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# Comparing the Content of Collective Agreements across the European Union: Is Europe-wide Data Collection Feasible?

Kea Tijdens, Janna Besamusca, Daniela Ceccon, Armanda Cetrulo, Maarten van Klaveren, Gabriele Medas, Gábor Szüdi [*]

## Abstract

*Collective bargaining is central to wage-setting and working conditions, but knowledge about what exactly has been concluded in collective bargaining agreements (CBAs) in Europe is limited. In light of the debate about a European Minimum Wage this information gap is evident. This article aims to explore the feasibility of an EU-wide CBA data collection. We conclude that such a database could cover all CBAs for nine countries, all multi-employer CBAs for another nine countries and a selection of CBAs for two countries. Data collection for the remaining countries has to rely on CBAs collected from social partners. Realisation of an EU-wide CBA Database seems a doable but challenging task. When CBA texts would be collected and coded, the content of CBAs could be compared across member states. The Wage Indicator CBA Database is an example of a cross-country coding scheme for CBA texts. Text-mining options are explored as a promising way forward as to reduce coding efforts.*

*Keywords: Collective Agreements; Registry of Agreements; European Union; Coding of Agreements; Text Mining*

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## 1. Introduction

In their renowned study, "What do unions do?" Freeman and Medoff (1984) argued that trade unisons bargain for higher wages, equal pay, and fair working conditions, implying that collective bargaining is central to wage-setting processes and that wage outcomes vary according to the wage levels agreed upon in collective bargaining. Almost forty years later, little is known about the wages set in collective bargaining agreements (CBAs) in the European Union (EU). The CAWIE report (Van Gyes and Schulten, 2015) showed that some knowledge of collectively agreed wages is available from National Statistical Offices or Central Banks in ten EU countries. Even less is known about working conditions agreed upon in CBAs across the EU, whereas, according to the European Commission's re-launched dialogue with social partners at the European level (European Commission, 2016), both wages and working conditions data is critical for monitoring progress in their fixing. This knowledge gap remained evident in the Commission's most recent ESDE reporting (European Commission, 2020), in OECD's 'Negotiating Our Way Up' report (2019), and in Eurofound's flagship report, 'Industrial Relations: Developments 2015–2019' (Eurofound, 2020). These reports reveal that knowledge about the impact of collective bargaining is based on data from labour force or enterprise surveys, on inventories of national bargaining systems or on reviews of legal regulations, but not on the coded texts of CBAs concluded throughout Europe.

This absence of data on what exactly has been concluded in collective bargaining is most likely related to the fact that at the European level no person or institution is systematically collecting full texts of CBAs and coding their content. Currently, this is particularly relevant in light of the debate about a European Minimum Wage, whereby some of the parties involved have argued that unions and employers set wage floors in collective agreements and that it is not up to political decision-making to set minimum wage standards. This calls for more information about the wages agreed upon in CBAs. A similar argument holds for other widely debated labour market issues such as working-time regulation. This article aims to explore the feasibility of building a database of CBAs in Europe to tackle such blind spots, taking as its starting point that both Internet use and advances in natural language processing may accelerate data collection and coding (Askitas and Zimmermann, 2015).

The outline of this article is as follows. Section 2 reviews the body of knowledge regarding the impact of CBA coverage and CBA clauses on wages and working conditions. Section 3 explores the presence of CBAs

in Europe. Section 4 maps the building blocks of an EU-wide CBA registry, including the requirements for gathering, coding and annotating CBAs, taking the WageIndicator CBA Database and the options for text mining of CBA texts as examples. Section 5 draws conclusions on the feasibility of establishing a continuous, Europe-wide data collection of coded CBAs.

This article is based on desk research and on three studies dealing with the coded content of CBAs. The first study relates to the coded database of collective agreements in the Netherlands, maintained by the FNV trade union confederation and the AWVN employers' association (Schreuder and Tijdens, 2004; Tijdens and Van Klaveren, 2003; Yerkes and Tijdens, 2010). The second study concerns the coding of collective agreements in 23 EU countries by means of survey questions in an EC-funded Social Dialogue project (WIBAR-3 VS/2014/0533, Van Klaveren and Gregory, 2019). The third project concerns the gathering and coding of CBAs for the WageIndicator CBA Database in EU and associate member states, in two consecutive EC-funded Social Dialogue projects (BARCOM VS/2016/0106, COLBAR-EUROPE VS/2019/0077) and in a third project that started in 2021 (BARCOVID VS/2021/0190).

