Trade unions, collective bargaining and income inequality: a transatlantic comparative analysis

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Abstract

This paper studies the collective bargaining systems in European Union countries and the United States and evaluates their possible impacts on income inequality by summarising the literature and presenting novel cross-section and time series evidence. We highlight the importance of extension mechanisms that expand the outcome of the bargaining to workers who are not members of a trade union, resulting in a much higher collective bargaining coverage than trade union density. We find that collective bargaining systems in Western and Nordic EU are much more centralised and coordinated than those in Anglo-Saxon economies and in Eastern EU countries. We argue that the union membership wage premium (ie higher wages for workers that are members of a trade union) is an inadequate measure of the impact of trade unions on wages where extension mechanisms are widespread. We find a negative correlation between income inequality and either trade union density or collective bargaining coverage both across countries at a point in time, and across time for several countries. Impulse response functions from vector autoregressions indicate declining inequality after an increase in trade union density and collective bargaining coverage.

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1. Introduction

In most developed economies, wages and working conditions are set through a collective bargaining process involving several social partners, such as trade unions[1], employers' organisations, and the government. The specifics of these arrangements vary considerably across countries and are the result of different labour laws and labour institutions.

In this essay, we present data on the main trends in trade union density and collective bargaining coverage, review the literature to understand how differences in collective bargaining processes affect wages and inequality, and present novel cross-section and time series evidence on the association between collective bargaining and income inequality. We focus on European Union countries and the United States (US), while also using data from the United Kingdom (UK) and some other countries to broaden the comparison. We discuss the differences in bargaining processes, as well as highlight considerable heterogeneity within the EU.

In the second section, we set up the background for a comparison of collective bargaining systems in European countries and the US. We particularly focus on two important indicators: trade union density and collective bargaining coverage. These indicators are used to evaluate the bargaining power of trade unions, which is a critical factor in the collective bargaining process and the focus of most research in this field. In the third section, we explore the centralisation of negotiation levels (vertical coordination of the bargaining process) and the coordination of trade unions across firms (horizontal coordination), which play a crucial role in determining the outcome of collective bargaining.

Building upon our discussion in these sections, the fourth section investigates the impact of collective bargaining on wages and income inequality, by reviewing the scarce literature on this topic and presenting some novel evidence. We report cross-section correlations

[1] The expressions 'trade union' (UK English) and 'labor union' (US English) are synonyms; they refer to an organisation that represents a set of workers, protects their rights, and discusses their pay and working conditions with employers and the government.

between the levels of collective bargaining/trade union density and inequality, and correlations of within-country temporal changes of the indicators. We discuss possible interpretations of these correlation coefficients – which may not necessarily imply causality – and complement the analysis with estimated impulse response functions from vector autoregressions.

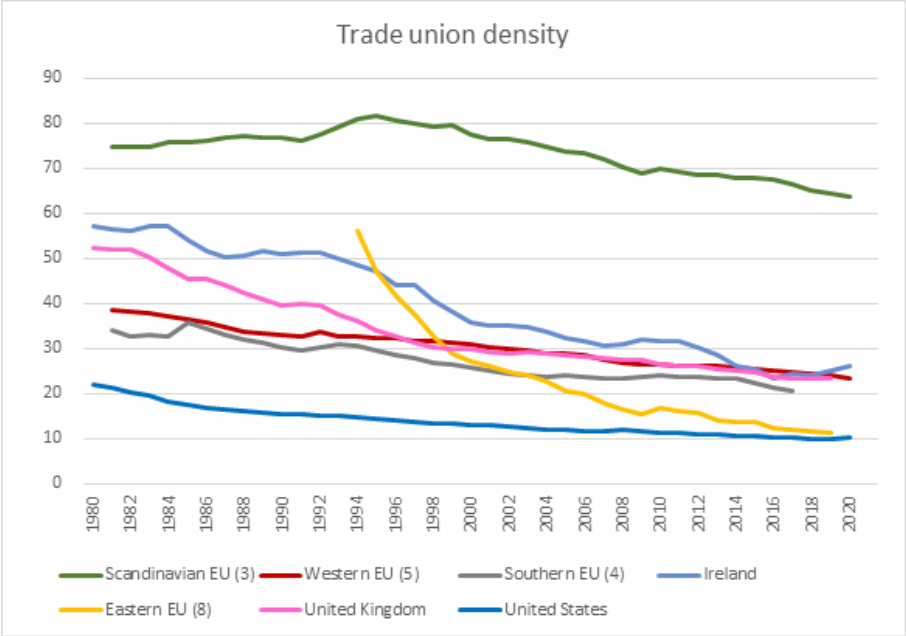
We draw our conclusions in the last section, summarising the main findings of our analysis and identifying potential avenues for future research.

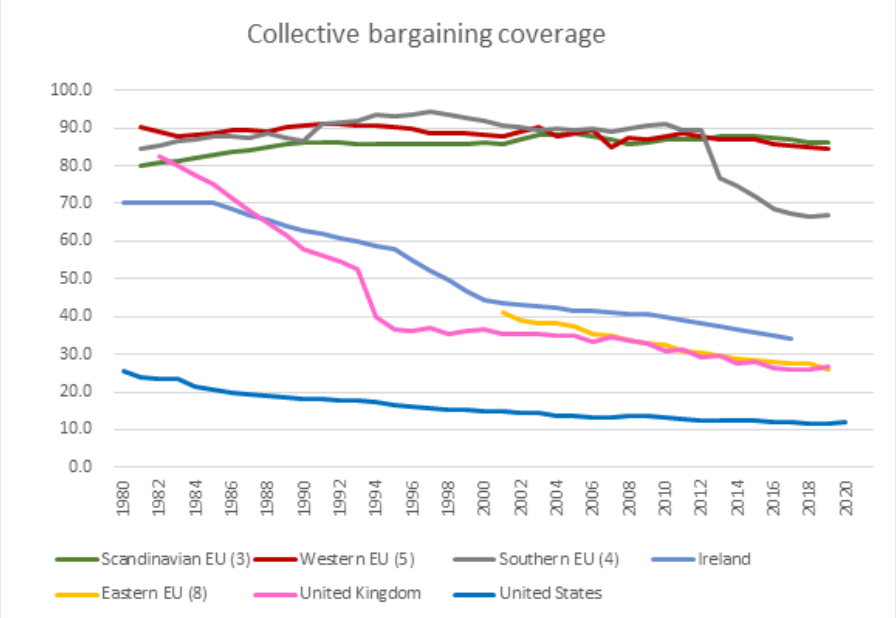
2. Trends of trade union density and collective bargaining coverage

To assess the bargaining power of workers across countries, we begin by exploring trends in trade union density. Trade unions are arguably the most important actors in the collective bargaining process. Those are voluntary organisations based on membership with the primary goal of improving and maintaining terms and conditions of work through collective bargaining with employers. The share of workers who join unions as a percentage of the labour force, also known as trade union density, may serve as an indicator of the bargaining power of unions.

