilities. Second, this period aligns with a historical phase in the agricultural industry when labor unions were conspicuously absent (Friedman, 2000).

Next, I explore the interplay between industries that directly compete with convict labor and the impact of capital-labor cost ratio, sourcing data from Hornbeck and Rotemberg (2021).[42] In counties where industries compete with convict labor, especially in the nature of their produce, the local economic landscape also experiences a significant shift. These changes include a higher capital-labor cost ratio and a drop in the share of manufacturing employment

[40] This corroborates the findings of Alston and Ferrie (1993, 1999) and Althoff and Reichardt (2022) that oppressive institutions in the American South benefited the elite.

[41] Using full-count linked Census data, I analyze the transition of workers from manufacturing and convict labor-employing industries to agriculture and other industries between 1880 and 1910 (Helgertz et al., 2023).

[42] For these analyses, I use an analogous estimation strategy to equation (19); however, as I use the sum of pre-convict labor prisons and their capacities to instrument for the IHS transformation of the sum of the interaction of a continuous measure for both competing division and labor-cost intensity (between zero and one) and the number of convict laborers per 100,000 inhabitants and their sum.

(see Online Appendix Table 21). Also, union activity changes significantly in areas where industries are in direct competition with convict labor. This competition stirs up union activity, leading to a noticeable increase in the formation of unions. Correspondingly, all aspects related to union formation witness growth in these counties (see Online Appendix Table 22). A surge in labor unrest is also noticeable, evident in more frequent, protracted, and intense strikes (see Online Appendix Table 23).

The productivity of convict labor, on the other hand, spurs union formation. In areas where convict labor proves more productive, all indicators associated with union formation escalate (see Online Appendix Table 24).

5.3 Robustness

First, I start by performing further sensitivity analyses to reinforce the validity of the identification strategy. I use a nearest-neighbor matching approach to address remaining concerns about factors influencing pre-convict labor prison locations. I identify control counties with similar observable characteristics to treated counties. The algorithm selects the closest control counties for each county with a pre-convict labor prison based on predetermined county-level characteristics. The Online Appendix Table 25 displays estimation results from matching counties considering population density, distance to coast, elevation, railway and water body access, and proximity to the nearest urban center. Second, I randomize pre-convict-labor prison locations by estimating the likelihood of a county having such a prison using pre-defined control variables. I derive predicted probabilities and randomly assign counterfactual prisons based on them. I then compute counterfactual counties' prison capacities using the same variables and obtain predicted capacities. This procedure is iterated 1,000 times. The Online Appendix Figure C7 presents t-statistic densities from placebo regressions, which, with low values, fail to refute the null hypothesis for all outcome variables.

An additional source of concern could be that pre-convict-labor prisons may affect local labor market outcomes through means other than the use of

convict labor. To address this potential issue, I demonstrate that exposure to early prisons (and capacities) does not correlate with the change in several labor market covariates in an exposed county before the implementation of convict-labor laws (see Online Appendix Table 26). Moreover, Online Appendix Table 27 shows no correlation between exposure to pre-convict labor prisons (and capacities) and measures of union formation before convict labor legislation, indicating no association with pre-existing trends.

To address potential cultural influences within the county that may lean towards unionization, I include additional control variables in Online Appendix Tables 28 and 29. These controls account for the proportion of European, Italian, German, Scandinavian, and French immigrants, considering their European roots and potential inclination towards labor organization. Additionally, I factor in the share of West Indies immigrants to account for their history with stringent slavery practices. These tables demonstrate that the results remain statistically significant even when factoring in immigrant demographics.

The monotonicity assumption assumes that the relationship between the instruments (pre-convict-labor prisons and their capacities) and the outcome (convict labor per 100,000) is such that the presence of a pre-convict-labor prison (or an increase in its capacity) should lead to a rise in the use of convict labor in a given county. This can be tested by examining the first-stage estimates of the instrumental variable regression. The monotonicity assumption is considered satisfied if the estimates are non-negative for any subsample. The results of these tests are presented in the Online Appendix Table 30. I show that the first stage is satisfied in subsamples of the data.

Second, I conduct robustness checks to reaffirm the findings of Section 5.2. In Online Appendix Tables 31 to 33, I present coefficients for various transformed outcome variables. I also evaluate the impacts of convict labor using alternative definitions, such as total convict laborers, number of prisons using them, and value of convict-made goods (Online Appendix Tables 34 to 36). I further analyze effects using standardized outcome variables in Online Appendix Table 37. Lastly, I address potential spatial correlation through Conley standard errors (Conley, 1999) in Online Appendix Table 38. All checks main-

tain the statistical significance of the results.

Up to this point, I have presented the results using one merging method, in which I linked the outcome variables to various measures of convict labor using report years from the Bureau of Labor reports. Yet, the findings remain robust across different merging techniques.[43] Online Appendix Table 39 presents regression outcomes for the inverse hyperbolic sine transformation of convict labor per 100,000 residents. This focuses on several key metrics: local Knights of Labor assemblies, 19th-century strikes and members, and 2020 union memberships. Using control variables from Section 5 and incorporating state × year fixed effects, the results align closely and significantly with Tables 1 and 2, reinforcing the consistency of the findings.

5.4 Mechanisms

Why does a rise in convict labor lead to increased unionization? Labor market competition is the primary mechanism, as wage workers collectively counteract wage suppression and deter convict labor usage. Alternatively, the prevalence of convict labor could stimulate employment in alternative occupations, such as skilled crafts or operational roles. Therefore, these professions, more conducive to unionization, could facilitate unionization due to this employment shift (Friedman, 1998, 1999). Mechanisms less likely to play a role include political channels, the influence of the Knights of Labor as a preliminary socialist organization, and an increase in the local labor supply.

5.4.1 Competition in the Labor Market

The primary mechanism at play appears to be labor market competition. The rise in convict labor leads to the reallocation of laborers to regular firms and depresses wages, necessitating wage laborers to organize collectively to counteract this effect. Simultaneously, these organized efforts also aim to deter the utilization of convict labor in the economy.

[43] For a detailed breakdown of merging methods, see Online Appendix Section G.

To understand whether wage suppression is the driving mechanism, examining the counterfactual impacts of convict labor on wages in the absence of unions is necessary. In an attempt to achieve this, I divide the sample into two categories: counties with union presence and those without. The Online Appendix Table 40 depicts the influence of convict labor on average manufacturing wage growth across the entire sample, a subset with KOL presence and a subset without union presence.

In counties without union presence, there is a statistically significant drop in average manufacturing wage growth following the increase in convict labor. However, the average manufacturing wage growth in counties with an active union presence does not show a statistically significant change. If anything, it tends to be in a positive direction.

These results indicate a more pronounced effect of convict labor on wage growth decline when unions are absent. This provides suggestive evidence that the mechanism is via wage reduction and solidifies the primary mechanism outlined in the model in Section 4.

5.4.2 Employment in Crafts and Operating Occupations

The prevalence of convict labor inadvertently stimulates an increase in free labor employment within alternative occupations, such as skilled crafts or operating roles. This shift in labor distribution, coupled with a rise in craft and operator workers, might facilitate the process of union organization.[44]

Employing the comprehensive linked full-count census data for the first time in this context, I calculate the number of individuals who transitioned from laborer to craft and operative occupations between the successive census years of 1880 to 1910 (Helgertz et al., 2023). In the Online Appendix Table 41, I disclose the results illustrating convict labor's influence on various occupational transitions within the entire sample and the subset of the sample with a presence of the Knights of Labor and without. These factors include the

[44]Unionization within craft and operative occupations was a relatively straightforward process. By the late-nineteenth century, trade unions had established a significant foothold across numerous skilled occupations in the United States (Friedman, 1998, 1999).

number of laborers transitioning to craftsmen or operative roles.

The findings suggest that convict labor bolsters the transition of laborers to craftsmen and operatives, an effect that is intensified in the absence of unions. Statistically significant transitions from labor to craftsman positions occur notably in the absence of unions, while unions' presence does not generate a similar impact. The shift from labor roles to operative positions is less pronounced in the presence of unions than without unions, despite both instances being statistically significant. This suggests an indirect influence where the prevalence of convict labor may inadvertently boost employment within the craft or operative roles, thereby aiding the process of union organization.

5.4.3 Unlikely Mechanisms

In this section, I evaluate possible mechanisms that, while feasible, are unlikely to explain the observed results. I probe whether increased labor supply, political influence, or the KOL's proto-socialist nature account for the findings.

A valid theory might link a rise in local labor supply to increased union formation. To investigate this, I use several migration metrics to examine how convict labor impacts local labor supply (Online Appendix Table 42). These metrics cover overall inbound and outbound migration rates, specific to the white population and those employed within the agricultural and manufacturing sectors. I determine these rates by quantifying the number of individuals per 100,000 residents who migrated into or out of each county in each category. Using linked full-count census data, I track individuals transitioning between counties from 1880 to 1910 for each census year (Helgertz et al., 2023).

A statistically significant shift in the migration of white individuals (as well as all individuals) would affect the local labor supply, given that the free labor workforce of that period predominantly comprised white individuals. However, as Online Appendix Table 42 shows, on aggregate, there are no statistically significant effects of convict labor on either inbound or outbound migration, suggesting that convict labor did not substantially alter the local labor supply. Finally, there is no evidence of any spillover effects to neighboring counties (Online Appendix Table 43).

An alternative hypothesis might lie within the realm of politics, suggesting that the use of convict labor could precipitate shifts in political outcomes. This, in turn, might play a vital role in escalating the rate of union formations. Consequently, I examine election results in Online Appendix Table 44, focusing on vote share, winning margin, and election outcomes (winning or losing) for the Democratic Party in presidential and congressional elections before party realignment. Although there is a slight decrease in the vote share and winning margin for the Democratic Party, it does not alter the overall election outcomes or substantially change the share and margin. Therefore, political outcomes are not likely to be a primary driver behind the results.

Finally, the Knights of Labor, frequently regarded as a precursor to proto-socialist organizations, could have been driven by an intent to enhance convict laborers' conditions. However, their primary concerns revolved around limiting competitive threats against free laborers. As mentioned in their preamble, the Knights of Labor declared that among their aims was the prohibition of the lease system, which involves hiring out convicts for work (Ely, 1886).

Moreover, resistance against convict labor emerged from two sources: (a) moral abuses associated with it and (b) the economic fallout from this disruptive competition and the substitution of free labor with inmate labor. However, it is important to note that the moral abuses in focus here are not the ill-treatment of convict laborers. Instead, the issue lies in the unequal competition seen by working citizens as unfair and, therefore, morally incorrect (Commons, 1910; Hiller, 1914).[45] Therefore, viewing the Knights of Labor as a proto-socialist organization is not a compelling explanation for the observed impact of convict labor on union formation.

[45]For instance, one argument asserted: "By allowing prison labor to dictate the outcomes of fair competition, the government shirks its responsibility, causing immense societal harm. This scenario coerces the law-abiding citizen to devalue their work, aligning their industry's reward rate below the standard level (Hiller, 1914)."

6 Further Quantitative Analysis

6.1 Calibration

The calibration exercise seeks to evaluate the impact of convict labor on the labor market dynamics and assess the counterfactual scenario in which unions successfully eliminate the use of convict labor. Furthermore, this section demonstrates that when calibrated, my model aligns with the moments observed in the data related to the average wage and capital-labor cost ratio in response to the impact of convict labor capacity.

The parameters of the model are α, β, λ, γ, r, $\bar{h}$, $\bar{H}$, and $z_e = z_r = z$. I set $z_e = z_r = z$ because differences in productivity between elite and regular firms are indiscernible in the data. Productivity of convict labor, λ, comes from the U.S. Bureau of Labor (1925), reporting the number of convict laborers and the number of free laborers needed to complete the same amount of work. The capital rental rate, r, is set as 0.0919, consistent with Bodenhorn and Rockoff (1992).[46] The number of free laborers is normalized to 1, whereas the quantity of convict laborers in exposed counties is chosen to match the convict-to-free labor ratio, $\frac{\bar{h}}{\bar{H}}$, observed in the data presented in Section 3. Lastly, γ is set to align with the causal coefficient estimate reflecting the employment share decline in the main industry, i.e. $1 - \gamma$.

Calibration Strategy and Model-Data Match. I target two key moments in the data: the contraction in free labor wages and the rise in capital-labor cost ratio - in response to an average increase in convict labor observed in exposed counties. To achieve exact identification with the remaining three parameters and the two target moments, I fix $z = 1$. The remaining parameters — the labor and capital shares in production, α and β — are set at 0.187 and 0.764, respectively, to match the model with the two target moments:

[46] Utilizing Table 5.9 from Bodenhorn and Rockoff (1992), which presents postbellum interest rates in the Southern United States, I calculate the average for 1870-1991 and 1891-1904, aligning with my analysis period in Section 5.2.

Table 3: Calibration

Parameter	Description	Value
α	Share of labor in production	0.187
β	Share of capital in production	0.764
λ	Productivity of convict labor	0.7
r	Rental rate of capital	0.0919
$\bar{h}$	Convict laborers	0.16
$\bar{H}$	Free laborers	1
γ	Employment share	0.98
$z_e = z_r = z$	Firm productivity	1

Note: The model's parameters include α, β, λ, γ, r, $\bar{h}$, $\bar{H}$, and $z_e = z_r = z = 1$. I sourced convict labor productivity, λ, from U.S. Bureau of Labor (1925). Main industry's employment share, γ, matches the causal coefficient estimate. I set the capital rental rate, r, at 0.05 based on Bodenhorn and Rockoff (1992), normalized free laborers to 1, and aligned convict labor quantities to the observed convict-to-free labor ratio. I use α and β to target the two moments observed in the data.

$$m(\theta) = \begin{bmatrix} \frac{w(\alpha,\beta,h=\bar{h})}{w(\alpha,\beta,h=0)} - \frac{w^{exposed}}{w^{overall}} \\ \\ \frac{CI(\alpha,\beta,h=\bar{h})}{CI(\alpha,\beta,h=0)} - \frac{CI^{exposed}}{CI^{overall}} \end{bmatrix}$$

The objective function can be expressed as follows, with W denoting the identity matrix:

$$\min_{\theta} \left(m(\theta)' W^{-1} m(\theta) \right) \tag{20}$$

To identify the target moments, I sourced average wage and capital-labor cost ratio data from Haines et al. (2005) for all counties in 1870 and calculated their average growth rates using the same dataset. I then utilize the causal coefficient estimates from Section 5.2 to determine the change in these variables in counties impacted by convict labor's introduction.[47]

Table 3 reports the list of the model parameters and their values used in the calibration. The initial two rows of Table 4 show the model's performance

[47]For more details on the calibration strategy, see the Online Appendix Section D.

Table 4: Model-Data Match

Variable	Model	Data
$\frac{w_{exposed}}{w_{overall}}$	0.982	0.982
$\frac{CI_{exposed}}{CI_{overall}}$	1.11	1.04
$\frac{\Pi^e_{exposed}}{\Pi^e_{overall}}$	1.35	–
$\frac{\Pi^r_{exposed}}{\Pi^r_{overall}}$	1.07	–
$\frac{\left(\frac{k_e}{h_{f,e}}\right)_{exposed}}{\left(\frac{k_e}{h_{f,e}}\right)_{overall}}$	1.23	–
$\frac{\left(\frac{k_r}{h_{f,r}}\right)_{exposed}}{\left(\frac{k_r}{h_{f,r}}\right)_{overall}}$	0.98	–

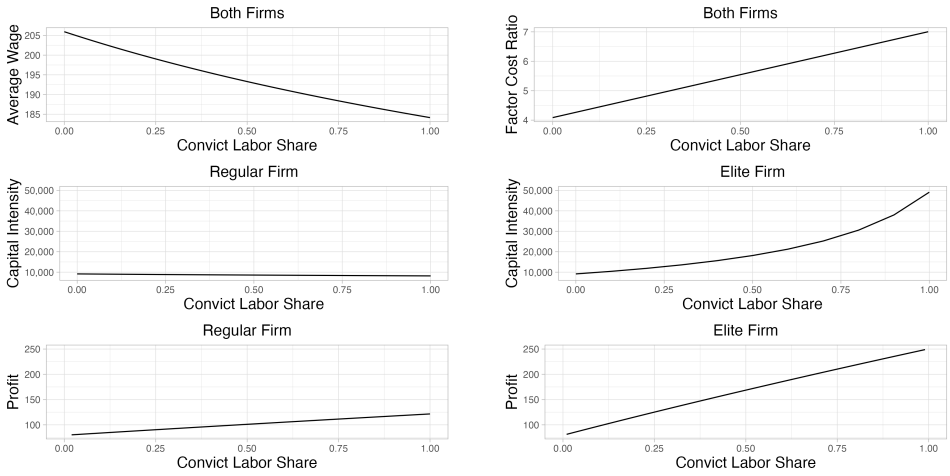
Note: The table displays ratios comparing the post-introduction convict labor effects in exposed counties to all pre-exposure counties. Drawing from Haines et al. (2005), I determined 1870 averages and growth rates, evaluated convict labor's impact with Section 5.2 coefficients, and estimated absent variables using calibrated parameters Table 3.

matching the two target moments. Evident from these rows, the model closely matches the data, demonstrating its capability to represent the two pivotal effects of convict labor on wage and capital-labor cost ratio. These effects are fundamental to my empirical analysis in Section 5.2.

Additionally, the first calibrated metric regarding the average wage illustrates how the model aligns with an untargeted moment: the average wage rate of free labor before the rise of convict labor. The data, described in Section 3, indicates an annual wage of $218 prior to the introduction of convict labor. In comparison, the model predicts an annual wage of $205, offering a form of model validation. Second, the model corroborates another untargeted moment. It predicts the labor share, α, at 0.187, closely matching the empirical data figure of $\alpha = 0.18$.[48] This not only validates the model but also confirms its internal consistency.

[48]I calculate the labor share by dividing workers' total wages by the manufacturing industry's output value, as detailed in Section 3.

Figure 4. Calibrated Metrics: Average Wage, Factor Cost Ratio, Capital Intensity, and Profits



Note: The figure illustrates the variations in per-worker wage, capital-labor cost ratio for both firms, physical capital intensity for elite and regular firms, and profits for both firms as the capacity constraint of convict labor shifts, based on equations 9, 14, A.1.12, 11, 12, 13.

Later rows in Table 4 show how exposure to convict labor amplifies the regular firm's physical labor intensity, increases the elite firm's physical capital intensity, and increases profits for both firm types.

Figure 4 illustrates the dynamics of key model variables over various levels of convict labor employment. This figure highlights several trends: With the rise in convict labor use, there is an increase in the physical labor intensity of regular firms and a decrease in that of elite firms. Additionally, the capital-labor cost ratio in the county and profits for both types of firms escalate. Although both elite and regular firms see profit gains, the increase is significantly more pronounced for elite firms. This trend illustrates each firm type's benefits from the growing use of convict labor. Crucially, there is a noticeable decline in wages per worker.

6.2 Unions and Inequality

The role of unions in diminishing inequality has long been debated, with research on this topic falling into two primary categories. The first category focuses on the direct impact of unions on their members' wages, positing that

unionization, especially benefiting lower-wage workers, leads to a decrease in overall wage inequality (DiNardo et al., 1996; Firpo et al., 2009). Conversely, the second category expands this perspective, arguing that unions also indirectly influence non-union wages. This influence, achieved through mechanisms like threat effects and setting industry-wide wage standards, contributes to a broader reduction in income inequality (Farber, 2005; Fortin et al., 2021; Taschereau-Dumouchel, 2020; Western and Rosenfeld, 2011).

Both research categories converge on the notion that unions play a crucial role in mitigating inequality. Yet, in a scenario where predominantly white workers in the main industry unionize in response to wage suppression caused by low-cost Black convict labor, the dynamics shift. Here, unionization acts to reverse wage reductions stemming from the use of convict labor. However, in the alternative industry, such as agriculture, where the workforce is predominantly Black and lacks union representation, this action exacerbates racial income disparities. Thus, while unions address wage inequality within the main industry, they contribute to a widening Black-white income inequality across different sectors.