## 2. The Literature about Comparisons of Collective Agreements

### *2.1 Introduction*

When reviewing the literature about collective bargaining, four dimensions can be distinguished. The first dimension refers to bargaining systems, the hierarchy in these systems, and collective bargaining coverage. Most studies addressing collective bargaining have discussed country-level trends in bargaining coverage, extension regimes, wage coordination, vertical structure of collective bargaining, and issues related to single- versus multi-employer bargaining, often using the OECD/AIAS database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS) (see OECD and AIAS, 2021). The second dimension refers to the actors involved in collective bargaining processes, including employers, employers' organisations, and trade unions and other employee representatives. In their overview of collective bargaining in Europe in the 21st century, Eurofound (2015) extensively covered the actors involved in bargaining. The third dimension covers the power relations between actors and the incidence of industrial action, as captured in Eurofound (2019) and in the ETUI/AIAS Collective Bargaining Newsletters. The fourth dimension covers the

outcomes of bargaining processes, in other words, the content of collective bargaining agreements (CBAs). These outcomes refer to topics such as wage levels or wage increases; working hours, working schedules and holidays; sickness and disability arrangements; social security; training; work-family arrangements; job security; internal mobility, and work organisation, or workforce numbers. Across Europe, the body of knowledge on bargaining systems, processes and actors is far more extensive than that on bargaining outcomes. This article aims to contribute to the body of knowledge regarding bargaining outcomes, in the next two sections focusing on wages and working conditions, followed by an inventory of the knowledge about the topics on the bargaining agendas in Europe and concluded with a review of the use of leximetric coding of legal texts to facilitate the coding of large volumes of collective agreements texts.

### *2.2 The Impact of Collective Bargaining on Wages*

Industrial relations theory predicts three main effects of collective bargaining on wages (e.g. Kaufman, 2010; Garnero et al., 2020, Zwysen and Drahokoupil, 2022; ILO, 2022). First, wages are expected to be higher for those covered compared to those not covered, which is referred to as the wage premium of collective bargaining. Second, collective bargaining is expected to raise wages and benefits of low-wage workers to a larger degree than those of middle- and higher-wage workers, thereby reducing wage inequality, as wage dispersion will be smaller in covered enterprises compared to not-covered enterprises. Third, those covered by a collective agreement are more likely to benefit from employer-provided health insurance, pensions, and paid holidays. The first expectation has widely been studied empirically, whereas the second and third have been explored to a lesser extent. The empirical studies at stake predominantly draw on survey data, using a binary variable indicating whether a worker is covered or not, or a categorical variable with three values, whereby coverage is divided into coverage by a single-employer agreement or a multi-employer agreement. The most relevant studies for Europe will be discussed below.

The binary variable approach is among others used to explore whether wage premiums exist related to collective bargaining coverage. Indeed, in the Czech Republic, Hungary and Poland industry agreements increase wages for low-skilled workers and company agreements do so for medium- and high-skilled workers, according to analyses on a large matched employer-employee dataset (Magda et al., 2012). Blien et al.

(2011) found the same result over time for Western Germany, whereas Heinbach and Schröpfer (2007) concluded that for Germany as a whole CBA opening clauses on employment levels in collective negotiations affected wage bargaining as well as bargaining on non-wage issues. Based on micro-level data from the Structure of Earnings Survey and other sources in OECD countries, workers covered by firm-level bargaining had higher wages, while no such effect was found for workers covered by sectoral bargaining (OECD, 2018). Firm-level CBAs benefitted both employers and employees by creating higher productivity and wages, without being detrimental to firm performance, according to a study of linked employer-employee panel data in Belgium (Garnero et al., 2020).

Cross-sectional survey data does not allow to control for companies' self-selection into sectoral and firm-level collective bargaining. Thus, the question remains whether companies with either predominantly low-skilled or predominantly high-skilled workforces would engage in firm-level collective bargaining, thereby affecting the wage outcomes of collective bargaining coverage. This problem has been addressed by Addison et al. (2014), using establishment-level wage data from Germany. These authors explored the CBA wage premium and found that average wages increased by 3 to 3.5 per cent for those entering into collective bargaining if they had no CBA before, and decreased by 3 to 4 per cent after abandoning collective bargaining.

The studies using survey data assume an effect of an average CBA with clauses regarding wage levels, but this approach does not capture the variation in wage clauses in CBAs; it has neither been empirically tested. According to the WageIndicator CBA Database, CBAs vary to the extent in which they regulate wages. Some CBAs detail pay scales, others only include pay increases; some refer to Statutory Minimum Wages while others include clauses indicating that wages are agreed for individual employees. Using data from 602 single-employer and multi-employer CBAs from 21 European countries included in the WageIndicator CBA Database, Besamusca (2021) revealed that 42 per cent had one pay scale table and 24 per cent multiple tables, while 3 per cent contained only indices and no payable amounts; the remaining 31 per cent did not include any pay scales. The variety found in wage-setting clauses in CBAs challenges the binary coverage versus non-coverage approach in analysis of survey data. In surveys this could be solved by adding a question regarding the name of the CBA to covered respondents. Using an open text box for storing the answers may result in unidentifiable responses, though this might be solved by using a tick box with a list of CBAs. Merging survey data with data from other sources, such as data from

administrative records, may also provide a solution. In conclusion, two conditions need to be fulfilled to explore the impact of collective bargaining, namely, first, acquiring insight in the clauses agreed in CBAs and, second, the creation of a system whereby individual workers with their wage and working conditions characteristics can be connected to the CBA they are covered by.