Panel A of Figure 1 shows the evolution of trade union density over time for four EU main country groups, the United Kingdom and the United States. We include data for Ireland separately, because this country differs from the four main EU country groups and has a union density similar to the UK. There is a great degree of heterogeneity across countries in our sample. The Scandinavian EU shows the highest level of unionisation (between 82 and 64 percent over time) whilst on the opposite side of the spectrum we find the US with a unionisation rate between 22 percent and 10 percent. Other EU countries and the UK are in between.

Figure 1: Trade union density and collective bargaining coverage in the European Union, the United Kingdom, and the United States, 1980-2020 (percent)





Source: OECD/AIAS database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS). Note: The trade union density is defined as the number of net union members (ie excluding those who are not in the labour force, unemployed and self-employed) as a proportion of the number of employees. The adjusted collective bargaining coverage rate is defined as the number of employees covered by a collective agreement in force as a proportion of the number of eligible employees equipped (ie the total number of employees minus the number of employees legally excluded from the right to bargain). Unweighted averages are reported for the EU groups: Scandinavian EU (3): Denmark, Sweden, Finland; Western EU (5): Austria, Belgium, Netherlands, France, Germany; Southern EU (4): Greece, Italy, Spain, Portugal; Eastern EU (8): Czechia, Estonia, Hungary, Lithuania, Latvia, Poland, Slovak Republic, Slovenia. Whenever one or a few observations were missing between two available observations, we interpolated missing data with linear trends. For a few countries, missing data at the end or at the beginning of the sample period was approximated by assuming the same percent change as the average of the other countries in the same country group.

The de-unionisation process occurred in all countries but with varying strengths. US unionisation halved over the past 40 years from the already low rate of around 22 percent in 1980 to 10 percent by 2020. Eastern EU countries experienced the sharpest decline in unionisation in the 1990s as part of the transition from the socialist economic system, where union membership was a method of signalling political preferences and was seen as a prerequisite for career-progression. As these countries moved to a market economy, unionisation declined sharply. The dataset we use includes values for most eastern EU countries starting from the mid-1990s when the average rate was close to 60 percent. Since then, unionisation in Eastern EU declined to close to 10 percent, nearing US values. The UK and Ireland went from having more than half of their labour force represented by a union in the early 80's, to only a fourth by 2020. Although there has been a shared declining trend, the decrease in unionisation has been less pronounced in Scandinavian, Southern and Western EU.

As a counterpart to unions, another actor involved in the collective bargaining process are employers' associations. Similar to unions, they have the primary function of engaging in coordinated collective bargaining (Jäger *et al*, 2022). They can either be organised at the sectorial level like the German metal and electrical industry association *Gesamtmetall* or at the national level, like the Italian *Confindustria*. While in many European countries the role of employers' associations is institutionalised in the collective bargaining process, in the US, where the bargaining happens mainly at the firm level, employers' associations do not directly partake in the bargaining process and have more of a lobbying role (OECD, 2019). The outcome of collective bargaining is often extended beyond the union and employer association members (Eurofound, 2015). One of the reasons is the existence of *erga omnes* (towards everyone) clauses that extend the terms set in collective agreements not only to the signatory parties but to all workers. That is, if an agreement is signed between an employer and a trade union, under *erga omnes* clauses, all workers are covered by the agreement. Moreover, in Europe, there is a tradition of extending negotiated agreements to non-unionised workers within a sector and even companies that were not originally involved

in the bargaining process. Several European countries, including Austria, Belgium, France, Germany, Spain, Finland and the Netherlands have automatic or common sector-level extension practices (Breda, 2015; Eurofound, 2015), though such sector-wide extensions are not a legal mechanism in Cyprus, Denmark, Malta, Sweden, and the United Kingdom (Eurofound, 2015). For this reason, collective bargaining coverage is a measure complementary to union density if the aim is to assess the potential impact of the whole bargaining process.

For example, in Germany, a bargaining agreement signed between an employer association and a union covers all the firms which are part of the employer association. Moreover, covered firms usually apply *erga omnes* clauses and extend the coverage to all employees, regardless of union membership (Jäger *et al*, 2022). This results in a trade union density of 17 percent vis-a-vis a collective bargaining coverage rate of 54 percent in 2018.
Due to the extension mechanism, a collective bargaining coverage rate higher than unionisation density can be observed in nearly all studied countries, although differences are apparent. In Scandinavian, Southern and Western EU, coverage is between 90 percent and 60 percent (Panel B of Figure 1) and it shows a certain stability despite the moderate trend in de-unionisation. The sharp decline in coverage for Southern Europe at the end of the sample period is particularly due to the reforms to reduce the extension mechanisms that Greece undertook after 2010 in the context of the financial assistance programme, where the 100 percent coverage rate in 2011 declined to 14 percent by 2017. In contrast, unionisation and collective bargaining coverage have relatively similar values in the US, UK and Ireland. In the Eastern EU, collective bargaining covers about 28 percent of the workforce, which is more than twice the percentage of workers who are members of trade unions. Yet, compared to other EU countries, collective bargaining coverage in Eastern Europe remains the lowest.

Taken together, trade union density and collective bargaining constitute a measure of the bargaining power of unions, which as we have seen, is drastically different across countries.

The US has consistently experienced low levels of unionisation and collective coverage since the 1980s, and a similar trend is observed in Anglo-Saxon and Eastern EU countries, despite higher initial levels. However, in most EU countries, although unionisation rates have decreased, collective coverage has remained relatively high and stable thanks to the presence of extension mechanisms and *erga omnes* clauses mentioned above. This resulted in a large gap between bargaining coverage and union density in many European countries.

Two facts are cited in the literature as reasons for relative persistency of union membership in the Nordic and Western EU: Ghent-system and sectoral character of European unions (Boeri and van Ours, 2013; Naidu, 2019; 2022). The role of unions in the welfare system is different in many European countries and in the US. In Nordic EU countries as well as in Belgium, big cross-industry unions are responsible for the administration of unemployment benefits, the system known as the Ghent-style benefits[2]. The union density has also remained high in countries where unions operate on a sectoral level (such as Nordic EU, Germany and Italy). The inclusion of unions within the welfare state system and the sector-specific nature of European unions may have prevented their decline in Europe and contributed to the persistence of large, well-established unions there.