To assess the negative impact of unionization on Black–white wage inequality, first consider the counterfactual scenario where the union effectively abolishes convict labor employment. In the model discussed in Section 4, the employment of convict labor initially results in a decrease of the main industry's wage level, w_f, to match that of the alternative industry, indicated as w_a. This alternative industry employs mainly Black workers and some white workers. Historical evidence and previous literature suggest a wage discrimination in this industry, represented by $w_a^{white} = \phi w_a^{black}$, with $\phi > 1$ reflecting racial discrimination (Goldin and Margo, 1992; Higgs, 1977, 1989; Ng and Virts, 1993). The model indicates that $w_a = A$, which leads to $w_a^{white} = \phi w_a^{black} = A$. In this case, the back-of-the-envelope calculation for the effect of the union on Black–white wage inequality is expressed by $\frac{\frac{w_a^{white}}{w_a^{black}} - \frac{w_f}{w_a^{black}}}{\frac{w_a^{white}}{w_a^{black}}}$.[49] Thus, it can be

[49]Given $w_a^{white} = A$ and $w_a^{black} = \frac{A}{\phi}$, the equation simplifies to $\frac{\frac{A}{\frac{A}{\phi}} - \frac{w_f}{\frac{A}{\phi}}}{\frac{A}{\frac{A}{\phi}}}$. Ng and Virts

inferred that in a counterfactual scenario where the union successfully eliminates the use of convict labor, this action would lead to a 6% increase in wage inequality between unionized white and Black workers.

Overall, this finding demonstrates the complex role of unions in wage inequality, especially under racial dynamics. While unions historically aim to reduce wage disparities, their impact can exacerbate racial wage gaps, as seen in the case of convict labor.

7 Conclusion

Following the abolition of slavery in 1865, the Southern United States experienced a marked rise in the use of convict labor to compensate for the lost labor force. Introducing low-cost convict labor posed direct competition to free workers, jeopardizing their rights and employment opportunities. As a result, wages declined, forming the first labor unions.

This paper offers the first theoretical and empirical study on how the U.S. convict labor system influenced the first labor union formation. Using pre-legislation prison locations and capacities as an instrumental variable, I analyze the impact of post-legislation convict laborers. Evidence reveals a direct relationship between the rise in union assemblies, members, strikes, and counties with larger convict labor population shares. Specifically, a 10% increase in convict laborers per 100,000 led to a 9.5% growth in union formation and a 16% increase in strikes. Furthermore, convict labor employment consistently influenced union density over the 20$^{\text{th}}$ century. By 2020, counties with higher convict laborer concentrations had elevated union memberships. Crucially, these findings underscore the deep-seated implications of historical and institutional contexts on today's outcomes, emphasizing the lasting consequences of leveraging convict labor as a low-cost workforce on the labor market.

Moreover, convict labor significantly influenced local economies, particularly impacting the working conditions of free laborers. The results show a decrease in wage growth per worker and employment share growth, an in-

(1993) sets $\phi = 1.28$, based on $\frac{1}{\phi} = 0.78$. See the Online Appendix Section D for details.

crease in manufacturing output value and gross profits, and an increase in the capital-labor cost ratio. This growing gap between the wages of free laborers and firm earnings accentuates the role of convict labor in intensifying income inequality between workers and the elite. In essence, it is evident that the oppressive institutions of the American South primarily catered to the interests of the upper echelons. All empirical results align with the predictions of my model: workers earn less and shift to other firms, increasing firm profits. Consequently, workers unionize and strike.

Two primary mechanisms explain the findings. First, there is the factor of labor market competition: wage workers band together to resist wage suppression and discourage the use of convict labor. Second, the widespread use of convict labor encourages a shift towards alternate professions like crafts or operational roles. Such occupations, being more amenable to unionization, further union growth due to this employment transition. Less likely mechanisms are political channels, the Knights as a proto-socialist organization, and a rise in local labor supply.

The calibrated model reveals that first, Southern U.S. unions likely worsened wage disparity between Black and white workers. Thus, this paper uniquely links unions to increased wage inequality and offers a new angle on U.S. racial segregation's deep-seated roots post-Civil War. It underscores the convict labor system's detrimental impact, highlighting its worsening of conditions for Black convicts and adverse effects on the white labor market. This spurred union creation in opposition to Black convict labor, perpetuating racial divides and hinting at the historical roots of contemporary U.S. segregation issues. Further research is necessary to understand the role of convict labor in shaping other societal structures and the dynamics of racial relations in the United States.

References

Acemoglu, D., Aghion, P., and Violante, G. L. (2001). Deunionization, Technical Change and Inequality. Carnegie-Rochester Conference Series on Public Policy.

Acemoglu, D., García-Jimeno, C., and Robinson, J. A. (2012). Finding Eldorado: Slavery and Long-run Development in Colombia. *Journal of Comparative Economics*, 40(4):534–564.

Acemoglu, D. and Restrepo, P. (2018). The Race Between Man and Machine: Implications of Technology for Growth, Factor Shares, and Employment. *American Economic Review*, 108(6):1488–1542.

Acemoglu, D. and Robinson, J. A. (2008). The Persistence and Change of Institutions in the Americas. *Southern Economic Journal*, 75(2):281–299.

Alder, S., Lagakos, D., and Ohanian, L. (2023). Labor Market Conflict and the Decline of the Rust Belt. Journal of Political Economy (forthcoming).

Alston, L. J. and Ferrie, J. P. (1993). Paternalism in Agricultural Labor Contracts in the US South: Implications for the Growth of the Welfare State. *American Economic Review*, pages 852–876.

Alston, L. J. and Ferrie, J. P. (1999). *Southern Paternalism and the American Welfare State: Economics, Politics, and Institutions in the South, 1865-1965*. Cambridge University Press.

Althoff, L. and Reichardt, H. (2022). Jim Crow and Black Economic Progress After Slavery. Princeton Working Paper.

American Federation of Labor (1890). Proceedings.

American Federation of Labor (1897). Proceedings.

Archibong, B. and Obikili, N. (2020). Prison Labor: The Price of Prisons and the Lasting Effects of Incarceration. African Economic History Working Paper Series No. 52.

Autor, D., Dorn, D., Katz, L. F., Patterson, C., and Van Reenen, J. (2020). The Fall of the Labor Share and the Rise of Superstar Firms. *Quarterly Journal of Economics*, 135(2):645–709.

Autor, D. and Salomons, A. (2018). Is Automation Labor-Displacing? Productivity Growth, Employment, and the Labor Share. NBER Working Paper 24871.

Bernstein, I. (1954). The Growth of American Unions. *American Economic Review*, 44(3):301–318.

Bittarello, L. (2019). Organizing Collective Action: Labor Strife in the US in the 1880s. Northwestern Working Paper.

Bodenhorn, H. and Rockoff, H. (1992). Regional Interest Rates in Antebellum America. In *Strategic Factors in Nineteenth Century American Economic History*, pages 159–187. University of Chicago Press.

Buggle, J. C. and Nafziger, S. (2021). The Slow Road from Serfdom: Labor Coercion and Long-run Development in the Former Russian Empire. *Review of Economics and Statistics*, 103(1):1–17.

Card, D. (2001). The Effect of Unions on Wage Inequality in the US Labor Market. *ILR Review*, 54(2):296–315.

Card, D., Heining, J., and Kline, P. (2013). Workplace Heterogeneity and the Rise of West German Wage Inequality. *Quarterly Journal of Economics*, 128(3):967–1015.

Clubb, J. M., Flanigan, W. H., and Zingale, N. H. (1987). *Electoral Data for Counties in the United States: Presidential and Congressional Races, 1840-1972*. Inter-university Consortium for Political and Social Research.

Collins, W. J. and Niemesh, G. T. (2019). Unions and the Great Compression of Wage Inequality in the US at Mid-century: Evidence from Local Labour Markets. *Economic History Review*, 72(2):691–715.

Commons, J. R. (1910). *A Documentary History of American Industrial Society, Vol. 6: Labor Movement*.

Commons, J. R., Andrews, J. B., and Perlman, S. (1918). *History of labour in the United States*. Beard Books.

Conley, T. G. (1999). GMM Estimation with Cross Sectional Dependence. *Journal of Econometrics*, 92(1):1–45.

Dell, M. (2010). The Persistent Effects of Peru's Mining Mita. *Econometrica*, 78(6):1863–1903.

DiNardo, J., Fortin, N. M., and Lemieux, T. (1996). Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach. *Econometrica*, 64:1001–1044.

DiNardo, J. and Lee, D. S. (2004). Economic Impacts of New Unionization on Private Sector Employers: 1984–2001. *Quarterly Journal of Economics*, 119(4):1383–1441.

Eckert, F., Gvirtz, A., Liang, J., and Peters, M. (2020). A Method to Construct Geographical Crosswalks with an Application to US Counties since 1790. NBER Working Paper 26770.

Ely, R. T. (1886). *The Labor Movement in America*. TY Crowell.

Farber, H. (2005). Nonunion wage rates and the threat of unionization. *ILR Review*, 58(3):335–352.

Farber, H. S., Herbst, D., Kuziemko, I., and Naidu, S. (2021). Unions and Inequality Over the Twentieth Century: New Evidence from Survey Data. *Quarterly Journal of Economics*, 136(3):1325–1385.

Firpo, S., Fortin, N. M., and Lemieux, T. (2009). Unconditional Quantile Regressions. *Econometrica*, 77(3):953–973.

Foner, P. S. (1978). *History of the Labor Movement in the United States*. International Publischers.

Fortin, N. M., Lemieux, T., and Lloyd, N. (2021). Labor market institutions and the distribution of wages: The role of spillover effects. *Journal of Labor Economics*, 39(S2):S369–S412.

Frey, J. P. (1913). *The Trade-Union Attitude Toward Prison Labor*, volume 46.

Friedman, G. (1988). Strike Success and Union Ideology: The United States and France, 1880–1914. *Journal of Economic History*, 48(1):1–25.

Friedman, G. (1998). *State-Making and Labor Movements: France and the United States, 1876-1914*. Cornell University Press.

Friedman, G. (1999). US Historical Statistics: New Estimates of Union Membership the United States, 1880–1914. *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 32(2):75–86.

Friedman, G. (2000). The Political Economy of Early Southern Unionism: Race, Politics, and Labor in the South, 1880–1953. *Journal of Economic History*, 60(2):384–413.

Garlock, J. (1982). *Guide to the Local Assemblies of the Knights of Labor*. Greenwood.

Garlock, J. (1984). *Knights of Labor Assemblies, 1879-1889*. Inter-university Consortium for Political and Social Research.

Gildemeister, G. A. (1977). *Prison Labor and Convict Competition with Free Workers in Industrializing America, 1840-1890.* Northern Illinois University.

Goldin, C. and Margo, R. A. (1992). The Great Compression: The Wage Structure in the United States at Mid-Century. *Quarterly Journal of Economics*, 107(1):1–34.

Haines, M. R. et al. (2005). *Historical, Demographic, Economic, and Social Data: the United States, 1790-2002*. Inter-university Consortium for Political and Social Research Ann Arbor, MI.

Helgertz, J., Ruggles, S., Warren, J. R., Fitch, C. A., Hacker, J. D., Nelson, M. A., Price, J. P., Roberts, E., and Sobek, M. (2023). IPUMS Multigenerational Longitudinal Panel: Version 1.1. https://doi.org/10.18128/D016.V1.1.

Higgs, R. (1977). *Competition and Coercion: Blacks in the American Economy 1865-1914*, volume 163. CUP Archive.

Higgs, R. (1989). Black Progress and the Persistence of Racial Economic Inequalities, 1865-1940. *The Question of Discrimination: Racial Inequality in the US Labor Market*, pages 9–31.

Hiller, E. T. (1914). Labor Unionism and Convict Labor. *Journal of Criminal Law and Criminology*, 5:851.

Hornbeck, R. and Rotemberg, M. (2021). Growth Off the Rails: Aggregate Productivity Growth in Distorted Economies.

Hubmer, J. and Restrepo, P. (2022). Not a Typical Firm: Capital–Labor Substitution and Firms' Labor Shares. Working Paper.

Jiang, W. (2017). Have Instrumental Variables Brought Us Closer to the Truth. *Review of Corporate Finance Studies*, 6(2):127–140.

Kaufman, J. (2001). Rise and Fall of a Nation of Joiners: The Knights of Labor Revisited. *Journal of Interdisciplinary History*, pages 553–579.

Kleibergen, F. and Paap, R. (2006). Generalized Reduced Rank Tests Using the Singular Value Decomposition. *Journal of Econometrics*, 133(1):97–126.

Lewis, O. F. (1922). *The Development of American Prisons and Prison Customs, 1776-1845: With Special Reference to Early Institutions in the State of New York*. Prison Association of New York.

Lichtenstein, A. (1996). *Twice the Work of Free Labor: The Political Economy of Convict Labor in the New South*. Verso.

Lowes, S. and Montero, E. (2016). Blood Rubber: The Effects of Labor Coercion on Institutions and Culture in the DRC. Harvard Working Paper.

McKelvey, B. (1934). Prison Labor Problem: 1875-1900. *Journal of the American Institute of Criminal Law and Criminology*, 25:254.

McKelvey, B. (1936). A Study in American Social History Prior to 1915. *American Prisons*.

Mohler, H. C. (1925). Convict Labor Policies. *Journal of Criminal Law and Criminology*, 530:563.

Naidu, S. (2010). Recruitment Restrictions and Labor Markets: Evidence from the Postbellum US South. *Journal of Labor Economics*, 28(2):413–445.

Naidu, S. and Yuchtman, N. (2016). Labor Market Institutions in the Gilded Age of American Economic History.

Ng, K. and Virts, N. (1993). The Black-White Income Gap in 1880. *Agricultural History*, 67(1):1–15.

North American Review (1866). American Prisons. *North American Review*, 103(213):383–412.

Nunn, N. (2008). The Long-term Effects of Africa's Slave Trades. *Quarterly Journal of Economics*, 123(1):139–176.

Nunn, N. and Wantchekon, L. (2011). The Slave Trade and the Origins of Mistrust in Africa. *American Economic Review*, 101(7):3221–52.

Oster, E. (2019). Unobservable Selection and Coefficient Stability: Theory and Evidence. *Journal of Business and Economic Statistics*, 37(2):187–204.

Poyker, M. (2019). Economic Consequences of the U.S. Convict Labor System. *Institute for New Economic Thinking Working Paper Series*, (91).

Prison Association of New York (1870). *Report of the Prison Association of New York*, volume 3. Prison Association of New York.

Reid, J. D. (1973). Sharecropping as an Understandable Market Response: The Post-bellum South. *The Journal of Economic History*, 33(1):106–130.

Roback, J. (1984). Southern Labor Law in the Jim Crow Era: Exploitative or Competitive? *University of Chicago Law Review*, 51(4):1161–1192.

Rubio, M. (2022). From Plantations to Prisons: The Race Gap in Incarceration After the Abolition of Slavery in the US. ECONtribute Working Paper 195.

Ruggles, S., Fitch, C. A., Goeken, R., Hacker, J. D., Nelson, M. A., Roberts, E., Schouweiler, M., and Sobek, M. (2021). IPUMS Ancestry Full Count Data: Version 3.0. https://doi.org/10.18128/D014.V3.0.

Schmick, E. (2018). Collective Action and the Origins of the American Labor Movement. *Journal of Economic History*, 78(3):744–784.

Sellin, J. T. (1976). *Slavery and the Penal System*.

Song, J., Price, D. J., Guvenen, F., Bloom, N., and Von Wachter, T. (2019). Firming Up Inequality. *Quarterly Journal of Economics*, 134(1):1–50.

Taft, P. (1964). Organized Labor in American History.

Taschereau-Dumouchel, M. (2020). The Union Threat. *Review of Economic Studies*, 87(6):2859–2892.

U.S. Bureau of Labor (1886). *Second Annual Report of the Commissioner of Labor: Convict Labor*. Government Printing Office, Washington, DC.

U.S. Bureau of Labor (1888). *Third Annual Report of the Commissioner of Labor: Strikes and Lockouts*. Government Printing Office, Washington, DC.

U.S. Bureau of Labor (1896). *Tenth Annual Report of the Commissioner of Labor: Strikes and Lockouts*. Government Printing Office, Washington, DC.

U.S. Bureau of Labor (1906). *Twentieth Annual Report of the Commissioner of Labor: Convict Labor*. Government Printing Office, Washington, DC.

U.S. Bureau of Labor (1914). *Federal and State Laws Relating to Convict Labor*. Number 63d Congress, 2nd Session, 494. Washington, DC.

U.S. Bureau of Labor (1925). *Convict Labor in 1923*. Government Printing Office, Washington, DC.

U.S. Bureau of the Census (1933). *United States Population Census*. U.S. Government Printing Office, Washington, D.C.

Voss, K. (1993). *The Making of American Exceptionalism: The Knights of Labor and Class Formation in the Nineteenth Century*. Cornell University Press.

Western, B. and Rosenfeld, J. (2011). Unions, Norms, and the Rise in US Wage Inequality. *American Sociological Review*, 76(4):513–537.

Wines, E. C. (1871). *Transactions of the National Congress on Penitentiary and Reformatory Discipline Held at Cincinnati, Ohio, October 12-18, 1870*. Parsons.

Wright, G. (2013). *Sharing the Prize*. Harvard University Press.

