UPPSALA UNIVERSITET

Uppsala Papers in Economic History (UPEH)
Department of Economic History

Working Paper 2023/09

The Union Wage Effect at the Dawn of the Great Leveling: Evidence from Interwar Sweden

William Skoglund
Department of Economic History, Uppsala University
william.skoglund@ekhist.uu.se

The Union Wage Effect at the Dawn of the Great Leveling: Evidence from Interwar Sweden

William Skoglund
Department of Economic History, Uppsala University
william.skoglund@ekhist.uu.se

Uppsala Papers in Economic History (UPEH), ISSN 2004-5263
Working Paper 2023/09
DOI: 10.33063/upeh.v2i.553
Date: 8 December 2023

Abstract
In this paper, I use a new plant-level dataset to investigate the relationship between wages and the regional strength of unions. Using a shift-share or 'Bartik' instrumental variables approach, I disentangle the causal effect of union strength on wage levels. I find statistically and economically significant, heterogeneous union wage effects for men with the bottom of the distribution being impacted by union density and the top two-thirds being unaffected. I find a negative effect around the median for women and argue that unions, in general, were uninterested in the issues for women and were organizations mostly for men, by men. The paper contributes to the literature by providing the only evidence of a union wage effect in Sweden and, the earliest identified union wage effect anywhere—highlighting the importance of unions in shaping labor market outcomes in the early 20th century and showing that union wage effects have to be understood in their historical context.

Keywords: Labor Market, Union Effect, Wages

JEL: J01, J31, J51

UPEH Uppsala Papers in Economic History

are working papers intended to disseminate research results to other scholars in order to encourage discussion and suggestions before journal publication. The papers have not undergone peer review, but are published at the discretion of the UPEH editors.

UPEH series seeks to be a platform with a broad coverage in terms of timeframe, geographical scope, and methodological approaches. It seeks to disseminate work by economic historians, political economists, business scholars, economists, historians, demographers, geographers, political scientists, sociologists and other social scientists covering a wide variety of topics such as, but not limited to, economic growth, political economy, money and banking, international trade and finance, business, ecology, education, labour markets, inequality, industrial organization, science and technology, consumption, transportation, energy, agriculture, sustainability, health, family/household, advertisement and marketing, institutional economics, history of economic thought and others.

UPEH are usually in English but working papers in any of the Scandinavian languages (Danish, Norwegian and Swedish) are also welcome for publication.

UPEH working papers receive a unique Digital Object Identifier (DOI). The working papers are hosted by the Uppsala University Library (UUB.se) and are available at the homepage of the Department of Economic History, Uppsala University as well as via DiVA, S-WoPEc: Uppsala Papers in Economic History (hhs.se), EconPapers RePEc and IDEAS. A list of UPEH is available at https://journals.uu.se/upeh/issue/archive

UPEH is the continuation of several series that has been issued at the Department of Economic History at Uppsala University since 1983: *Uppsala papers in economic history: Research reports*, ISSN 0281-4560 (1983–2005), *Uppsala papers in economic history: Basic Readings*, ISSN 0282-9142 (1985–1998), *Uppsala papers in economic history: Working papers*, ISSN 1102-1306 (1988–1993), *Working papers in transport and communication history* (1994–1999) and *Uppsala Papers in Economic History*, ISSN 1654-8019 (2007). Uppsala Papers in Economic History are issued in collaboration with the *Uppsala Papers in Business and Financial History* (since 1993). All these printed papers have been digitalised and are thus also possible to download.

Potential working papers should be submitted to the editors: Anders Ögren (anders.ogren@ekhist.uu.se) or Valbona Muzaka (valbona.muzaka@ekhist.uu.se)

The Union Wage Effect at the Dawn of the Great Leveling

Evidence from Interwar Sweden

William Skoglund*

October 2023

Abstract

In this paper, I use a new plant-level dataset to investigate the relationship between wages and the regional strength of unions. Using a shift-share or 'Bartik' instrumental variables approach, I disentangle the causal effect of union strength on wage levels. I find statistically and economically significant, heterogeneous union wage effects for men with the bottom of the distribution being impacted by union density and the top two-thirds being unaffected. I find a negative effect around the median for women and argue that unions, in general, were uninterested in the issues for women and were organizations mostly for men, by men. The paper contributes to the literature by providing the only evidence of a union wage effect in Sweden and, the earliest identified union wage effect anywhere—highlighting the importance of unions in shaping labor market outcomes in the early 20th century and showing that union wage effects have to be understood in their historical context.

Keywords: Labor Market, Union Effect, Wages

*Skoglund, William: Department of Economic History, Uppsala University, William.skoglund@ekhist.uu.se.

I'm grateful to Jakob Molinder, Anders Ögren, Henry Ohlsson, Valbona Muzaka, Diego Castañeda Garza, Svante Prado, participants at the session for labour, living standards and inequality at the 15th Swedish economic history meeting, participants at the department of economic history in Uppsala's higher seminar and participants at Uppsala Urban Lab Seminar for their helpful comments.

1 Introduction

In this article I provide a historical perspective on the union effect on wages. Labor unions have been a hallmark of labor markets since the 19th century and tend to have a positive effect on wages. Unionization in the industrialized world peaked during the middle of the 20th century, but remain an important actor in contemporary labor markets.[1]

The effect of unions on wages has been highlighted especially in the economics literature where union wage premiums have been the focus of study.[2] This approach tends to not capture a broader union wage effect, stemming from increased bargaining power. Or miss the union effect where the institutional setup has unions bargaining for both union and non-union workers.[3] In this context, Sweden is an interesting case of strong unions, a presumed union effect on both wages and inequality but no previous evidence for such a relationship exists.[4] Although plenty of studies certainly point towards a union effect on both wages and inequality in Sweden.[5] When this effect became an important factor, is less clear in the previous literature.[6]

In this study, I use a novel, plant-level dataset from the interwar period in Sweden to investigate the broader union effect on wages. This is a period in which Sweden experienced rapid industrialization as well as falling inequality alongside rising unionization. The case of Sweden is further motivated by the fact that Sweden is commonly viewed as a country with strong unions that have heavily impacted the labor market through centralization and high unionization rates. However, in the interwar period, unionization was not exceptional and the Swedish labor market was decentralized. This paper therefore analyzes a period before Sweden became an outlier.

Using a shift-share, or Bartik, instrumental variables approach, I am able to estimate the causal effect of unions on wages. This approach is similar to the study by Collins & Niemesh on unionization and inequality in post World War II USA but differs both methodologically and substantively. [7]

This paper contributes to the literature in three main ways: (1) Through the case of Sweden, I show that unions early in the 20th century were a factor in determining wage levels and generating equal outcomes, providing the earliest identified union wage effect; (2) I show that this effect was heterogeneous across the wage distribution and gender, highlighting the need to understand union effects in their historical and ideological context; and (3) I show, for the first time, that unionization in Sweden has historically been linked with wages. These results speak directly to both an international debate on the historical role of the unions and a debate as to the case of Sweden in particular.

The rest of the paper is organized in the following manner: In the next section, I review the literature

[1] Freeman & Medoff (1984).
[2] Freeman & Medoff (1984) discuss the union wage premium, for a discussion on recent advancements in the field see Fang & Hartley (2022).
[3] Bryson (2007).
[4] The closest evidence for a effect in a similar setup is Barth et al. (2020) who find a positive relationship between unionization and wages in 21th century Norway.
[5] Piketty (2014), Scheidel (2017), Lundh & Heikkinen (2020), Collin et al. (2019), Bengtsson (2020).
[6] Several studies, including Prado & Waara (2018), and Collin et al. (2019) point towards union effects becoming important towards the end of the 1930s, beginning of 1940s.
[7] Collins & Niemesh (2019).

on union wage premiums and union wage effects, and discuss the case of Sweden during the interwar period. In Section three I establish the theoretical framework for the study. In section four, I introduce a novel database, the interwar wage database, containing detailed plant-level observations for firms across Sweden. I also discuss the unionization data and the empirical strategy. In section five, I examine whether or not unions did impact wages, arguing that unions had a strong, but heterogeneous effect. Finally, in section six I discuss the findings in relation to the existing literature.

2 Literature review

The union wage premium is a widely studied phenomenon. We know that unions today on average have a positive impact on wages for their members and that, while there is heterogeneity in the strength of this wage premium, the overwhelming evidence points to such a premium existing.[8] Puzzling, however, some of the countries where unionization has been strongest lack a union wage premium: In Norway, men have no union wage premium whereas women only experience a small one.[9] In Sweden, the premium has been estimated to be zero in a modern setting. This fact is likely a result of unions impacting not just wages for union workers but for all workers on the labor market. Bryson has argued that this remote effect is the reason why not just Sweden but Germany, Italy, the Netherlands, and France all have no apparent union wage premium.[10]

The lack of a union wage premium, however, does not suggest the lack of a union wage effect. Where there is a union wage premium, we are likely to observe a broader union wage effect as a spillover to non-union workers but in places like Sweden and Norway where there is no premium we might still observe union wage effects that are not tied to individual membership, instead varying with union strength.[11] In a study on 21st century Norway, firm level union density was found to be positively correlated with wages showing that despite no wage premium variation in union strength affected wages.[12] This approach captures not only differences between union and non-union workers, but instead highlights the relationship between union strength and wages. This alternative approach to union wage effects suggests that union strength is at the very core of understanding the role that unions play in shaping labor markets. It also provides support to the literature that argues for union strength being strongly correlated with inequality as both Collins & Niemesh as well as Wallace et al. who apply this perspective find. Collins & Niemesh study the post World War II era in the US, so does Wallace et al.[13] Our understanding of the early 20th century, however, remains largely unexplored. We know from Lewis that there were differences in wages for union and non-union workers in

[8] Freeman & Medoff (1984), Fang & Hartley (2022).

[9] Bryson et al. (2020) earlier studies have however found an effect during the 1990s in Norway, see Bryson (2007).

[10] Bryson (2007). France and Germany have union wage premiums but these are non-significant.

[11] See Freeman and Medoff for a discussion on the spillover from union to non-union wages. Freeman & Medoff (1984) pp. 158–160.

[12] I differ between the union wage premium—the wage increase that an individual gets from joining a union and the union wage effect, the overall effect unions have on wages. See Barth et al (2020) for an example of a union wage effect.

[13] Collins & Niemesh (2019). Wallace et al. (2022)

the United States as early as in the 1920s.[14] The causal nature of these differences, however, is unclear.

In Sweden, there is a large debate on the role of unions in the labor market and in shaping wages, and the wage structure during the 20th century. In his synthesis on Swedish labor market history, Lundh points towards the increased importance of centralization during the 1930s but doesn't discuss a union wage effect during this period.[15] Prado and Waara similarly argue that following 1938, unionization and the centralization of bargaining had an effect on the wage structure.[16] Collin et al. in their study on regional wage convergence, point towards centralization of bargaining and high unionization rates in Sweden as early as the 1930s and 1940s being a potentially primary driver for wage convergence.[17] None of these studies provide any econometric evidence for the relationship between unionization, bargaining and wages or the wage structure. And the evidence in Collin et al. point towards an effect from the 1940s onwards, even though they speculate as to a union effect in the 1930s.