It also must be noted that the de-unionisation process did not affect all collective bargaining systems in the same way. Jäger *et al* (2022) stress that membership is crucial for unions in the US, as their influence strongly relies on the legitimisation and is a direct function of the share of workers who have joined them.

[2] For example, in Belgium, the National Employment Office (NEO), a public body, disburses unemployment benefits, which are funded by compulsory contributions from both employees and employers as well as from contributions from the federal budget. There are four payment agencies: three trade unions and the Auxiliary Fund for the Payment of Unemployment Benefits (AFPUB), a public agency to deal with workers who do not wish to join a trade union. The unemployed can decide whether to request the payment via a trade union or the AFPUB. The three trade unions handle 85 percent of cases. Trade union staff help the jobless to prepare her/his claim and then forward the claim to the NEO for verification. Once the NEO verified the claim, it transfers the amount of benefit to the trade union, plus some extra to cover the costs incurred by the trade union in providing services to the unemployed, and then the trade union transfers the benefit to the jobless. For further details, see Faniel (2020)

3. Vertical and horizontal orientation of wage bargaining process

The collective bargaining process is the outcome of labour regulations and characteristics of unions and employer organisations. The literature builds a taxonomy of collective bargaining systems around two dimensions: 1) the level of union density and bargaining coverage, explained previously and 2) the extent of vertical and horizontal coordination of social partners on which we focus now (Calmfors, 1993; Bhuller *et al*, 2022).

Collective bargaining systems vary in their degree of centralisation of the bargaining level. This concept, known also as vertical coordination, determines the level at which wage negotiations occur, which could be within a specific company (a decentralised system), industry, sector, or across the entire nation (a highly centralised system). For example, in Germany, most of wage bargaining agreements are reached on industry-regional level (Jäger *et al*, 2022), whereas in the US this mostly happens on the firm-level (see Table 1). An example of the centralised bargaining is provided by Sweden between 1930s and 1980s that consisted of agreements reached by the main trade union of the country and nation-wide employers' association that set the frame for additional agreements on lower levels (Freeman and Gibbons, 1995). The OECD/AIAS database suggests that there were four countries (Denmark, Israel, Spain, and Sweden) in 1980 with a centralised level of bargaining at the national level. Data for 2019 shows none (Table 1), suggesting a move towards more decentralised bargaining processes.

Trade unions that engage in the bargaining process vary in the degree of coordination of different types of workers or units, which is known as horizontal coordination. An example of high horizontal coordination can be the export-led pattern bargaining present in Germany, Sweden and Norway, where unions in the chemical or the metalworking sectors set the path for sequential wages negotiation in other industries (Bhuller *et al*, 2022). On the opposite side, the UK, where several unions for different professions bargaining separately may coexist in the same workplace, is a case of horizontal decentralisation (Calmfors, 1993).

Following these two categories and building on the analysis of Bhuller *et al* (2022), in Table 1 we present a classification of the EU countries, the US, and the UK based off the levels of

vertical and horizontal coordination. The US, where bargaining happens at the firm level and where horizontal decentralisation is strong, lies in the bottom left corner of the grid. The same applies for several Eastern EU countries, with a decentralised collective bargaining taking place mainly at the firm level and with little horizontal coordination across crafts (Magda 2017).

The Scandinavian EU countries and some of the Western EU countries are found at the opposite side of the chart. Germany and Sweden were previously identified as countries where horizontal coordination is strong and this is corroborated in Table 1. It is important to stress that the OECD database used to construct Table 1 introduces a certain degree of simplification, as it categorises the predominant bargaining level. For instance, Germany has a sectoral-regional collective bargaining system (Jäger *et al*, 2022) which is arguably not as centralised as the Italian one - a fact to which we return later. Similarly, while the predominant bargaining in some countries (Sweden, Denmark, Germany, Belgium) is at the sectoral level, these countries also utilise a two-tier framework that incorporates additional local wage bargaining at the firm level.

Table 1: Wage setting coordination in the EU, UK and US, 2019

Vertical coordination	Little to none	Some	Moderate	High	Very high
Centralised national					
Centralised sectoral					Belgium
Sectoral		Portugal Slovenia	Finland Italy Spain	Austria Denmark Germany Netherlands Sweden	
Some sectoral	Greece Romania	Croatia Cyprus Ireland Luxembourg Slovakia	France		
Fully decentralised (firm level)	Hungary Latvia Lithuania Malta Poland US	Czechia Estonia UK			

Horizontal coordination

Source: updated from Figure 2 of Bhuller *et al* (2022) using the OECD/ICTWSS database. Note: Vertical coordination considers the predominant bargaining level. A level is 'predominant' if it accounts for more than two-thirds of the total bargaining coverage rate (code 1, 3 or 5). If it accounts for less, but more than one-third of the coverage rate, there is a mixed or intermediate situation, between two levels (code 2). A mixed situation also occurs when bargaining levels alternate and/or it is impossible to assess which of the two contributes more to the actual coverage of agreements (code 4).

4. How does collective bargaining affect wages and income inequality?

Research on the economic consequences of collective bargaining processes on macroeconomic variables is relatively scarce (Bhuller *et al*, 2022). This is partly because of difficulties in cross-country comparisons which are subject to the criticism of omitted variables and other endogeneity issues (Naidu *et al*, 2022) and partly due to data availability issues (Ahlquist, 2017). Instead, recent research in labour economics has focused to understand the relative importance of individual determinants of wages, including wage premiums associated with unionised status ('union membership wage premium'). This exercise is simpler, as focusing on one economy enables researchers to condition the calculation on domestic wage-setting practices. Unfortunately, research of effects of unions on employment is scarce. For this reason, we focus on the effect of trade unions on the wage distribution, reporting findings on employment whenever it is possible.

Trade unions and wages

Bryson (2014) analysed household surveys to compute union membership wage premium across a sample of OECD countries. The findings are reproduced in Table 2. Although this study relies on simple econometric methods, we found that in most cases, the estimated effects are quite similar to studies employing more complicated identification strategies (for a literature review, see Fang and Hartley, 2022). For example, Fang and Hartley (2022) reported a consensus on positive union wage premia for the US, with estimates that tend to hover between 10 percent and 20 percent, which is 17 percent in Bryson's (2014) data.