Online Appendix to:

Convicts and Comrades: Coerced Labor's Impact on the First Labor Unions

by Hazal Sezer

A The Solution and Proofs

A.1 Solving the Model

A.1.1 Labor Demand and Capital

Elite firm $h_{f,e}$ and k_e: Elite firm's production function is $y_e = z_e \left(\lambda h_{c,e} + h_{f,e}\right)^{\alpha} k_e^{\beta}$, $\alpha + \beta < 1$. Solving the maximization problem of the elite firm and taking the first-order conditions:

$$\max_{\{h_{f,e},k_e\}} \Pi_e = y_e - w_f h_{f,e} - r k_e$$
$$\max_{\{h_{f,e},k_e\}} \Pi_e = z_e \left(\lambda \bar{h} + h_{f,e}\right)^{\alpha} k_e^{\beta} - w_f h_{f,e} - r k_e, \;\; \bar{h} = h_{c,e}$$

Taking the first-order condition w.r.t. $h_{f,e}$:

$$\frac{\partial \Pi_e}{\partial h_{f,e}} \Rightarrow \alpha z_e k_e^{\beta} \left(\lambda \bar{h} + h_{f,e}\right)^{\alpha-1} - w_f = 0$$
$$\left(\lambda \bar{h} + h_{f,e}\right)^{\alpha-1} = \frac{w_f}{\alpha z_e k_e^{\beta}}$$
$$\lambda \bar{h} + h_{f,e} = \left(\frac{w_f}{\alpha z_e k_e^{\beta}}\right)^{\frac{1}{\alpha-1}}$$

Simplifying $h_{f,e}$ becomes:

$$h_{f,e} = \left(\frac{w_f}{\alpha z_e k_e^{\beta}}\right)^{\frac{1}{\alpha-1}} - \lambda \bar{h}$$

Taking the first-order condition w.r.t. k_e:

$$\frac{\partial \Pi_e}{\partial k_e} \Rightarrow \beta z_e (\lambda \bar{h} + h_{f,e})^{\alpha} k_e^{\beta-1} - r = 0$$

Simplifying k_e becomes:

$$k_e = \left(\frac{r}{\beta z_e (\lambda \bar{h} + h_{f,e})^{\alpha}} \right)^{\frac{1}{\beta-1}}$$

Plugging k_e into $h_{f,e}$:

$$h_{f,e} = \left(\frac{w_f}{\alpha z_e \left(\frac{r}{\beta z_e (\lambda \bar{h} + h_{f,e})^{\alpha}} \right)^{\frac{\beta}{\beta-1}}} \right)^{\frac{1}{\alpha-1}} - \lambda \bar{h}$$

$$h_{f,e} = \left(\frac{w_f}{\alpha} \left(\frac{\beta}{r} \right)^{\frac{\beta}{\beta-1}} z_e^{\frac{1}{\beta-1}} \left(\lambda \bar{h} + h_{f,e} \right)^{\frac{\alpha\beta}{\beta-1}} \right)^{\frac{1}{\alpha-1}} - \lambda \bar{h}$$

$$h_{f,e} = \left(\frac{w_f}{\alpha} \right)^{\frac{1}{\alpha-1}} \left(\frac{\beta}{r} \right)^{\frac{\beta}{(\beta-1)(\alpha-1)}} z_e^{\frac{1}{(\beta-1)(\alpha-1)}} \left(\lambda \bar{h} + h_{f,e} \right)^{\frac{\alpha\beta}{(\beta-1)(\alpha-1)}} - \lambda \bar{h}$$

$$\left(h_{f,e} + \lambda \bar{h} \right)^{\frac{1-\alpha-\beta}{(\beta-1)(\alpha-1)}} = \left(\frac{w_f}{\alpha} \right)^{\frac{1}{\alpha-1}} \left(\frac{\beta}{r} \right)^{\frac{\beta}{(\beta-1)(\alpha-1)}} z_e^{\frac{1}{(\beta-1)(\alpha-1)}}$$

$$h_{f,e} + \lambda \bar{h} = \left(\left(\frac{w_f}{\alpha} \right)^{\frac{1}{\alpha-1}} \left(\frac{\beta}{r} \right)^{\frac{\beta}{(\beta-1)(\alpha-1)}} z_e^{\frac{1}{(\beta-1)(\alpha-1)}} \right)^{\frac{(\beta-1)(\alpha-1)}{1-\alpha-\beta}}$$

Plugging $h_{f,e}$ into k_e and k_e into $h_{f,e}$, $h_{f,e}$ and k_e become:

$$h_{f,e} = \left(\frac{w_f}{\alpha} \right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r} \right)^{\frac{\beta}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} - \lambda \bar{h} \tag{A.1.1}$$

$$k_e = \left(\frac{r}{\beta} \right)^{\frac{\alpha-1}{1-\alpha-\beta}} \left(\frac{\alpha}{w_f} \right)^{\frac{\alpha}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} \tag{A.1.2}$$

Regular firm $h_{f,r}$ and k_r: Regular firm's production function is $y_r = z_r h_{f,r}^{\alpha} k_r^{\beta}$, $\alpha + \beta < 1$. Solving the maximization problem of the regular firm:

$$\begin{aligned}\max_{\{h_{f,r},k_r\}} \ \Pi_r =& y_r - w_f h_{f,r} \\ \max_{\{h_{f,r},k_r\}} \ \Pi_r =& z_r h_{f,r}^{\alpha} k_r^{\beta} - w_f h_{f,r} - r k_r\end{aligned}$$

Taking the first-order condition w.r.t. $h_{f,r}$:

$$\frac{\partial \Pi_r}{\partial h_{f,r}} \Rightarrow \alpha z_r k_r^{\beta} \left(h_{f,r}\right)^{\alpha-1} - w_f = 0$$

Simplifying $h_{f,r}$ becomes:

$$h_{f,r} = \left(\frac{w_f}{\alpha z_r k_r^{\beta}}\right)^{\frac{1}{\alpha-1}}$$

Taking the first-order condition w.r.t. k_r:

$$\frac{\partial \Pi_r}{\partial k_r} \Rightarrow \beta z_r h_{f,r}^{\alpha} k_r^{\beta-1} - r = 0$$

Simplifying k_r becomes:

$$k_r = \left(\frac{r}{\beta z_r h_{f,r}^{\alpha}}\right)^{\frac{1}{\beta-1}}$$

Plugging $h_{f,r}$ into k_r and k_r into $h_{f,r}$, $h_{f,r}$ and k_r become:

$$h_{f,r} = \left(\frac{w_f}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \tag{A.1.3}$$

$$k_r = \left(\frac{r}{\beta}\right)^{\frac{\alpha-1}{1-\alpha-\beta}} \left(\frac{\alpha}{w_f}\right)^{\frac{\alpha}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \tag{A.1.4}$$

Total labor supply of free-laborers in the main industry: Adding $h_{f,e}$ and $h_{f,r}$ and simplifying, the total labor supply of free-laborers become:

$$\bar{H}_f = \left(\frac{w_f}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right) - \lambda\bar{h} \tag{A.1.5}$$

Simplifying equation (A.1.5), we find the wage rate in the main industry:

$$w_f = \alpha \left(\frac{\bar{H} + \lambda\bar{h}}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)} \right)^{\frac{1-\alpha-\beta}{\beta-1}} \tag{A.1.6}$$

The effect of capacity constraint on the main industry wage rate is negative, $\frac{\partial w_f}{\partial \bar{h}} < 0$:

$$\frac{\partial w_f}{\partial \bar{h}} = \frac{\lambda(-\alpha-\beta+1)}{\beta-1} (\bar{H} + \lambda\bar{h})^{\frac{1-\alpha-\beta}{\beta-1}-1} \frac{\alpha}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{\beta-1}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{\beta-1}}} \tag{A.1.7}$$

A.1.2 Alternative Industry and Employment Share

Alternative industry's production function is $y_a = Al$, where $l = l_a + h_a$. Here, h_a represents the quantity of free workers moving from the main industry to the alternative industry. Solving the maximization problem of the alternative industry:

$$\max_{\{l\}} \ \Pi_a = Al - w_a l$$

Taking the first order condition w.r.t. l, we find w_a:

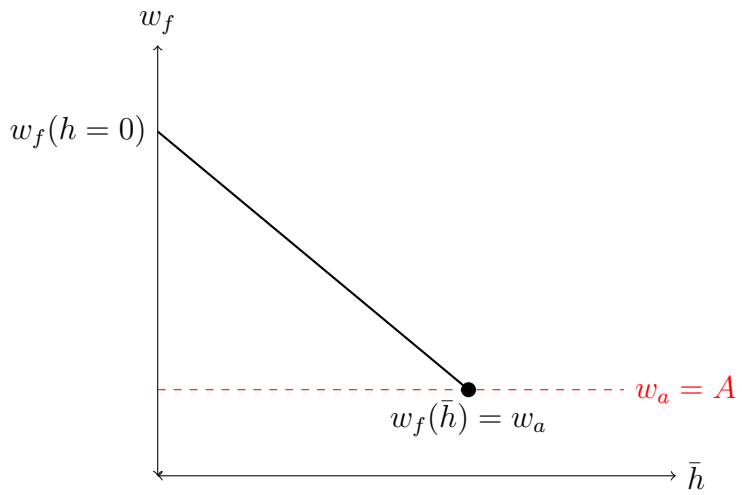
$$w_a = A$$

Assuming the wage rate in the main industry without convict labor exceeds

that in the alternative industry, $w_f(\bar{h} = 0) > w_a$, no movement of free labor from the main to the alternative industry occurs, $\gamma = 1$, where γ represents the employment share in the main industry. Consequently, with no transfer of free labor between these industries, it will hold that $\gamma = 1$.

However, with the introduction of convict labor, w_f declines (see equation (A.1.7)). This monotonic decline will continue until $w_f(\bar{h} > 0) = w_a$, as if the decline continues below w_a, regular firms will make zero profits. In this case, there will be a positive transfer of free labor from the main industry to the alternative industry, $\gamma < 1$.

Figure 5. Main and Alternative Industry Wages



Note: The figure illustrates the downward trend in wages within the main industry following the introduction of convict labor, eventually equalizing with the wage levels of the alternative industry.

Total labor supply of free-laborers: We can denote the total labor supply in the main industry as $\bar{H}_f = \gamma \bar{H}$, where γ is the employment share in the main industry, and total labor supply as $\bar{H} = \gamma \bar{H} + h_a$. Adding $h_{f,e}$, $h_{f,r}$, and h_a and simplifying, the total labor supply of free-laborers become:

$$\bar{H} = \underbrace{\left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right) - \lambda \bar{h}}_{\gamma \bar{H}} + h_a \tag{A.1.8}$$

A.1.3 Equilibrium Wage Rate

Simplifying equation (A.1.8), we find the equilibrium wage rate:

$$\begin{aligned}\left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} =& \frac{\overbrace{\bar{H}-h_a}^{\gamma\bar{H}}+\lambda\bar{h}}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}}\left(z_e^{\frac{1}{1-\alpha-\beta}}+z_r^{\frac{1}{1-\alpha-\beta}}\right)} \\ w =& \alpha\left(\frac{\gamma\bar{H}+\lambda\bar{h}}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}}\left(z_e^{\frac{1}{1-\alpha-\beta}}+z_r^{\frac{1}{1-\alpha-\beta}}\right)}\right)^{\frac{1-\alpha-\beta}{\beta-1}}\end{aligned} \tag{A.1.9}$$

Proof of Proposition 1. *The effect of capacity constraint on equilibrium wage rate is negative,* $\frac{\partial w}{\partial \bar{h}} < 0$*:*

$$\frac{\partial w}{\partial \bar{h}} = \frac{\lambda(-\alpha-\beta+1)}{\beta-1}(\gamma\bar{H}+\lambda\bar{h})^{\frac{1-\alpha-\beta}{\beta-1}-1}\frac{\alpha}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{\beta-1}}\left(z_e^{\frac{1}{1-\alpha-\beta}}+z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{\beta-1}}} \tag{A.1.10}$$

When $\bar{h}$ *is sufficiently large, the productivity of convict labor and its capacity becomes strategic complements. As a result, enhancing convict productivity further depresses equilibrium wages,* $\frac{\partial^2 w}{\partial \bar{h}\partial\lambda} > 0$*:*

$$\begin{aligned}\frac{\partial^2 w}{\partial \bar{h}\partial\lambda} =& \frac{1-\alpha-\beta}{\beta-1}(\gamma\bar{H}+\lambda\bar{h})^{\frac{1-\alpha-\beta}{\beta-1}-1}\left(\left(\frac{1-\alpha-\beta}{\beta-1}-1\right)\frac{\lambda\bar{h}}{\lambda\bar{h}+\gamma\bar{H}}+1\right) \\ & \frac{\alpha}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{\beta-1}}\left(z_e^{\frac{1}{1-\alpha-\beta}}+z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{\beta-1}}}\end{aligned} \tag{A.1.11}$$

For equation (A.1.11) to be positive, it must be that $\left|\left(\frac{1-\alpha-\beta}{\beta-1}-1\right)\frac{\lambda\bar{h}}{\lambda\bar{h}+\gamma\bar{H}}\right| > 1$*. The first term consistently exceeds one, while the second remains below one. Thus, equilibrium wages decrease with increased convict productivity when* $\bar{h}$ *is sufficiently large, i.e., above the threshold* $\bar{h}^*$ *that uniquely solves*

$\left|\left(\frac{1-\alpha-\beta}{\beta-1}-1\right)\right| \frac{\lambda\bar{h}}{\lambda\bar{h}+\gamma\bar{H}} = 1.$ ■

Employment share in the main industry: The employment share in the main industry, γ, is declining in the capacity constraint of convict labor.

Proof of Proposition 2. *To see this, first note that the introduction of convict labor results in the wage rate satisfying* $w(\bar{h} > 0) = w_a$ *(see Section A.1.2). In this case:*

$$\alpha \left(\frac{\gamma\bar{H} + \lambda\bar{h}}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}} \right)} \right)^{\frac{1-\alpha-\beta}{\beta-1}} = A$$

Simplifying, we find:

$$\left(\frac{\gamma\bar{H} + \lambda\bar{h}}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}} \right)} \right) = \left(\frac{A}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}}$$

$$\left(\gamma\bar{H} + \lambda\bar{h}\right) = \left(\frac{A}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}} \right)$$

$$\gamma = \frac{\left(\frac{A}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}} \right) - \lambda\bar{h}}{\bar{H}}$$

Taking the derivative of γ *w.r.t.* $\bar{h}$*, we can see that* $\frac{\partial\gamma}{\partial\bar{h}} < 0$*:*

$$\frac{\partial\gamma}{\partial\bar{h}} = -\frac{\lambda}{\bar{H}} < 0$$

Therefore, an increase in the capacity constraint of convict labor leads to a decrease in the employment share of the main industry. ■

A.1.4 Labor Reallocation

To demonstrate the shift of labor from elite to regular firms, it is necessary to show that $\frac{\partial \frac{h_{f,e}}{h_{f,r}}}{\partial \bar{h}} < 0$. This involves substituting the equilibrium wage into the expressions for $h_{f,e}$, and $h_{f,r}$:

$$\begin{aligned} h_{f,e} &= \left(\gamma \bar{H} + \lambda \bar{h}\right) \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}} \right)^{-1} z_e^{\frac{1}{1-\alpha-\beta}} - \lambda \bar{h} \\ h_{f,r} &= \left(\gamma \bar{H} + \lambda \bar{h}\right) \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}} \right)^{-1} z_r^{\frac{1}{1-\alpha-\beta}} \end{aligned}$$

Then $\frac{h_{f,e}}{h_{f,r}}$ becomes:

$$\frac{h_{f,e}}{h_{f,r}} = \frac{z_e^{\frac{1}{1-\alpha-\beta}}}{z_r^{\frac{1}{1-\alpha-\beta}}} - \frac{\lambda \bar{h}}{\gamma \bar{H} + \lambda \bar{h}} \frac{z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}}{z_r^{\frac{1}{1-\alpha-\beta}}}$$

Proof of Proposition 3 ***(Part 1).*** *Taking the derivative of $\frac{h_{f,e}}{h_{f,r}}$ with respect to $\bar{h}$, we find the equilibrium level of labor demand ratio of both firms:*

$$\frac{\partial \frac{h_{f,e}}{h_{f,r}}}{\partial \bar{h}} = \underbrace{-\frac{\gamma \lambda \bar{H}}{\left(\gamma \bar{H} + \lambda \bar{h}\right)^2}}_{\downarrow \, in \, \bar{h}} \frac{z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}}{z_e^{\frac{1}{1-\alpha-\beta}}}$$

Therefore, an increase in the capacity constraint of convict labor leads to a reallocation of free labor from elite to regular firms $\left(\frac{\partial \frac{h_{f,e}}{h_{f,r}}}{\partial \bar{h}} < 0 \right)$. ■

Physical capital intensity of the elite firm:

$$\frac{k_e}{h_{f,e} + \bar{h}} = \left(\left(\frac{\beta}{r}\right)^{-1} \left(\frac{w}{\alpha}\right)^{-1} + (1-\lambda)\bar{h} \left(\frac{\beta}{r}\right)^{\frac{\alpha-1}{1-\alpha-\beta}} \left(\frac{w}{\alpha}\right)^{\frac{\alpha}{1-\alpha-\beta}} z_e^{-\frac{1}{1-\alpha-\beta}} \right)^{-1} \tag{A.1.12}$$

For clearer interpretation, I take the first-order condition of $\frac{h_{f,e}+\bar{h}}{k_e}$ with respect

to w, as if $\frac{\partial \frac{h_{f,e}+\bar{h}}{k_e}}{\partial w} < 0$, then $\frac{\partial \frac{k_e}{h_{f,e}+\bar{h}}}{\partial w} > 0$. The first-order condition w.r.t. w:

$$\begin{aligned}\frac{\partial \frac{h_{f,e}+\bar{h}}{k_e}}{\partial w} =& -\left(\frac{\beta}{r}\right)^{-1}\left(\frac{w}{\alpha}\right)^{-2} \\ &+ (1-\lambda)\bar{h}\frac{\alpha}{1-\alpha-\beta}\left(\frac{\beta}{r}\right)^{\frac{\alpha-1}{1-\alpha-\beta}}\left(\frac{w}{\alpha}\right)^{\frac{\alpha}{1-\alpha-\beta}-1} z_e^{-\frac{1}{1-\alpha-\beta}}\end{aligned}$$

The effect of wages on the physical capital intensity of the elite firm is positive, i.e., $\frac{\partial \frac{k_e}{h_{f,e}}}{\partial w} > 0$, if $\lambda > 1 - \frac{1-\alpha-\beta}{\alpha\bar{h}}\left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}}\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}}$. Plugging in w, we find the equilibrium level of physical capital intensity of the elite firm:

$$\frac{k_e}{h_{f,e}+\bar{h}} = \left(\left(\frac{\beta}{r}\right)^{\frac{1}{\beta-1}}\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{\beta-1}}(\gamma\bar{H}+\lambda\bar{h})^{\frac{1-\alpha-\beta}{1-\beta}} + (1-\lambda)\bar{h}\left(\frac{\beta}{r}\right)^{\frac{1}{\beta-1}}\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{1-\beta}} z_e^{-\frac{1}{1-\alpha-\beta}}(\gamma\bar{H}+\lambda\bar{h})^{\frac{\alpha}{\beta-1}}\right)^{-1}$$

Again, taking the first-order condition of $\frac{h_{f,e}+\bar{h}}{k_e}$ w.r.t $\bar{h}$, as if $\frac{\partial \frac{h_{f,e}+\bar{h}}{k_e}}{\partial \bar{h}} > 0$, then $\frac{\partial \frac{k_e}{h_{f,e}+\bar{h}}}{\partial \bar{h}} < 0$:

$$\begin{aligned}\frac{\partial \frac{h_{f,e}+\bar{h}}{k_e}}{\partial \bar{h}} =& \frac{1-\alpha-\beta}{1-\beta}\lambda\left(\frac{\beta}{r}\right)^{\frac{1}{\beta-1}}\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{\beta-1}} \\ &+ \frac{\alpha}{\beta-1}\lambda\bar{h}(\lambda\bar{h}+\gamma\bar{H})^{\frac{\alpha}{\beta-1}-1}(1-\lambda)\left(\frac{\beta}{r}\right)^{\frac{1}{\beta-1}}\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{1-\beta}} z_e^{-\frac{1}{1-\alpha-\beta}} \\ &+ (\lambda\bar{h}+\gamma\bar{H})^{\frac{\alpha}{\beta-1}}(1-\lambda)\left(\frac{\beta}{r}\right)^{\frac{1}{\beta-1}}\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{1-\beta}} z_e^{-\frac{1}{1-\alpha-\beta}}\end{aligned}$$

Whether the elite firm's physical capital intensity rises with an expansion in the convict labor capacity constraint depends on the value of λ. An increase in the capacity constraint of convict labor increases physical capital intensity of the elite firm if $\lambda < 1 - \frac{1-\alpha-\beta}{\alpha\bar{h}}\left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}}\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}}$.

Physical capital intensity of the regular firm:

$$\frac{k_r}{h_{f,r}} = \left(\frac{\beta}{r}\right)\left(\frac{w}{\alpha}\right)$$

Taking the first-order condition w.r.t w:

$$\frac{\partial \frac{k_r}{h_{f,r}}}{\partial w} = \frac{\beta}{r\alpha}$$

The effect of wages on the physical capital intensity of the regular firm is positive $\left(\frac{\partial \frac{k_r}{h_{f,r}}}{\partial w} > 0\right)$.