In his study on unionization and labor shares, Bengtsson, however, argues that unions were positively linked with the labor share throughout the 20th century. He argues that unionization surged around 1920 drastically increasing the bargaining power of unions.[18] The eight hour work day in 1920 also affected the wage structure, sharply increasing hourly wages. Implying that unions, through bargaining, during this special instance raised wages.[19] Lundh and Heikkinen suggest the existence of a union wage effect during this period. In their comparative study on the effects of the Great Depression in Sweden and Finland, they argue that Sweden had more sticky wages as a result of stronger unions.[20] So does Fregert in his study on the Great Depression in Sweden. Arguing that wages exerted upward pressure on wages, producing a rigid labor market.[21]

Unions clearly play a large role in the literature but different studies place the union wage effect in different time periods. In one part of the literature, the unions start mattering from the 1940s onwards, and in another part they played a large role in the Interwar Period. In this study I use new data to show that unions did in fact play a role in shaping wages during the 1920s and 1930s in Sweden. In doing so I contribute both to the Swedish literature on the role of the unions in the labor market and to an international literature by providing the earliest identified union wage effect.

2.1 The Interwar Labor Market

Labor markets in the Swedish interwar period were characterized by heavy turbulence. While real wages increased sharply in the early 1920s, so did strikes and unemployment, as well as unionization. After being somewhat defeated following the 1909 general strike, union membership declined in Sweden. But as World

[14] Johnson (1984)
[15] Lundh (2020).
[16] Prado & Waara (2018).
[17] Collin et al. (2019).
[18] Bengtsson (2014)
[19] Bengtsson & Molinder (2017).
[20] Lundh & Heikkinen (2020).
[21] Fregert (2000).

War I drew to an end unionization surged, almost doubling during a span of 20 years, as the top income share simultaneously fell between 1910 and 1920 (and rose slightly up until 1935).[22]

In the early 1900s collective bargaining agreements were heavily decentralized. During the interwar period, however, these agreements would become increasingly centralized and cover a larger share of the workforce. In 1930, between sixty and eighty percent of workers were covered by a collective bargaining agreement (depending heavily on industry), with national agreements slowly becoming dominant.[23] Obtaining collective bargaining agreements was, as Lundh points out, an important goal for the labor movement during the interwar period with 15% of strikes during the 1930s coming as an attempt to force firms into accepting collective bargaining.[24]

As collective bargaining became the dominating regime during the interwar period, several important steps were taken to codify and structure the labor market and industrial relations. In 1928, a new law was adopted that codified the principle of remote effect and limited the ability for labor market parties to use conflict measures during a period in which an agreement was active. Labor market peace would thus be ensured and the collective bargaining agreement's role as a central pillar on the labor movement made certain. The law of 1928 also introduced a special court for labor disputes, and made it possible for unions to legally demand collectively bargained wages for non-union members, further enforcing the principle of remote effect. The law of 1928 was followed by the Saltsjöbaden agreement in 1938 and the ability for the labor movement to strike was further diminished.[25]

During the interwar period, the foundation of the Rehn-Meidner or Swedish model was laid. The aforementioned law of 1928, the Saltsjöbaden agreement, the turn towards centralization and the promises of peace in the labor market grew out of the turbulent 1920s and 1930s into the post-war golden years of social democracy.[26] Clearly, the interwar period meant a changing role for the labor movement. It went from being in opposition politically to dominating Swedish politics from 1932 onwards. There was also a transition from being a decentralized, combative, organization to centralizing and working in a *consensual* spirit. However, the local organizations seem to have played an important role throughout the interwar, both through their role as a negotiator but also as enforcers of existing agreements and champions of new ones.

[22] Roine & Waldenström (2008).
[23] Lundh (2020), p.126.
[24] Ibid, p.127.
[25] Ibid, pp.127–128, 171–172.
[26] The Rehn-Meidner model was built on three pillars; (1) centralized bargaining and a solidaristic wage policy, (2) active labor market policies and (3) fiscal restrictiveness to hold off inflationary pressures. For more discussion on this, see Molinder (2017).

3 Theoretical Framework

A central question to the distribution and growth of wages is how wages are set. While standard models of the labor market often assume firms as price-takers in the labor market. It is clear that firms have labor market power through their position as monopsonies or oligopsonies.[27] Conversely, labor can also obtain power in the labor market through collusion. At their core, unions are a collusion against capital. Wage setting then should rather be considered as a bargaining exercise, not purely a product of market forces. Labor and capital have diverging interests in this bargaining, which in the context of this paper can be understood as one wants higher wages and the other wants lower. These diverging interests do not necessarily lead to a zero-sum conflict but can be solved with both sides benefiting by establishing clear and stable rules of the game.[28] Fang and Hartley have similarly argued that unions can, through what they refer to as "the voice face", act as a channel through which workers and firms can cooperate or at least create stable work environments.[29] In the end however, how conflict between labor and capital is resolved and who benefits the most will, from a bargaining perspective, ultimately be determined by the relative strength of the two parties. As we have already seen, firm power in this conflict stems from a monopsonist or a collusive oligoponistic situation. Labor market power comes from several factors, among them organizational strength, attributes of the labor supply (education and skill levels), labor market conditions, and political institutions.[30] In this paper I utilize a monopolist approach to union strength by focusing on union density as a way of approximating union bargaining power, in line with previous studies.[31] At its core, union density is a measure of how much of the labor supply is controlled by the unions. This is central because it determines what the options are for firms in a negotiation. A firm deciding between setting a certain wage must consider the actions of workers following the wage setting. If a firm with market power would maximize profits by setting wages at $\text{Wage}_{\text{Markdown}}$ workers could organize to inflict, or have the potential to inflict, economic damage to the firm. This damage varies with the share of unionized workers. We can capture this [potential] damage with $\pi * \textit{union density}$, where π is an unknown parameter inflicting damage to firms based on the union density. If $\pi * \textit{union density}$ is greater than the rents the firm gains from setting the markdown wage then the unions can raise wages from $\text{Wage}_{\text{markdown}}$. That is, if Equation one holds wages will be raised above the markdown wage:

$$\text{Wage}_{\text{market}} - \text{Wage}_{\text{markdown}} < \pi \text{Uniondensity} \quad (1)$$[32]

[27] Card (2022). The traditional monopsony setting is a one-company town with an employer that dominates the labor market. Because of a lack of competition, the firm sets its wage and has to increase wages to increase employment. Oligopsonies are similar but instead imply that there are several dominating firms with labor market power. In practice, however, any number of firms can through collusion obtain this position. For an example of firm collusion in a historical setting see: Delabastita & Rubens (2022)

[28] Bengtsson (2013). In fact Barth et al. (2020) argue that a stronger union at a firm will increase productivity at the firm.

[29] Fang & Hartley (2022).

[30] Korpi (1983), Kjellberg (2021).

[31] For examples of union density being used as a proxy for union strength see: Wallace et al. (2022), Collins & Niemesh (2021) and Barth et al. (2020).

[32] Market wage is the wage that would be paid under perfectly competitive conditions. The markdown wage is the wage firms would pay given a degree of firm labor market power. The difference between these two are rents that the firm accrues.

The wage will be set so that it equals the potential damage the union is able to inflict. Equation two reflects an equilibrium, the union cannot inflict more economic damage than the added wage and the firm cannot set a lower wage than $\text{Wage}_{\text{bargained}}$ without facing union action.

$$\text{Wage}_{\text{bargained}} - \text{Wage}_{\text{markdown}} = \text{Added Wage} = \pi\text{Uniondensity} \quad (2)[33]$$

Equation two implies that higher union density will lead to a higher bargained wage. Further below I build upon Equation two in my regression framework. However, because we do not observe the markdown wage or the market wage I must, in my model, assume that $\text{Wage}_{\text{markdown}}$ and union density are unrelated to each other. If union density is correlated with $\text{Wage}_{\text{markdown}}$ our estimates of the union wage effect will be biased.[34]

This proposed framework assumes a homogeneous effect for workers. In reality this is not necessarily the case—the literature shows differences in union wage premiums across different genders and other characteristics. Later in this text, I elaborate on the heterogeneity of union wage effects and how I capture these using a novel dataset.

4 Data and Empirical strategy

4.1 Interwar Wage Database

For this study, I have constructed a new plant-level, repeated cross-section, database using material from the archives of the Social Board and Statistics Sweden: the Interwar Wage Database. The Social Board surveyed firms in Sweden regarding wages, hours worked, number of workers, and type of pay, among other things. Using the geographical information provided by the firms I code the plants into one of the 24 historical counties of Sweden.

The material comes from surveys done by the Social Board to firms. Starting in 1919 the Social Board surveyed firms requesting information on plant-level wages and workers.[35] This would then be used as a basis for yearly publications regarding primarily wages.

The Social Board material was published in an aggregated format by the Social Board and this aggregated material forms the basis of the Historical Wage Database (HILD) managed by Gothenburg University. The aggregated data have been utilized in different ways. Svensson has used it to examine wage differentials within the Swedish manufacturing industry between 1930 and 1990.[36] It is an essential component of the

[33] The bargained wage is the wage we observe as the outcome on the labor market.
[34] Estimates would likely be biased downwards if these two were correlated with each other. In practice though, this concern is dealt with using an identification strategy.
[35] Prado (2010)
[36] See for instance: Svensson (2004), pp.161–180.

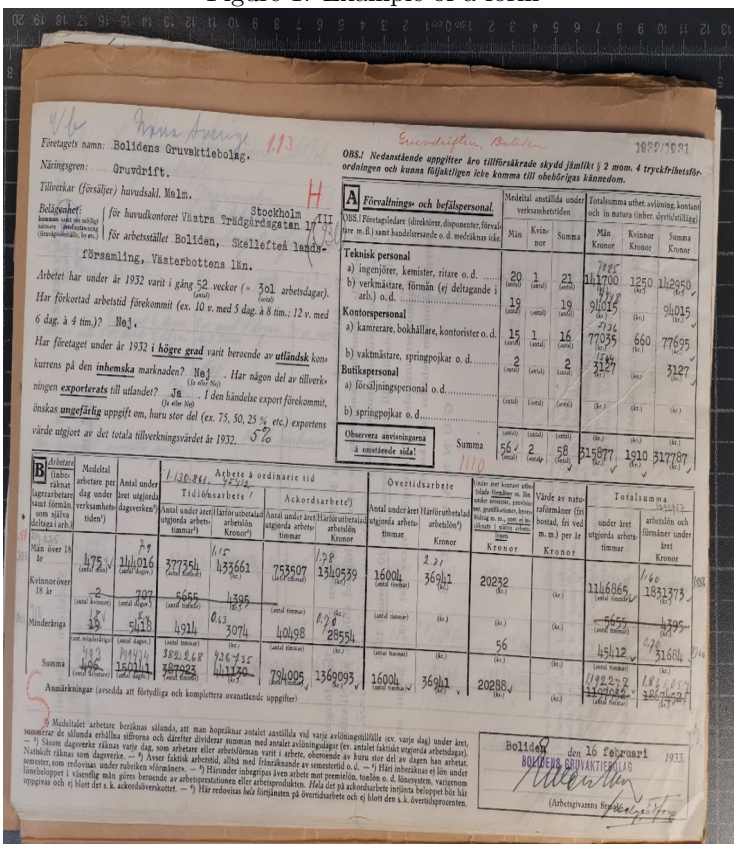
regional GDP estimates constructed by Enflo et al.[37] Because of the detailed and regional nature of the material, it has also been used to examine regional wage differentials for different industries.[38] With the exception of Collin et al. (2019), however, the plant-level material that I utilize in this article has not previously been used.[39]

There are some limitations to the Social Board data. It consists of self-reported information given from firms. As with any survey, it suffers from reporting issues. The Social Board and Statistics Sweden never published the raw material so firms did not need to fear confidential information to leak to the public or to competing firms. Despite this however, the data from the Social Board experienced some underreporting for certain industries.[40] The material covers all industries except for agriculture. Note that within these groups white-collar workers are not included, only those who are assigned as workers involved in production or storage are included. This entails that, for instance, sales representatives in a store is not included but the warehouse workers are.

