



COMPARATIVE REPORT

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Associazione per gli studi Internazionali e Comparati
sul Diritto del Lavoro e sulle Relazioni Industriali



SUNI (*Smart Unions for New Industry*) is a project co-funded by the European Commission, DG Employment, Social Affairs and Inclusion, budget heading VP/2017/002 (Grant Agreement VP/2017/0426), Information and training measures for workers' representatives

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This document was produced with the financial support of the European Union. The viewpoints expressed herein reflect the opinion of the authors and, therefore, do not represent, under no circumstance, the official position of the European Commission, which is not responsible for any use that may be made of the information this document contains

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Executive summary

Introduction

- Since the concept “Industrie 4.0” was devised in Germany in 2011, more and more scholars, institutions, consultants and practitioners across OECD countries, have started to take an interest in the perspective of a Fourth industrial revolution, driven by the introduction of the Internet of Things and Services.
- With specific regard to its impact on work, existing research sheds light on a wide spectrum of different development paths, generally delimited by two poles: pessimistic studies forecasting a considerable proportion of jobs threatened by digitalisation, a polarisation of competences in labour markets and workplaces, and the paradoxical combination of decentralisation and multifunctional roles with standardization and control tasks, in modern work-organisational models; more optimistic analyses foreseeing the long-term employment creation resulting from digital technologies, an upgrading of qualifications and skills due to the increasing complexity of digitised industrial work, and self-organised and highly-flexible work organisation systems.
- While seeking clarity in such a controversial scenario, some authors have drawn on evolutionary theories and work-sociological studies to argue that the above-described variety of projections is somehow a symptom of the non-linear and non-deterministic relationship between the implementation of new technologies and their social consequences, which instead are influenced by many non-technical and social factors, such as management strategies, power relations, economic and social processes, etc.
- Stemming from this background, this report is intended to explore similarities and differences in the role that trade unions, conceivable as relevant stakeholders in industrial innovation and socio-economic transitions according to both evolutionary perspectives and work-sociological studies, are already playing in influencing the development of Industry 4.0 in four European countries (Germany, Italy, Spain and Sweden). These countries have been chosen given their different industrial relations’ regimes and degrees of social partners’ embeddedness in public policies. This report

concentrates on the metalworking sector (encompassing steel industry, foundry, metal processing, mechanical engineering, etc.), regarded as a leading manufacturing sector in Europe and a strategic enabler in Industry 4.0, and on four metalworkers' organisations (the German IG Metall, the Italian FIM-CISL, the Spanish UGT-FICA and the Swedish IF Metall), selected as case studies.

Policy context

- As already known from literature, the first country launching a strategy for Industry 4.0 was Germany, where in 2011 a working group named “Industrie 4.0” was established under the chairmanship of Henning Kagermann (spokesman of the promoter group “Kommunikation” for the Industry-Science Research alliance, set up by the Federal Ministry for Education and Research to support the national “High Tech Strategy 2020”, launched in 2006) and Wolfgang Wahlster, who actually contributed to coining the term “Industrie 4.0”. The German approach paved the way for the development of several governmental plans for Industry 4.0 in Europe, that, though sharing the same important goal of boosting national competitiveness and industrial innovation, slightly differ from each other in terms of the date from which the measures came into force, their main pillars and promoters, the amounts of public investment, etc.
- Given this context, both trade unions and employers' associations in Germany, Italy, Spain and Sweden are increasingly interested in Industry 4.0. The perspectives of trade unions in the metalworking sector are quite homogeneous across the European countries considered in this research. Despite some internal discrepancies, trade union organisations generally exhibit a proactive behaviour towards the challenge of Industry 4.0, which is considered as something that could have positive effects, something that could open up opportunities for developing the content of work and improving its environment. However, this bright future perspective cannot be realised without conditions: trade unions' main idea is that in order to successfully shape the future of work in an Industry 4.0 era, they don't have to infringe their traditional roles and responsibilities.
- As far as the employers' side is concerned, Industry 4.0 is generally conceived as a huge opportunity to boost competitiveness in different sectors. However, the attention to the difficulties faced by Italian SMEs to keep the pace with technological innovation, the concerns expressed by Spanish employers about increasing international competition and dumping practices from third countries, and the German Gesamtmetall's emphasis on the need to renew labour legislation in accordance with employers' demands for

flexibility, contribute to shedding light on the various issues that despite the employers' positive stand on Industry 4.0, are still open and from the employers' perspective, need to be addressed to successfully embrace digital development.