Proof of Proposition 3 ***(Part 2).*** *Plugging in w, we find the equilibrium level of physical capital intensity of the regular firm:*

$$\frac{k_r}{h_{f,r}} = (\gamma\bar{H} + \lambda\bar{h})^{\frac{1-\alpha-\beta}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{1-\beta}}$$

Taking the first-order condition w.r.t $\bar{h}$:

$$\frac{\partial \frac{k_r}{h_{f,r}}}{\partial \bar{h}} = \frac{1-\alpha-\beta}{\beta-1}\lambda(\gamma\bar{H} + \lambda\bar{h})^{\frac{1-\alpha-\beta}{\beta-1}-1} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{1-\beta}}$$

Therefore, an increase in the capacity constraint of convict labor leads to a decrease in the regular firm's physical capital intensity. $\left(\frac{\partial \frac{k_r}{h_{f,r}}}{\partial \bar{h}} < 0\right)$. ■

A.1.5 Equilibrium Profits of the Elite Firm

Proof of Proposition 4. *The profit of the elite firm is* $\Pi_e = z_e \left(\lambda\bar{h} + h_{f,e}\right)^{\alpha} k_e^{\beta} - wh_{f,e} - rk_e$. *Solving for the equilibrium level, plugging $h_{f,e}$ in Π_e:*

$$\Pi_e = z_e^{\frac{1-\beta}{1-\alpha-\beta}} \left(\frac{w}{\alpha}\right)^{\frac{\alpha(\beta-1)}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\alpha\beta}{1-\alpha-\beta}} k_e^{\beta} - w\left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} + \lambda\bar{h}w - rk_e$$

Plugging k_e in Π_e:

$$\Pi_e = \left(\frac{w}{\alpha}\right)^{\frac{-\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} - w \left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} + \lambda\bar{h}w$$
$$- r \left(\frac{w}{\alpha}\right)^{\frac{-\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{1-\alpha}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}}$$

Defining parts of the equation:

$$(1) \equiv \left(\frac{w}{\alpha}\right)^{\frac{-\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}}$$
$$(2) \equiv -w \left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}}$$
$$(3) \equiv \lambda\bar{h}w$$
$$(4) \equiv -r \left(\frac{w}{\alpha}\right)^{\frac{-\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{1-\alpha}{1-\alpha-\beta}} z_e^{\frac{1}{1-\alpha-\beta}}$$

Plugging w in Π_e for all parts of the equation:

$$(1) \equiv \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}}$$
$$(2) \equiv -\alpha \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} z_e^{\frac{1}{1-\alpha-\beta}}$$
$$(3) \equiv \alpha\lambda\bar{h} \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{1-\alpha-\beta}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{1-\beta}}$$
$$(4) \equiv -r \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} z_e^{\frac{1}{1-\alpha-\beta}}$$

Simplifying $\Pi_e = (1) + (2) + (3) + (4)$ becomes:

$$\Pi_e = \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(\frac{r}{\beta}(1-\alpha-\beta)\right)$$
$$+ \alpha\lambda\bar{h} \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{1-\alpha-\beta}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{1-\beta}} \tag{A.1.13}$$

The impact of capacity constraint on equilibrium profits of the elite firm is positive ($\frac{\partial \Pi_e}{\partial \bar{h}} > 0$). *The first part of equation A.1.13 demonstrates an increasing trend with respect to* $\bar{h}$. *Rewriting the second part of equation A.1.13:*

$$= \alpha\lambda\bar{h}\left(\gamma\bar{H}+\lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} \frac{1}{\left(\gamma\bar{H}+\lambda\bar{h}\right)} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{1-\beta}}$$

$$= \frac{\lambda\bar{h}}{\left(\gamma\bar{H}+\lambda\bar{h}\right)} \underbrace{\left(\gamma\bar{H}+\lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}}}_{\uparrow in\ \bar{h}} \alpha \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{1-\alpha-\beta}{1-\beta}}$$

To see that $\frac{\lambda\bar{h}}{(\gamma\bar{H}+\lambda\bar{h})}$ *is also increasing in* $\bar{h}$, *applying the product rule:*

$$\underbrace{\left(\lambda(\gamma\bar{H}+\lambda\bar{h}) - \lambda\lambda\bar{h}\right)}_{=\lambda\gamma\bar{H}>0 \Rightarrow \uparrow in\ \bar{h}} \underbrace{\left(\frac{1}{(\gamma\bar{H}+\lambda\bar{h})^2}\right)}_{\uparrow in\ \bar{h}}$$

Therefore, it holds that ($\frac{\partial \Pi_e}{\partial \bar{h}} > 0$).

A.1.6 Equilibrium Profits of the Regular Firm

This section provides the proof of Proposition 3. The profit of the regular firm is $\Pi_r = z_r h_{f,r}^{\alpha} k_r^{\beta} - w h_{f,r} - r k_r$. *Solving for the equilibrium level, plugging* $h_{f,r}$ *in* Π_r*:*

$$\Pi_r = z_r^{\frac{1-\beta}{1-\alpha-\beta}} \left(\frac{w}{\alpha}\right)^{\frac{\alpha(\beta-1)}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\alpha\beta}{1-\alpha-\beta}} k_r^{\beta} - w \left(\frac{w}{\alpha}\right)^{\frac{\beta-)}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} - r k_r$$

Plugging k_r *in* Π_r*:*

$$\Pi_r = \left(\frac{w}{\alpha}\right)^{\frac{-\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} - w \left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}}$$
$$- r \left(\frac{w}{\alpha}\right)^{\frac{-\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{1-\alpha}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}}$$

Defining parts of the equation:

$$(1) \equiv \left(\frac{w}{\alpha}\right)^{\frac{-\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}}$$

$$(2) \equiv -w \left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}}$$

$$(3) \equiv -r \left(\frac{w}{\alpha}\right)^{\frac{-\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{1-\alpha}{1-\alpha-\beta}} z_r^{\frac{1}{1-\alpha-\beta}}$$

Plugging w in Π_r for all parts of the equation:

$$(1) \equiv \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}}$$

$$(2) \equiv -\alpha \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}}$$

$$(3) \equiv -r \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}}$$

Simplifying $\Pi_r = (1) + (2) + (3)$ becomes:

$$\Pi_r = \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(\frac{r}{\beta}(1-\alpha-\beta)\right) \tag{A.1.14}$$

The impact of capacity constraint on equilibrium profits of the regular firm is positive $\left(\frac{\partial \Pi_r}{\partial \bar{h}} > 0\right)$:

$$\begin{aligned}\frac{\partial \Pi_r}{\partial \bar{h}} =& \frac{\lambda\alpha}{1-\beta} \left(\gamma\bar{H} + \lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}-1} z_r^{\frac{1}{1-\alpha-\beta}} \\ & \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(\frac{r}{\beta}(1-\alpha-\beta)\right). \quad \blacksquare\end{aligned}$$

A.1.7 Capital-Labor Cost Ratio

The capital-to-labor cost ratio for the region is denoted as $CI \equiv \frac{rk_e+rk_r}{w\gamma\bar{H}+w_c\bar{h}}$. Since $w_c = 0$, the ratio simplifies to:

$$CI \equiv \frac{rk_e + rk_r}{w\gamma\bar{H}}.$$

Proof of Proposition 5. *The capital-to-labor cost ratio rises with the convict labor capacity constraint, i.e.,* $\frac{\partial CI}{\partial \bar{h}} > 0$. *We deduce this from the fact that as* $\bar{h}$ *increases, both* k_e *and* k_r *increase and* γw *decreases. To see that* γw *is decreasing in* $\bar{h}$*, plug* γ *in the wage equation:*

$$\begin{aligned}
\gamma w =& A\left(\left(\frac{A}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}}\left(\frac{\beta}{1-\alpha-\beta}\right)\right)\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)\bar{H}^{-1} - A\frac{\lambda\bar{h}}{\bar{H}} \\
\frac{\partial\gamma w}{\partial\bar{h}} =& -\frac{A\lambda}{\bar{H}} < 0
\end{aligned}$$

To see that $\frac{\partial k_r}{\partial \bar{h}} > 0$ *and* $\frac{\partial k_e}{\partial \bar{h}} > 0$*:*

$$\begin{aligned}
k_r =& (\gamma\bar{H} + \lambda\bar{h})^{\frac{\alpha}{1-\beta}}\left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} z_r^{\frac{1}{1-\alpha-\beta}}\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} \\
\frac{\partial k_r}{\partial\bar{h}} =& \frac{\alpha}{1-\beta}\lambda(\gamma\bar{H} + \lambda\bar{h})^{\frac{\alpha}{1-\beta}-1}\left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} z_r^{\frac{1}{1-\alpha-\beta}}\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} > 0
\end{aligned}$$

$$\begin{aligned}
k_e =& (\gamma\bar{H} + \lambda\bar{h})^{\frac{\alpha}{1-\beta}}\left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} z_e^{\frac{1}{1-\alpha-\beta}}\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} \\
\frac{\partial k_e}{\partial\bar{h}} =& \frac{\alpha}{1-\beta}\lambda(\gamma\bar{H} + \lambda\bar{h})^{\frac{\alpha}{1-\beta}-1}\left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} z_e^{\frac{1}{1-\alpha-\beta}}\left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{\beta-1}} > 0 \quad \blacksquare
\end{aligned}$$

A.1.8 Union Membership and Strikes

Benefit of workers from striking: Should the strike succeed, the value or benefit (Ω) accrued by the employee is $\Omega = \left(w(h_c = 0) - w(h_c = \bar{h})\right)\gamma\bar{H}$. We can rewrite this as:

$$\Omega = \left(\gamma w(h_c = 0) - \gamma w(h_c = \bar{h})\right)\bar{H}$$

Section A.1.2 shows that if $w(h_c = 0)$, then $\gamma = 1$. This equation becomes:

$$\Omega = \left(w(h_c = 0) - \gamma w(h_c = \bar{h})\right)\bar{H} \tag{A.1.15}$$

Probability of workers joining a union and striking: Assuming a strike at an elite firm can be prevented with probability $1 - p$ or succeed with p, successful strikes lead to the elimination of convict labor and unsuccessful ones to a utility loss, L. Free labor will strike if:

$$J < p\Omega - (1-p)L = p\left(\left(w(h_c = 0) - \gamma w(h_c = \bar{h})\right)\bar{H} - (1-p)L \right. \tag{A.1.16}$$

Proof of Proposition 6. *The right-hand side of equation (A.1.16) increases in correlation with $\bar{h}$:*

$$J < p \underbrace{\left(\underbrace{w(h_c = 0)}_{\frac{\partial w(h_c=0)}{\partial h}=0} - \underbrace{\gamma}_{\frac{\partial \gamma}{\partial h}<0} \underbrace{w(h_c = \bar{h})}_{\frac{\partial w(h_c=\bar{h})}{\partial h}<0} \right)}_{\uparrow \text{ in } \bar{h}} \bar{H} - (1-p)L$$

To see that $\left(w(h_c = 0) - \gamma w(h_c = \bar{h})\right)$ is increasing in $\bar{h}$, let's first plug in $w(h_c = 0)$ and $w(h_c = \bar{h})$:

$$w(h_c = 0) - \gamma w(h_c = \bar{h}) = \alpha \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right) \left(\bar{H}^{\frac{1-\alpha-\beta}{\beta-1}} - \gamma(\gamma\bar{H} + \lambda\bar{h})^{\frac{1-\alpha-\beta}{\beta-1}}\right)$$

Plugging in γ, and simplifying:

$$w(h_c = 0) - \gamma w(h_c = \bar{h}) = \alpha \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)$$
$$\left(\bar{H}^{\frac{1-\alpha-\beta}{\beta-1}} - \left(\frac{A}{\alpha}\right)^{\frac{-\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\alpha\beta}{(1-\alpha-\beta)(1-\beta)}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{1-\beta}} \bar{H}^{-1}\right)$$
$$+ \frac{\lambda\bar{h}}{\bar{H}} A \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{1-\beta}}$$

Taking the derivative of this expression w.r.t. $\bar{h}$, we find:

$$\frac{\partial w(h_c = 0) - \gamma w(h_c = \bar{h})}{\partial \bar{h}} = \frac{\lambda}{\bar{H}} A \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)^{\frac{\alpha}{1-\beta}} > 0$$

Therefore, an increase in convict labor capacity results in escalated levels of union membership and strike occurrences. ■

A.2 Model Extensions

A.2.1 Firm Type Distribution

In this section, I extend the model to allow for a general firm-type distribution for elite and regular firms: η to capture elite and $1-\eta$ to capture regular and study the implications of η on $\partial w/\partial \bar{h}$. The equilibrium labor demand $h_{f,e}$ and $h_{f,r}$ remain the same as Section 4. Combining $h_{f,e}$ and $h_{f,r}$, and firm weights η and $(1-\eta)$ to find the total free-labor demand and equating it to the total labor supply of free-laborers, $\bar{H}$, characterizes the general equilibrium of the model:

$$\bar{H} = \left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(\eta z_e^{\frac{1}{1-\alpha-\beta}} + (1-\eta) z_r^{\frac{1}{1-\alpha-\beta}}\right) - \eta\lambda\bar{h} + h_a \quad \text{(A.2.1)}$$

Wage rate of free-laborers, w:

$$w = \alpha \left(\frac{\gamma \bar{H} + \eta \lambda \bar{h}}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(\eta z_e^{\frac{1}{1-\alpha-\beta}} + (1-\eta) z_r^{\frac{1}{1-\alpha-\beta}} \right)} \right)^{\frac{1-\alpha-\beta}{\beta-1}} \tag{A.2.2}$$

The effect of capacity constraint on equilibrium wage rate is negative, $\frac{\partial w}{\partial \bar{h}} < 0$:

$$\frac{\partial w}{\partial \bar{h}} = \frac{\eta\lambda(-\alpha-\beta+1)}{\beta-1} (\gamma \bar{H} + \eta\lambda\bar{h})^{\frac{1-\alpha-\beta}{\beta-1}-1} \frac{\alpha}{\left(\frac{\beta}{r}\right)^{\frac{\beta}{\beta-1}} \left(\eta z_e^{\frac{1}{1-\alpha-\beta}} + (1-\eta) z_r^{\frac{1}{1-\alpha-\beta}} \right)^{\frac{1-\alpha-\beta}{\beta-1}}}$$

When $\eta = 1$—all firms are elite—convict labor negatively affects wages. But when $\eta = 0$—no elite firms—convict labor does not impact wages ($\frac{\partial w}{\partial \bar{h}} = 0$).

Profits of Elite and Regular Firms:

$$\begin{aligned} \Pi_e = & \left(\gamma \bar{H} + \eta\lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} z_e^{\frac{1}{1-\alpha-\beta}} \left(\eta z_e^{\frac{1}{1-\alpha-\beta}} + (1-\eta) z_r^{\frac{1}{1-\alpha-\beta}} \right)^{\frac{\alpha}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(\frac{r}{\beta}(1-\alpha-\beta)\right) \\ & + \alpha\lambda\bar{h} \left(\gamma \bar{H} + \eta\lambda\bar{h}\right)^{\frac{1-\alpha-\beta}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}} \left(\eta z_e^{\frac{1}{1-\alpha-\beta}} + (1-\eta) z_r^{\frac{1}{1-\alpha-\beta}} \right)^{\frac{1-\alpha-\beta}{1-\beta}} \end{aligned} \tag{A.2.3}$$

The impact of capacity constraint on equilibrium profits of elite firms is positive ($\frac{\partial \Pi_e}{\partial \bar{h}} > 0$).

$$\Pi_r = \left(\gamma \bar{H} + \eta\lambda\bar{h}\right)^{\frac{\alpha}{1-\beta}} z_r^{\frac{1}{1-\alpha-\beta}} \left(\eta z_e^{\frac{1}{1-\alpha-\beta}} + (1-\eta) z_r^{\frac{1}{1-\alpha-\beta}} \right)^{\frac{\alpha}{\beta-1}} \left(\frac{\beta}{r}\right)^{\frac{1}{1-\beta}} \left(\frac{r}{\beta}(1-\alpha-\beta)\right) \tag{A.2.4}$$

The impact of capacity constraint on equilibrium profits of the regular firms is positive ($\frac{\partial \Pi_e}{\partial \bar{h}} > 0$).

Union Membership and Strikes: The union and strike aspect of the model is unchanged. As previously, expanding convict labor capacity leads to more union memberships and strikes.

A.2.2 Household Preferences and Endogenous Labor Supply

In this section, the model is expanded to include a labor-leisure trade-off for workers, which supersedes the component involving the alternative industry.

The aspect of the model pertaining to the elite and regular firms remains unaltered; it builds upon the aspects related to households and the general equilibrium. The model features an economy populated by N households, endowed with a maximum amount of $\hat{h}$ units of labor services. Each household exhibits consumption-labor preferences:

$$u(c,h) = c - \frac{1}{1+\mu}h^{1+\mu}, \tag{A.2.5}$$

where c denotes the consumption, h denotes the hours of labor supply, and μ denotes the wage elasticity of labor supply of the free households. Solving the maximization problem of consumers:

$$\begin{aligned}
&\max_{\{c,h\}} U = u(c,h) \quad s.t. \quad c = wh \\
&\max_{\{c,h\}} U = wh - \frac{1}{1+\mu}h^{1+\mu} \\
&\quad \frac{\partial U}{\partial h} \Rightarrow -h^{\mu} + w = 0
\end{aligned}$$

Equilibrium hours of labor supply provided by households become:

$$h = w^{\frac{1}{\mu}} \tag{A.2.6}$$

Now, let us use this last expression together with the equation that character-

izes the general equilibrium of the economy:

$$
\begin{aligned}
Nw^{\frac{1}{\mu}} &= h_{f,e} + h_{f,r} \\
\underbrace{Nw^{\frac{1}{\mu}}}_{\text{Free Labor Supply}} &= \underbrace{\underbrace{\left(\frac{w}{\alpha}\right)^{\frac{\beta-1}{1-\alpha-\beta}} \left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(z_e^{\frac{1}{1-\alpha-\beta}} + z_r^{\frac{1}{1-\alpha-\beta}}\right)}_{\text{Free Labor Demand}} \quad \underbrace{-\lambda\bar{h}}_{\text{Convict Labor Demand (Capacity)}}}_{\text{Total Labor Demand}}
\end{aligned}
\tag{A.2.7}
$$

Key properties of equation (A.2.7):
Equilibrium uniqueness. The left-hand-side (LHS) of (A.2.7) monotonically increases in w while the right-hand-side (RHS) monotonically decreases in w. Therefore, the equilibrium is unique.

Equilibrium existence. We have the following limit properties:

$$
\begin{aligned}
\lim_{w\to 0} \text{LHS}(w) &= 0, \\
\lim_{w\to 0} \text{RHS}(w) &= \infty, \\
\lim_{w\to \infty} \text{LHS}(w) &= \hat{h}, \\
\lim_{w\to \infty} \text{RHS}(w) &= -\lambda\bar{h},
\end{aligned}
$$

which jointly imply that the equilibrium exists. Equilibrium uniqueness and equilibrium existence together show that the equilibrium is characterized by a unique wage rate.

The effect of $\bar{h}$ on the equilibrium wage rate is negative – as in the benchmark model in Section 4 where the labor supply is exogenously determined. To recognize this effect, it is essential to understand that an increase in $\bar{h}$ uniformly lowers the right-hand side (RHS) of equation (A.2.7). Since RHS(w) declines monotonically in w, while LHS(w) monotonically increases in w, this implies that a rise in $\bar{h}$ unambiguously lowers the equilibrium wage, w, of the free labor.

The properties obtained above extend (generalize) the previously formal-

ized impact of convict labor capacity result, that it reduces the unit wage rate of free labor, to a set-up where the supply of labor is determined endogenously. Additionally, it provides the insight that the equilibrium labor supply (work hours, voluntary (un)employment) of free-labor adjusts in equilibrium. To understand this, refer to equation (A.2.6), which demonstrates that the supply of free labor decreases as the wage rate drops. Specifically:

$$\frac{\partial h}{\partial w} = \frac{1}{\mu} w^{\frac{1}{\mu}-1} \tag{A.2.8}$$

which implies that $\bar{h}$ reduces the equilibrium wage rate of the free labor and in turn also the hours-work of the free labor in equilibrium.

Union Membership and Strikes: The model's union membership and strike facet remains constant. As before, an increase in the capacity for convict labor results in a surge in unionization and strikes.

A.3 Constant Elasticity of Substitution

This model has a representative firm, employing convict and free labor. Convict labor is not paid, while free labor is ($w_f = w > 0$). The firm has a capacity limit for convict labor, $h_{c,e} \leq \bar{h}$.