In Figure one we see an example of the Social Board material. In this example from 1933 (containing information for 1932), we can observe the company's name, *Bolidens Gruvaktiebolag*; the industry, *Mining*; where the work is located, *Boliden*; how many weeks and days of work, *52* & *301*. Note that I do not capture all workers at a given firm—it captures workers at a specific plant within a firm. The central information is given in the lower half of the form where the company provides information on the average number of workers, the number of hours worked and the pay workers received. This information is subdivided into three groups: minors, men over 18, and women over 18. The pay is also divided into piece wage (*Ackordslön*), hourly wage, and overtime wage. As already noted, the form distinguishes between what they call *Arbetare* (workers) and technical, office, and store staff. I do not collect any information on the staff as the companies are not asked to provide any information on the hours worked. It is therefore hard to construct an hourly wage. Note also that the form provides information on in-kind payments (*naturaförmåner*, this primarily includes food, drinks and housing), and benefits (such as paid vacation).

[37] Enflo et al. (2014).
[38] Collin et al. (2019) & Collin et al. (2021).
[39] Collin et al. (2019) use the plant-level data from 1922 to estimate wages on the county-level.
[40] Prado (2010). This under reporting is not necessarily consistent. The Social Board note in their publication for 1940 that the material was weaker than "previous years", Social Board (1942).

Figure 1: Example of a form



Företagets namn: Bolidens Gruvaktiebolag.
Näringsgren: Gruvdrift.
Tillverkar (försäljer) huvudsakl. Malm.
Belägenhet: för huvudkontoret Västra Trädgårdsgatan 17 Stockholm
för arbetsstället Boliden, Skellefteå landsförsamling, Västerbottens län.

OBS.! Nedanstående uppgifter äro tillförsäkrade skydd jämlikt § 2 mom. 4 tryckfrihetsförordningen och kunna följaktligen icke komma till obehörigas kännedom.

Arbetet har under år 1932 varit i gång 52 veckor (= 301 arbetsdagar).
Har förkortad arbetstid förekommit (ex. 10 v. med 5 dag. à 8 tim.; 12 v. med 6 dag. à 4 tim.)? Nej.
Har företaget under år 1932 i högre grad varit beroende av utländsk konkurrens på den inhemska marknaden? Nej. Har någon del av tillverkningen exporterats till utlandet? Ja. I den händelse export förekommit, önskas ungefärlig uppgift om, huru stor del (ex. 75, 50, 25 % etc.) exportens värde utgjort av det totala tillverkningsvärdet år 1932. 5 %

A Förvaltnings- och befälspersonal.

	Medeltal anställda under verksamhetstiden			Totalsumma utbet. avlöning, kontant och in natura (inber. övertidstillägg)		
	Män	Kvinnor	Summa	Män Kronor	Kvinnor Kronor	Summa Kronor
Teknisk personal						
a) ingenjörer, kemister, ritare o. d.	20	1	21	111700	1250	112950
b) verkmästare, förmän (ej deltagande i arb.) o. d.	19		19	91015		91015
Kontorspersonal						
a) kamrerare, bokhållare, kontorister o. d.	15	1	16	77035	660	77695
b) vaktmästare, springpojkar o. d.	2		2	3127		3127
Butikspersonal						
a) försäljningspersonal o. d.						
b) springpojkar o. d.						
Summa	56	2	58	315877	1910	317787

Observera anvisningarna å omstående sida!

B Arbetare (inberäknat lagerarbetare samt förmän som själva deltaga i arb.)

	Medeltal arbetare per dag under verksamhetstiden[1])	Antal under året utgjorda dagsverken[2])	Arbete å ordinarie tid: Tidlönsarbete: Antal under året utgjorda arbetstimmar[3])	Tidlönsarbete: Härför utbetalad arbetslön Kronor[4])	Ackordsarbete[5]): Antal under året utgjorda arbetstimmar	Ackordsarbete: Härför utbetalad arbetslön Kronor	Övertidsarbete: Antal under året utgjorda arbetstimmar	Övertidsarbete: Härför utbetalad arbetslön[6]) Kronor	Under året kontant utbetalda förmåner av lön under semester, provision, gratifikationer, honorering m. m., som ej ingå i någon annan gruppering Kronor	Värde av naturaförmåner (fri bostad, fri ved m. m.) per år Kronor	Totalsumma: under året utgjorda arbetstimmar	Totalsumma: arbetslön och förmåner under året Kronor
Män över 18 år	475	144016	377354	433661	753507	1340539	16004	36941	20232		1146865	1831373
Kvinnor över 18 år	2	707	5655	4395							5655	4395
Minderåriga	19	5418	4914	3074	40498	28554			56		45412	31684
Summa	496	150141	387923	441130	794005	1369093	16004	36941	20288		1197932	1867452

Anmärkningar (avsedda att förtydliga och komplettera ovanstående uppgifter)

[1]) Medeltalet arbetare beräknas sålunda, att man hopräknar antalet anställda vid varje avlöningstillfälle (ev. varje dag) under året, summerar de sålunda erhållna siffrorna och därefter dividerar summan med antalet avlöningsdagar (ev. antalet faktiskt utgjorda arbetsdagar). — [2]) Såsom dagsverke räknas varje dag, som arbetare eller arbetsförman varit i arbete, oberoende av huru stor del av dagen han arbetat. Naturligtvis räknas som dagsverke. — [3]) Avser faktisk arbetstid, alltså med frånräknande av semestertid o. d. — [4]) Häri inberäknas ej lön under semester, som redovisas under rubriken »förmåner». — [5]) Härunder inbegripas även arbete mot premielön, tonlön o. d. lönesystem, varjemte lönebeloppet i väsentlig mån göres beroende av arbetsprestationen eller arbetsprodukten. Hela det på ackordsarbete intjänta beloppet bör här uppgivas och ej blott den s. k. ackordsöverskotter. — [6]) Här redovisas hela förtjänsten på övertidsarbete och ej blott den s. k. övertidsprocenten.

Boliden den 16 februari 1933.
BOLIDENS GRUVAKTIEBOLAG
(Arbetsgivarens firma)

Note: Example of a company form from the Social Board. Source: Social Board (1933).

I have sampled plants from 1924, 1926, 1928, 1930, 1932, 1934, and 1936. I also have plants from 1922 courtesy of Collin et al.[41] In total, the database consists of close to 12,000 observations. This novel database captures plants of widely different sizes and varying legal entities. The sampling was done by selecting ca. every fifth survey form, representing one plant. In table one I compare the sampled material in relation to the published figures, showing that the 1924-1936 sample reflects between 19 and 29 per cent of workers captured by the social board survey material. The 1922 sample by Collin et al. covers almost the entire social board material. While the Social Board published statistics for workers and wages through the entire period, they did not publish the number of firms until 1929. For 1930-1936, however, sampling is between 17.5% and 25.7% of plants.

[41] Collin et al. (2019).

Table 1: How Large is the Sample?

	Total	1922	1924	1926	1928	1930	1932	1934	1936
Sampled workers	731,333.6	195,063.6	77558.02	79031.9	62328.25	85890	73090.6	70899.04	87472.5
Published workers	2,609,716	215,764	273,146	280,390	308,387	368,427	344,744	363,000	455,858
Sample share	28.02%	90.4%	29.47%	28.19%	20.21%	23.3%	21.2%	19.5%	19.2%
Sampled plants	11,928	2567	945	1107	867	1435	1410	1513	2084
Published plants	-	-	-	-	-	5570	8056	7906	9852
Sample share	-	-	-	-	-	25.7%	17.5%	19.1%	21.15%

Note: Authors calculations based on Interwar Wage Database and published material from the Social Board. Note that the social board did not publish the number of plants before 1929.

Calculating an average plant-level wage for the three personnel categories is straightforward. I aggregate the time-rate, the piece-rate, the overtime payments, as well as the benefits and in-kind payments for worker category c in plant i, i.e. men, women, and minors, and then divide this by the total hours worked. For the average hourly wage at a plant i, I then divide all of the payments by the total number of hours.

$$Hourly\ Wage_i = \frac{\Sigma Wage_{c,i} + benefits_{c,i} + inkind_{c,i}}{\Sigma hours_{c,i}}$$

To calculate an average hourly wage for a given year, I aggregate all hours and all wages paid out for each year, dividing wages by hours. Table one shows wages for men in my database and the aggregated reference figures from the Social board's published figures.

Table 2: Sample and Published Hourly Wages in Swedish Crowns

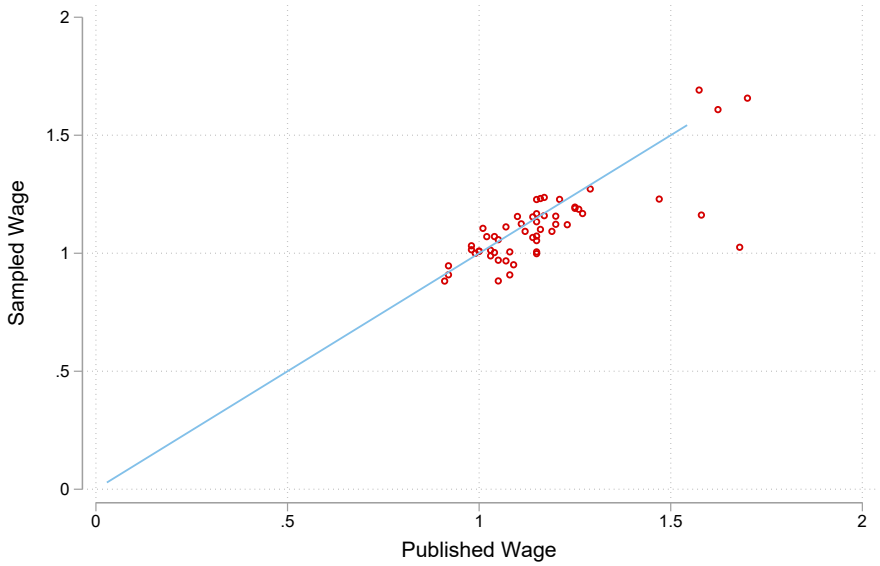
Year	Sample men	Published men	Sample women	Published women
1922	1.12	1.18	0.71	0.73
1924	1.12	1.14	0.71	0.70
1926	1.14	1.19	0.76	0.72
1928	1.23	1.22	0.71	0.73
1930	1.28	1.29	0.745	0.75
1932	1.18	1.27	0.74	0.74
1934	1.21	1.22	0.74	0.73
1936	1.21	1.25	0.73	0.75

Source: Interwar Wage Database

These sampled figures are reasonably close to the published figures for men, despite some underestimation. Note however For women, the sample is somewhat closer; 1926 is an outlier as the wages are overestimated. Overall the sampling should be considered good. Especially in relation to the fact that the Social Board do not themselves note how they calculate the wages. It seems unlikely that 1922 would underestimate wages to the extent Table two implies given that the sample covers 90% of the full survey population. In Figure two I compare the published county-level wages with estimated wages (for men) for each year. I plot a 45 degree

line which each observation would be on if sampling perfectly reflected the published wage.[42] Sampling is excellent with the exception of deviations for Norrbotten county, significantly below the line. In appendix C I run two regressions estimating the correlation between the log of the sampled wage and the log of the published wage. Without Norrbotten the two are correlated with a coefficient statistically insignificant from one. In appendix C I also show that removing the outlier years does not significantly change the results of the analysis.

Figure 2: Sampled vs. Published Wages



Note: Covers 1932, 1934, and 1936.