Key findings

- Though operating within different institutional settings, all analysed trade unions (i.e. the German IG Metall, the Italian FIM-CISL, the Spanish UGT-FICA and the Swedish IF Metall) appear to exhibit a similar, proactive approach to Industry 4.0, which essentially derives from the acknowledgment that Industry 4.0, with its controversial, possible effects, is here to stay and an essential task for unions would be to play a part in it so as to make the transition sustainable to all. However, when deepening trade unions' discourses as regards Industry 4.0, some differences do emerge and are essentially due to differences in their organisational structures and varieties of institutional frameworks where they operate. Importantly, the various degree of trade unions' embeddedness in labour market and society has significant implications also for trade unions' actions.
- By and large, by promoting an interpretation of Industry 4.0 as both a trigger of economic competitiveness and a potential enabler of union goals (e.g. maximisation of workers' welfare and personal development as in the case of FIM-CISL; increased job security as regards IF Metall; the transition from a support union to a development union as suggested by IG Metall), the four metalworkers' organisations are expected to overcome some of the cleavages (i.e. between environmental and subjective goals, between functional and organisational interests) that institutionalist perspectives have regarded as inherent to the non-unitary nature of unions and responsible for unions' "lagged behaviour" in the face of external transformations. Nevertheless, other cleavages are brought to the readers' attention in this report and invite to caution when forecasting the role of unions in an era of change: the reference is to the gaps between centre and periphery, and between leadership and membership.
- In order to close these fundamental gaps, unions would need to accompany their internal discursive capacity (intended as the ability to provide overarching narratives as a frame of reference for union action) with other, both internal and external, dimensions of union power, such as network embeddedness (or external solidarity, referring to the degree to which unions have horizontal and vertical links with other unions, community groups, social movements of other types of actors) and infrastructural resources (covering the material and human resources, also coming from outside of the

union, and their allocation through processes, policies and programmes). The relevance of the former source of power should be particularly emphasised as it's precisely by network embeddedness, that unions could succeed in «inserting concerns with identity, activism, and democracy into structures of social partnership, and seeking to “connect the spots” of local activism into renewed forms of social bargaining» (Mundlak, 2017, 316). This, subsequently, would mean for unions to overcome the mismatch between leadership and membership, by contemporarily bridging the presumed gap between the *organising* and *partnership* logics of labour's association.

- To conclude, no paradigm shift will occur unless new technology systems give rise to structural changes in the economy, society and institutions and no Industry 4.0 will materialise unless it is pervasive and embedded in a knowledge ecosystem, composed of companies, research centres, public authorities, civil society organisations and people. Trade unions' awareness of this era of change and their willingness to proactively participate, are a good start but more effort is needed to integrate their initiatives into a broader framework of co-designed and co-implemented paths of development at the national, regional and workplace level.