The production function and the maximization problem:

$$\begin{aligned} Y &= \left(\eta \bar{h}^{\rho} + (1-\eta) h_f^{\rho}\right)^{\frac{\alpha}{\rho}} \\ \max\ & \left(\eta \bar{h}^{\rho} + (1-\eta) h_f^{\rho}\right)^{\frac{\alpha}{\rho}} - w h_f \\ \frac{\partial}{\partial h_f} &: \alpha \left(\eta \bar{h}^{\rho} + (1-\eta) h_f^{\rho}\right)^{\frac{\alpha}{\rho}-1} (1-\eta) h_f^{\rho-1} - w \end{aligned} \tag{A.3.1}$$

Wage becomes:

$$\begin{aligned} w &= \alpha Y^{\frac{\alpha-\rho}{\rho}} (1-\eta) h_f^{\rho-1} \\ w &= \alpha \left(\eta \bar{h}^{\rho} + (1-\eta) h_f^{\rho}\right)^{\frac{\alpha-\rho}{\rho}} (1-\eta) h_f^{\rho-1} \end{aligned} \tag{A.3.2}$$

Taking the logarithm:

$$\log w = \log(\alpha) + \frac{\alpha - \rho}{\rho} \log\left(\eta \bar{h}^{\rho} + (1-\eta) h_f^{\rho}\right) + \log(1-\eta) + (\rho - 1)\log(h_f)$$

Differentiate w.r.t. $\bar{h}$:

$$\frac{\partial \log w}{\partial \bar{h}} = \frac{\eta(\alpha - \rho)\bar{h}^{\rho-1}}{\eta(\bar{h}^{\rho} - h_f^{\rho}) + h_f^{\rho}} \tag{A.3.3}$$

One can estimate the elasticity of substitution parameter, ρ, in the following way:

$$\begin{aligned} \log w &= \log(\alpha) + \frac{\alpha - \rho}{\rho} \log\left(\eta \bar{h}^{\rho} + (1-\eta) h_f^{\rho}\right) \\ &\quad + \log(1-\eta) + (\rho - 1)\log(h_f) \\ \frac{\partial \log w}{\partial \log Y} &= \left(\frac{\alpha - \rho}{\rho}\right) \end{aligned} \tag{A.3.4}$$

Once $\frac{\partial \log w}{\partial \log Y}$ and α from the data are known, one can get a unique ρ from equation (A.3.4), since $\left(\frac{\alpha-\rho}{\rho}\right)$ is monotone in ρ. The estimation of ρ is carried out independently of η, simplifying the process as η is not necessary to determine ρ.

Calibration. First, I find $\alpha = 0.18$ by dividing the total wage by manufacturing output and taking the average for the years in the analysis (Haines et al., 2005). Then, I regress average wage growth on log(manufacturing output) and log(convict labor share). In this regression specification, I control for the convict labor share because the feasibility of estimating the CES-parameter ρ is conditional on convict labor being present in the area (i.e., $\bar{h} > 0$). We can note that the equation estimating the CES parameter would change, and ρ would altogether drop from the framework - leading to a standard Lucas-span-of-control production with h_f^{α} if convict labor is not available for the firms (i.e. if $\bar{h} = 0$).

The coefficient estimate β from the regression equation, although statistically insignificant, equals -0.8, which gives the left-hand side of equation (A.3.4). Plugging these values in:

$$-0.8 = \left(\frac{0.18 - \rho}{\rho}\right)$$

which gives ρ equal to 0.9.

The estimated value of ρ is close to 1, suggesting a high degree of substitutability between convict and free labor. However, it is important to interpret this result cautiously due to the limitations of the available data. The proximity of ρ to 1 implies that convict labor and free labor can be considered nearly perfectly substitutable within the context of this estimation. The model presented in the main body is derived from, and is in accordance with, this estimation. It is important to note that since ρ is greater than α, the predictions of this model will be qualitatively the same as the model in the main text.

B Additional Data

To account for the possibility that counties dependent on prison labor were fundamentally different from others, I control for trends in pre-existing differences in 1860 that might be related to the growth of prison labor. The baseline set of control variables includes population density, the share of enslaved individuals, the average value of agricultural output per acre of farmland, total improved acres of farmland, proximity to the coast, elevation, access to railway transportation and navigable waterways, distance to the nearest urban center with a population over 100,000, and the Democratic Party's vote share. Using United States shapefiles, I calculate the distance to the coast and the nearest urban center. The remaining control variables are obtained from the decennial Census records from the Integrated Public Use Microdata Series and the Historical, Demographic, Economic, and Social Data (ICPSR 2896) spanning the period 1850-1940 (Haines et al., 2005).

Average Wage Growth in Manufacturing: Considering the lack of direct data on county-level workers' wages, I adopt a different strategy to estimate the average manufacturing wage. This technique calculates the average wage by dividing the annual wage bill in manufacturing by the estimated number of sector workers. The data sources include ICPSR 2896 (Haines et al., 2005) for county-level data and Hornbeck and Rotemberg (2021) for county-industry-level data from 1860-1880.

Capital-Labor Cost Share: I derive the capital-labor cost ratio using county-level data from the ICPSR 2896 (Haines et al., 2005). The annual manufacturing capital spending represents the capital cost, and the annual wage bill in manufacturing signifies the labor cost. I compute the $\frac{K}{K+L}$ ratio from these values.

Election Outcomes: The election outcomes are sourced from the ICPSR 08611 (Clubb et al., 1987). The vote share of the Democratic Party in both presidential and congressional elections represents the percentage of votes they received in a particular election. I compute the win margin by subtracting the combined vote share of the other parties from the Democratic Party's vote share. Additionally, I define a dummy variable 'win' to depict the election outcome. This variable takes a value of 1 if the Democratic Party secures a vote share exceeding 50 percent, indicating a win.

Farming Outcomes: In the analysis, I examine several farming outcomes including changes in farm value, farm equipment value, farm output value, number of farms, number of farm tenants and sharecroppers, and acres of farmland. For each outcome, I compute the change relative to the previous census year. This data comes from the ICPSR 2896 (Haines et al., 2005).

Manufacturing Employment Share: This measure represents the proportion of individuals employed in manufacturing out of the total number of employed individuals from the ICPSR 2896 (Haines et al., 2005).

Manufacturing Establishments: I sourced the data on the number of manufacturing establishments from ICPSR 2896 (Haines et al., 2005). This variable indicates the total count of manufacturing establishments in a specific county for each census year. The data for the 1910 census is not available.

Manufacturing Output Value: The information on the value of manufacturing output is obtained from ICPSR 2896 (Haines et al., 2005). This variable presents the cumulative value of manufacturing output in a county for each census year. The 1910 data is missing. For the balance table, I calculate the manufacturing output value per establishment. This is achieved by dividing the total manufacturing output value by the total number of manufacturing establishments within a county.

Migration Outcomes: For calculating migration outcomes, I utilize the linked full count census (Helgertz et al., 2023; Ruggles et al., 2021). Initially, I identify individuals who have changed their county of residence between consecutive census years. This data is then aggregated at the county level to compute the total in and out migration for the specific county.

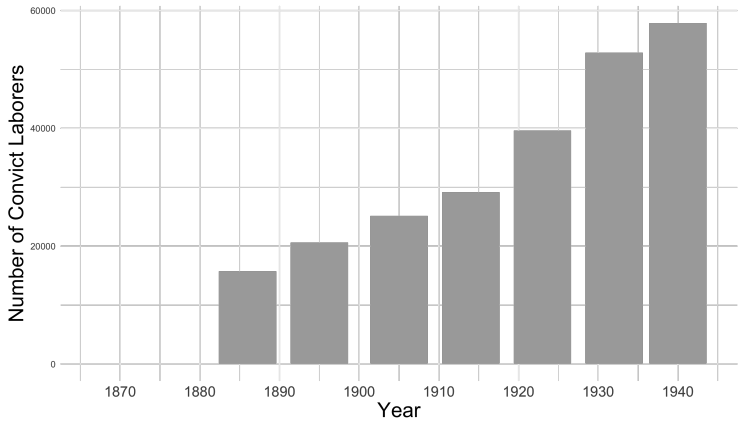
The linked full count census also includes demographic variables such as race and industry of occupation for each individual. To determine the total number of white individuals and those employed in the agriculture and manufacturing industries who have migrated, I perform the same calculation on these specific subsets of the population.

Occupation Outcomes: To quantify the shift in labor distribution, I use the linked full-count census data, specifically focusing on the occupation variable, occ1950 (Helgertz et al., 2023; Ruggles et al., 2021). According to this variable, values ranging from 500-595 indicate the individual is a craftsman, 600-690 suggest they are operatives, and 910-970 point to laborers.

To compute the count of new craftsmen and operatives, I look for individuals who held occupations other than craftsman, operative, and laborer in the prior census year, and transitioned to either craftsman or operative in the subsequent year. Similarly, for determining the count of individuals transitioning from laborer roles to craft and operative occupations, I identify those who were laborers in the previous census year and transitioned to craftsman or operative roles in the following year. Next, I aggregate these values at the county level. This gives me the total number of individuals who either transitioned into craftsman or operative roles or shifted from being laborers to either of these occupations within the county.

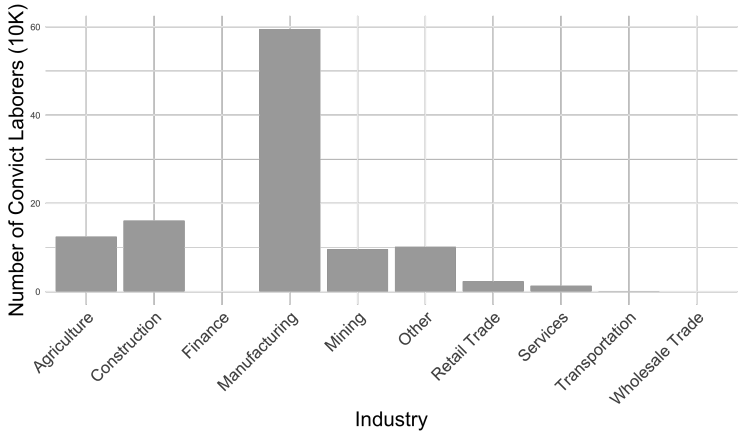
C Figures and Tables

Figure C1. Convict Labor Employment in the South: 1870-1940



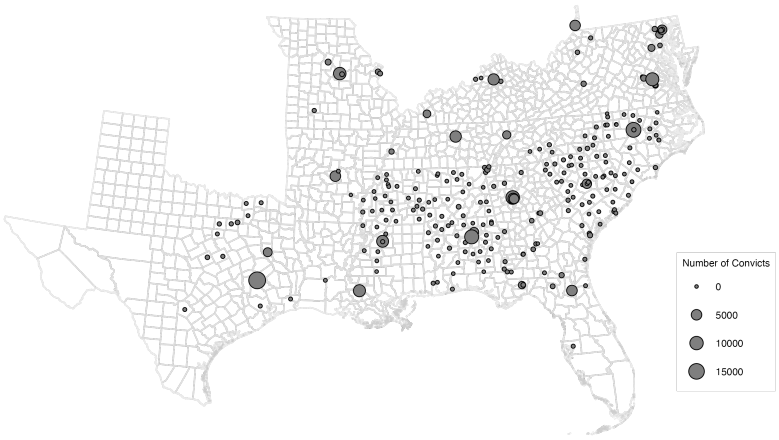
Note: Drawing upon data from the Bureau of Labor reports for the years 1886, 1895, 1905, 1914, 1923, 1932, and 1940, the figure visually portrays the total count of convict laborers in each reported year in the southern United States.

Figure C2. Employment of Convict Labor Across Industries: 1886-1940



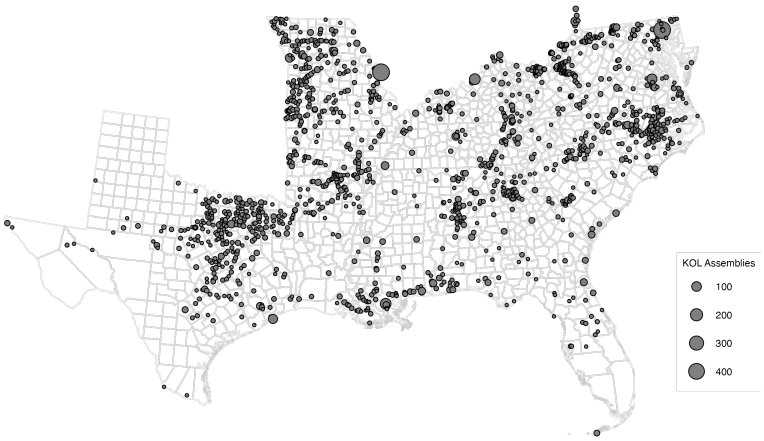
Note: Drawing from the Bureau of Labor reports for the years 1886, 1895, 1905, 1914, 1923, 1932, and 1940,, the figure aggregates and illustrates the total number of convict laborers across industries over this period.

Figure C3. Average Number of Convicts 1886-1940



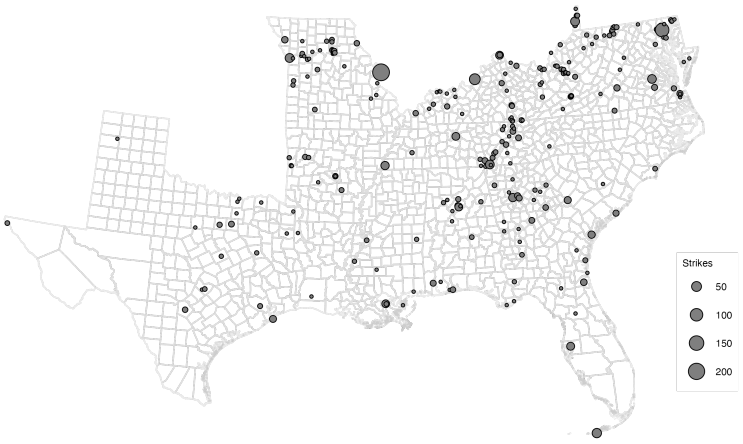
Note: The figure uses data from Bureau of Labor reports for 1886, 1895, 1905, 1914, 1923, 1932, and 1940 to visually display the average number of convicts employed at various prisons. In this illustration, each dot's size reflects the average number of convicts employed at the corresponding prison.

Figure C4. Geographic Distribution of KOL Assemblies



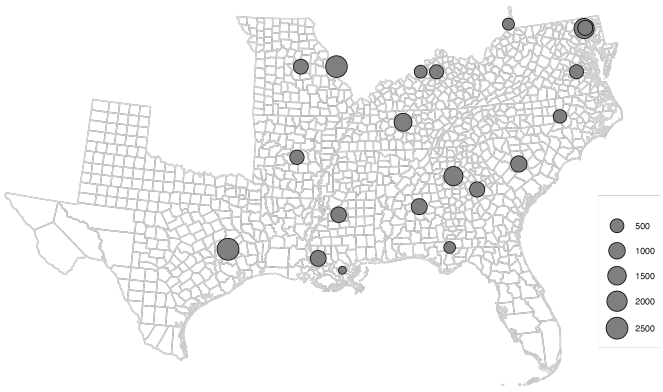
Note: Using data sourced from Garlock (1982) and Garlock (1984), the figure visually illustrates various local KOL assemblies, with each dot marking a distinct assembly.

Figure C5. Geographic Distribution of Strikes



Note: The data from (U.S. Bureau of Labor, 1888) and (U.S. Bureau of Labor, 1896) serve as the basis for the figure. This visual representation plots each strike as a dot, with each dot's value corresponding to the total number of strikes in a specific locality.

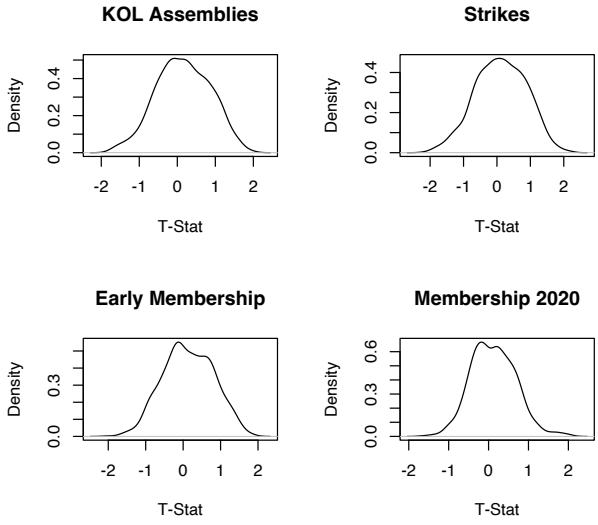
Figure C6. Geographic Distribution of Pre-Convict-Labor Prisons



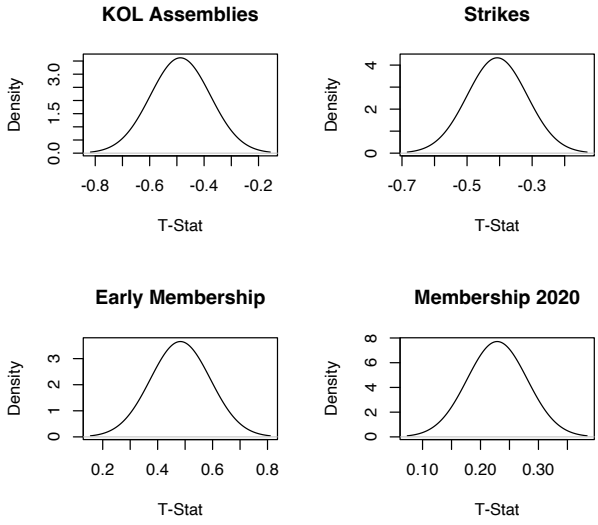
Note: By leveraging data from North American Review (1866), Prison Association of New York (1870), and Wines (1871), the figure offers a visual depiction of pre-convict-labor prisons. Each dot in the figure represents an individual correctional facility, with its size indicating its capacity.

Figure C7. Density Plot for t-statistics of Placebo Regressions

Panel A: Early Prison Dummy IV



Panel B: Early Prison Capacities IV



Note: The figure displays the density distributions of t-statistics obtained from the placebo regressions analogous to equation (19). I use counterfactual pre-convict-labor prison locations to generate graphs 1-4 in Panel A, and capacities to generate graphs 5-8 in Panel B. The actual t-statistics from Table 1 for the number of KOL assemblies and the number of strikes are 2.79 and 2.24, and 2.61 and 2.08 for the early prison dummy and capacities as instruments, respectively. Similarly, the actual t-statistics from Table 2 for early membership and membership in 2020 are 3.82 and 6.63, and 3.77 and 5.84 for the early prison dummy and capacities as instruments, respectively.