### *2.3 The Impact of Collective Bargaining on Working Conditions*

Compared to the large number of studies focusing on the impact of bargaining coverage on wages, the number of studies focusing on the impact on working conditions is relatively small. In contrast to the studies on wages, here we find studies that explore the impact of specific clauses in collective agreements, thereby capturing the variation within CBAs. These outcomes prompt major questions in industrial relations theory. For example, does a CBA clause on training result in a larger share of the covered workforce following training courses or is a clause on training particularly negotiated in CBAs covering enterprises where the workforce hardly follows any training? This section reviews studies that explored the impact of bargaining coverage on working conditions.

Survey data has also been used to explore the impact of bargaining coverage on working conditions. Country-level collective bargaining coverage was the strongest factor shaping the social consequences of non-standard schedules, shown based on the European Social Survey (ESS) (Taiji and Mills, 2020). When covered by a collective agreement, employees in crisis-hit organisations reported wage adjustments less often and workforce adjustments more often compared to those not covered, according to a web-survey about the impact of the economic crisis during the early 2010s on companies' wage or workforce adjustments in Germany and the Netherlands (Tijdens et al., 2014). Other studies relied solely on coded CBA information or merged coded CBA information with other sources. Clauses on flexible working practices demonstrated greater formalization in some agreements, while shifting towards more general managerial prerogative clauses in others, according to the content of approximately 100 CBAs in the United Kingdom (Dunn and Wright, 1994). CBA clauses did not seem to enhance workers' voices in restructuring processes, based on Swiss and French case studies (Bonvin et al., 2013). During Greece's economic crisis in the early 2010s, sector-level CBA wages in the metal industry sector were considered legally binding in subsectors facing low product market competition, but firms suffering losses made use of the opt-out clause in their sectoral

agreements to negotiate firm-level wage agreements (Nicolitsas, 2020). In the Netherlands CBA clauses largely compensated for declining welfare state coverage with respect to disability and work-life arrangements, shown in a study using coded data from the FNV Database of CBAs from 1995 to 2008 (Yerkes and Tijdens, 2010). The studies discussed here reveal a scattered pattern and are typically focused on a small number of clauses, which were predominantly coded manually for the selected CBAs, challenging for an EU-wide approach.

### *2.3 Which Topics are on the Bargaining Agendas?*

One would expect to find quite some reviews regarding the topics included in CBAs, but actually we found few. The Estonian government applies a present/absent coding scheme for the CBAs concluded in its archive Kollektiivlepingute andmekogu, showing that the list of topics varies across CBAs. Schulten (2018, 78) provides a table based on information regarding extended CBAs from the German Ministry of Labour, covering 13 broad categories, namely: general framework agreements; wages and salaries; additional pensions; capital-forming benefits; holidays and holiday bonuses; minimum wages; wage structure; apprenticeship pay; training; annual bonuses; dismissal/job protection; working time, and a category 'other'. According to the author, around 80 per cent of all extended CBAs covered issues other than basic wages and more than one-fifth concerned general framework agreements (*Manteltarifverträge*). The extended CBAs covered mostly topics such as additional pensions, capital-forming benefits, holidays and holiday bonuses and a few regulated annual bonuses, wage structures, training, employment protection, and working time. In France, the Ministry of Labour reports about the topics negotiated, showing a ranking of participation, incentive, employee savings first, salaries and bonuses second, working time third, and the right to organize fourth (Ministère du Travail, 2020). In France, additions to CBAs are concluded for specific topics, such as gender equality (Charni, Greenan and Besamusca, 2021). Almost all of 181 CBAs in 23 EU countries contained clauses on wages (97%), but references to wage *increases* were much more common than references to wage *levels* (Van Klaveren and Gregory, 2019). Almost nine in ten agreements contained clauses on working hours, schedules and holidays (88%). About half to three quarters of the CBAs included clauses on sickness and disability (76%), social security (72%), training (69%), work-family arrangements (68%), medical assistance (65%), job security (63%), and internal mobility (50%). Fewer agreements had clauses on

work organisation (38%) and relatively few on agreed workforce numbers (8%). The topics included in multi-employer and single-employer CBAs hardly differed, except for wage increases and training topics which were noticed significant more frequently in multi-employer CBAs whereas work organisation was found more often in single-employer CBAs. In Italy, Fondazione di Vittorio and ADAPT publish every year a report on second-level collective bargaining in Italy with qualitative and quantitative analysis on agreements' clauses (Fondazione di Vittorio, 2022; ADAPT, 2022), for which the National Council for Economics and Labour (CNEL) makes available an online archive where the contents of collective agreements on specific clauses is already identified. Moreover, several scholars have studied the specificity of the Italian industrial relation system (Pulignano et al., 2018) characterized by i) the prevalence of sectoral collective agreements that cover around 90% of private employees, ii) the scarce diffusion of second-level agreements that concerns only 20% of Italian companies, despite incentives over time to decentralisation (Carrieri et al., 2018) iii) declines and revivals of tripartite social pacts during the last three decades (Regalia and Regini, 2004).
In our research, we came across a few empirical study tracing trends in bargaining topics. Using country reports provided to the ILO, it was shown that in many parts of the world clauses expanded to include topics such as work organization, vocational training, the regularization of employment, and parental leave and family responsibilities (Hayter and Stoevska 2010).