An intuitive relation between the union membership premium and collective bargaining coverage emerges in the data. Namely, in presence of effective extension mechanisms that can widen the coverage of collective agreement irrespective of individual worker's union membership, premiums are expected to be compressed. Indeed, this conjecture finds support in our data. As can be verified in Table 2, the union wage premium in France, Germany, Italy, the Netherlands, and Sweden is zero or not significantly different from zero (which we mark as 'ns'). All these countries also have a very high collective bargaining coverage (Figure 1). This contrasts with Anglo-Saxon economies (especially the US), which have some of the highest

union premiums in Table 2 but were previously identified as countries with weak collective bargaining coverage. Therefore, for Anglo-Saxon countries the empirical literature focuses on the effect of union membership on wages, while for Continental Europe the central question should revolve around the role of collective bargaining (Gürtzgen, 2016).

Table 2: Union membership wage premia in selected European countries and the United States

Country	Years	Union % increase
Austria	1994, 1995, 1998, 1999	12
Cyprus	1996-1998	14
Denmark	1997-1998	16
France	1996-1998	3 (ns)
Germany	1994-1999	4 (ns)
Italy	1994, 1998	0
Netherlands	1994, 1995	0
Norway	1994-1999	7
Portugal	1998-1999	18
Spain	1995, 1997-1999	7
Sweden	1994-1999	0
UK	1993-2002	10
US	1973-2002	17

Source: Bryson (2014). Note: the estimates control for age, its square, years of schooling, private sector, hours worked, and union status.

Contrary to high union premiums found in the US and other economies, research trying to uncover causal effects of union formation found negative effects on wages and employment in the US setting. Those studies compare unions that barely won the National Labour Relations Board (NLRB) elections to those that barely lost (Dinardo and Lee, 2004; Frandsen,

2022; Wang and Young, 2022). In the US, a worker who wants to form a union typically needs to gather signatures from at least 30 percent of their co-workers to trigger a union election supervised by NLRB and then win a majority of the votes in that election to gain recognition. Frandsen (2022) reports that union creation led to decrease in average wages of workers and establishment employment. The wage impact was mostly driven by changes in workforce composition (high-paid workers leaving and young, lower-paid workers coming to replace them). However, there is a major problem related to this method: the causal impact applies only to establishments close to the margin of victory and thus considers only a small subset of trade unions. This is especially problematic given that unions efficacy depends on their legitimisation which is gained through favourable election results (Cahuc *et al*, 2014). Interestingly, Wang and Young (2022) provided some evidence that the negative employment effects of unionisations are driven by managerial opposition to the unionisation process. According to Naidu (2019), this strand of literature highlights the problems with union creation laws present in the US and not unions themselves.

But even for countries with limited collective bargaining coverage like the US, there is another obstacle in establishing a conclusive link between unions and wages. Activities of unions have a potential to influence not only unionised employees but also their non-unionised counterparts (Ahlquist, 2017). For example, employers who would like to discourage unionisation would be prone to offer better conditions and wages to their employees, mimicking the benefits of covered workers. This mechanism, called the threat of unionisation, would therefore reduce the wage differentials in the covered and non-covered sectors. In this regard, Fortin *et al* (2021) showed that the direct effects of unions on wages and spill-over effects are similar in magnitude. They estimate that by accounting for both, the total effect of unionisation amounts to 29 percent of the increase in log wages between 1979 and 2017 in the US. Unfortunately, we lack similar research for other countries with low collective bargaining coverage, like the UK and eastern EU countries.

To overcome the problem of understanding the impact of unions (or wage bargaining) on wages in countries with extension mechanisms, Card and Cardoso (2021) explore the relationship between collectively negotiated wage floors and actual wages in Portugal. Collective bargaining in Portugal follows a system in which agreements specify a set of wage floors for different occupation groups. Employers can, and often do, pay idiosyncratic wage premiums on top of the floors. As argued by the authors, this system of sectoral bargaining is broadly similar to systems present in Spain, Italy, Belgium, the Netherlands and France. Card and Cardoso (2021) found that increases in wage floors have a positive effect on the actual wages of Portuguese workers, but the effect is smaller than the associated increase in wage floors. This is because employers offset the increase in wage floors by reducing wage premiums. The authors estimate that the average passthrough rate of wage floor increases is around 50 percent. The authors find that in Portugal, non-unionised workers have higher wages than unionised workers[3]. Upward adjustments in wage floors have a positive effect on employment, contradicting theories predicting that union pressure to increase wages would lead to a reduction in employment. This is less surprising in Portuguese setting, where majority of workers earn some premia above the wage floors. However, due to inflation, the purchasing power of wages declined despite increases in nominal wages. Between 2010 and 2016, the average Portuguese worker lost 1.7 percent of mean log wages in real terms, with 24 percent of the between-skill group variation in real wages being explained by declines in real wage floors.

Boeri *et al* (2021) provide a case-study showing the importance of vertical coordination on the impact of the collective bargaining on wages in Germany and Italy. According to Boeri *et al*'s (2021) research, the German system maintains high employment rates throughout the country, even in lower-productivity areas, particularly East Germany. This is due to several

[3] This stands in sharp contrast to the 18 percent Portuguese union membership premium estimate we reported in Table 2 based on Bryson (2014). The differences could be attributed to different sample periods (1998-1999 in Bryson (2014) and 2008-2018 in Card and Cardoso (2021)) and different coverage (Bryson (2014) used an ISSP survey data with relatively small sample size, while Card and Cardoso (2021) used the census data covering nearly the universe of Portuguese workers).

factors, including non-mandatory employer participation and the regionalisation of sectoral bargaining, which allow wages to vary based on firm (and by extension, regional) productivity. In contrast, the Italian system imposes uniform wage floors across all firms within a sector, leading to flat relation between wages and regional productivity, and subsequently depressing employment in low-productivity regions, such as Southern Italy.