Table 1: Effect on KOL Assemblies and Strikes 1886-1905

	Dependent variable:					
	Number of KOL Assemblies			Number of Strikes		
	(1)	(2)	(3)	(4)	(5)	(6)
Convict Labor per 100,000 (IHS)	0.253***	0.232**	0.236***	0.114***	0.109***	0.108***
	(0.094)	(0.092)	(0.091)	(0.041)	(0.040)	(0.039)
Economic Controls	×	×	×	×	×	×
Geographic Controls		×	×		×	×
Socio-political Controls			×			×
State × Year FE	×	×	×	×	×	×
Mean Outcome	1.23	1.23	1.23	0.28	0.28	0.28
Clusters	1,302	1,302	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (17). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. Outcome variables include the count of local KOL assemblies and strikes. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 2: Effect on Membership 1886-1905 and 2020

	Dependent variable:					
	Early Membership (IHS)			Membership 2020 (IHS)		
	(1)	(2)	(3)	(4)	(5)	(6)
Convict Labor per 100,000 (IHS)	0.052***	0.049***	0.050***	0.142***	0.133***	0.144***
	(0.019)	(0.018)	(0.018)	(0.023)	(0.022)	(0.023)
Economic Controls	×	×	×	×	×	×
Geographic Controls		×	×		×	×
Socio-political Controls			×			×
State × Year FE	×	×	×	×	×	×
Mean Outcome	20.83	20.83	20.83	3,525	3,525	3,525
Clusters	1,302	1,302	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (17). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. The outcome variables are the IHS-transformed counts of 19^{th}-century Knights of Labor members and current union members. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 3: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
	(1)	(2)	(3)	(4)
Convict Labor (IHS)	0.429***	0.204***	0.081***	0.196***
	(0.154)	(0.075)	(0.027)	(0.029)
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,525
Clusters	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (17). The observation unit is the county (1880), with convict labor presence (number of convicts employed - IHS) as the independent variable. The outcome variables are the count of local KOL assemblies, strikes, IHS-transformed 19$^{\text{th}}$-century Knights of Labor members and current union members. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 4: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
	(1)	(2)	(3)	(4)
Number of Prisons (IHS)	2.233**	1.122**	0.288***	0.818***
	(1.036)	(0.568)	(0.112)	(0.149)
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,525
Clusters	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (17). The observation unit is the county (1880), with the number of prisons that employ convicts (IHS) as the independent variable. The outcome variables are the count of local KOL assemblies, strikes, IHS-transformed 19$^{\text{th}}$-century Knights of Labor members and current union members. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 5: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership	Membership 2020
	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS)	0.236***	0.108***	8.138	1,189***
	(0.091)	(0.039)	(6.331)	(272.175)
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,542
Clusters	1,302	1,302	1,302	1,296
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (17). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. The outcome variables are the count of local KOL assemblies, strikes, 19^{th}-century Knights of Labor members and current union members. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 6: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS)	0.236***	0.108***	0.050***	0.144***
	(0.087)	(0.038)	(0.018)	(0.023)
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,542
Clusters	1,302	1,302	1,302	1,296
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (17). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. The outcome variables are the count of local KOL assemblies, strikes, IHS-transformed 19^{th}-century Knights of Labor members and current union members. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects and Conley standard errors.

Table 7: First Stage: Effect on Convict Labor per 100,000 Inhabitants

	Dependent variable:					
	Convict Labor per 100,000 (IHS)					
	(1)	(2)	(3)	(4)	(5)	(6)
Early Prison Dummy	6.677***	6.694***	6.663***			
	(0.588)	(0.589)	(0.592)			
Early Prison Capacities (IHS)				0.941***	0.943***	0.939***
				(0.068)	(0.068)	(0.069)
Economic Controls	×	×	×	×	×	×
Geographic Controls		×	×		×	×
Socio-political Controls			×			×
State × Year FE	×	×	×	×	×	×
Mean Outcome	76.07	76.07	76.07	76.07	76.07	76.07
Clusters	1,302	1,302	1,302	1,302	1,302	1,302
F-stat	89.45	81.67	80.6	92.24	84.22	83.1
Observations	3,906	3,906	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (18). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the dependent variable. Independent variables include pre-convict labor prison locations and capacities. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The regression includes state × year fixed effects, with standard errors clustered at the county level.

Table 8: First Stage: Effect on Convict Labor

	Dependent variable:					
	Convict Labor (IHS)					
	(1)	(2)	(3)	(4)	(5)	(6)
Early Prison Dummy	5.915***	5.916***	5.896***			
	(0.498)	(0.497)	(0.499)			
Early Prison Capacities (IHS)				0.836***	0.836***	0.834***
				(0.054)	(0.055)	(0.055)
Economic Controls	×	×	×	×	×	×
Geographic Controls		×	×		×	×
Socio-political Controls			×			×
State × Year FE	×	×	×	×	×	×
Mean Outcome	15.74	15.74	15.74	15.74	15.74	15.74
Clusters	1,302	1,302	1,302	1,302	1,302	1,302
F-stat	105.01	95.85	94.45	110.4	100.78	99.3
Observations	3,906	3,906	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (18). The observation unit is the county (1880), with convict labor presence (the number of convicts employed - IHS) as the dependent variable. Independent variables include pre-convict labor prison locations and capacities. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The regression includes state × year fixed effects, with standard errors clustered at the county level.

Table 9: First Stage: Effect on Prisons

	Dependent variable:					
	Number of Prisons (IHS)					
	(1)	(2)	(3)	(4)	(5)	(6)
Early Prison Dummy	0.884***	0.884***	0.878***			
	(0.077)	(0.077)	(0.077)			
Early Prison Capacities (IHS)				0.125***	0.125***	0.125***
				(0.009)	(0.009)	(0.009)
Economic Controls	×	×	×	×	×	×
Geographic Controls		×	×		×	×
Socio-political Controls			×			×
State × Year FE	×	×	×	×	×	×
Mean Outcome	0.12	0.12	0.12	0.12	0.12	0.12
Clusters	1,302	1,302	1,302	1,302	1,302	1,302
F-stat	97.45	89.03	87.99	99.98	91.35	90.27
Observations	3,906	3,906	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (18). The observation unit is the county (1880), with the number of prisons that employ convict labor as the dependent variable. Independent variables include pre-convict labor prison locations and capacities. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The regression includes state × year fixed effects, with standard errors clustered at the county level.

Table 10: Effect on KOL Assemblies 1886-1905

	Dependent variable:									
	Number of KOL Assemblies									
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Convict Labor per 100,000 (IHS)	1.417**	1.421**	1.232***	1.232***	1.213***	1.209***	1.176***	1.166***	1.154***	1.166***
	(0.553)	(0.552)	(0.434)	(0.433)	(0.427)	(0.426)	(0.423)	(0.421)	(0.417)	(0.418)
KP F-stat	122.77	125.81	128.3	128.85	130.18	129.35	129.16	129.49	129.3	126.59
Panel B: Early Prison Capacities IV										
Convict Labor per 100,000 (IHS)	1.370**	1.376**	1.187***	1.187***	1.169***	1.166***	1.134***	1.125***	1.114***	1.126***
	(0.562)	(0.563)	(0.443)	(0.442)	(0.436)	(0.436)	(0.435)	(0.434)	(0.430)	(0.431)
KP F-stat	187.15	189.9	191.82	192.25	193.33	192.17	191.69	191.86	191.08	186.55
Population Density	×	×	×	×	×	×	×	×	×	×
Enslaved Population Share		×	×	×	×	×	×	×	×	×
Farm Output Value per Acre of Farmland		×	×	×	×	×	×	×	×	×
Number of Improved Acres of Farmland				×	×	×	×	×	×	×
Distance to Coast					×	×	×	×	×	×
Elevation						×	×	×	×	×
Access to Railways							×	×	×	×
Access to Navigable Water Bodies								×	×	×
Distance to the Nearest Urban Center									×	×
Vote Share for the Democratic Party										×
State × Year FE	×	×	×	×	×	×	×	×	×	×
Mean Outcome	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23
Clusters	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906	3,906	3,906	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variable is the number of local KOL assemblies. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 11: Effect on Strikes 1886-1905

	Dependent variable:									
	Number of Strikes									
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Convict Labor per 100,000 (IHS)	0.603**	0.605**	0.468**	0.466**	0.461**	0.461**	0.453**	0.448**	0.449**	0.450**
	(0.286)	(0.286)	(0.206)	(0.206)	(0.204)	(0.204)	(0.204)	(0.204)	(0.202)	(0.201)
KP F-stat	122.77	125.81	128.3	128.85	130.18	129.35	129.16	129.49	129.3	126.59
Panel B: Early Prison Capacities IV										
Convict Labor per 100,000 (IHS)	0.635**	0.638**	0.504**	0.503**	0.497**	0.497**	0.490**	0.487**	0.487**	0.488**
	(0.318)	(0.318)	(0.238)	(0.238)	(0.235)	(0.236)	(0.236)	(0.236)	(0.234)	(0.234)
KP F-stat	187.15	189.9	191.82	192.25	193.33	192.17	191.69	191.86	191.08	186.55
Population Density	×	×	×	×	×	×	×	×	×	×
Enslaved Population Share		×	×	×	×	×	×	×	×	×
Farm Output Value per Acre of Farmland		×	×	×	×	×	×	×	×	×
Number of Improved Acres of Farmland				×	×	×	×	×	×	×
Distance to Coast					×	×	×	×	×	×
Elevation						×	×	×	×	×
Access to Railways							×	×	×	×
Access to Navigable Water Bodies								×	×	×
Distance to the Nearest Urban Center									×	×
Vote Share for the Democratic Party										×
State × Year FE	×	×	×	×	×	×	×	×	×	×
Mean Outcome	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Clusters	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906	3,906	3,906	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variable is the number strikes. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 12: Effect on Early Membership

	Dependent variable:									
	Early Membership (IHS)									
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Convict Labor per 100,000 (IHS)	0.216***	0.216***	0.195***	0.195***	0.193***	0.192***	0.188***	0.186***	0.185***	0.187***
	(0.057)	(0.057)	(0.051)	(0.051)	(0.050)	(0.050)	(0.049)	(0.049)	(0.049)	(0.049)
KP F-stat	122.77	125.81	128.3	128.85	130.18	129.35	129.16	129.49	129.3	126.59
Panel B: Early Prison Capacities IV										
Convict Labor per 100,000 (IHS)	0.209***	0.209***	0.188***	0.189***	0.186***	0.186***	0.182***	0.180***	0.179***	0.181***
	(0.055)	(0.055)	(0.049)	(0.049)	(0.049)	(0.049)	(0.048)	(0.048)	(0.048)	(0.048)
KP F-stat	187.15	189.9	191.82	192.25	193.33	192.17	191.69	191.86	191.08	186.55
Population Density	×	×	×	×	×	×	×	×	×	×
Enslaved Population Share		×	×	×	×	×	×	×	×	×
Farm Output Value per Acre of Farmland		×	×	×	×	×	×	×	×	×
Number of Improved Acres of Farmland				×	×	×	×	×	×	×
Distance to Coast					×	×	×	×	×	×
Elevation						×	×	×	×	×
Access to Railways							×	×	×	×
Access to Navigable Water Bodies								×	×	×
Distance to the Nearest Urban Center									×	×
Vote Share for the Democratic Party										×
State × Year FE	×	×	×	×	×	×	×	×	×	×
Mean Outcome	20.83	20.83	20.83	20.83	20.83	20.83	20.83	20.83	20.83	20.83
Clusters	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906	3,906	3,906	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variable is the IHS-transformed 19^{th}-century KOL membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 13: Effect on Membership 2020

	Dependent variable:									
	Membership 2020 (IHS)									
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Convict Labor per 100,000 (IHS)	0.315***	0.314***	0.266***	0.269***	0.253***	0.250***	0.227***	0.223***	0.214***	0.225***
	(0.045)	(0.046)	(0.040)	(0.040)	(0.039)	(0.039)	(0.038)	(0.039)	(0.038)	(0.040)
KP F-stat	122.59	125.69	128.16	128.7	130.08	129.21	129.03	129.36	129.21	126.29
Panel B: Early Prison Capacities IV										
Convict Labor per 100,000 (IHS)	0.309***	0.308***	0.260***	0.263***	0.248***	0.245***	0.223***	0.220***	0.211***	0.222***
	(0.041)	(0.042)	(0.037)	(0.037)	(0.037)	(0.037)	(0.036)	(0.037)	(0.036)	(0.038)
KP F-stat	186.79	189.68	191.56	191.98	193.13	191.9	191.44	191.61	190.87	186.04
Population Density	×	×	×	×	×	×	×	×	×	×
Enslaved Population Share		×	×	×	×	×	×	×	×	×
Farm Output Value per Acre of Farmland		×	×	×	×	×	×	×	×	×
Number of Improved Acres of Farmland				×	×	×	×	×	×	×
Distance to Coast					×	×	×	×	×	×
Elevation						×	×	×	×	×
Access to Railways							×	×	×	×
Access to Navigable Water Bodies								×	×	×
Distance to the Nearest Urban Center									×	×
Vote Share for the Democratic Party										×
State × Year FE	×	×	×	×	×	×	×	×	×	×
Mean Outcome	3,542	3,542	3,542	3,542	3,542	3,542	3,542	3,542	3,542	3,542
Clusters	1,296	1,296	1,296	1,296	1,296	1,296	1,296	1,296	1,296	1,296
Observations	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variable is the IHS-transformed number of union members in 2020. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 14: Effect of Covariates on the Presence of Early Prisons

	Dependent variable:	
	Early Prison Dummy	Early Prison Capacities (IHS)
	(1)	(2)
White Population Share	0.940	7.556
	(1.793)	(13.121)
Free Colored Population Share	0.861	6.886
	(1.840)	(13.532)
Enslaved Population Share	0.945	7.609
	(1.808)	(13.249)
Population Density	0.003***	0.016*
	(0.001)	(0.008)
Number of Manufacturing Establishments	0.0002	0.001
	(0.0002)	(0.001)
Manufacturing Output Value per Laborer	−0.00000	−0.00001
	(0.00000)	(0.00001)
Farm Output Value per Acre of Farmland	0.001	0.009
	(0.001)	(0.006)
Number of Improved Acres of Farmland	−0.00000	−0.00000
	(0.00000)	(0.00000)
Number of Farms	0.00001	0.0001
	(0.00002)	(0.0001)
Elevation	0.0002	0.001
	(0.0004)	(0.003)
Distance to Coast	0.00001	0.00003
	(0.00004)	(0.0003)
Access to Railways	0.020*	0.159**
	(0.010)	(0.076)
Access to Navigable Water Bodies	0.012	0.085
	(0.010)	(0.072)
Distance to the Nearest Urban Center	−0.00003	−0.0003
	(0.00005)	(0.0003)
Vote Share for the Democratic Party	−0.0001	−0.001
	(0.0002)	(0.001)

Note: Each column presents coefficients and standard errors (in parentheses) from distinct regressions, where the pre-convict-labor prison dummy and capacities are regressed on all 1860 covariates. Each row discloses the coefficients of the incorporated covariates. The model includes state fixed effects, and standard errors are clustered at the county level.

Table 15: Effect on Survival of KOL 1886-1905

	Dependent variable:			
Early Prison Dummy and Capacities IV	Avg. Survival (1)	New KOL (2)	Avg. Survival (3)	New KOL (4)
Convict Labor per 100,000 (IHS)	0.161***	0.171**	0.162***	0.156**
	(0.056)	(0.069)	(0.057)	(0.063)
KP F-stat	126.59	126.59	186.55	186.55
Controls	×	×	×	×
State × Year FE	×	×	×	×
IV: Early Prison Dummy	×	×		
IV: Early Prison Capacities			×	×
Mean Outcome	0.52	0.24	0.52	0.24
Clusters	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variable is the average survival period of all KOL assemblies and the number of newly formed KOL assemblies. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 16: Change Union Formation on Change Convict 1895-1905

	Dependent variable:					
	Change in Convict Labor 100K (IHS)					
	(1)	(2)	(3)	(4)	(5)	(6)
Change in KOL	0.003					
	(0.005)					
Change in KOL100K		−0.00000				
		(0.00002)				
Change in Strike			0.007			
			(0.013)			
Change in Strike100K				0.001		
				(0.001)		
Change in Member					0.0001	
					(0.0001)	
Change in Member100K						0.00002
						(0.00003)
Controls	×	×	×	×	×	×
State x Year FE	×	×	×	×	×	×
Mean Outcome	30.41	30.41	30.41	30.41	30.41	30.41
Clusters	1302	1302	1302	1302	1302	1302
Observations	2,604	2,604	2,604	2,604	2,604	2,604

Note: Each column reports coefficients and standard errors (in parentheses) from a different regression. The observation unit is the county (1880), with change in convict labor presence (change in convicts per 100,000 inhabitants - IHS) as the dependent variable. Independent variables are the change in the number of KOL assemblies (and per 100,000 inhabitants), change in strikes (and per 100,000 inhabitants), and change in membership (and per 100,000 inhabitants). Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 17: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership	Membership 2020
	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS) × Share of Enslaved Individuals	1.105**	0.514**	0.178***	0.221***
	(0.453)	(0.256)	(0.048)	(0.037)
Controls	×	×	×	×
State × Year FE	×	×	×	×
IV: Early Prison Dummy + Capacities	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,542
Clusters	1,302	1,302	1,302	1,296
KP F-stat	100.16	100.16	100.16	99.8
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from a regression analogous to equation (19). The observation unit is the county (1880), with the IHS-transformed sum of the interaction of share of enslaved individuals and the number of convict laborers per 100,000 inhabitants and the sum of these two as the independent variable. It is instrumented by the sum of pre-convict labor prisons and their capacities. Outcome variables are the number of local KOL assemblies, strikes, 19^{th}-century Knights of Labor members and current union members. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 18: Effect on Manufacturing Outcomes 1880-1900

	Dependent variable:				
	Avg. Wage Growth	Employment Share	Capital Cost Share Change	Output Value	Gross Profit
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)
Convict Labor per 100,000 (IHS)	−1.581*	−1.920***	0.448**	181,093**	31,254**
	(0.816)	(0.670)	(0.204)	(77,583)	(13,983)
KP F-stat	86.79	86.05	86	86.03	86.03
Panel B: Early Prison Capacities IV					
Convict Labor per 100,000 (IHS)	−1.382*	−1.914***	0.451**	185,888**	31,160**
	(0.771)	(0.629)	(0.204)	(88,966)	(15,330)
KP F-stat	121.15	120.26	120.24	120.4	120.4
Controls	×	×	×	×	×
State × Year FE	×	×	×	×	×
Mean Outcome	26.4	94.8	12.58	970,522	79,779
Clusters	1,154	1,231	1,237	1,298	1,298
Observations	2,265	2,439	2,463	2,526	2,526

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the average manufacturing wage growth, manufacturing employment share, the change in capital-labor cost-share, manufacturing output value, and gross profits. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 19: Effect on Industry Shift 1880-1910

	Dependent variable:			
	Manufacturing		Convict Industry	
	Agriculture	Other	Agriculture	Other
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS)	0.189**	1.236**	0.251**	1.560**
	(0.077)	(0.558)	(0.111)	(0.693)
KP F-stat	151	151	151	151
Panel B: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	0.191**	1.257**	0.251**	1.588**
	(0.086)	(0.629)	(0.124)	(0.784)
KP F-stat	225.21	225.21	225.21	225.21
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	0.52	0.77	0.84	1.08
Clusters	1,278	1,278	1,278	1,278
Observations	2,510	2,510	2,510	2,510

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variable is the number of employees migrating from manufacturing and convict labor employing industries (manufacturing, mining, construction) to agriculture or other industry. Control variables are population density, enslaved individuals' share, farmland statistics (output value per acre and improved acres), the distance to the coast, elevation, transport access, proximity to large urban centers, and the vote share of the Democratic Party. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 20: Effect on Farming Outcomes 1880-1900

	Dependent variable:								
	Δ Acimp	Δ Acumimp	Δ Farmval	Δ Equipval	Δ Farmout	Δ Farms	Δ Farm Tenant	Δ Sharecrop	Δ Acres
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Convict Labor per 100,000 (IHS)	3,228.285	50,837.530	74,527.800	2,223.608	31,445.680	−8.361	−34.577	−762.436	9,924.631
	(3,089.867)	(42,596.680)	(73,407.690)	(1,694.205)	(24,330.500)	(13.766)	(63.487)	(608.406)	(8,938.648)
KP F-stat	86.07	86.07	86.07	86.07	86.07	86.07	86.07	86.07	86.07
Panel B: Early Prison Capacities IV									
Convict Labor per 100,000 (IHS)	2,683.423	43,392.750	63,282.970	1,888.140	26,862.420	−10.008	−37.125	−774.254	8,363.240
	(2,846.639)	(38,852.110)	(65,887.090)	(1,534.479)	(22,227.830)	(13.734)	(63.651)	(613.703)	(8,236.992)
KP F-stat	120.49	120.49	120.49	120.49	120.49	120.49	120.49	120.49	120.49
Controls	×	×	×	×	×	×	×	×	×
State × Year FE	×	×	×	×	×	×	×	×	×
Mean Outcome	30,139	409,882	575,443	20,157	234,323	120.64	470.48	1,730	78,527
Clusters	1,284	1,284	1,284	1,284	1,284	1,284	1,284	1,284	1,284
Observations	2,543	2,543	2,543	2,543	2,543	2,543	2,543	2,543	2,543