### *2.4 Leximetric Coding of Legal Texts*

An analysis of the content of the CBAs requires an understanding the CBAs full-text. Two methods are at hand to study the content, namely interviewing the persons who have been involved in the preparation or use of the texts or coding the content of the CBAs full text. The latter refers to the so-called leximetric coding of legal texts. This method is particularly suited if the study requires understanding texts in detail, as is relevant for CBAs, some of which may be hundreds of pages long. Leximetric coding has for example been applied in the Labour Index of the Centre for Business Research of the University of Cambridge, abbreviated as the CBR-LRI dataset, as to code labour laws, case law, collective agreements, and regulations in many countries (Adams et al., 2017). It has also been applied in the Mapping Employment Dismissal Law study to measure employment protection legislation (EPL) stringency over five years (2009 – 2013) for some hundred countries (Freyens and

Verkerke, 2017). Another example is the leximetric coding of 12 variables, derived from the constitutions of private companies incorporated within Scotland (Hardman, 2020). Based on the leximetric coding of 46 aspects of national labour laws in 115 countries the Labour Rights Index provides insight in the legal variation across countries (Ahmad, 2020). It should be noted that leximetric coding only clarifies the legal texts coded. Measuring compliance with legal texts requires additional methods, such as surveys. Coding of texts is also applied in other academic fields, as is shown by the Manifesto Project with a content analysis of parties' electoral manifestos of over 1,000 parties, covering several decades and over 50 countries. The Manifesto Dataset provides coded data for statistical analysis. Whenever coding texts, a coding scheme must be prepared, tested and where needed revised, before actual coding can start. Kucera (2007) provides an overview of methodological challenges for the coding of texts and the related construction of indexes or indicators. For example, once several texts have been coded, backward coding is needed if new coding questions are added. Increasingly, tools are available for coding texts to reduce human efforts, such as text-mining technologies, discussed in the next section.

## 3. CBAs and their Registries in Europe. An Overview

### *3.1 CBA Registries*

Collective bargaining is central to wage-setting and working conditions but in Europe knowledge about what exactly is concluded in CBAs is limited. To increase this knowledge, in a first step insight is required into the extent that CBAs are registered in the European Union. In order to be legally binding, in 14 EU countries all CBAs are registered whereas in ten countries (Croatia, Czechia, Finland, Greece, Latvia, Luxembourg, Poland, Romania, Slovakia, Slovenia) this is only the case for multi-employer agreements (sectoral agreements). In two countries (Ireland and Malta) CBAs are partially registered and in one country (Denmark) CBAs do not need to be registered. If registered, registration is carried out by the Ministries of Justice or Labour, by the Labour Inspectorate or in one country by a Mediation Institute. Registration typically aims to verify whether the bargaining actors are eligible and whether general and specific validity criteria are met, for example compliance with national Minimum Wage legislation. The main reasons why single-employer CBAs are not registered or why they are not publicly available, are competition across enterprises, intellectual property rights, or access for members only.

As a second step, for the 27 EU countries insight is needed in to what extent CBAs are centrally archived and made publicly available. Most Ministries maintain an archive of the registered CBAs (Table 1, 3rd column), though in some countries this task is assigned to an agency, such as CNEL in Italy. In Sweden the Institute for Labour Mediation maintains an archive. In Denmark, where registration is not required, the Confederation of Danish Employers (DA) maintains a CBA archive. In the Netherlands three archives are maintained, respectively with the Ministry of Social Affairs and Employment, with the organisation servicing the employers' association, and with the largest trade union confederation. Overall, we found archives in whatever form in 26 countries. Only Malta does not maintain an archive.

In previous decades, governments mostly announced the agreements declared binding in the Government Gazettes. Increasingly they post them online, but two countries (Croatia and Latvia) still publish CBAs in their Gazettes. In the 2010s social partners in Europe increasingly published the CBAs they had signed online, usually in PDF format. While in the early 2000s copyright issues as well as commercial restrictions regarding the publication of CBA texts were at stake, today the registries and the social partners in many EU countries publish CBA texts free downloadable. Often CBA texts are considered to be legal texts and therefore they should be freely accessible to citizens. Maintaining an archive however not implies that CBAs are freely and full-text online available. Nine archives make all CBAs full-text online downloadable while nine do so for multi-employer CBAs though not for single-employer CBAs (Table 1, 4th column). In Denmark and Sweden an employer's organisation, respectively a trade union confederation, publishes the CBAs they have signed online. Four countries do not publish CBAs online: Germany, Hungary, Ireland and Malta.