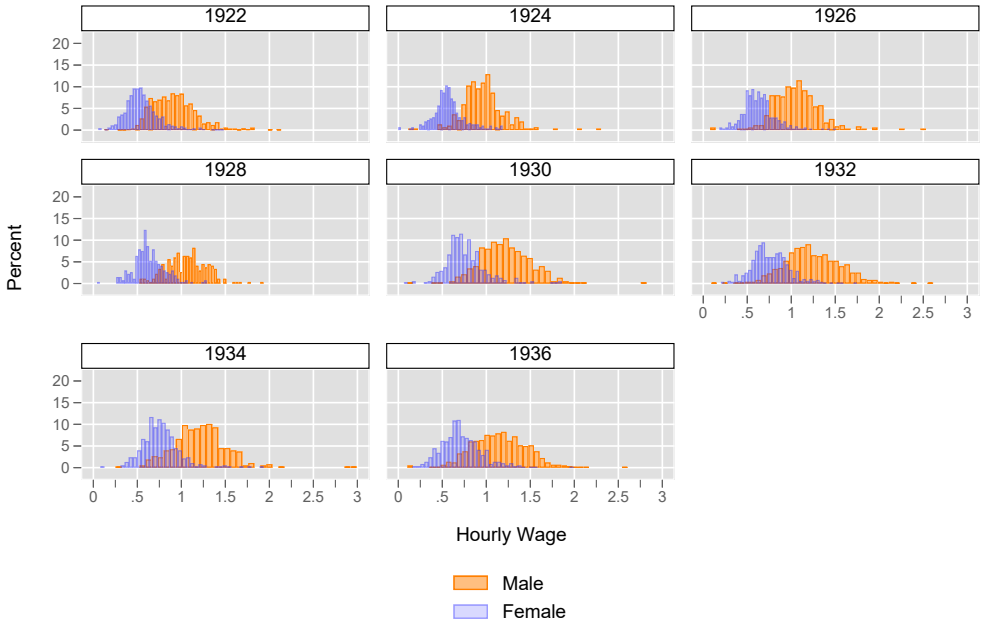
To calculate real wages, I use regional cost of living figures from Collin. Collin created this series using figures from the social board that published price information for a set of towns.[43] This is the only cost of living index available and has previously been used when studying regional wage convergence.[44] Using regional cost of living indices better reflects the real wage in a given county as opposed to using national cost of living indices, especially since wages were differentiated by regional price differences up until the latter part of the 20th century.

Using this new database, I am able to observe the spread of hourly wages across plants and complement the aggregated evolution of wages. Figure three shows the distribution of real wages for each year. The distribution of both male and female wages is similar for all years; female wages are consistently lower than male wages and follow a similar normal distribution. Observing wages at a plant level allows me to observe

[42]Note that county-level wages were not published before 1931, sampling quality can not be tested in the same way as for the 1930s, however, the samples 1922-1930 on average cover a larger portion of the total number of workers in the published material. I can therefore, with confidence, assume that sampling was at least of the same quality for these years if not better..
[43]Collin (2016) pp.28–29.
[44]Collin et al. (2019).

heterogeneity in the union wage effect across different parts of the wage distribution. This is a clear strength of utilizing this novel dataset as opposed to relying on aggregated figures.

Figure 3: Distribution of Male and Female Real Hourly Wages



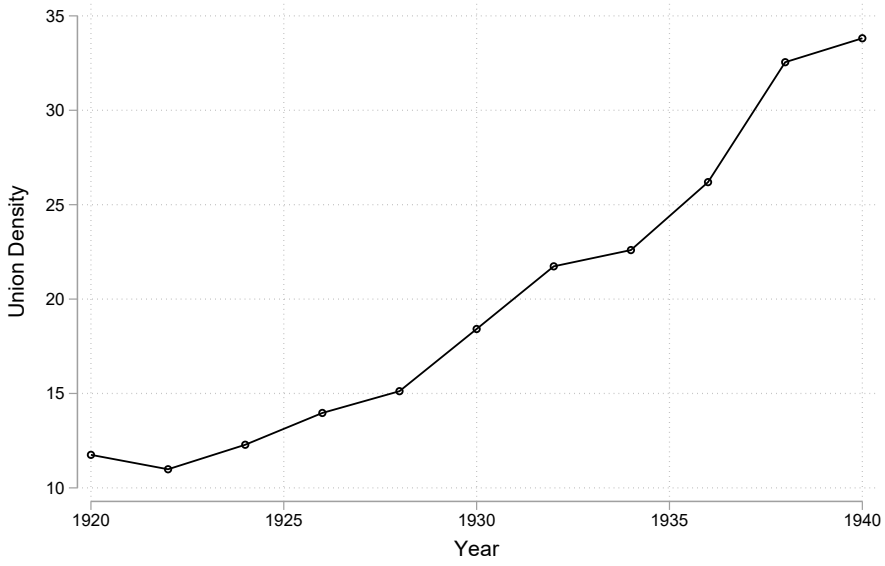
Note: Author's calculations. Outliers larger than two standard deviations have been dropped for visual reasons. Source: Interwar Wage Database.

4.2 Union Density

To calculate union density for each county, I collect union membership information from Andrae & Lundkvist.[45] I match their data with employment statistics from the 1920, 1930, and 1940 censuses. From these censuses I then impute bi-annual employment statistics for each industry within all 24 counties using the geometric mean of the growth rate between 1920 and 1930 as well as 1930 and 1940.[46] Based on this I can calculate union density at the county level. Figure four shows the aggregated union density between 1920 and 1940. Union density grows consistently throughout the interwar period, climbing from around ten percent to above thirty.

[45] Andrae & Lundkvist (1984).
[46] Note that this is the published, aggregated, census, not the microdata.

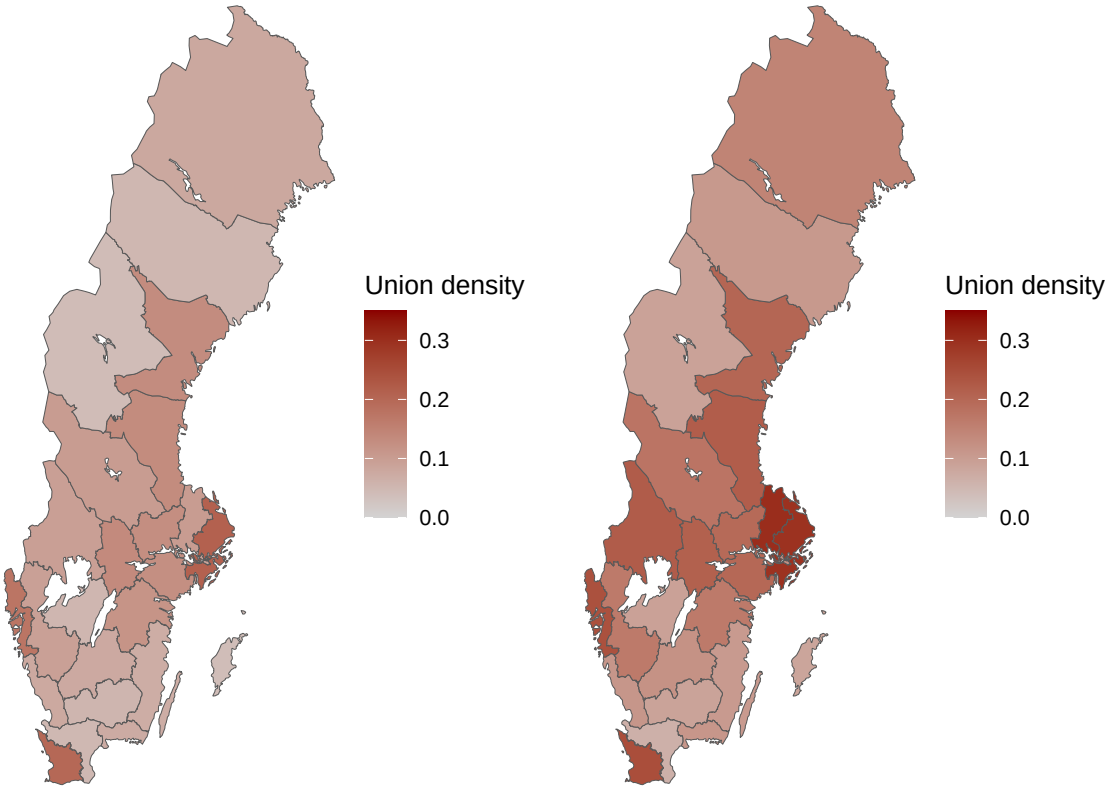
Figure 4: Union Density in the Interwar period



Note: Authors calculations

Behind the rapid growth across Sweden is regional heterogeneity in unionization that I exploit. Figure five shows union density on a county level for Sweden in 1920 and 1930. The three counties containing the nation's three largest cities clearly stand out: Stockholm County, Gothenburg & Bohus County, and Malmöhus County all have the highest union density rates—around 25% in 1930. Rural counties like Kristianstad, Jämtland, and Gotland had some of the lowest rates—these rural counties hovered around 6.5-10%. While there is some persistence in union density, counties such as Uppsala and Värmland experienced relatively rapid growth between 1920 and 1930. The overall increasing trend is clear, but comparing 1920 and 1930 reveals heterogeneity in growth rates as well as levels of union density. This heterogeneity and variation between counties are what I use to disentangle the union wage effect.

Figure 5: Union Density in 1920 & 1930



Note: Author's calculations, see appendix for further discussion.

Note that the union density calculated here is an overall proxy of union strength and covers all workers, not just blue-collar workers (*Arbetare*), whereas the wage data covers just blue-collar workers. This is not an issue as I treat union density as a proxy for overall union strength within a county. I am therefore similarly not concerned with what level of union density individual firms or plants had. If they hire workers in a labor market where unions have raised wages, they will still be impacted by the union wage effect.

4.3 Empirical Strategy

Estimating the relationship between unionization and wages is confounded by omitted variable bias and reverse causality. As previous research has shown, union strength and wages are likely correlated in both directions, and there could be a number of unobservables confounding a normal OLS regression.[47] Low wages and inequality create a breeding ground for unionization while, at the same time, stronger unionization likely causes higher wages. Union strength should also be correlated with local labor market conditions. For identification I use a Bartik Instrument approach for union density. A Bartik Instrument is an instrumental variables approach that typically levies the *exposure* to the national growth rate as an instrument for

[47] Chauvel & Schröder (2017).

exogenous variation in regional growth. It is commonly used to estimate employment growth and has, to some extent, been used by Collins & Niemesh who utilize the principles of the Bartik approach to investigate the impact unions have on local inequality. However, because they do not observe local union density rates, they only utilize differences in exposure to union density.[48]

We can decompose the regional union density into a national and a regional component. The national variation can be used as exogenous to regional inequality—effectively solving the issue of reverse causality and omitted variable bias. A way of conceptualizing this approach is to consider the instrument as capturing the exposure that each county would have to trends in unionization given a fixed employment structure. That is: a county has a union density level that is both idiosyncratic and exogenous. Using the idiosyncratic, endogenous, part will bias our estimates of the union wage effect. Therefore, we use an exogenous part that is determined by the national trend in unionization and that county A is exposed to due to a historical employment structure. In this paper, what I call the "Bartik Union Density" is constructed in the following manner: I obtain employment shares for all industries from the tabulated census for each county in 1920. These employment shares are then multiplied by the national level of union density within the given industry in year t, and summed at the county level:

$$\text{Bartik Union Density}_{l,\ t} = \sum_k Z_{l,k,t(1920)} * \text{ Union Density}_{k,\ t}$$

The key identifying assumption is that the exclusion restriction holds: that the instrument does not affect the dependent variable through any other means than through the dependent variable.[49] In this case, it translates to exposure to national level of union density not affecting wages in a specific region in any other way than through increasing regional union density.