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the changes in acres of improved and unimproved farmland, farm value, farm equipment value, farm output value, number of farms, number of farm tenants and sharecroppers, and total acres of farmland. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 21: Effect on Manufacturing Outcomes 1880-1900

	Dependent variable:		
	Avg. Wage Growth	Mfg. Emp. Share	Capital Cost Share Change
	(1)	(2)	(3)
Convict Labor per 100,000 (IHS) × Competing Industries	−3.749	−6.805***	1.637**
	(2.587)	(2.412)	(0.706)
Controls	×	×	×
State × Year FE	×	×	×
IV: Early Prison Dummy + Capacities	×	×	×
Mean Outcome	26.4	94.8	12.58
Clusters	1,154	1,231	1,237
KP F-stat	30.55	30.42	30.42
Observations	22,650	24,390	24,630

Note: Each column reports coefficients and standard errors (in parentheses) from a regression analogous to equation (19). The observation unit is the county (1880), with the IHS-transformed sum of the interaction of competing industries and the number of convict laborers per 100,000 inhabitants and the sum of these two as the independent variable. It is instrumented by the sum of pre-convict labor prisons and their capacities. Outcome variables are the average manufacturing wage growth, employment share, and capital-labor cost share. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 22: Effect on Union Formation 1880-1900

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS) × Competing Industries	1.550**	0.744**	0.249***	0.222***
	(0.663)	(0.378)	(0.070)	(0.037)
Controls	×	×	×	×
State × Year FE	×	×	×	×
IV: Early Prison Dummy + Capacities	×	×	×	×
Mean Outcome	1.84	0.42	31.25	3525.44
Clusters	1,302	1,302	1,302	1,302
KP F-stat	70.23	70.23	70.23	70.23
Observations	2,604	2,604	2,604	2,604

Note: Each column reports coefficients and standard errors (in parentheses) from a regression analogous to equation (19). The observation unit is the county (1880), with the IHS-transformed sum of the interaction of competing industries and the number of convict laborers per 100,000 inhabitants and the sum of these two as the independent variable. It is instrumented by the sum of pre-convict labor prisons and their capacities. Outcome variables are the number of KOL assemblies and strikes and IHS-transformed 19^{th}-century KOL membership and union membership in 2020. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 23: Effect on Strike Outcomes 1880-1900

	Dependent variable:			
	Strike	Duration	Aggressive	Hours Change
	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS) × Competing Division	0.666*	1.207**	0.031**	−0.062*
	(0.360)	(0.563)	(0.013)	(0.036)
Controls	×	×	×	×
State × Year FE	×	×	×	×
IV: Early Prison Dummy + Capacities	×	×	×	×
Mean Outcome	0.08	0.42	0.01	-0.01
Clusters	1,302	1,302	1,302	1,302
KP F-stat	28.79	28.79	28.79	28.79
Observations	13,020	13,020	13,020	13,020

Note: Each column reports coefficients and standard errors (in parentheses) from a regression analogous to equation (19). The observation unit is the county (1880), with the IHS-transformed sum of the interaction of competing division and the number of convict laborers per 100,000 inhabitants and the sum of these two as the independent variable. It is instrumented by the sum of pre-convict labor prisons and their capacities. Outcome variables are the number, duration, and aggressiveness of strikes, and hours of employment change before and after the strike. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 24: Productivity of Convict Labor: Union Outcomes

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS) × Productivity	0.123**	0.059*	0.020***	0.025***
	(0.055)	(0.031)	(0.005)	(0.005)
Controls	×	×	×	×
State × Year FE	×	×	×	×
IV: Early Prison Dummy + Capacities	×	×	×	×
Mean Outcome	1.23	0.28	20.84	3578.69
Clusters	1,192	1,192	1,192	1,187
KP F-stat	59.74	59.74	59.74	59.72
Observations	3,583	3,583	3,583	3,568

Note: Each column reports coefficients and standard errors (in parentheses) from a regression analogous to equation (19). The observation unit is the county (1880), with the IHS-transformed sum of the interaction of productivity of convict labor and the number of convict laborers per 100,000 inhabitants and the sum of these two as the independent variable. It is instrumented by the sum of pre-convict labor prisons and their capacities. Outcome variables are the number of KOL assemblies and strikes and IHS-transformed 19^{th}-century KOL membership and union membership in 2020. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 25: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
Panel A: Early Prison Dummy IV	KOL Assemblies (1)	Strikes (2)	Early Membership (IHS) (3)	Membership 2020 (IHS) (4)
Convict Labor per 100,000 (IHS)	0.633***	0.196*	0.175***	0.253***
	(0.245)	(0.113)	(0.042)	(0.049)
KP F-stat	105.78	105.78	105.78	105.43
Panel B: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	0.590**	0.246**	0.166***	0.246***
	(0.245)	(0.121)	(0.042)	(0.047)
KP F-stat	130.76	130.76	130.76	130.44
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	2.45	0.77	57.98	6,760
Clusters	295	295	295	294
Observations	788	788	788	785

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variable is the IHS-transformed 19^{th}-century KOL membership. The control group is identified using a nearest-neighbor matching procedure based on population density, the distance to the coast, elevation, access to railways and navigable water bodies, and the distance to the nearest urban center. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 26: Effect on the Change in Manufacturing Covariates 1860-1870

	Dependent variable:			
	Δ Farm Output Value	Δ M. Establishments	Δ M. Output Value	Δ M. Total Employed
Panel A	(1)	(2)	(3)	(4)
Early Prison Dummy	−5.680	158.062	−11.668	1.778
	(9.554)	(110.824)	(120.981)	(71.921)
Panel B	(5)	(6)	(7)	(8)
Early Prison Capacities (IHS)	−0.769	21.902	−2.830	0.533
	(1.276)	(15.148)	(14.796)	(9.431)
Controls	×	×	×	×
State FE	×	×	×	×
Mean Outcome	-14.53	189.72	268.1	151.88
Clusters	1,074	1,074	1,074	1,074
Observations	1,176	1,176	1,176	1,176

Note: Each column reports coefficients and standard errors from a separate regression. The observation unit is the county (1880), with pre-convict labor prisons (Panel A) and their capacities (Panel B) as the independent variables. Outcome variables are the changes in the average farm output value, the number of manufacturing establishments, the manufacturing output value, and the total number of manufacturing employees from 1860-1870. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state-fixed effects and standard errors are county-level clustered.

Table 27: Effect on KOL Assemblies before Convict Labor 1870-1880

	Dependent variable:					
	Number of KOL Assemblies					
	(1)	(2)	(3)	(4)	(5)	(6)
Early Prison Dummy	0.168	0.163	0.161			
	(0.145)	(0.143)	(0.141)			
Early Prison Capacities (IHS)				0.029	0.028	0.028
				(0.025)	(0.025)	(0.025)
Economic Controls	×	×	×	×	×	×
Geographic Controls		×	×		×	×
Socio-political Controls			×			×
State × Year FE	×	×	×	×	×	×
Mean Outcome	0.03	0.03	0.03	0.03	0.03	0.03
Clusters	1,302	1,302	1,302	1,302	1,302	1,302
Observations	15,624	15,624	15,624	15,624	15,624	15,624

Note: Each column reports coefficients and standard errors (in parentheses) from a separate regression. The observation unit is the county (1880), with pre-convict labor prisons and their capacities as the independent variables. The outcome variables are the number of KOL assemblies before convict labor laws were enacted. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects and standard errors are county-level clustered.

Table 28: Effect on KOL Assemblies 1886-1905

	Dependent variable:					
	Number of KOL Assemblies					
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)
Convict Labor per 100,000 (IHS)	0.887***	0.884***	0.866***	0.886***	0.863***	0.877***
	(0.331)	(0.330)	(0.326)	(0.332)	(0.316)	(0.324)
KP F-stat	125.19	125.17	123.42	124.88	129.49	124.86
Panel B: Early Prison Capacities IV						
Convict Labor per 100,000 (IHS)	0.769***	0.766***	0.748***	0.768***	0.753***	0.759***
	(0.272)	(0.270)	(0.267)	(0.272)	(0.266)	(0.266)
KP F-stat	195.76	195.89	193.4	196.01	196.7	193.6
Controls	×	×	×	×	×	×
European Share	×					
Italian Share		×				
German Share			×			
Scandinavian Share				×		
French Share					×	
West Indies Share						×
State × Year FE	×	×	×	×	×	×
Mean Outcome	1.23	1.23	1.23	1.23	1.23	1.23
Clusters	1,180	1,180	1,180	1,180	1,180	1,180
Observations	3,546	3,546	3,546	3,546	3,546	3,546

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variable is the number of KOL assemblies. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. Additional controls are share of European, Italian, German, Scandinavian, French, and West Indies immigrants. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 29: Effect on Strikes 1886-1905

	Dependent variable:					
	Number of Strikes					
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)
Convict Labor per 100,000 (IHS)	0.283**	0.281**	0.270**	0.285**	0.281**	0.305**
	(0.132)	(0.130)	(0.128)	(0.132)	(0.131)	(0.135)
KP F-stat	125.19	125.17	123.42	124.88	129.49	124.86
Panel B: Early Prison Capacities IV						
Convict Labor per 100,000 (IHS)	0.275**	0.273**	0.263**	0.276**	0.274**	0.295**
	(0.124)	(0.123)	(0.121)	(0.125)	(0.124)	(0.128)
KP F-stat	195.76	195.89	193.4	196.01	196.7	193.6
Controls	×	×	×	×	×	×
European Share	×					
Italian Share		×				
German Share			×			
Scandinavian Share				×		
French Share					×	
West Indies Share						×
State × Year FE	×	×	×	×	×	×
Mean Outcome	0.28	0.28	0.28	0.28	0.28	0.28
Clusters	1,180	1,180	1,180	1,180	1,180	1,180
Observations	3,546	3,546	3,546	3,546	3,546	3,546

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variable is the number of strikes. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. Additional controls are share of European, Italian, German, Scandinavian, French, and West Indies immigrants. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 30: Testing Monotonicity Assumption

	Dependent variable:									
	Convict Labor per 100,000 (IHS)									
	High Density	High Farm OV	High Acimp	High Coast	High Ele	High Rail	High Water	High Urban	High DemVote	High S.Share
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Early Prison Dummy	6.351***	6.852***	6.648***	7.705***	8.206***	6.427***	6.388***	6.212***	6.210***	6.559***
	(0.969)	(0.740)	(0.714)	(0.604)	(0.143)	(0.725)	(0.859)	(1.398)	(0.874)	(0.852)
Early Prison Capacities (IHS)	0.896***	0.985***	0.930***	1.100***	1.143***	0.899***	0.924***	0.865***	0.905***	0.910***
	(0.134)	(0.083)	(0.084)	(0.074)	(0.091)	(0.090)	(0.096)	(0.144)	(0.103)	(0.102)
Observations	300	1,317	1,560	1,878	1,494	840	1,173	1,515	2,379	1,680
	Low Density	Low Farm OV	Low Acimp	Low Coast	Low Ele	Low Rail	Low Water	Low Urban	Low DemVote	Low S.Share
Panel B	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Early Prison Dummy	7.131***	6.863***	6.847***	6.263***	6.487***	7.231***	7.044***	6.728***	7.854***	6.653***
	(0.791)	(0.846)	(1.003)	(0.794)	(0.660)	(0.957)	(0.775)	(0.629)	(0.492)	(0.738)
Early Prison Capacities (IHS)	0.988***	0.963***	0.997***	0.895***	0.918***	1.034***	0.962***	0.957***	1.071***	0.956***
	(0.085)	(0.103)	(0.111)	(0.086)	(0.077)	(0.106)	(0.102)	(0.080)	(0.061)	(0.082)
Observations	3,606	2,589	2,346	2,028	2,412	3,066	2,733	2,391	1,527	2,226
Controls	×	×	×	×	×	×	×	×	×	×
State × Year FE	×	×	×	×	×	×	×	×	×	×
Mean Outcome	76.07	76.07	76.07	76.07	76.07	76.07	76.07	76.07	76.07	76.07
Clusters	1,202	863	782	676	804	1,022	911	797	509	742

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (18). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the dependent variable. Independent variables include pre-convict labor prison locations and capacities. Panel A displays data for the economic, geographic, and socio-political controls, filtered for the subsample falling above the median. Conversely, Panel B illustrates the same controls, but for the subsample that falls below the median. The regression includes state × year fixed effects, with standard errors clustered at the county level.

Table 31: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies (IHS)	Strikes (IHS)	Early Membership (IHS)	Membership 2020 (IHS)
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS)	0.091***	0.049***	0.187***	0.225***
	(0.023)	(0.016)	(0.049)	(0.040)
KP F-stat	126.59	126.59	126.59	126.29
Panel B: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	0.089***	0.048***	0.181***	0.222***
	(0.023)	(0.016)	(0.048)	(0.038)
KP F-stat	186.55	186.55	186.55	186.04
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,542
Clusters	1,302	1,302	1,302	1,296
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the IHS-transformed number of KOL assemblies, strikes, 19^{th}-century KOL and 2020 union membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 32: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership	Membership 2020
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS)	1.166***	0.450**	45.129**	2,005***
	(0.418)	(0.201)	(22.546)	(634.707)
KP F-stat	126.59	126.59	126.59	126.29
Panel B: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	1.126***	0.488**	40.982**	1,973***
	(0.431)	(0.234)	(20.721)	(618.722)
KP F-stat	186.55	186.55	186.55	186.04
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,542
Clusters	1,302	1,302	1,302	1,296
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the number of KOL assemblies, strikes, 19^{th}-century KOL and 2020 union membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 33: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies (log)	Strikes (log)	Early Membership (log)	Membership 2020 (log)
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (log)	0.083***	0.044***	0.183***	0.244***
	(0.022)	(0.015)	(0.049)	(0.044)
KP F-stat	123.45	123.45	123.45	123.18
Panel B: Early Prison Capacities IV				
Convict Labor per 100,000 (log)	0.081***	0.044***	0.176***	0.241***
	(0.021)	(0.015)	(0.048)	(0.041)
KP F-stat	184.13	184.13	184.13	183.66
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,542
Clusters	1,302	1,302	1,302	1,296
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - log) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the natural logarithm transformed number of KOL assemblies, strikes, 19^{th}-century KOL, and 2020 union membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 34: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)
Convict Labor (IHS)	1.318***	0.508**	0.211***	0.254***
	(0.458)	(0.222)	(0.053)	(0.043)
KP F-stat	139.57	139.57	139.57	139.46
Panel B: Early Prison Capacities IV				
Convict Labor (IHS)	1.268***	0.550**	0.204***	0.250***
	(0.469)	(0.256)	(0.051)	(0.041)
KP F-stat	230.9	230.9	230.9	230.63
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,542
Clusters	1,302	1,302	1,302	1,296
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (the number of convicts employed - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the number of KOL assemblies, strikes, IHS-transformed 19^{th}-century KOL, and 2020 union membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 35: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)
Number of Prisons (IHS)	8.850***	3.412**	1.417***	1.705***
	(3.022)	(1.459)	(0.390)	(0.291)
KP F-stat	128.65	128.65	128.65	128.37
Panel B: Early Prison Capacities IV				
Number of Prisons (IHS)	8.487***	3.680**	1.362***	1.672***
	(3.051)	(1.676)	(0.373)	(0.287)
KP F-stat	188.55	188.55	188.55	188.15
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,542
Clusters	1,302	1,302	1,302	1,296
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with the number of prisons employing convict labor as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the number of KOL assemblies, strikes, IHS-transformed 19^{th}-century KOL, and 2020 union membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 36: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)
Goods Value (IHS)	1.196***	0.461**	0.191***	0.230***
	(0.441)	(0.212)	(0.047)	(0.047)
KP F-stat	93.75	93.75	93.75	93.63
Panel B: Early Prison Capacities IV				
Goods Value (IHS)	1.155**	0.501**	0.185***	0.227***
	(0.454)	(0.245)	(0.046)	(0.043)
KP F-stat	124.01	124.01	124.01	123.81
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,542
Clusters	1,302	1,302	1,302	1,296
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with the total value of goods produced by convict laborers as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the number of KOL assemblies, strikes, IHS-transformed 19^{th}-century KOL, and 2020 union membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 37: Normalized Outcomes

	Dependent variable:			
Panel A: Early Prison Dummy IV	KOL 100K IHS (1)	Strike 100K IHS (2)	Early Member 100K IHS (3)	Member 2020 100K IHS (4)
Convict Labor per 100,000 (IHS)	0.086***	0.043**	0.195***	0.117***
	(0.026)	(0.018)	(0.051)	(0.038)
KP F-stat	126.59	126.59	126.59	126.29
Panel B: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	0.084***	0.042**	0.188***	0.120***
	(0.026)	(0.018)	(0.050)	(0.034)
KP F-stat	186.55	186.55	186.55	186.04
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	12.93	1.15	116.08	653,462
Clusters	1,302	1,302	1,302	1,296
Observations	3,906	3,906	3,906	3,888

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the IHS transformed number of KOL assemblies, strikes, 19^{th}-century KOL, and 2020 union membership per 100,000 inhabitants. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 38: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS)	1.166***	0.450**	0.187***	0.242***
	(0.330)	(0.159)	(0.044)	(0.039)
F-stat	1,629	1,629	1,629	1,629
Panel B: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	1.126***	0.488**	0.181***	0.238***
	(0.349)	(0.196)	(0.044)	(0.037)
F-stat	1,719	1,719	1,719	1,719
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.23	0.28	20.83	3,525
Clusters	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the number of KOL assemblies, strikes, IHS-transformed 19^{th}-century KOL, and 2020 union membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and Conley standard errors.