Introduction

It's been few years since the concept of "Industrie 4.0" was devised in Germany to indicate a new type of industrialisation, expected to «solve some of the challenges facing the world today such as resource and energy efficiency, urban production and demographic change» (Kagermann, Wahlster, Helbig, 2013, 5). Since then, more and more scholars, institutions, consultants and practitioners across OECD countries, have started to take an interest in the perspective of a Fourth industrial revolution, driven by the introduction of the Internet of Things and Services. With specific regard to its impact on work, existing research sheds light on a wide spectrum of different development paths, generally delimited by two poles (Hirsh-Kreinsen 2016; Seghezzi, 2017). On the one side, there are studies forecasting a considerable proportion of jobs threatened by digitalisation, a polarisation of competences in labour markets and workplaces, whereby a growing share of high-qualification activities is accompanied with persisting easy and non-automatable tasks, and the paradoxical combination of decentralisation and multifunctional roles with standardization and control tasks, in modern work-organisational models (among others, Ford, 2015; Frey, Osborne, 2013; Rinaldini, 2017; World Economic Forum, 2016). On the other side, more optimistic analyses foresee the long-term employment creation resulting from digital technologies, an upgrading of qualifications and skills due to the increasing complexity of digitised industrial work, and self-organised and highly-flexible work organisation systems (among others, Arntz, Gregory, Zierahn, 2016; Butera, 2018; Davies, Coole, Smith, 2017; Lorenz et al., 2016)¹. While seeking clarity in such a controversial scenario, some authors have drawn on evolutionary theories and work-sociological studies to argue that the above-described variety of projections is somehow a symptom of the non-linear and non-deterministic relationship between the implementation of new technologies and their social consequences, which instead are influenced by many non-technical and social factors, such as management strategies, power relations, economic and social processes, etc. (Butera, 2018; Hirsh-Kreinsen, 2016; Valenduc, Vendramin, 2017). In other words, in the light of Industry 4.0, in order to orient the development of

¹ See also Eurofound, 2018, that in addition to specific, generally high-skilled occupational profiles, also stresses the relevance of non-technical skills such as social and communication skills, decision-making and creativity.

organisations, jobs and qualifications, the current challenge would consist of reshaping institutional frameworks in the regulation of economic activities, policy-making and the labour market (Valenduc, Vendramin, 2017)². Similar positions have been supported by a number of institutional players at the European level. On April 19, 2016, for instance, the European Commission set out a holistic path to digitise European industry, stressing the role of EU institutions to coordinate national strategies, provide network opportunities for stakeholders, adopt a suitable regulatory framework, and support skills development (European Commission press release, 2016). More recently, on April 25, 2018, when addressing the impact of Artificial Intelligence, the European Commission has encouraged Member States to prepare to socio-economic challenges, by updating education and training policies and supporting labour market transitions, in line with the European Pillar of Social Rights (European Commission press release, 2018). A demand for an ambitious and resolved European Commission's action to ensure a successful, inclusive transition to Industry 4.0, was moreover expressed by the European Trade Union Confederation in June 2016, after acknowledging that «nobody has a crystal ball to look into the digital future and there is no such thing as technological determinism related to digitalisation» (ETUC resolution on digitalization, 2016). Finally, the role of institutions and stakeholders is considered as pivotal to anticipate change, thus effectively coping with human, organisational and social challenges, by both the European union federation of workers in manufacturing, mining and energy sectors, industriAll European Trade Union, and its partner employer organisation, CEEMET (Council of European Employers of the Metal, Engineering and Technology-based Industries, CEEMET, 2016).

Stemming from this background, this report is intended to explore similarities and differences in the role that trade unions, conceivable as relevant stakeholders in industrial innovation and socio-economic transitions according to both evolutionary perspectives and work-sociological studies (Butera, 2018; Totterdill, Exton, 2014; Totterdill, Hague, 2017; Valenduc, Vendramin, 2017), are already playing in influencing the development of Industry 4.0 in four European countries (Germany, Italy, Spain and Sweden). These countries have been chosen given their different industrial relations' regimes and degrees of social partners'

² Interestingly, as regards the countries (Germany, Italy, Spain and Sweden) considered in this research, the relevance of education and training policies for workers has been highlighted in Kahale Carrillo, 2016; the importance of employees and their representatives involvement has been underlined in Lins et al., 2018; and the need to modernize industrial relations systems and labour regulation has been stressed in Seghezzi, Tiraboschi, 2018. Finally, the role of research in asking the right questions and deepening all knowledge gaps deriving from the digitalization of work, whose outcomes are far from being pre-given, has been emphasized in Johansson et al., 2017.