A common concern with the bartik instrument approach is that the industry shares are a source of endogeneity.[50] Motivated by this concern I use fixed-effects to eliminate this potential source of endogeneity, and, in Section three, I perform a robustness test by adding a control for the share of the metal industry within a county. I also test whether or not the results are robust to an orthogonality test where the model is set up to predict the past—something it should not be able to do if the exclusion restriction holds. The findings in this paper are robust to both tests, suggesting that industry structure is not biasing the results.

To test whether or not unions had hetergeneous effects on wages across the wage distribution I employ an instrumental variables quantile regression to disentangle any potential heterogeneity across the distribution. Because unions tend to compress wages and benefit the bottom of the distribution the most, I expect a stronger union wage effect at the bottom of the distribution. Mechanically this is intuitive—if unions work to enforce and introduce collective bargaining agreements and minimum wages, we should expect the largest effect for those who are affected by these wages. An instrumental variables quantile regression (IVQR) differs

[48] Collins & Niemesh (2019), Autor et al (2013).
[49] Stock and Watson (2015).
[50] Goldsmith-Pinkham et al. (2020).

from a normal 2SLS regression in several ways. It is less sensitive to outliers, and produces estimates of the marginal effect of X on Y at quantile q. IVQR is a powerful tool for understanding heterogeneity across the distribution and can be extended to settings where group-level treatment affects individual-level outcomes.[51]

5 Did Unions Affect Wages in the Interwar Period?

Wages in Sweden developed rapidly following World War I. The explosion of real wages between 1919 and 1921 coincided with falling inequality. Bengtsson has also characterized this period as a structural break, with the wage share rising for the first time.[52] Visible in Figure six is the sharp rise in wages, followed by a period of slower yet relatively consistent growth. As mentioned above, this jump in real wages has been attributed to the eight-hour workday and successful bargaining from the labor movement, an argument that fits well into a bargaining power perspective. During this jump in wages, the labor movement were able to hold nominal wages still while prices fell and thereby saw massive real wage gains.

Figure 6: Wage Growth in Swedish Manufacturing 1910-1940

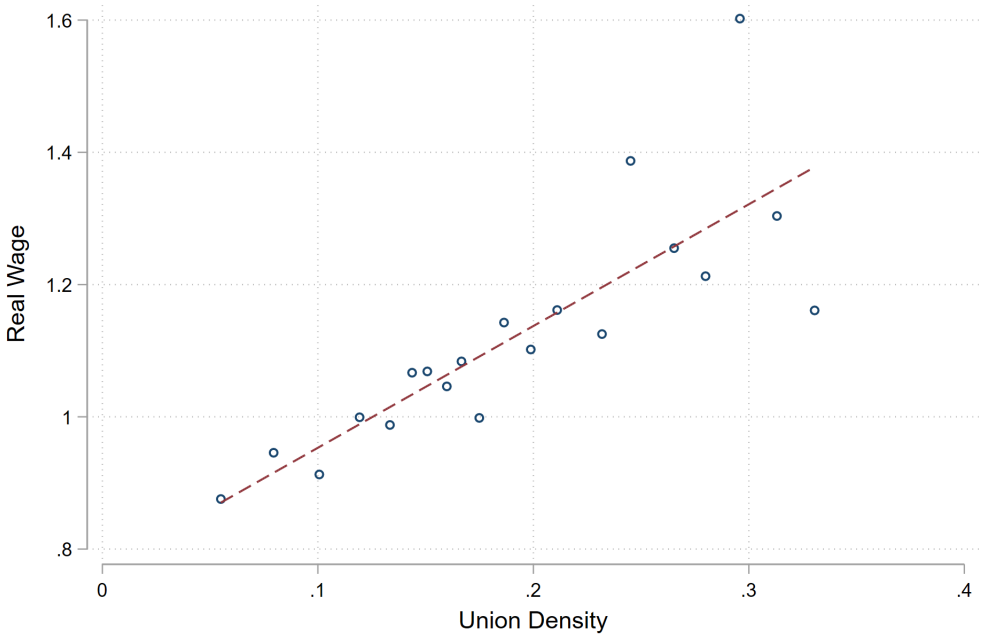
Source: Social Board

As inequality began falling and wages began rising, unions expanded their share of the working population while facing fierce competition for control of the labor market. It is in this context that we should understand the expanding wages. Exploring the relationship between unions and wages descriptively reveals a strong correlation. In Figure seven, I plot the unconditional relationship between union density and real log wages for men. As expected, the relationship is positive. However, this unconditional relationship is confounded

[51] Chetverikov et al. (2016). For estimation I use the *MDQR* package in stata, discussed in Melly & Pons (2023).
[52] Bengtsson (2014)

by biases and of course does not reveal heterogeneous effects across the distribution.

Figure 7: Wages vs. Unions



Note: Observations are binned. Real wage shows men's wages and union density is on the county level.

5.1 Union Wage Effect

I can now estimate the union wage effect and test my prediction: that union density generates higher wages. In Equation three, I regress log wages on the instrumented union density measure (UD). The wages are for plant f in county c and year t and the estimated union density is on a county-wide yearly level. I also include θ, a vector of yearly-fixed effects, λ, a vector of county-fixed effects, and X a vector of plant specific characteristics, including share of female workers, share of minor workers and size of firm (measured by number of workers). The coefficient of interest here is π which captures the relationship between local union strength and wages. In Table two, I run a standard 2SLS model, estimating the effect of unions on wages. In Figure eight, I report the results from an IVQR regression estimating the effect unions have at different quantiles. In Table two I run Equation three. Figure eight estimates a quantile regression version of of Equation three:

$$log(Wage_{f,c,t}) = \alpha_0 + \pi UD_{c,t} + X + \lambda + \theta + \epsilon_{f,c,t} \quad (3)$$

In Figure five, we observed considerable persistence in union density. The county-fixed effects, therefore, control for any unobservable time-invariant, county-level confounders. The year-fixed effects control for

any unobservable time-varying, nationwide, confounders. And the size of the plant can capture eventual plant market power or potential omitted variable bias due to any correlation between plant size and union strength.[53] I also split the sample. In columns one and two I run regressions on the full sample, in three and four, only men's wages are included.

Table 3: Estimating the Union Wage Effect Using Least Squares

	Whole sample		Male sample	
	(1)	(2)	(3)	(4)
VARIABLES	IV TWFE	IV TWFE + Controls	IV TWFE	IV TWFE + Controls
Union density	-0.000216	0.00618	0.0104	0.00960
	(0.00821)	(0.00585)	(0.00852)	(0.00681)
1922	ref.	ref.	ref.	ref.
1924	0.105***	0.0796***	0.0827***	0.0825***
	(0.0285)	(0.0240)	(0.0305)	(0.0279)
1926	0.148***	0.148***	0.135***	0.139***
	(0.0380)	(0.0289)	(0.0400)	(0.0352)
1928	0.226***	0.182***	0.191***	0.182***
	(0.0531)	(0.0428)	(0.0499)	(0.0475)
1930	0.396***	0.303***	0.250***	0.226***
	(0.0709)	(0.0566)	(0.0657)	(0.0608)
1932	0.367***	0.290***	0.256**	0.258***
	(0.105)	(0.0733)	(0.104)	(0.0828)
1934	0.402***	0.296***	0.271**	0.273***
	(0.108)	(0.0762)	(0.106)	(0.0839)
1936	0.321**	0.210**	0.163	0.165
	(0.134)	(0.0978)	(0.140)	(0.116)
Average # of workers		5.70e-05*		
		(3.01e-05)		
Average # of male workers				7.62e-05***
				(2.41e-05)
Constant	-0.0995	-0.0224	-0.0848	-0.0838
	(0.132)	(0.0988)	(0.139)	(0.114)
Observations	10,719	10,719	10,567	10,567
R-squared	0.296	0.553	0.368	0.393
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
F-statistic	78.61	77.72	75.05	74.452
Mean Union Density	19.08	19.08	19.05	19.05
Union Density sd	7.58	7.58	7.58	7.58

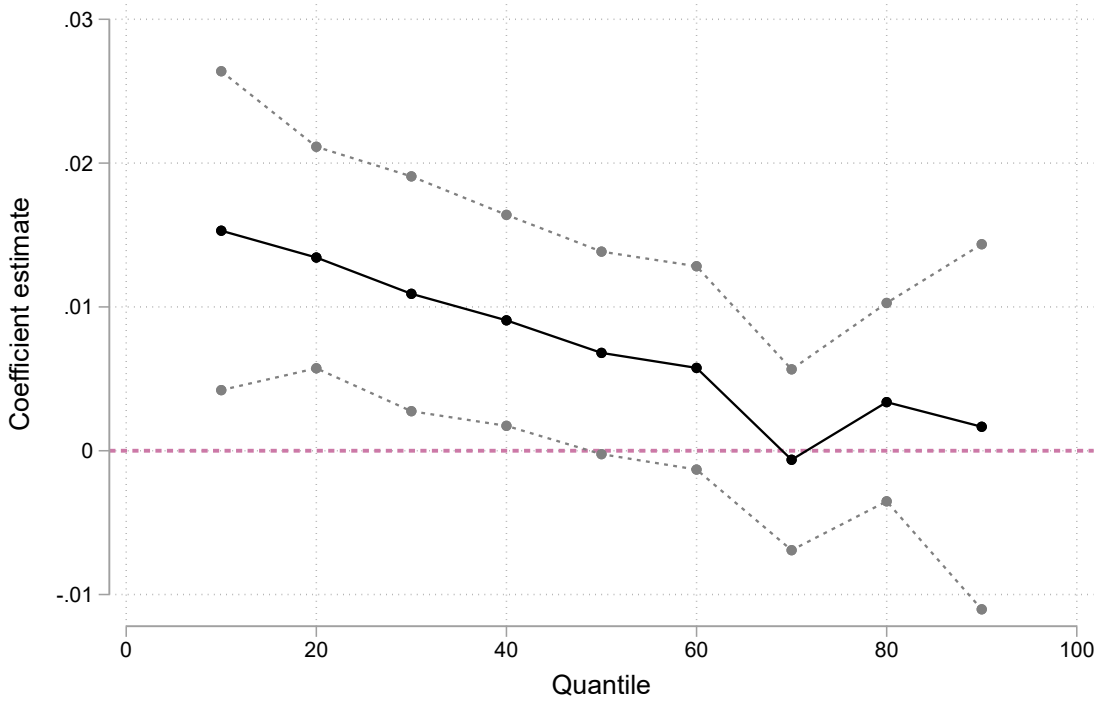
Note: controls include plant size, female share of employment, and minor's share of employment.
Standard errors clustered at the county level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table two summarizes the results from the regressions. Column one shows a two-way fixed effects model without controlling for the number of workers at each plant using wages for men, women, and minors. Column two reports results from the same model, while adding controls for the share of women and minors

[53] Remember that the union wage premium and wages are likely impacted by plant size as argued by Fang & Hartley (2022).

at each plant, as well as plant size. Columns three and four report the same models, but for just men. The strong F-test for each model suggests that no issues of a weak instrument are confounding the estimates. All models have F-tests close to or above 70. Which is well above the common threshold of 10. There is no apparent statistically significant relationship between union density and wages using this 2SLS framework. However, this 2SLS model does not reveal any heterogeneity across the distribution. Using instrumental variables quantile regressions, on the other hand, shows that there is a solid and heterogeneous effect of union density on men's wages. Figure eight shows that unions affect the bottom of the distribution. An effect of around 1 to 1.5 percent is measured for the bottom 40% of the wage distribution, whereas no significant effect is found for the top 60%. The size of the effect for the bottom is similar to the one found by Barth et al for their entire sample.[54]

Figure 8: Coefficient estimates across the wage distribution - Men



Note: The figure shows the point estimate of the coefficient of interest from quantile 10 to 90. Confidence intervals are at the 90% level.