Table 39: Effect on KOL Assemblies, Strikes, and Membership

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
Average Merge	(1)	(2)	(3)	(4)
Panel A: Early Prison Dummy IV				
Convict Labor per 100,000 (IHS)	0.123***	0.048**	0.083***	0.222***
	(0.045)	(0.021)	(0.026)	(0.042)
KP F-stat	170.46	170.46	170.46	169.04
Panel B: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	0.119***	0.052**	0.078***	0.220***
	(0.046)	(0.025)	(0.023)	(0.040)
KP F-stat	232.38	232.38	232.38	230.34
Cumulative Average Merge				
Panel C: Early Prison Dummy IV				
Convict Labor per 100,000 (IHS)	0.124***	0.048**	0.084***	0.223***
	(0.045)	(0.021)	(0.025)	(0.041)
KP F-stat	164.57	164.57	164.57	163.85
Panel D: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	0.120***	0.052**	0.078***	0.221***
	(0.046)	(0.025)	(0.023)	(0.039)
KP F-stat	247.7	247.7	247.7	246.42
Maximum Value Merge				
Panel E: Early Prison Dummy IV				
Convict Labor per 100,000 (IHS)	0.117***	0.045**	0.079***	0.210***
	(0.042)	(0.020)	(0.024)	(0.040)
KP F-stat	169.21	169.21	169.21	167.85
Panel F: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	0.113***	0.050**	0.074***	0.209***
	(0.044)	(0.024)	(0.022)	(0.038)
KP F-stat	228.95	228.95	228.95	227.02
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	0.13	0.03	2.23	3,542
Clusters	1,302	1,302	1,302	1,296
Observations	36,456	36,456	36,456	36,288

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons and their capacities. Outcome variables are the number of KOL assemblies, strikes, IHS-transformed 19^{th}-century KOL, and 2020 union membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 40: Presence of the Knights of Labor and Average Manufacturing Wage Growth 1880-1910

	Dependent variable:		
	Average Manufacturing Wage Growth		
	All	KOL Presence	No KOL Presence
Panel A: Early Prison Dummy IV	(1)	(2)	(3)
Convict Labor per 100,000 (IHS)	−1.581*	1.047	−3.240***
	(0.816)	(1.998)	(1.061)
KP F-stat	86.79	271.02	24.88
Panel B: Early Prison Capacities IV			
Convict Labor per 100,000 (IHS)	−1.382*	1.138	−3.246***
	(0.771)	(1.970)	(1.047)
KP F-stat	121.15	326.9	33.81
Controls	×	×	×
State × Year FE	×	×	×
Mean Outcome	26.4	44.34	21.77
Clusters	1,154	411	1,097
Observations	2,265	465	1,800

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons and their capacities. Outcome variable is the average manufacturing wage growth. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 41: Presence of the Knights of Labor and Effect on Craftsmen and Operatives 1880-1910

	Dependent variable:					
	Labor – Craft	Labor – Operative	Labor – Craft	Labor – Operative	Labor – Craft	Labor – Operative
	All		KOL Presence		No KOL Presence	
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)
Convict Labor per 100,000 (IHS)	0.421**	4.166**	0.075	3.716**	0.718**	3.959**
	(0.196)	(1.928)	(0.045)	(1.820)	(0.356)	(1.954)
KP F-stat	151	151	217.25	217.25	91.12	91.12
Panel B: Early Prison Capacities IV						
Convict Labor per 100,000 (IHS)	0.373**	4.234*	0.086*	3.869*	0.626**	3.983*
	(0.163)	(2.177)	(0.050)	(2.107)	(0.292)	(2.187)
KP F-stat	225.21	225.21	322.59	322.59	128.42	128.42
Controls	×	×	×	×	×	×
State × Year FE	×	×	×	×	×	×
Mean Outcome	0.54	4.6	0.21	9.54	0.61	3.6
Clusters	1,278	1,278	421	421	1,275	1,275
Observations	2,510	2,510	423	423	2,087	2,087

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons and their capacities. Outcome variable is the number of laborers transitioning into craftsmen and operatives. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 42: Effect on Migration 1886-1905

	Dependent variable:							
	Out-Migration				In-Migration			
	All	White	Agriculture	Manufacturing	All	White	Agriculture	Manufacturing
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Convict Labor per 100,000 (IHS)	12.771	12.898	3.949	0.170	126.437	126.236	55.914	0.269
	(13.557)	(13.566)	(5.082)	(0.127)	(86.205)	(86.227)	(42.088)	(0.269)
KP F-stat	151.15	151.15	151.15	151.15	151.15	151.15	151.15	151.15
Panel B: Early Prison Capacities IV								
Convict Labor per 100,000 (IHS)	10.461	10.581	3.168	0.177	109.943	109.725	47.834	0.266
	(12.549)	(12.559)	(4.620)	(0.120)	(79.426)	(79.444)	(38.779)	(0.242)
KP F-stat	225.36	225.36	225.36	225.36	225.36	225.36	225.36	225.36
Controls	×	×	×	×	×	×	×	×
State × Year FE	×	×	×	×	×	×	×	×
Mean Outcome	312.06	309.01	79.03	1.8	1,031.66	1,028.93	462.31	1.29
Clusters	1,271	1,271	1,271	1,271	1,271	1,271	1,271	1,271
Observations	2,503	2,503	2,503	2,503	2,503	2,503	2,503	2,503

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). The outcome variables represent the number of incoming and outgoing migrants across the entire population, specifically among white individuals, as well as those employed in the agriculture and manufacturing sectors. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control. The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 43: Spillovers to Neighboring Counties

	Dependent variable:			
	KOL Assemblies	Strikes	Early Membership (IHS)	Membership 2020 (IHS)
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)
Convict Labor per 100,000 (IHS)	0.257	0.159	0.049	0.066*
	(0.205)	(0.110)	(0.038)	(0.035)
KP F-stat	126.59	126.59	126.59	126.59
Panel B: Early Prison Capacities IV				
Convict Labor per 100,000 (IHS)	0.238	0.149	0.046	0.067**
	(0.196)	(0.101)	(0.038)	(0.033)
KP F-stat	186.55	186.55	186.55	186.55
Controls	×	×	×	×
State × Year FE	×	×	×	×
Mean Outcome	1.14	0.22	17.86	3694.31
Clusters	1,302	1,302	1,302	1,302
Observations	3,906	3,906	3,906	3,906

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). Outcome variables are the number of KOL assemblies, strikes, IHS-transformed 19^{th}-century KOL, and 2020 union membership. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The vote share of the Democratic Party is the socio-political control.The model includes state × year fixed effects, and standard errors are county-level clustered.

Table 44: Effect on Election Outcomes 1886-1905

	Dependent variable:					
	Presidential			Congressional		
	Vote Share	Win Margin	Win	Vote Share	Win Margin	Win
Panel A: Early Prison Dummy IV	(1)	(2)	(3)	(4)	(5)	(6)
Convict Labor per 100,000 (IHS)	−0.635***	−1.270***	−0.001	−0.583**	−1.165**	−0.009
	(0.230)	(0.461)	(0.010)	(0.269)	(0.539)	(0.009)
KP F-stat	125.11	125.11	125.11	269.98	269.98	269.98
Panel B: Early Prison Capacities IV						
Convict Labor per 100,000 (IHS)	−0.629***	−1.258***	−0.001	−0.592**	−1.183**	−0.008
	(0.227)	(0.454)	(0.010)	(0.269)	(0.538)	(0.009)
KP F-stat	195.98	195.98	195.98	309.61	309.61	309.61
Controls	×	×	×	×	×	×
State × Year FE	×	×	×	×	×	×
Mean Outcome	61.05	22.1	0.71	61.83	23.67	0.7
Clusters	1,290	1,290	1,290	1,286	1,286	1,286
Observations	3,797	3,797	3,797	3,403	3,403	3,403

Note: Each column reports coefficients and standard errors (in parentheses) from the regression displayed equation (19). The observation unit is the county (1880), with convict labor presence (convicts per 100,000 inhabitants - IHS) as the independent variable. It is instrumented by pre-convict labor prisons (Panel A) and their capacities (Panel B). The outcome variables encompass the Democratic Party's vote share, victory margin, and election results for both presidential and congressional elections. Economic controls encapsulate population density, enslaved individuals' share, and farmland statistics (output value per acre and improved acres). Geographic controls account for distance to the coast, elevation, transport access, and proximity to large urban centers. The model includes state × year fixed effects, and standard errors are county-level clustered.

D Calibration Strategy

The model's parameters are α, β, λ, γ, r, $\bar{h}$, $\bar{H}$, and $z_e = z_r = z$. The equality $z_e = z_r = z$ reflects the lack of productivity differences between elite and regular firms in the data. The productivity of convict labor, $\lambda = 0.7$, is derived from the U.S. Bureau of Labor (1925), which compares the number of convict laborers and the number of free laborers needed to complete the same amount of work. The capital rental rate, r, is set at 0.0919, following Bodenhorn and Rockoff (1992). This rate is calculated using Table 5.9 from Bodenhorn and Rockoff (1992), which lists postbellum interest rates in the Southern United States, averaging the rates for 1870-1991 and 1891-1904, consistent with the analysis timeline in Section 5.2. The number of free laborers is standardized to 1, and the number of convict laborers in exposed counties is adjusted to reflect the convict-to-free labor ratio, $\frac{\bar{h}}{\bar{H}} = 0.16$, as shown in Section 3.

In my calibration strategy, although γ is not a parameter, I treat it as one. Specifically, I set $\gamma = 0.98$. This value is based on the causal coefficient estimate detailed in the Online Appendix (refer to Table 18). It represents a 2% decrease in the employment share of the main industry, indicated by $1-\gamma$.

In the model, I focus on two critical data points: the decline in free labor wages and the increase in the capital-labor cost ratio, corresponding to the average rise in convict labor in affected counties. For precise identification, I fix $z = 1$ and align the two target moments with the remaining three parameters. The labor and capital shares in production, α and β, are calibrated at 0.187 and 0.764, respectively, to match the model with the two target moments:

$$m(\theta) = \begin{bmatrix} \frac{w(\alpha,\beta,h=\bar{h})}{w(\alpha,\beta,h=0)} - \frac{w^{exposed}}{w^{overall}} \\ \\ \frac{CI(\alpha,\beta,h=\bar{h})}{CI(\alpha,\beta,h=0)} - \frac{CI^{exposed}}{CI^{overall}} \end{bmatrix}$$

The objective function can be expressed as follows, with W denoting the identity matrix:

$$\min_{\theta} \left(m(\theta)' W^{-1} m(\theta) \right)$$

To identify the target moments, I sourced and calculated the average growth rates of average wage and capital-labor cost ratios for all counties in 1870 from Haines et al. (2005). Then, using the causal coefficient estimates from Section 5.2, I determined the changes in these variables for counties impacted by the introduction of convict labor. Specifically, I employ the causal estimates detailed in the Online Appendix Table 18 to calculate the ratios of $\frac{w_{exposed}}{w_{overall}} = 0.982$ and $\frac{CI_{exposed}}{CI_{overall}} = 1.04$.

The Online Appendix Table 18 gives the causal coefficient estimates for the decline in average wage growth and the decline in capital-labor cost ratio in the county. To achieve the decline in wage level and capital-labor cost ratio level, I follow the steps below:

Establishing baseline levels: The initial step is to determine the baseline levels for wages and capital-labor cost ratio before the introduction of convict labor. These are sourced from the county Census (Haines et al., 2005).

Calculating overall growth rates: After establishing the baseline levels, I calculate the overall growth rates in wages and capital-labor cost ratio. These growth rates reflect the general trends in wages and capital-labor cost ratio before the introduction of convict labor, as derived from the county Census (Haines et al., 2005). Then, I apply these growth rates to the initial baseline wage and capital-labor cost ratio to find the wage and capital-labor cost ratio with growth rates, denoted as $w_{overall}$ and $CI_{overall}$.

Adjusting for convict labor impact: Next, I apply the causal coefficient estimates of the decline in the wage and capital-labor cost ratio growth from the Online Appendix Table 18 to the growth rates before the introduction of convict labor. This involves adjusting the baseline growth rates to account for the impact of convict labor. The adjusted rates represent the change in wage growth and capital-labor cost ratio growth due to the introduction of convict labor. Applying these growth rates to the baseline wages and capital-labor cost ratio results in $w_{exposed}$ and $CI_{exposed}$.

Deriving ratios: Finally, I calculate the ratios $\frac{w_{exposed}}{w_{overall}} = 0.982$ and $\frac{CI_{exposed}}{CI_{overall}} = 1.04$. I jointly optimize the loss function for both ratios in calibrating the model.

For the back-of-the-envelope calculations in Section 6.2, I similarly calculate the wage decline but use the causal coefficient estimate for the decrease in wage growth without the Knights of Labor, as detailed in the Online Appendix Table 40. The model predicts an annual worker wage of \$205. Accounting for the growth rate decline (see Online Appendix Table 40) and the impact of convict labor without unionization, wages adjust to \$195. Thus, with $w_f = 205$, $A = 195$, and $\phi = 1.28$, the calculation reveals a 6% decrease in wage inequality between unionized white and Black workers.

E Types of Convict-Labor Systems in the United States

This section presents the definitions of the six convict labor systems: contract, piece-price, state-account, state-use, public-works-and-ways, and convict leasing.

Under the *contract system*, prison officers, under legal instruction, advertised for bids for the employment of the convicts of their respective institutions. The highest bidder would secure the contract. The contractor employed several convicts at a specific price per day. The prison or the state furnished power and sometimes machinery, but rarely tools. All convicts were employed within the walls of the prison.

The *piece-price system* was similar to the contract system, except that the contractor had nothing to do with the convicts. Under this system, the contractor had no position at the prison. The contractor furnished the prison officers with material ready for manufacturing. The prison officers agreed to return the completed work, for which the government received an agreed price per piece.

Under the *convict leasing system*, prisons and local sheriffs had the right to "lease" convicts to private individuals, firms, farms, and plantations. The lessee paid the prison and various public officials involved and were responsible for feeding, clothing, and housing the prisoners (Sellin, 1976).

Under the *state-account system*, the prison acted as a firm and sold goods on the market, thus assuming all business risks. All profits went directly to the states. However, this system had two major problems. The first problem was managerial: wardens were often subpar businessmen. Second, prisons needed to employ convicts even if there was no demand for the goods produced.

The *state-use system* is similar to the state-account system, except that the sale of goods was limited exclusively to state departments and agencies.

Under the *public works and ways (PWW) system*, as is evident from the name, prisoners constructed and repaired roads rather than producing goods for consumption.

F Jim Crow Laws

F.1 Enticement and Contract Enforcement Laws

It was illegal under the *enticement laws* for an employer to "entice" a worker under contract with another employer. These rules aimed to stop companies from aggressively bidding against one another for contract workers and were particularly geared toward white firms. Enticement laws have a long history in criminal and civil law, dating back to England in the fourteenth century. However, eight of the eleven Southern states that approved enticement laws did so in a way that turned the practice into a criminal infraction instead of a civil wrong.

The *contract-enforcement laws* enforced criminal penalties for violating an employment contract and were particularly aimed at black farm employees. According to such rules, a worker who signed a contract and then quit their position might be detained and charged with a crime. Ultimately, they had only two options: negotiate their contract or join the chain gang. Both inducement and contract enforcement legislation have the same economic goal: to reduce competition for farm labor during the contract season.

In the 1911 decision of Bailey v. Alabama, the United States Supreme Court ruled that the Alabama Act was unconstitutional. The court stated that

the defendant was "stripped by the statute of the presumption of innocence, and exposed to conviction for fraud upon evidence only of breach of contract and failure to pay" and that there was "not a particle of evidence of any circumstance indicating that [the defendant] made the contract or received the money with any intent to injure or defraud his employer." According to the Alabama Act, refusal to work and refund the money was prima facie evidence of intent to defraud.

The Peonage Act of 1867, which forbade involuntary servitude except to punish crime, stated, "The state... may not compel one man to labor for another in payment of a debt, by punishing him as a criminal if he does not perform the service or pay the debt." The Alabama statute violated both of these provisions.

There is some proof that employment contracts were nonetheless upheld, notwithstanding the lack of evidence that the employee intended to defraud. The employee would frequently be ignorant that the legislation required proof of fraudulent intent or that the current law was unconstitutional. Additionally, employees were occasionally "reclaimed" by their employers—rather than by law enforcement officials—and coerced into working off debt without a warrant. Thus, the legislation gave cruel acts that were actually against the law the appearance of legitimacy.

F.2 Vagrancy Laws

Vagrancy laws served as the second law to enforce the labor-market cartel. Vagrancy laws essentially made it illegal to be out of work or unemployed. The traditional definition of a vagrant was "anyone roaming or strolling about in idleness, who can work, but has no property to support him; or any person leading an idle, immoral, profligate life, having no property to support him." While vagrancy was typically regarded as a misdemeanor, this does not imply that the punishment was insignificant; misdemeanants were frequently put into state or county chain gangs.

Laws making unemployment a crime reduced the time spent looking for

new, better-paying employment, at least in part. More importantly, these laws raised the cost of leaving the labor field altogether. One can discover instances of the law being applied to both goals. Black people who traveled, even to see family, risk being arrested. People who weren't working or not in the labor force were frequently gathered up as vagrants and forced to work on nearby farms or public works projects.

F.3 Emigrant-Agent Laws

The *emigrant-agent legislation* was the last category of labor law. The Southern states created these regulations to stifle the actions of brokers who hired workers from one state for employment in another. Not the black employees themselves, but the white recruiters were subject to regulation under these regulations, which mandated that agents be licensed for up to $5000 per county where the recruiting took place. Many states repeatedly raised the taxes and penalties in response to subsequent immigration since the laws were frequently implemented in response to a wave of out-migration.

By the time of the Great Migration of Black people to the North during World War I, Montgomery, Alabama, passed a law making it illegal to tempt workers to leave the city to pursue work elsewhere. Violators would be subject to a $100 fine, up to six months of hard labor, or both. While these punishments might not seem severe, the ordinance had broad implications. For this law, anyone who printed, published, authored, delivered, posted, or distributed any newspaper, booklet, or advertisement encouraging citizens to emigrate was considered an emigrant agent. Blacks' one defense against this ordinance was to subscribe to Northern periodicals exempt from local law. A radical black journal, The Chicago Defender, promoted visits to the Chicago stockyards.

The emigrant-agent regulations' major impact on the economy was raising the cost of black laborers' access to information about employment opportunities outside their immediate market. The city of Montgomery's efforts to retain its labor force demonstrates how limited a description of the local labor

market may be. Although possible and often done, breaking the law came at a price for both the agents and the workers.

F.4 Convict-Lease System

The *convict-lease system*, which is a statutory practice of leasing out state or county convicts to private businesses, was used by Southern states in addition to the legislation already mentioned. Particularly in the 1880s, convict leasing was commonly practiced in the South. The lease system gave the lessee firm control over the day-to-day management of the prisoners, in contrast to other forms of convict labor where the government retains control. TThe lessee firm lacked any financial incentive to ensure the survival of prisoners beyond the expiration of their sentences or contracts. The lease system was worse than slavery in this regard. A slaveholder is incentivized to maintain the enslaved person's health since he obtains the fully capitalized worth of the enslaved person's output for the duration of his working life. These chain gangs' fatality statistics highlight the distinction: Mortality rates were as high as 45%.

The convict-lease system was significant because many victims were black misdemeanants, such as vagrants and those who broke the laws enforcing contracts. A combination of the likelihood of punishment and the seriousness of punishment can be used to estimate the cost of breaching any law. Although we lack a precise estimate of the probability of receiving a sentence for contract jumping or vagrancy, a 45% percent possibility of death as a punishment undoubtedly served as a potent deterrent for the black laborer.

G Merging Methods

I have digitized and compiled seven Bureau of Labor reports covering the years 1886-1940. These reports provide comprehensive data on penal institutions and the prisoners employed therein, including information on the facility's name, location, management, employment practices, as well as a breakdown of inmates by gender and prison responsibilities. To supplement this, I have

also utilized data on Knights of Labor assemblies from 1869-1919, which include location, years of operation, and membership statistics. Additionally, I have incorporated information on strikes that occurred from 1881-1894, which includes location and dates. However, I face some limitations due to the absence of data on local Knights of Labor assemblies after 1919 and the lack of information on the number of convicts employed in the 1914 Bureau of Labor report. As a result, I focused on the Bureau of Labor reports from 1886-1905 and employed different merging methods, which are described below.

Report Year Merge: In this particular merge, also known as the "report year merge," I adopt a discrete merging method to combine the Knights of Labor assemblies and strikes with prison data. The Bureau of Labor releases reports for the years 1886, 1895, 1905, 1914, 1923, 1932, and 1940. To accomplish the merge, I introduce a merge-year variable to the KOL and strikes data that takes on the values of 1886, 1895, and 1905 for the respective periods of 1886-1894, 1895-1904, and 1906-1913. Within each time bracket, I calculate the total number of assemblies and strikes. Ultimately, I merge the resulting data with prison data using the year of the report (merge-year) and the county FIPS codes.

Average Merge: I use a continuous merging method, known as the "average merge," to combine the data. This method involves calculating the average number of prisons and employed convicts over the seven report years for each county. First, I assign year variables to the prison data, covering the period from 1869 to 1940. Then, the resulting averages are assigned to the corresponding year variables. Finally, I merge these data with the Knights of Labor and strikes data by utilizing the year and county FIPS codes.

Cumulative Average Merge: I utilize a continuous merging method called the "cumulative average merge" to combine The data. The process involved assigning a year variable to the prison data spanning from 1869 to 1940. I then compute the average number of prisons and convicts employed for each county for every year between the report years. Specifically, I calculate the average of these variables between 1886 and 1895 for the year 1890, and for years between 1869 and 1886, I average 0 and the 1886 value. Ultimately,

I merge this data with the Knights of Labor and strikes data using year and county FIPS codes.

Maximum Value Merge: I utilize a continuous merging method known as the "maximum value merge" to merge The data. This method involves obtaining the highest value for the number of prisons and convicts employed in each county across the seven report years. I then assign year variables to the prison data spanning from 1869 to 1940, with each year having the maximum value of all the report years. Lastly, I merge this data with the Knights of Labor and strikes data, using year and county FIPS codes.