Registries typically register the metadata from the CBAs including the name(s) of the company or the sector covered; the names of the signatories from the employer and employee side; the operative date, and, if agreed, the duration or the end date. Registration of the number of employees covered by the agreement can only be noticed in eight EU countries: Bulgaria, Estonia, France, Hungary, Ireland, Italy, Lithuania, and Spain. Based on the experience of the WageIndicator CBA Database, the number of employees covered shows up as one of the variables most difficult to trace, especially in cases with workforces covered by multiple agreements:

**Table 1. Country, Name of CBA Registry, CBA Archive Maintained, Full Text Availability.**

| Country | Registration by | Arch. | Full text available |
|---|---|---|---|
| Austria | Federal Ministry of Social Affairs, Health, Care and Consumer Protection | Yes | Yes, all CBAs |
| Belgium | Directorate-General for Collective Labour Relations | Yes | Yes, all CBAs |
| Bulgaria | Ministry of Labour and Social Policy | Yes | Yes, all CBAs |
| Croatia | Ministry of Labour, Pension Systems, Family and Social Policy | Yes | Yes, in Gazette |
| Cyprus | Ministry of Labour, Welfare and Social Insurance | Yes | Yes, multi-employer CBAs in PDF scans |
| Czechia | Ministry of Labour and Social Affairs | Yes | Yes, multi-employer CBAs |
| Denmark | No state registration | Yes | Yes, partial |
| Estonia | Ministry of Labour | Yes | Yes, all CBAs |
| Finland | Ministry of Justice | Yes | Yes, multi-employer CBAs |
| France | Ministry of Labour | Yes | Yes, all CBAs |
| Germany | Federal Ministry of Labour and Social Affairs | Yes | No |
| Greece | Ministry of Labour – Labour Inspectorate | Yes | Yes, multi-employer CBAs |
| Hungary | Ministry of Innovation and Technology | Yes | No |
| Ireland | Labour Court Register of Employment Agreements | Yes | No |
| Italy | National Council for Economics and Labor | Yes | Yes, multi-employer CBAs |
| Latvia | Ministry of Justice | Yes | Yes, in Gazette |
| Lithuania | Ministry of Social Security and Labour | Yes | Yes, all CBAs |
| Luxembourg | Inspectorate of Labour and Mines | Yes | Yes, multi-employer CBAs |
| Malta | Department for Industrial and Employment Relations | No | No |
| Netherlands | Ministry of Social Affairs and Employment | Yes | Yes, all CBAs |
| Poland | Ministry of Family, Labour and Social Policy | Yes | Yes, multi-employer CBAs |
| Portugal | Ministry of Labour | Yes | Yes, all CBAs |
| Romania | Ministry of Labour, Family and Social Protection | Yes | Yes, multi-employer CBAs |
| Slovakia | Ministry of Labour, Social Affairs and Family | Yes | Yes, multi-employer CBAs |
| Slovenia | Ministry of Labour, Family, Social Affairs and Equal Opportunities | Yes | Yes, multi-employer CBAs |
| Spain | Ministry of Employment and Social Economy | Yes | Yes, all CBAs |
| Sweden | Swedish national mediation office | Yes | Yes, partial via Trade Union |

Source: Inventory of online CBA registries made by the authors for the COLBAR-EUROPE project in 2020 and updated in 2021/22.

## 3.2 Coding of CBA Characteristics

Given that almost all EU countries maintain a registry of the CBAs declared binding, do they provide information about the content of the CBAs, for example by identifying whether keywords are present, by identifying the headings in the texts, by annotating relevant pieces of texts, by coding annotated texts, or by registering wage levels or wage increases? Our inventory revealed that most registries provide structured information regarding the meta data, but only few do so regarding the full texts. The Estonian registry provides a good example of keyword identification by comparing CBA clauses to the relevant legislation. The registry in Austria provides a fine example of identification of headings in a CBA text, with clicks to the related content. In the Netherlands, the FNV confederation applies full-text coding for more than 500 variables; the organisation servicing the employers' association codes the changes in CBAs, while the Ministry of Social Affairs codes CBAs for specific research objectives.

The coding of working conditions is relatively easy compared to coding wages, provided a tested coding scheme. In contrast, the coding of agreed wages is more difficult because CBAs either register an agreed wage increase or agreed wage levels. Particularly the coding of the latter is difficult due to the complicated nature of pay structures in CBAs and the diversity of structures applied across CBAs (Armstrong, 2007; Besamusca, 2021). Based on a study of 181 CBAs in 23 EU countries almost twice as many CBAs contained clauses about wage increases than about wage levels (Van Klaveren and Gregory, 2019). A study of 108 commerce CBAs in EU28 presented similar conclusions. Only one-third contained details about wage levels, whereas wage increases were reported more often (Besamusca et al., 2018). However, for 602 agreements from all EU countries, an equal percentage of CBAs with wage increases and with pay scales (both 66%) was reported (Besamusca, 2021). Coding pay scales is demanding because of their complexity and company-specific terminology. For cross-country comparisons of agreed wages, wages need to be converted into hourly wages, requiring information about the agreed working hours per week and per year. Finally, for computing the level of agreed wages in a national labour force, information about the distribution of enterprise workforces over the pay scales is required. We did not come across any registry providing the latter data. The Netherlands Statistical Office calculates the annual increases of agreed wages, based on selected CBAs and selected enterprises reporting about the wage distribution. The coding of wage increases can result in a computation of an average

negotiated wage increase, and we came across two registries publishing the negotiated wage increase on a twelve-month basis, namely CAO-kijker in the Netherlands, and WSI-Tarifarchiv in Germany.