The economic impact of these findings are large. With union density growing by close to twenty points throughout the interwar period, the predicted wage effect for men is somewhere between a 20 and 30% wage increase. Because the effect is limited to the bottom 40% of the distribution, the wage effect for the entire population is closer to 9.7%.[55] This increase is more than a third of the observed increase of close to 26% in

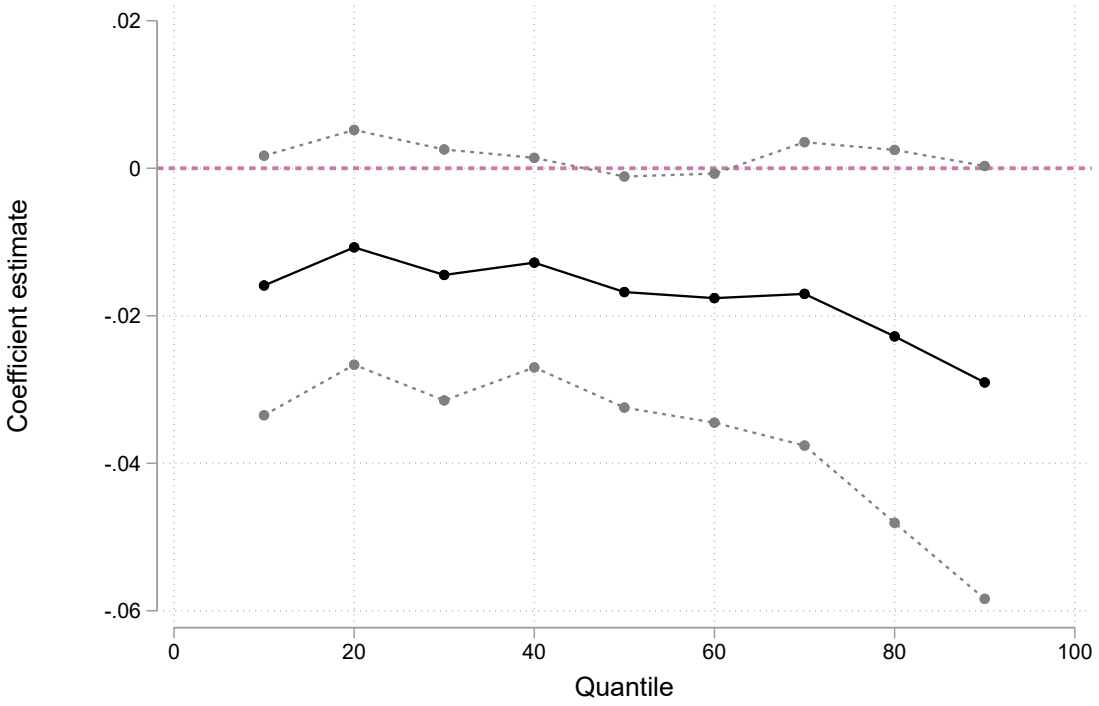
[54] Barth et al.(2020).

[55] Calculated by taking the average point estimate for the bottom 40% (1.2175) multiplied by 20, i.e the increase in union

the sample data. The economic significance should therefore be considered quite large. The distributional effects are also noteworthy with unions clearly compressing the wage structure. We know that inequality began falling at the start of the interwar period, these results indicate that the simultaneously strengthened labor movement could have played a role in this early secular fall in inequality.

For women, union density is barely significant at the 90% level at two quantile. The fiftieth and the sixtieth. Here, I find a negative effect around 1.8%. Women were, therefore, not just unaffected as a whole but some parts of the distribution were even disadvantaged by the union and had their wages lowered. Note that for women, there are far fewer observations: closer to 4,000 as opposed to the above 10,000 for men. Because of this, the quantiles are selected within county as opposed to county and year as is for the men, which is the preferred method of picking percentiles/quantiles in an IVQR regression.[56]

Figure 9: Coefficient estimates across the wage distribution - Women



Note: The figure shows the point estimate of the coefficient of interest from quantile 10 to 90. Confidence intervals are at the 90% level

Importantly, these findings are for real wages that are deflated by a regional cost of living index. In Appendix B, I show that the negative effect on women's wages was more profound in nominal terms, suggesting that women were drastically held back by these male-dominated unions.

Clearly, wages for women were not a priority for the male-dominated labor movement, and only the

density and then weighting for the fact that only 40% of the distribution were impacted through multiplying by 0.4

[56] Chetverikov et al. (2016).

bottom of the male distribution benefitted from union strength. In the next subsection I test the robustness of these findings by adding a new control and performing an orthogonality test. And in the next section I discuss these results more extensively.

5.2 Robustness check

A possible critique against the Bartik instrument is that it is correlated with employment structure and therefore violates the exclusion restriction. While I argue that county-fixed effects will capture this potential confounder, it is possible, using the census information, to calculate the share of an industry within a given county on a yearly basis. In Table three, I run the quantile regressions for the bottom third of the distribution and include a control variable controlling for the share of the metal manufacturing industry, similar to Autor et al.[57] Not only does this not change the results in any way for the tenth through thirtieth quantile, the metal share coefficient is non-significant and small. These results, therefore, validate the assumption of the exclusion restriction holding at all four quantiles.

In line with suggestions by Borusyak et al., I also test for orthogonality. In practice, this is done by using lagged outcomes and running the same specification so that a plant in 1930 is matched with our instrumented union density from 1932.[58] If the instrument is truly exogenous, it should not be able to predict outcomes in previous periods. Table three reports the results from this exercise in Columns four, five, and six. The coefficients turn to non-significant when performing the orthogonality test, suggesting that the model is not able to predict the past and should not be correlated with any confounding variables. If the coefficients were significant, there must be some unobserved variable correlated with both wages and unionization over time that the model is capturing. However, because there is no significance, this is not the case.

Table 4: Adding controls and orthogonality test for men

VARIABLES	(1) 10th percentile	(2) 20th percentile	(3) 30th percentile	(4) 40th percentile	(5) 10th percentile	(6) 20th percentile	(7) 30th percentile	(8) 40th percentile
uniondensity	0.0154**	0.0135***	0.0110**	0.00910**	0.0145	0.0138	0.0101	0.00762
	(0.00676)	(0.00468)	(0.00493)	(0.00446)	(0.0130)	(0.00957)	(0.00939)	(0.00799)
metal_share	-1.483	-1.128	-0.852	-0.484				
	(0.953)	(0.736)	(0.668)	(0.661)				
Constant	-0.380***	-0.229***	-0.130*	-0.0737	-0.576	-0.396	-0.168	0.00272
	(0.103)	(0.0770)	(0.0666)	(0.0668)	(0.495)	(0.362)	(0.352)	(0.303)
Observations	10,565	10,565	10,565	10,565	10,565	10,565	10,565	10,565
Metal share	Yes	Yes	Yes	Yes	No	No	No	No

Standard errors clustered at the county level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Column 1–4 adds metal share as a control, and columns 5–8 perform an orthogonality test.

[57] Autor et al. (2013).
[58] Borusyak et al. (2020).

For women, the results appear similarly robust to the inclusion of the metal share of employment and the orthogonality test. Again, the model is significant at the 90% level at the median and the sixtieth quantile. In the next section, I discuss how I interpret these findings.

Table 5: Adding controls and orthogonality test for women

	(1)	(2)	(3)	(4)
VARIABLES	50th percentile	60th percentile	50th percentile	60th percentile
uniondensity	-0.0170*	-0.0174*	-0.0359	-0.0372
	(0.00936)	(0.00999)	(0.0260)	(0.0270)
metal_share	1.480	1.760		
	(1.152)	(1.267)		
Constant	-0.252*	-0.195	1.239	1.351
	(0.132)	(0.149)	(1.029)	(1.064)
Observations	3,814	3,814	3,814	3,814
Metal share	Yes	Yes	No	No

Standard errors clustered at the county level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6 Conclusion & Discussion

In this article, I have shown that unions exerted pressure on wages for large portion of wage earners during the interwar period. Using a novel dataset on wages for more than 10,000 plant I have been able to estimate the relationship between unions and wages through an instrumental variables approach. The case of interwar Sweden provides evidence that unions and institutions were a force to be reckoned with at the dawn of the great leveling. This article shows that the union wage effect extends not just further back in history than what was previously known, but also extends to institutional settings where unions have seemingly had no effect. Crucially, I tie in to a debate on whether or not Sweden, during this period, had a union wage effect.

The empirical strategy in this article utilizes regional differences in exposure to unionization in an instrumental variables setting to identify the relationship between unions and wages. These findings are robust to both yearly and county fixed effects as well as a set of plant-level characteristics. As a robustness check, I estimated the main specification at the significant quantiles of the distribution and included the metal share of employment as a control. This exercise does not change the coefficient in any significant direction, the exclusion restriction therefore seems robust. The findings are similarly robust to an orthogonality test, for all four quantiles, where I regress wages in year t on union density in year $t+2$, showing that the instrument is exogenous to previous periods—the model does not predict the past.

I find that unions impacted the bottom of the distribution of male workers, at the tenth, twentieth, thirtieth, and fortieth quantile. All saw considerable effects from changes in union density over time: a one percentage point increase in union density increased wages at these plants by an average of 1.2%. This is slightly smaller than the effect found by Barth et al. who found a 1.4% increase from a similar change in

union density at a firm level. However, the effect in Barth et al. is within the confidence bands and not statistically different. While one would have to adjust for observing the effect at different levels, this finding shows that for those who experience a union wage effect, the effect was the same in the interwar period as in the early 21st century.

While unions impacted wages for men positively, the middle of the distribution of female wage earners was negatively impacted by the rise of unions, contrasting more modern results showing relatively large positive effects for women.[59] Explaining the heterogeneous union wage effect is outside the scope of this study. However, some tentative speculations are reasonable. Firstly, unions in Sweden became increasingly egalitarian in their wage policies only in the post-war era, introducing low wage pots after 1969.[60] The union wage policy during the interwar period was characterized by Johansson & Magnusson as unsolidaristic.[61] However, the effect found here—that local unions increased wages for the bottom of the distribution—might point towards local unions either being more egalitarian or simply fighting for the introduction of minimum wages, which impacts the bottom of the distribution the most. By lifting the bottom of the distribution unions not only impacted inequality, they also affected economic performance and could have spurred on industrial rationalization—just as the Rehn-Meidner model aimed to do in the post-war era.

For women, we know that it is only in the post-war era that the Federation of Labor Unions (LO) adopt a policy of equalizing wages between women and men.[62] Before this, the unions seemed to be relatively uninterested in women's issues and clearly did more material harm to women than good. In understanding union wage effects, we have to consider the historical and ideological context in which the union is operating. Unions are not an ahistorical entity that can be assumed to have the same goals over time. This point is perhaps especially important in understanding the gendered aspect of union wage effects. Unions are evolving organisms that across time and space might act differently.