Trade unions and inequality

Even though collective bargaining system vary widely across advanced economies, union density is negatively correlated with inequality. Jaumotte and Osorio Buitron (2020) analysed cross-country data and found a negative correlation between union density and the income share of the top 10 percent earners as well as the Gini coefficient. Time series evidence from the US also shows a negative correlation between union density and income inequality. Farber *et al* (2021) presented a dataset of US unionisation at the household level going back to 1936 and argued that the negative correlation partially resulted from causal effects of increased unionisation on decreased inequality. First, the authors establish that the union wage premium stayed high throughout the twentieth century and amounted to 10 percent to 20 percent. Second, they document that during peak union density years (1940s through 1960s), unionised households were composed from disadvantaged groups (less educated, non-white) which did not happen before or after. Those effects accelerated inequality-reducing effect of unions. The authors find that the rise unionisation, even accounting for spillover effects, explains more than a fourth of the decline in the Gini coefficient between 1938 and 1968 and, conversely, its decline after 1968 leads to over one tenth of the rise in Gini coefficient after 1968. To account for the macroeconomic effects of unions in the non-union sector, which might lead to an underestimation of the overall impact on inequality, the authors develop a second analysis. Using two policies of union liberalisation in the 1930's that led to a negative exogenous shock in the cost of organising as exogenous variation, they show that the policies increased permanently state-level unionisation while decreasing state-level inequality.

Looking at European evidence, Dustmann *et al* (2009) investigated the effects of collective bargaining on wage distribution for Germany using a linked employee-employer dataset over the period 1995-2004. They find that if the unionisation rate had not declined in the 1990s, wages would have been higher at the end of the sample especially for workers at the bottom of the income distribution. More precisely, between 1995 and 2004 wage inequality in the upper tail (50-85 quantile) of the distribution would have decreased by 13 percent whereas in the lower tail (50-15 quantile) by 28 percent.

New cross-section and time series evidence on collective bargaining and inequality

We extend the analysis of Jaumotte and Osorio-Buitron (2020) to more countries and also consider collective bargaining coverage. Figure 2 Panel A confirms a negative correlation, -0.38, between trade union density and the Gini coefficient of income inequality for 37 countries, which is statistically different from zero at the 2 percent significance level. The correlation between trade union density and other indicators, such as the income share of the top 10 percent and top 20 percent earners and the income quintile share ratio (the ratio of total income received by the 20 percent of the population with the highest income to that received by the 20 percent of the population with the lowest income – usually abbreviated as S80/S20) is similarly negative. The correlation between trade union density and the income share of the bottom 10 percent or 20 percent earners is positive.

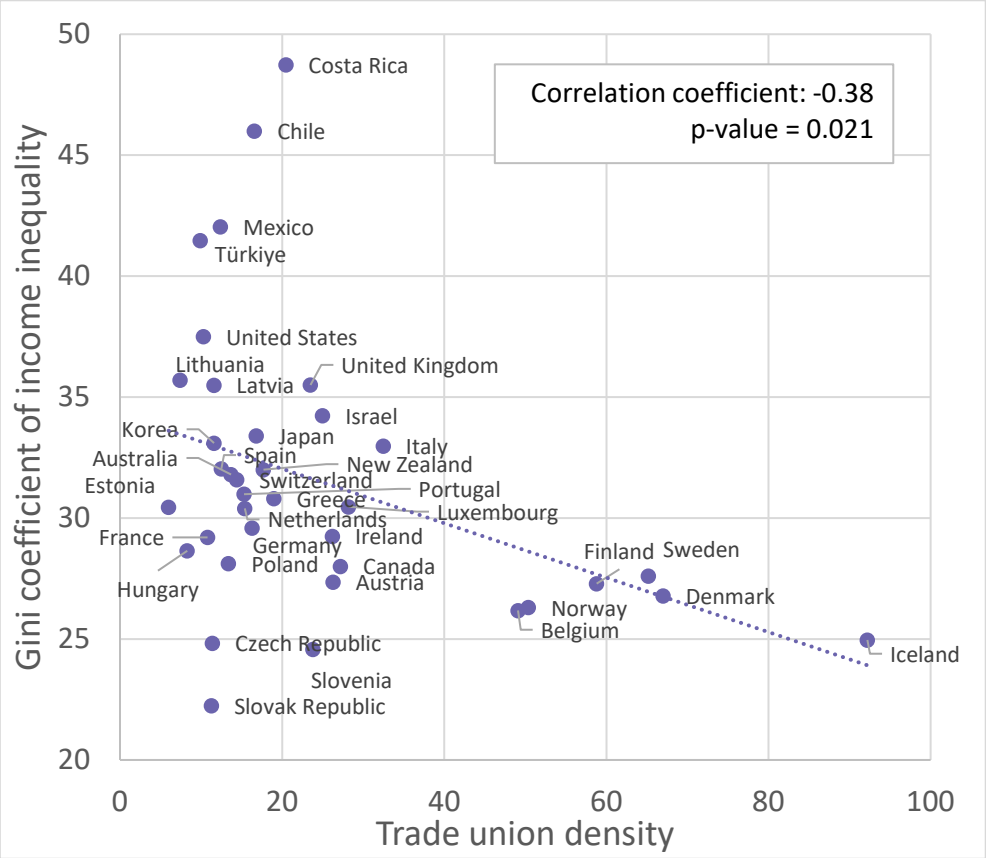
Figure 2 Panel A suggests that five Nordic countries and Belgium form a separate group by having relatively high levels of union density and low income inequality. When we exclude these six countries, the correlation coefficient falls to -0.08, which is not statistically different from zero, suggesting that these six countries drive the negative correlation.

Among all countries for which data is available, we find an even higher correlation (in absolute terms) between the share of workers covered by collective bargaining, which is -0.52 (Figure 2 Panel B). This estimate is highly statistically significant (p value= 0.001). When excluding the six Nordic countries and Belgium, the correlation coefficient remains high at -0.40, which continues to be statistically significant (p value = 0.025). These findings suggest that collective bargaining coverage could be a more important factor in influencing inequality than union