### 3.3 The Number of CBAs in Europe

When aiming to increase knowledge about what exactly is concluded CBAs, an estimate of the number of CBAs in the EU could provide an impression of the work ahead. Answering this question is easier for the number of multi-employer agreements than for the single-employer agreements. In most countries the stock of multi-employer agreements remains relatively stable, whereas the stock of single-employer agreements is volatile because of entries and exits due to mergers, bankruptcies, or removals. The real number of CBAs will be underestimated in countries where single-employer agreements do not need to be registered or where the signatories do not disseminate their CBA text beyond the enterprise or beyond their membership. We tried to estimate the number of CBAs in Europe by counting the number of CBAs in the CBA registries. When information from registries was missing two sources were used, namely the ETUI website about National Industrial Relations based on Fulton (2020), and the Eurofound website about the country profiles.

The number of multi- and single-employer collective agreements throughout the EU is estimated at slightly over 85,000 (Table 2). Note that this estimate is seriously hampered by the fact that for more than half of the EU countries information about the number of single-employer agreements is lacking. Single-employer agreements could not be counted for Cyprus, Czechia, Ireland, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia, Slovenia. For France, we counted the CBAs classified as vigour and extended. In a previous study (Tijdens, 2021), we counted all non-expired documents, but we learned that we should limit our search because many additional French documents should be considered a CBA clause rather than a CBA (Charni et al, 2021). For ten countries we counted less than 100 CBAs (Cyprus, Czechia, Ireland, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia, Slovenia); for 15 countries we found between 200 and 1,400 CBAs (Austria, Belgium, Bulgaria, Croatia, Denmark, Estonia, Finland, France, Greece, Italy, Latvia, Lithuania, Netherlands, Spain, Sweden). Further, we counted almost 3,000 CBAs for Hungary and more than 73,000 CBAs for Germany, in which country single-employer agreements are accurately registered and counted. Hence, Germany makes up almost 85 per cent of the total EU estimate.

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**Table 2. Estimated Number of Collective Agreements, the Counting Method, a Breakdown by Multi- and Single-employer Agreements (resp. MEB and SEB) if available, and the Year Applicable to the Estimate, by country**

| Country | Counting | Estimate # | Of which MEB | Of which SEB | Year |
|---|---|---|---|---|---|
| Austria | in force | 560 | | | 2021 |
| Belgium | in force | 240 | | | 2021 |
| Bulgaria | concluded | 754 | 14 | 740 | 2020 |
| Croatia | in force | 570 | 16 | 554 | 2014 |
| Cyprus | multi-employer CBAs in force | 68 | | | 2021 |
| Czech Rep. | In force | 14 | | | 2021 |
| Denmark | in force | 600 | | | 2021 |
| Estonia | in force | 677 | | | 2021 |
| Finland | in force | 158 | | | 2021 |
| France | in force | 655 | | | 2021 |
| Germany | in force | 73,000 | | | 2021 |
| Greece | in force | 271 | | | 2021 |
| Hungary | in force | 2,869 | 87 | 2782 | 2019 |
| Ireland | in force | 3 | 3 | | 2019 |
| Italy | in force | 992[1] | | | 2021 |
| Latvia | in force | 1152 | 8 | 1144 | 2016 |
| Lithuania | in force | 456 | | | 2021 |
| Luxembourg | in force | 33 | | | 2021 |
| Malta | in force | 34 | 34 | | 2021 |
| Netherlands | in force | 658 | 485 | 173 | 2020 |
| Poland | in force | 61 | 61 | | 2021 |
| Portugal | in force | 39 | 15 | 24 | 2021 |
| Romania | in force | 36 | 17 | 19 | 2019 |
| Slovakia | in force | 18 | 18 | | 2021 |
| Slovenia | in force | 50 | | | 2021 |
| Spain | in force | 849 | 693 | 156 | 2020 |
| Sweden | in force | 700 | | | 2020 |
| Total | | 85,517 | | | |

Source: Inventory of online CBA registries the authors made for the COLBAR-EUROPE project in 2020 and updated in 2021/22. Where registries were absent, websites from ETUI (www.worker-participation.eu) or from national research institutes were consulted.

[1] Data provided by CNEL (2022).

How many CBA texts can be gathered for a Europe-wide data collection? Based on Tables 1 and 2 we can conclude that in nine countries in total slightly over 6,000 texts from all CBAs are available online. In another nine countries some 2,000 texts of all multi-employer CBAs are available online. In two countries 1,300 CBA texts are available, the large majority of all CBAs. Finally, in three countries with together almost 1,800 CBAs the texts could be collected from the Gazettes or from PDF scans. For four EU countries it will be difficult to collect CBA texts. When excluding the large number of CBAs in Germany, the universe of CBAs in 26 EU countries consists of almost 13,000 CBAs, of which approximately 8,000, thus two thirds, could easily be gathered online.