embeddedness in public policies: fundamental characteristics that would allow this report to shed light on those institutional variables that, in addition to union organisational and ideological elements, could underlie national unions' discourses and action in the field of Industry 4.0. The selection of these variables is explained by the relevance attributed to them in justifying organisational behaviour by new-sociological institutionalism and studies on trade unionism stemming from those theories (among others, Scott, 2001; Hodder, Edwards, 2015). This report concentrates on the metalworking sector (encompassing steel industry, foundry, metal processing, mechanical engineering, etc.), regarded as a leading manufacturing sector in Europe and a strategic enabler in Industry 4.0³. To achieve its main goals, this report adopts the method of cross-national comparison, depicted as suitable to find “probabilistic” social science causes (Crompton, Lyonett, 2006). In this regard, a note of caution is, however, needed because different factors (even those elements not belonging to institutional frameworks and union organisational structures or identities but ascribable to cultural legacies and the role of single actors in organisational behaviour: DiMaggio, 1988) may contribute to the phenomenon under investigation, and the relative significance of particular factors may vary between analysed countries. Importantly, cross-national comparative research is here conducted essentially on the basis of four national reports, that have been already drafted within the framework of the SUNI (Smart Unions for New Industry) project. These reports rely on qualitative research methods, encompassing content analysis of primary (i.e. official documents, press releases, collective agreements, laws, etc.) and secondary sources (e.g. academic papers, institutional reports, etc.), as well as case-study analysis on four metalworkers' organisations, the German IG Metall, the Italian FIM-CISL, the Spanish UGT-FICA and the Swedish IF Metall. These analyses have been conducted also via interviews with national union officials. The comparative report is structured as follows. Section 1 describes and compares main governmental measures in relation to Industry 4.0. Section 2 provides an overview of the different models of industrial relations in Germany, Italy, Spain and Sweden, with particular regard to the metalworking sectors. Section 3 shows and compares national social partners' perspectives of Industry 4.0, with particular reference to trade union federations and employers' associations in the metalworking sector. Section 4 concentrates on those metalworkers' organisations, that have been selected as case studies, and compares their internal characteristics, as well as their discourse and actions in relation to Industry 4.0, along some pre-set dimensions (i.e. as regards trade union action, the themes of research and development, communication and dissemination, lobbying, training

³ For a classification of industrial sectors according to the degree of the impact of Industry 4.0, see: IndustriALL Global Union, 2017. See also Orgalime Vision Paper, 2016.

and collective bargaining are all taken into consideration). Last section concludes the comparative report, by discussing the main findings and describing their significance in the light of the above-mentioned research purposes.

Section 1.

Governmental plans for Industry 4.0

As already known from literature, the first country launching a strategy for Industry 4.0 was Germany, where in 2011 a working group named “Industrie 4.0” was established under the chairmanship of Henning Kagermann (spokesman of the promoter group “Kommunikation” for the Industry-Science Research alliance, set up by the Federal Ministry for Education and Research to support the national “High Tech Strategy 2020”, launched in 2006) and Wolfgang Wahlster, who actually contributed to coining the term “Industrie 4.0” (Kagermann, Wahlster, Helbig, 2013). Accordingly, the concept referred to the Fourth industrial revolution, made possible by the use of the Internet, sensors and software in production processes enabling the creation of the so-called “Cyber-Physical Systems”, suggesting a progressive integration between the physical, real world (characterised by production facilities and objects) and cyber, virtual world (animated by algorithms and Big Data). Technologies related to Industry 4.0 were assumed to spur Germany’s innovative strength and competitiveness, according to their main promoters. Following a report published by the working group in 2012, the “Plattform Industrie 4.0” was created as a result of a cooperation agreement between relevant stakeholders in the field of technological innovation: BITKOM (the Federal Association for Information Technology), VDMA (Mechanical Engineering Industry Association), ZVEI (the German Electric and Electronic Manufacturers Association). Progressively, the platform was expanded via the involvement of actors from industry, politics, science and trade unions. Today, it is led by the Federal Minister for Economic Affairs and Energy (BMWi) and the Federal Minister for Education and Research (BMBF); it comprises a steering body (composed of companies) and working groups (composed of business representatives and experts) in charge of properly implementing Industry 4.0 strategies; it also includes a strategy group (composed of business and labour representatives, politicians and Fraunhofer officers) which provides policy leadership and promotes a sociopolitical debate of the effects of Industry 4.0. Plus, in Germany, different federal ministries have initiated programmes and projects to explore change in Industry 4.0. Among the various initiatives, it is worth mentioning the Green Paper on Work 4.0, published in 2015, and the White Paper on Work 4.0, published in 2016, both promoted by the Federal Ministry for

Labour and Social Affairs (BMAS) after fruitful discussions with companies, trade unions and business associations, and shedding light on the areas of work most impacted by Industry 4.0 (i.e. skills' development, working time, health and safety, data protection, co-determination).