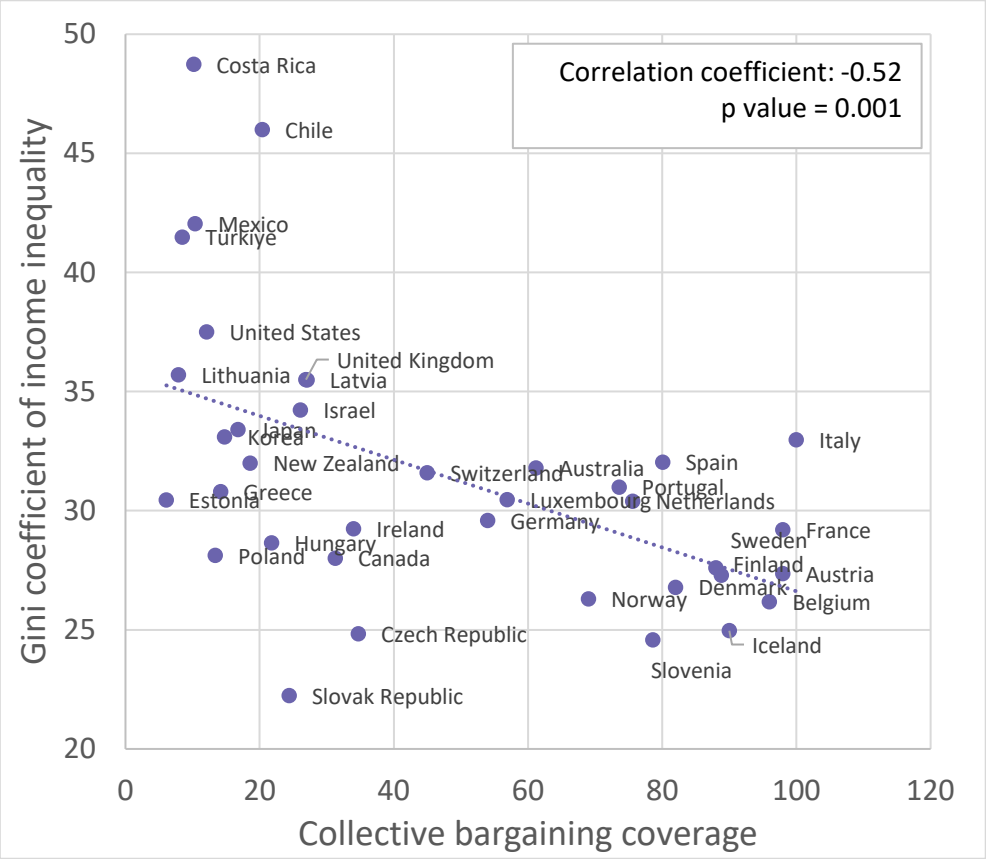
density, which is an intuitive result, since the conclusions of collective bargaining are extended beyond trade union and employer association members, as discussed above.

Figure 2: Cross-country correlation of income inequality with trade union density and collective bargaining coverage

A) Trade union density and income inequality



B) Collective bargaining coverage and income inequality



Source: OECD's OECD/AIAS database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS) for trade union density and collective bargaining coverage, and the OECD Income Distribution Database for the Gini coefficient of disposable income inequality. Note: The latest available observation is used for each country, which is for the year 2019 in most cases. The Gini coefficient is measured on a 0-100 scale (the higher the value, the higher income inequality), while trade union density and collective bargaining coverage are measured in percent.

Still, these cross-country correlation coefficients should be assessed cautiously and might not be interpreted as a causal relationship. Assessing the causal impact of trade union density and collective bargaining on income inequality is burdened with serious difficulties. Income inequality is influenced by various factors, including market forces that determine the pre-redistribution (before taxes and transfers) incomes, and redistributive policies which reallocate income from the rich to the poor. In principle, trade unions could influence both the market distribution (for example, via increasing the gross relative wages of low earners) and redistribution policies (for example, by lobbying the government). However, identifying the contribution of trade unions is inherently difficult, and we cannot exclude that other

factors influence both indicators. For example, in a country with a high level of social sensitivity and solidarity, the electorate might elect governments that pursue redistributive policies and workers might be more willing to join trade unions, resulting in a negative correlation between union density and income inequality.

Such country-wide preferences might be less of an issue for within-country temporal change in the indicators, provided these preferences are persistent. There are twelve countries in the OECD/AIAS ICTWSS dataset for which data on trade union density, collective bargaining, and income inequality (which we take from the Standardised World Income Inequality dataset of Solt, 2019) is available for at least 50 years for all indicators. These twelve countries comprise of six European Union countries, the United States and five other countries.

We use data sampled in every fifth year for two reasons. First, trade union membership and collective bargaining might influence inequality with a time lag. Second, for several countries, data on collective bargaining coverage is available only for every fifth year in the period before 2000.

Since trade union density, collective bargaining coverage, and inequality have trends in most countries, we work with differenced data, that is, we calculate the 5-year changes in the indicators. The requirement of 50 years of data and 5-year differencing implies that we have at least ten observations for each country.

For ten of twelve countries, all correlation coefficients are negative, and a large share of these correlation coefficients are statistically different from zero. These findings again highlight a negative association between bargaining and inequality. For France, the correlation coefficients are positive when trade union density is used, while for Ireland, all four correlation coefficients are positive. Further research should explore the reasons behind the differing French and Irish results.

Table 3: Trade unions/collective bargaining and income inequality: correlation coefficients between 5-year changes

	cor(dTUD,dGiniNet)	cor(dCBC,dGiniNet)	cor(dTUD,dGiniMkt)	cor(dCBC,dGiniMkt)
Australia	-0.53	-0.13	-0.63	-0.44
Canada	-0.55	-0.67	-0.71	-0.73
Finland	-0.62	-0.21	-0.30	-0.20
France	0.35	-0.28	0.19	-0.18
Germany	-0.62	-0.22	-0.38	-0.43
Ireland	0.19	0.41	0.38	0.58
Italy	-0.47	NA	-0.34	NA
Japan	-0.41	-0.42	-0.43	-0.44
Norway	-0.58	-0.25	-0.49	-0.31
Sweden	-0.63	-0.85	-0.40	-0.66
United Kingdom	-0.46	-0.61	-0.43	-0.71
United States	-0.49	-0.52	-0.27	-0.04

Source: Bruegel. Note: Data refer to 5-year changes. dTUD: change in trade union density; dCBC: change in collective bargaining coverage; dGiniNet: change in the Gini coefficient of disposable income inequality; dGiniMkt: change in the Gini coefficient of market income inequality. For Italy, collective bargaining coverage is 100 percent in the whole sample period, thus, lack of variation prohibits the calculation of a correlation coefficient.