The gathering, uploading, annotating and coding of these 8,000 CBAs will require substantial resources annually, at least when assuming that most CBAs are renewed per year. To reduce the efforts, sampling CBAs to generate a representative picture could be considered. Sampling could be based on selecting one of more CBAs with the largest number(s) of covered workers in the industry. If no data is available regarding the number of workers covered, the CBAs in the industry need to be randomly sampled. Hence, the CBAs need to be identifiable by NACE industry code. We found that some registries provide NACE codes, but others do not, requiring additional efforts to classify CBAs according to their NACE code.

## 4. An Example of a Multi-Country CBA Database

Our study aimed to explore ways to increase the knowledge about what wages and working conditions are concluded in CBAs across EU-countries, thereby raising the question regarding the feasibility of an EU-wide database of CBA texts. This section outlines the building blocks of such an EU-wide CBA Database. It addresses the requirements for gathering, coding and annotating CBAs and does so by detailing the WageIndicator CBA Database. To the best of our knowledge, this database is the only one that gathers and codes CBA full texts in the EU-27 countries and beyond.

### *4.1. The WageIndicator CBA Database*

WageIndicator Foundation is a non-profit NGO that develops, operates, and owns national WageIndicator websites with labour-related content. The first WageIndicator website was launched in the Netherlands in 2001. Today, the websites are operational in over 190 countries; in 2021

WageIndicator received 40 million web visitors. WageIndicator shares and compares information on wages, labour law, and careers by making relevant information freely available on easy-to-reach-and-read websites in the national language(s). To attract a large audience, the websites apply search engine optimization as to meet the search terms that web visitors use in Google search and other search engines. The pages in the websites are filled from databases maintained by WageIndicator, namely a Collective Agreements (CBA) Database, a Minimum Wages Database, a Living Wages Database and the related Cost-of-Living Survey, a Salary Check and a related Salary and Working Conditions Survey, and a Labour Law Database and the related DecentWorkCheck survey.

For its CBA Database, the Foundation has developed a web-based platform for uploading, annotating, and coding CBA texts, using a predefined coding scheme. A web-based platform is advantageous because it allows annotators to work from any place in the world and the CBAs while the annotated and coded content are centrally archived. The CBA Database aims to enrich the content of the national WageIndicator websites and allows users to browse CBAs online and to view CBA visualizations. The annotated CBA texts are published on the national websites.

The initial idea to publish CBAs online came from social partners in developing countries, who experienced high costs and logistic difficulties when distributing the printed texts of the agreed CBAs to the employers and employees covered. In December 2013 the very first CBA was entered in the platform. Initially mainly CBAs from developing countries were entered, but by early 2022 the Database contained almost 1,700 agreements from 61 countries, of which approximately half from European countries. The database allows to conduct statistical analysis, because it is accessible using statistical software. The database has been used for analyses in EU Social Dialogue projects, in the garment industry in Indonesia, regarding the work-family balance in CBAs, and regarding wage and remuneration-related CBA clauses in middle- and low-income countries (Ceccon, 2017; Besamusca and Tijdens, 2015). Through BARCOVID, the authors' latest EU project, the CBA Database will be populated with renewed CBAs, allowing a longitudinal comparison of the clauses agreed. BARCOVID also allows further text mining explorations to speed up coding.

### *4.2 Gathering CBA Texts*

WageIndicator employs three approaches for gathering full-text agreements: downloading from national registries, smart Google searches, and asking directly bargaining signatories. In some cases, the latter turned out to problematic when signatories are unwilling to share their CBAs for competitive reasons in case of single-employer agreements (Poland and Hungary), or because they are available for union members only (Germany). Countries with the lowest coverage rates happen to be the countries posting their agreements least online.
Gathered CBAs can have various formats, e.g., Word, PDF, or JPEG, or even a printed booklet. These formats need to be converted, or 'cracked', into a plain text editor. In a next step, Amaya software is used to assign headings for titles, chapters, and articles. Then, the text can be uploaded in HTML format in the WageIndicator CBA Database. This process can be a time-consuming effort, specifically in case of long full texts, or in case of tables. Once texts are uploaded on the platform, they can be coded.

### *4.3 Coding CBA Texts*

A coding scheme for the gathered CBAs is a precondition for any statistical analysis of the content of CBAs. For the CBA Database, a coding scheme has been developed, aiming to capture the critical elements. The coding scheme falls apart into two sections, namely metadata and content. The metadata refers to the signatories: employers or their associations, trade unions, or in some cases, works councils or professional associations, and to the operative date as well as the duration of the CBA, if agreed. Metadata also refers to the status of the CBA, i.e., a single-employer or a multi-employer CBA, a framework agreement, an appendix, a transnational agreement, whether a ratification process is applicable, whether the CBA has force of extension to employers who do not conclude the agreement, and whether certain groups of workers are included or excluded. In the case of a multi-employer CBA, the identification of sectoral boundaries is required. If possible, the number of employees covered is to be registered if given, otherwise this information has to be collected from negotiators, which is challenging task. For the registration of the name of the CBA, the CBA Database developed a pick list. Using a pick list is preferred over keying in the CBA names, because of the risk of typing errors, due to which two CBAs might not be identified as being a renewed CBA.