While the rapid rise in real wages for men and the labor share in Sweden during the interwar period can not alone be explained by rising union density. The introduction of the eight-hour workday is the obvious candidate for explaining this.[63] However, the consistent rise in wages afterward is well correlated with the evolution of unionization in Sweden. Mean real hourly wages for men rose in my sample by 26% between 1922 and 1936. Simultaneously, union density more than doubled, exerting upwards pressure on wages. The argument that the eight-hour workday increased wages is similarly strengthened by the results in this article. The shortening of the work day was not guaranteed to raise wages, it was only after bargaining that real wages could increase. This article lends support to the literature suggesting a union wage effect in the interwar period.[64]

When inequality began falling at the end of World War I in Sweden and around the world. Unions, I have shown, were a major player in determining wages and creating a more compressed wage structure. The

[59] Fang & Hartley (2022).
[60] Molinder (2017).
[61] Johansson & Magnusson (1998) p.36.
[62] Waldemarson (2000) p.81. Sund (2002).
[63] Bengtsson & Molinder (2017).
[64] As Lundh & Heikkinen (2020) as well as Fregert (2000) does.

great leveling can not be understood by economic growth and the destructive nature of war. We must add to this the role of unions that expanded not just in Sweden but across Europe and the United States. While unions appear to have compressed wages for men, they worked to increase the wage gap between men and women.

To conclude, this study shows that union strength is a key component in understanding the evolution of wages and the structure of wages in the early stages of real wage growth. The long-run union wage effects are less clear, but this article shows that bargaining power resources and the institution of unions impacted wages early on in Swedish economic development. It also highlights the need to examine the role of power relations and institutions in shaping wages during industrialization and at the dawn of the great leveling

7 References

Socialstyrelsen, Löneförhållandena inom industrin, byggnadsindustrin, förvaltning, m.m 1913-1961, Riksarkivet, Arninge, reference: SE/RA/420267/06/H/H 4/H 4 A/H 4 AB/H 4 ABA/.

Kungliga Socialstyrelsen, Lönestatistisk årsbok för Sverige. Isaac Marcus boktryckeri-aktiebolag, Stockholm 1931, 1936, 1941, 1942, 1946, 1951, 1953.

Kungliga statistiska centralbyrån - Folkräkningen 1920, 1930, 1940.

Andrae, C. G., & Lundkvist, S. (1984) Arbetarhistoria, meddelanden från arbetarrörelsens arkiv och bibliotek; No. 31-32 1984. https://doi.org/10.5878/002531

Autor, David H, David Dorn, and Gordon H Hanson. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." American Economic Review 103, no. 6 (October 1, 2013): 2121–68. https://doi.org/10.1257/aer.103.6.2121.

Barth, Erling, Alex Bryson, and Harald Dale-Olsen. "Union Density Effects on Productivity and Wages." The Economic Journal 130, no. 631 (October 16, 2020): 1898–1936. https://doi.org/10.1093/ej/ueaa048.

Bengtsson, Erik.

———. Essays on Trade Unions and Functional Income Distribution. Gothenburg Studies in Economic History 9. Göteborg: Dep. of Economy and Society, School of Business, Economics and Law, Univ. of Gothenburg, 2013.

———. "Labour's Share in Twentieth-Century Sweden: A Reinterpretation." Scandinavian Economic History Review 62, no. 3 (September 2, 2014 B): 290–314. https://doi.org/10.1080/03585522.2014.932837.

—. "Inequality and the Working Class in Scandinavia 1800–1910: Workers' Share of Growing Incomes". Investigaciones de Historia Económica 13, nr 3 (october 2017): 180–89. https://doi.org/10.1016/j.ihe.2017.05.002.

—. Världens Jämlikaste Land? Lund: Arkiv Förlag, 2020.

Bengtsson, Erik, and Jakob Molinder. "The Economic Effects of the 1920 Eight-Hour Working Day Reform in Sweden." Scandinavian Economic History Review 65, no. 2 (May 4, 2017): 149–68.

https://doi.org/10.1080/03585522.2017.1290673.

Borusyak, Kirill, Peter Hull, och Xavier Jaravel. "Quasi-Experimental Shift-Share Research Designs". Redigerad av Dirk Krueger. The Review of Economic Studies 89, nr 1 (10 january 2022): 181–213.

https://doi.org/10.1093/restud/rdab030.

Bryson, Alex. "The Effect of Trade Unions on Wages." Reflets et perspectives de la vie économique XLVI, no. 2 (2007): 33. https://doi.org/10.3917/rpve.462.0033.

Bryson, Alex, Harald Dale-Olsen, and Kristine Nergaard. "Gender Differences in the Union Wage Premium? A Comparative Case Study." European Journal of Industrial Relations 26, no. 2 (June 2020): 173–90. https://doi.org/10.1177/0959680119840572.

Card, David."Who Set Your Wage?" American Economic Review 112, no. 4 (April 1, 2022): 1075–90.

Chauvel, Louis, and Martin Schröder. "A Prey-Predator Model of Trade Union Density and Inequality in 12 Advanced Capitalisms over Long Periods: Inequality and Union Density as Prey and Predator." Kyklos 70, no. 1 (February 2017): 3–26. https://doi.org/10.1111/kykl.12128.

Chetverikov, Denis, Bradley Larsen, and Christopher Palmer. "IV Quantile Regression for Group-Level Treatments, With an Application to the Distributional Effects of Trade." Econometrica 84, no. 2 (2016): 809–33. https://doi.org/10.3982/ECTA12121.

Collin, Kristoffer. Regional Wages and Labour Market Integration in Sweden 1732-2009. Gothenburg Studies in Economic History 17. Göteborg, 2016.

Collins, William J., and Gregory T. Niemesh. "Unions and the Great Compression of Wage Inequality in the US at Mid-century: Evidence from Local Labour Markets." The Economic History Review 72, no. 2 (May 2019): 691–715. https://doi.org/10.1111/ehr.12744.

Collin, Kristoffer, Christer Lundh, and Svante Prado. "Exploring Regional Wage Dispersion in Swedish Manufacturing, 1860–2009." Scandinavian Economic History Review 67, no. 3 (September 2, 2019): 249–68. https://doi.org/10.1080/03585522.2018.1551242.

Collin, Kristoffer, Christer Lundh, Svante Prado, and Kerstin Enflo. "Labour and the 'Law of One Price': Regional Wage Convergence of Farm Workers in Sweden, 1757–1980." Scandinavian Economic History Review 69, no. 1 (January 2, 2021): 41–62.
https://doi.org/10.1080/03585522.2020.1740776.

Delabastita, Vincent and Rubens, Michael. Colluding Against Workers: Evidence from Belgium, 1845-1913. Working paper. November 30, 2021.

Ericsson, Johan, and Jakob Molinder. “Economic Growth and the Development of Real Wages: Swedish Construction Workers’ Wages in Comparative Perspective, 1831–1900.” The Journal of Economic History 80, no. 3 (September 2020): 813–52. https://doi.org/10.1017/S0022050720000285.

Enflo, Kerstin, Martin Henning, and Lennart Schön. ”Swedish regional GDP 1855–2000: Estimations and general trends in the Swedish regional system.” In Research in Economic History. Emerald Group Publishing Limited, 2014.

Fang, Tony, och John Hartley. ”Evolution of Union Wages and Determinants”. SSRN Electronic Journal, 2022. https://doi.org/10.2139/ssrn.4123774.

Freeman, Richard B., and James L. Medoff. What Do Unions Do? New York, NY: Basic Books, 1984.

Fregert, Klas. “The Great Depression in Sweden as a Wage Coordination Failure.” European Review of Economic History 4, no. 3 (2000): 341–60.

Goldsmith-Pinkham, Paul, Isaac Sorkin, and Henry Swift. “Bartik Instruments: What, When, Why, and How.” American Economic Review 110, no. 8 (August 1, 2020): 2586–2624. https://doi.org/10.1257/aer.20181047.

Heikkinen, Sakari, and Christer Lundh. “Sticky Swedes and Flexible Finns: Manufacturing Labour Markets in Finland and Sweden during the Great Depression.” Scandinavian Economic History Review 68, no. 2 (May 3, 2020): 145–69. https://doi.org/10.1080/03585522.2020.1716059.

Johansson, Anders L., och Lars Magnusson. LO andra halvseklet: fackföreningsrörelsen och samhället. Stockholm: Atlas, 1998.

Johnson, George E. “Changes over Time in the Union-Nonunion Wage Differential in the United States.” In The Economics of Trade Unions, edited by Jean-Jacques Rosa, 3–25. Dordrecht: Springer Netherlands, 1984. https://doi.org/10.1007/978-94-017-1371-9_1.

Kjellberg, Anders. Vad är facklig styrka?: arbetsplatsfacket centralt i den svenska partsmodellen, 2021.

Korpi, Walter. The Democratic Class Struggle. London; Boston: Routledge & K. Paul, 1983.

Kuznets, Simon. “Economic Growth and Income Inequality.” American Economic Review XLV, no. 1 (1955).

Lundh, Christer. Spelets regler: institutioner och lönebildning på den svenska arbetsmarknaden 1850-2018. Tredje upplagan. Lund: Studentlitteratur, 2020.

Melly, Blaise, Pons, Martina. "Minimum Distance Estimation of Quantile Panel Data Models". Working paper.

Molinder, Jakob. Interregional Migration, Wages and Labor Market Policy: Essays on the Swedish Model in the Postwar Period. Uppsala Studies in Economic History 111. Uppsala: Uppsala Universitet, 2017.

Prado, Svante. Nominal and Real Wages of Manufacturing Workers, 1860-2007". In Exchange Rates, Prices, and Wages, 1277–2008, edited by Edvinsson, Rodney, Jacobson, Tor, and Waldenström, Daniel, 479–527. Stockholm: Ekerlids förlag, 2010

Prado, Svante, Christer Lundh, Kristoffer Collin, and Kerstin Enflo. "Labour and the 'law of one price': regional wage convergence of farm workers in Sweden, 1757–1980." Scandinavian Economic History Review 69, no. 1 (2021): 41-62.

Roine, Jesper, och Daniel Waldenström. "The Evolution of Top Incomes in an Egalitarian Society: Sweden, 1903–2004". Journal of Public Economics 92, nr 1–2 (februari 2008): 366–87.
https://doi.org/10.1016/j.jpubeco.2007.06.012.

Scheidel, Walter. The Great Leveler: Violence and the History of Inequality from the Stone Age to the Twenty-First Century. The Princeton Economic History of the Western World. Princeton, New Jersey: Princeton University Press, 2017.

Stock, James H., and Mark W. Watson. Introduction to Econometrics. Updated 3. ed., Global ed. The Pearson Series in Economics. Boston Munich: Pearson, 2015.

Sund, Bill. "Kvinnolön och institutionell makt: Lönefrågans institutioner och drivkrafter i ett historiskt och industriellt perspektiv". In Askegård, Josephine, ed. Kvinnor tar plats: arbetsmarknad och industriarbete på 1900-talet. Stockholm: Arbetarrörelsens arkiv och bibliotek, 2002.

Svensson, Lars Industrial Dynamics, Labour Demand, and Wage Differ-entials in the Swedish Manufacturing Industry 1930-1990. In Lundh, Christer, ed. Wage, Formation, Labour Market Institutions & Econom-ic Transformation in Sweden 1860 - 2000. Lund Studies in Economic History 32. Stockholm: Almqvist, 2004.

Söderberg Johan, "Wage Differentials in Sweden, 1725-1950", In Brenner, Y. S., Hartmut Kaelble, and Mark Thomas, eds. Income Distribution in Historical Perspective. Cambridge [England]; New York: Paris: Cambridge University Press; Editions de la Maison des Sciences de l'Homme, 1991.

Waldemarson, Ylva. Kvinnor och klass - en paradoxal skapelseberättelse:LOs kvinnoråd och makten att benämna 1898 - 1967. Arbetsliv i omvandling, 2000,1. Stockholm, 2000.

Wallace, Michael, Allen Hyde, and Todd E. Vachon. "States of Inequality: Politics, Labor, and Rising Income Inequality in the U.S. States since 1950." Research in Social Stratification and Mobility 78 (April 2022): 100677. https://doi.org/10.1016/j.rssm.2022.100677.