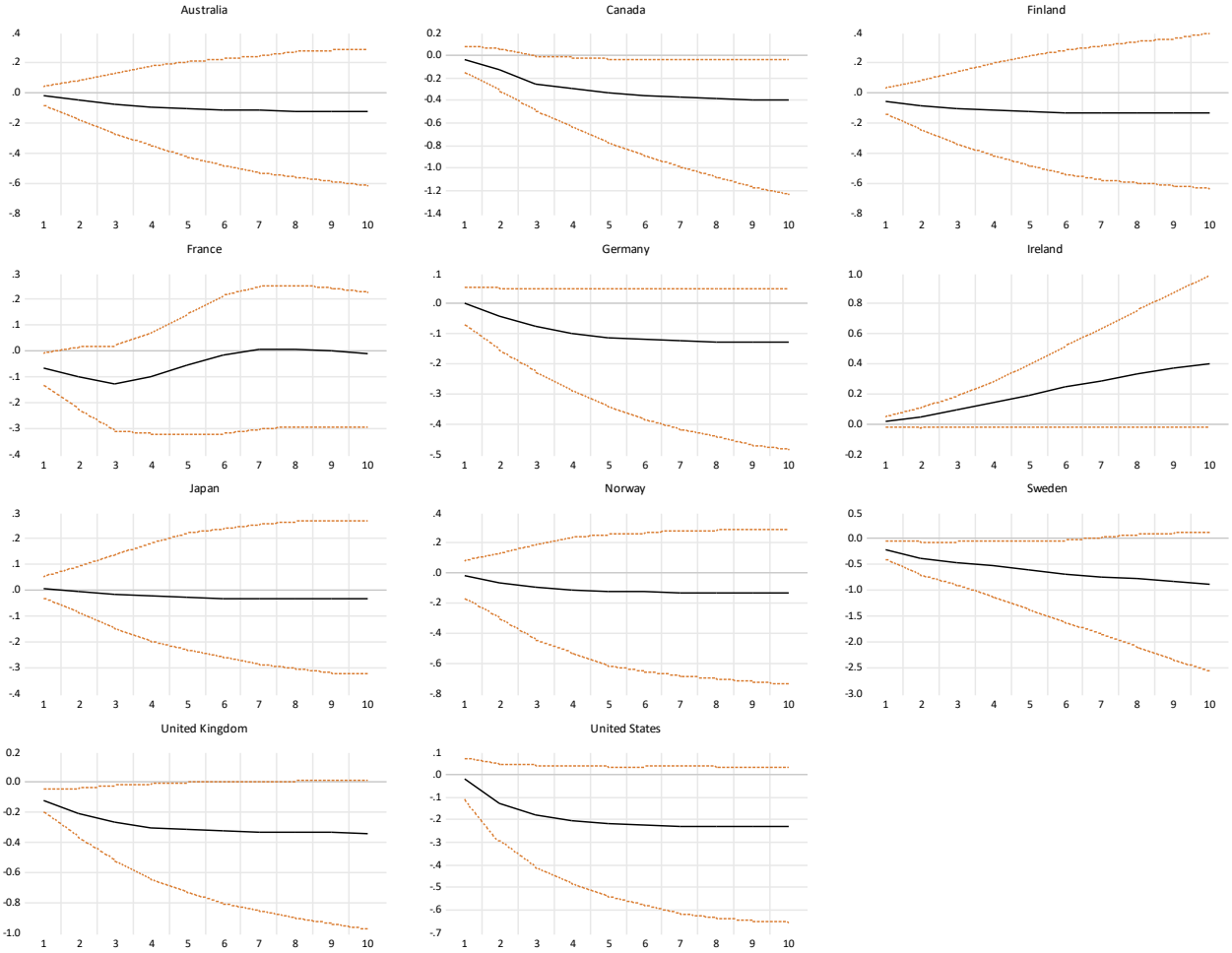
To explore the dynamic impacts of changes in trade union membership on income inequality, we use annual data to estimate vector autoregressions (VARs) and to calculate impulse response functions. We estimate the generalised impulse response function derived by Pesaran and Shin (1998), which achieves orthogonalised residuals irrespective of the ordering of the variables, in contrast to the frequently used Cholesky decomposition. Shocks identified by the Pesaran and Shin (1998) methodology can be interpreted as shocks to the variables of the VAR, but these shocks are not structurally identified in the sense of being derived from a particular theoretical framework. We estimate the confidence intervals for the impulse response functions with the bias-corrected bootstrap-after-bootstrap method of Kilian

(1998), which tends to be more accurate than traditional asymptotic intervals in small samples.

We find that the point estimates of disposable income inequality response to a shock in collective bargaining are negative for ten of the eleven countries (the model cannot be estimated for Italy due to unchanged collective bargaining coverage), though zero is not included in the confidence interval only for Canada, Sweden and the United Kingdom (Figure 3). In line with the positive correlation reported in Table 3 for Ireland, the point estimates of the impulse response function for Ireland are also positive.

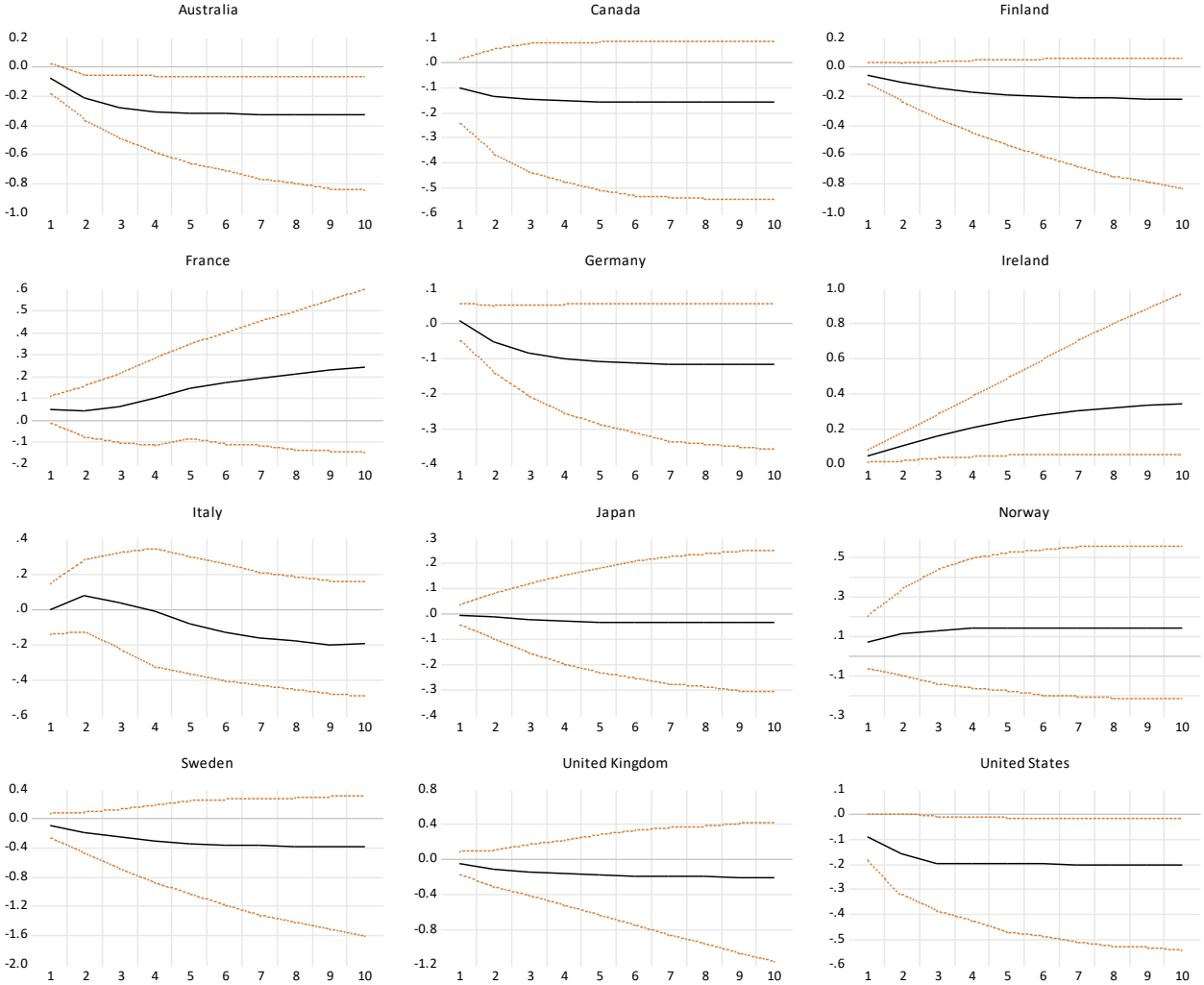
When studying the impact of trade union density, the point estimates are negative for nine of the twelve countries, but statistically significant only for Australia and the United States (Figure 4). The point estimates are positive for three countries: France, Ireland and Norway. The French and the Irish results are in line with the positive correlation coefficients reported in Table 3, but contrasts with the negative coefficient for Norway. The French and Norwegian estimates are statistically not different from zero.