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The coding scheme addresses ten topics (Table 3). Each topic starts with a Yes/No question: Does the CBA include any clauses on this topic? If so, the coding scheme follows with detailed questions. If not, the scheme moves on to the next topic. The coding scheme of the WageIndicator CBA Database generates 740 variables (Ceccon and Medas, 2022). Annotators read the full text to select the sentence or sentences relevant for the question in the coding scheme and enter a numerical answer to the question. Both elements, the selected text as well as the numerical code, are stored in the CBA Database.

**Table 3. Ten Topics in the Coding Scheme of the WageIndicator CBA Database**

| Nr | Topic |
|---|---|
| 1 | Job titles |
| 2 | Wages |
| 3 | Working Hours, Schedules, Paid Leaves and Paid Holidays |
| 4 | Employment Contracts |
| 5 | Work and Family Arrangements |
| 6 | Health and Safety and Medical Assistance |
| 7 | Sickness and Disability |
| 8 | Social Security and Pensions |
| 9 | Training |
| 10 | Gender Equality Issues |

WageIndicator started with annotators from as many countries as needed to code the CBAs from those countries. However, time learned that CBA coding requires skilled and experienced annotators rather than native annotators unfamiliar with the coding tool. Currently, WageIndicator is has skilled, multilingual annotators who are able to manage multiple languages. In case of coding one or a few CBAs in a language not mastered, the coding team uses sophisticated translation software. If a substantial number of CBAs in a not-mastered language needs to be coded, a native annotator is trained to do so, for which WageIndicator has developed a training kit. Annotators usually need one to several hours to code one CBA, specifically in case a CBA consists of a long document.

## 4.4 Text and Data Mining Technologies

Thanks to the SSHOC project (EU-H2020 nr 823782), text mining for CBAs could be explored (Ceccon and Ceccon, 2020). The text-mining efforts aimed at identification of one or more keywords most typical for an annotated clause. This was done with a set of at least 30 coded and

annotated CBA texts for one language: the so-called training set. A text part, which is called a clause, comprises of the text the annotator has identified as relevant for a question in the coding scheme. Across the 30 CBAs in the training set a software script identifies the most common words for each annotated clause, thereby accurately identifying the lemma for each word and disregarding redundant words. Next, several statistical models have been applied to assign the correct keyword to a clause, such as word frequency and neural network models to identify those clauses not accurately identified. In a final step, the key word set is tested on a second set of 30 manually coded CBAs, and adapted if needed. After the test phase, the key word set can be used for automatic keyword extraction. Today for some languages keywords are increasingly used in the coding platform of the WageIndicator CBA Database, thereby allowing annotators to look for information in the relevant text areas where these keywords have been identified, and disregard texts that do not include keyword matches.

## 5. By way of Conclusion: How Feasible Is an EU-Wide CBA Database?

Industrial relations theory stresses the importance of collective bargaining for workers' wages and working conditions, but the impact of collective bargaining has predominantly been studied by means of survey data providing a binary variable for being covered or not. Very few studies have been able to connect data with information about workers' coverage status to the name of the collective bargaining agreement (CBA) and thus the characteristics of that CBA they are covered by. Coded CBA information is also needed to compare bargaining outcomes wages and working conditions across EU-countries.

To contribute to closing the knowledge gap, this article focuses on the second condition, namely to increase insight in the content of CBAs in the light of a cross-EU27 country approach. Our study shows that CBAs are registered in an archive in 26 EU countries, of which nine publish all CBAs online, nine publish the multi-employer CBAs, two publish CBAs partially, three publish them in the Government Gazette or in PDF scans, and four do not make CBAs online available. Only eight countries publish the number of workers covered. Few countries apply any form of leximetric coding of the CBA texts, for example by keyword identification, assigning headings, annotating of relevant texts, or coding annotated text. Few countries code the wages agreed, facilitating the identification of collectively agreed wages, though such efforts are hardly

associated with the registries, but are performed by the Central Banks or the National Statistical Offices.

We estimated the total number of CBAs in EU27 at slightly over 85,000 – an underestimate because for almost half of the EU countries we could not identify the number of single-employer agreements. With some 73,000 CBAs Germany accounted for 85 per cent of these CBAs. When excluding the German CBAs because these texts are accessible for members only, some 8,000 CBAs from in total 20 countries can be gathered online for such a database.

The WageIndicator CBA Database with currently more than 1,700 CBAs shows that the collecting, uploading, and coding of many CBAs is technically feasible, and that the resulting dataset allows for analyses beyond the current body of knowledge. In conclusion, aiming for an EU-wide CBA Database of 8,000 yearly updated CBAs seems a doable but very challenging task. However, text-mining technologies may reduce the efforts needed, as well as targeting only one or a few sectors or limiting the number of coded CBAs by random sampling.

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## Supplementary Material

The CBA Database can be downloaded from the ZENODO repository (https://zenodo.org/deposit/4475583).

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