A Calculating Union Density

To calculate union density and the Bartik union density, three things have to be done. Firstly, I need information on union memberships. This is taken from Andrae & Lundkvist, as noted above. Secondly, I need information on employment, taken from the censuses. Lastly I need to code both the union membership statistics and the censuses information in to industries that match.

Since the census is reported on a within county industry basis I harmonize the industries across census and then proceed to code the different unions to these industries.

In the rest of this appendix I discuss how I first harmonize the employment figures across different censuses, I also show how I impute employment for years that are between census', I then discuss coding the unions in to industries.

A.1 Coding the Employment Statistics

I collect employment statistics from the 1920, 1930, and 1940 censuses for each county and each industry within these counties. These industries are broadly the same across time although some subtle changes occur. I harmonize 1930 and 1940 with the 1920 census. For instance: the category trade is in 1920 simply trade and includes banks, insurance, hotels and restaurants. In 1930 and 1940, I therefore aggregate the subcategories to create a single category called trade. Similarly, to cope with the transport category changing, I aggregate all forms of transport to a single one. This entails that the postal service is also contained in this category. In table six I show this harmonizing exercise in detail.

For the years between the censuses I impute employment levels. First I calculate the change between two censuses: either $\frac{Employment in 1940}{Employment in 1930}$ or $\frac{Employment in 1930}{Employment in 1920}$. Secondly, I use the geometric mean of this change to impute a biannual employment level.

Table 6: Harmonizing industries over censuses

Industry in 1920	1930	1940
Trade	Trade, Banking, Hotels	Trade, Banking, Hotels, Agency, Real estate
Transport (ground + seafaring)	Postal service, Railroads, Common ground transport, Piloting, Seafaring	Postal service, Seafaring, Common ground transport, Air transport

A.2 The Union Data

The union data from Andrae & Lundkvist come in the form of observations on the local chapter level for different unions. These unions can be coded in accordance with the census industries above. For instance the metal workers union is coded into the metal industry, the railroad workers' union coded to the transport industry, and so on. This way I can calculate a national industry-level union density to be used in the Bartik instrument.

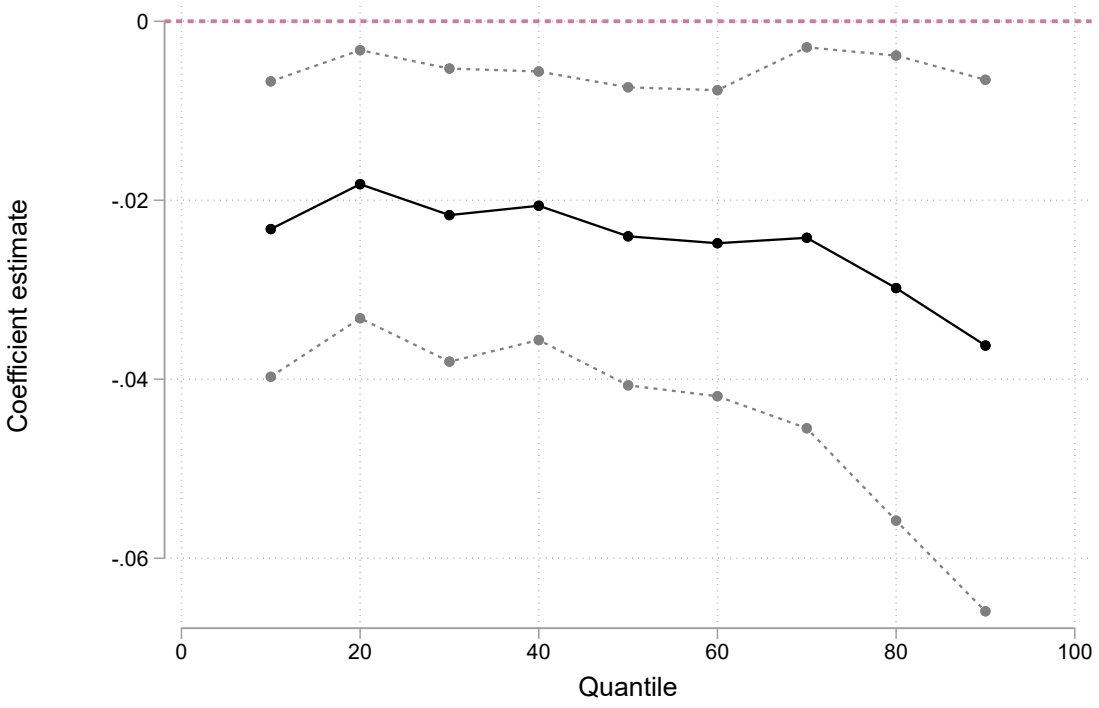
In the replication files, I show exactly how each union has been coded and to which industries they

belong. In general, however, unions fit an industry quite well. Using secondary sources allows me to quite precisely code the different unions.

B Nominal Wage Regression

This section runs the same model as in Figure nine and eight, but for nominal wages. The results for women show a negative effect across all quantile groups, suggesting that unions exerted negative nominal wage pressure for women.

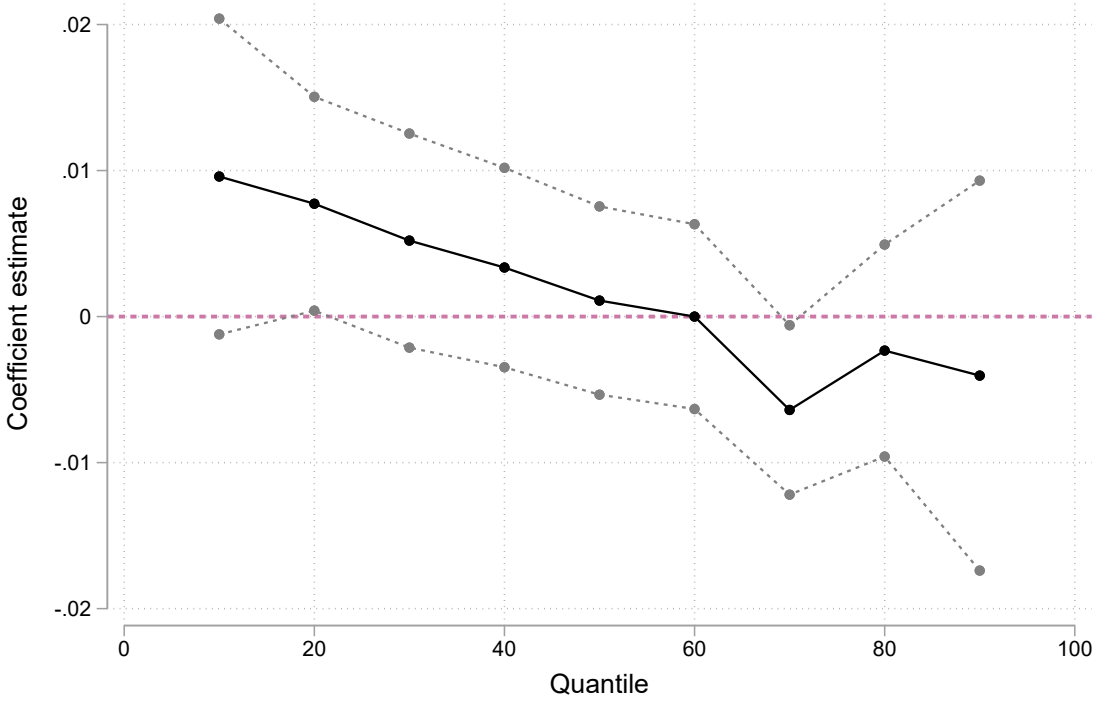
Figure 10: Nominal wage coefficent estimations - Women



Note: Figure shows the point estimate of the coefficient of interest from quantile 10 to 90 (q01 to q09). Confidence intervals are at the 90% level.

Curiously, for men, no effect is apparent. While it is clear from the analysis above, that they did raise real wages, they were not raising nominal wages. I interpret this as real wages being the main concern for workers and being cognizant of local changes to prices. At the 90% level, there is a positive effect on wages at the 20th percentile and a negative effect at the 70th percentile.

Figure 11: Nominal Wage Coefficient Estimations - Men



C Sample Quality and Outlier Analysis

Using simple OLS, I formally test the quality of the sample on the county level by regressing the sampled wage on the published wage:

$$Wage_{Sample} = \alpha_0 + \beta Wage_{Published} + \epsilon$$

In column one I run the OLS with the full sample and in column two I remove the observations for Norrbotten. With the exception of Norrbotten county, the sampling is essentially correlated 1:1 with the published figures. This suggests that overall sampling is excellent and accurately reflects the overall wage level in the county.

Table 7: Correlation Between Sampled and Published County-level Wages

Sample	Point Estimate	Lower Bound	Upper Bound
Full	0.68	0.54	0.81
	(0.081)		
Without Norrbotten	0.98	0.87	1.08
	(0.063)		

Note: Upper and Lower bound based on 95% confidence intervals.

Norrbotten poses no problem for the analysis, despite the three outlier years. In Table eight I drop the three outlier years for Norrbotten and show that there is no statistically significant change in the analysis.

Table 8: Outlier Sensitivity Analysis

VARIABLES	(1) 10th percentile	(2) 20th percentile	(3) 30th percentile	(4) 40th percentile
Union density	0.0162**	0.0147***	0.0124**	0.0103**
	(0.00687)	(0.00479)	(0.00501)	(0.00450)
workersday_men	0.000188***	0.000102***	3.67e-05	-3.34e-05
	(3.96e-05)	(3.13e-05)	(3.15e-05)	(3.77e-05)
femaleshare	0.0644**	0.0146	-0.00458	-0.00305
	(0.0289)	(0.0230)	(0.0226)	(0.0212)
minorshare	-0.139**	-0.154***	-0.181***	-0.199***
	(0.0691)	(0.0440)	(0.0379)	(0.0338)
1924	0.0957***	0.0674***	0.0594***	0.0527***
	(0.0204)	(0.0185)	(0.0195)	(0.0195)
1926	0.0966***	0.111***	0.119***	0.128***
	(0.0318)	(0.0220)	(0.0218)	(0.0218)
1928	0.160***	0.147***	0.140***	0.136***
	(0.0360)	(0.0285)	(0.0315)	(0.0290)
1930	0.199***	0.210***	0.220***	0.240***
	(0.0511)	(0.0393)	(0.0431)	(0.0393)
1932	0.115	0.170***	0.188***	0.211***
	(0.0733)	(0.0540)	(0.0577)	(0.0524)
1934	0.106	0.138**	0.160***	0.193***
	(0.0773)	(0.0576)	(0.0614)	(0.0571)
1936	-0.0141	0.00712	0.0495	0.0994
	(0.102)	(0.0735)	(0.0791)	(0.0717)
Constant	-0.524***	-0.346***	-0.226***	-0.133*
	(0.126)	(0.0834)	(0.0807)	(0.0741)
Observations	10,407	10,407	10,407	10,407

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

D First Stage

In this appendix I report the first-stage estimation for the specification reported in Figure eight.

Table 9: First stage for Figure Eight

VARIABLES	(1) uniondensity
bartik_union_density	1.229***
	(0.0157)
1924.year	-0.116**
	(0.0568)
1926.year	-0.129
	(0.0786)
1928.year	-0.0281
	(0.0835)
1930.year	1.236***
	(0.120)
1932.year	3.997***
	(0.108)
1934.year	4.953***
	(0.112)
1936.year	6.493***
	(0.133)
Constant	-1.368***
	(0.212)
Observations	10,569
R-squared	0.960
F-statistic	53.93

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1