Figure 3: Response of the Gini coefficient of income inequality to a generalised one standard deviation collective bargaining coverage innovation



Source: Bruegel. Note: The vector autoregressions were estimated for differences of the variables, while the impulse response functions show the accumulated impacts, that is, the impacts on the level of the Gini coefficient. The horizontal axis shows the years after the shock, with the shock occurring in year 1. The generalised impulse response function of Pesaran and Shin (1998) was used. The 95 percent confidence intervals (indicated as red dashed lines) were calculated using the bias-corrected bootstrap-after-bootstrap method of Kilian (1998) with 999 bootstrap repetitions and 499 double bootstrap repetitions.

Figure 4: Response of the Gini coefficient of income inequality to a generalised one standard deviation trade union density innovation



Source: Bruegel. Note: The vector autoregressions were estimated for differences of the variables, while the impulse response functions show the accumulated impacts, that is, the impacts on the level of the Gini coefficient. The horizontal axis shows the years after the shock, with the shock occurring in year 1. The generalised impulse response function of Pesaran and Shin (1998) was used. The 95 percent confidence intervals (indicated as red dashed lines) were calculated using the bias-corrected bootstrap-after-bootstrap method of Kilian (1998) with 999 bootstrap repetitions and 499 double bootstrap repetitions.

5. Conclusions

This essay has provided an overview of collective bargaining systems in European Union countries and the United States, by presenting data on the main trends and drawing on the literature studying the impacts of collective bargaining processes on wages and inequality. Several main conclusions arise from our study.

First, the potential of unions to influence wages and employment vary considerably across countries. The union density rates differ significantly across the studied countries, with Scandinavian EU countries having the highest unionisation rate and the United States having the lowest. In all studied countries, union density has declined over the past decades. This trend did not hurt Western and Nordic EU unions as much as their US and UK counterparts, because extension mechanisms expand the outcome of the bargaining to workers who are not members of a trade union, resulting in a much higher collective bargaining coverage than trade union density. Thus, a major transatlantic divide is the gap between collective bargaining coverage and union density.

Second, by distinguishing between vertical coordination (whether there is coordination at the country level, or industry level, or there is decentralised bargaining at the firm level) and horizonal coordination (the extent to which there is coordination between different firms in an industry or between different industries), we found that collective bargaining systems in Western and Nordic EU are much more centralised and coordinated than those in Anglo-Saxon economies and in Eastern EU countries. Most eastern EU countries have bargaining processes similar to that of the United States.

Third, we show that the consequences of alternative collective bargaining systems are an under-studied issue even though some articles have identified important consequences of differences in those processes. For example, Boeri *et al*'s (2021) analysis indicate that the German economy has a stronger link between productivity and wages than Italian economy, because of the differences in the level of bargaining negotiation.

Fourth, research on the impact of trade unions on wages has focused on identifying union membership premium (ie higher wages for workers that are members of a trade union). However, this measure is not useful for analysing many European countries, where collective bargaining coverage is much higher than trade union density due to extension mechanisms. Consequently, close to zero estimated union wage premia should not be interpreted as unions having no impact on wages. In the US and other countries with low trade union membership and low collective bargaining coverage, the 'threat of unionisation' might complicate the analysis of the impact of trade unions on the wage premium: employers who would like to discourage unionisation would be prone to offer better conditions and wages to their employees, mimicking the benefits of covered workers. Further research should develop methods for identifying the impacts of trade unions on overall wage developments.

Finally, we reported a negative correlation between income inequality and either trade union density or collective bargaining coverage both across countries at a point in time, and across time for several countries. The cross-country corelation coefficient is higher (in absolute terms) between inequality and collective bargaining coverage than between inequality and trade union density, and the latter correlation is primarily driven by five Nordic countries and Belgium, while the former correlation remains strong even when excluding these six countries. Although the causal relation between those variables is difficult to establish and the correlation might arise from a common cause, the degree of social preferences of the electorate, literature we investigated suggested that rising inequality in the twentieth century's US and in Germany since 1975 can be attributed to falling unionization among other factors. Our estimated impulse response functions from bivariate vector autoregressions suggested a statistically significant negative impact of an increase in collective bargaining coverage on income inequality for Canada, Sweden and the United Kingdom. For Australia and the United States, a positive shock to trade union density is found to reduce income inequality in a statistically significant way. For most other countries, the impacts were similarly negative but statistically not significant. Further

research using richer models, including other determinants of income inequality, should elaborate on the possible impacts of trade union density and collective bargaining coverage on income inequality.

While in this essay we focused on wages and inequality, the possible impacts of trade unions and collective bargaining on employment and output are equally important. These issues are also left for future research.

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