The German approach paved the way for the development of several governmental plans for Industry 4.0 in Europe, that, though sharing the same important goal of boosting national competitiveness and industrial innovation, slightly differ from each other in terms of the date from which the measures came into force, their main pillars and promoters, the amounts of public investment, etc. This report explores some of these features, notably those that have been described in the four national reports written within the framework of the SUNI (Smart Unions for New Industry) project.

The Spanish strategy named “Industria Conectada 4.0” was launched in 2015 by the General Secretariat for Industry and SMEs, within the Ministry of Economy, Industry and Competitiveness, and articulated around four main actions, related respectively to (i) awareness, communication and training, (ii) cross-sectoral collaboration, (iii) development of digital facilitators, and (iv) support for companies in the transition towards Industry 4.0. Similar guidelines were traced also within the framework of the Italian Industry 4.0 plan and the Swedish “Smart Industry” strategy, both initiated in 2016. However, whereas the former stresses the relevance of sustaining firms' and SMEs' investments in new technologies, fostering skills' development and providing adequate infrastructures, the latter almost uniquely emphasises the need to exploit the potential of new technologies for driving the transition towards a fossil fuel and circular economy: environmental sustainability is thus placed at the heart of the Swedish plan for a smart industry. Overall, the topics stressed by all four national strategies for Industry 4.0 are digital transition and skills development, essentially via closer collaboration between the education system and the world of work, career changes and mobility between the higher education sector and the business sector (especially in Sweden) and promotion of lifelong learning opportunities. Among the other tools most frequently mentioned in all plans, there are: public support and fiscal tools (e.g. innovation friendly procurement practices and public funds for innovation projects in Sweden and Spain; subsidised loans for the purchase of new technologies in Italy), new infrastructures (e.g. the reference to open data in Sweden and to network infrastructures, data security and protection in Italy), guidance and awareness programmes (e.g. the development of a pool of facilitators in Spain, the envisaged role of Digital Innovation Hubs in Italy), research and development policies (e.g. the attention paid by Swedish government to make the country an attractive place for researchers to work; the increase in the number of industrial 4.0 PhDs in Italy).

The idea of ensuring a multi-stakeholder governance is included in both the German way to Industry 4.0, via the “Plattform Industrie 4.0”, and the Italian Industry 4.0 plan, via the so-called “Cabina di Regia” (*control room*). However, whereas the former performs both guidance, decision-making and implementation tasks and constitutes the cornerstone of the whole strategy, the latter appears to be as a sort of a consultative-coordinating body, including national and local institutions, trade associations, trade unions and the academic world. Importantly, in the case of Sweden, the “Smart Industry” strategy is described as developed since the beginnings in close dialogue with social partners, including trade unions. By contrast, in Spain, social partners are depicted as not concretely involved in the design of national plans: hence, they performed an intense lobbying activity in order to affect governmental paths towards industrial development. On November 28, 2016, the *Declaración de los Agentes Sociales instando al desarrollo de un Pacto de Estado por la Industria* (*Declaration of Social Partners for the development of a Social Pact for Industry*) was signed by four trade union federations representing workers in industrial sectors, construction and services, and by all the employers’ associations included in the so-called “Alliance for the Competitiveness of Spanish Industry”. The Declaration contains nine policies aimed at boosting industrial competitiveness (via technological and digital development, new infrastructures, labour law reforms, etc.) in accordance with the need to create good work and ensure environmental sustainability. These policies are intended to be the foundations for a new social pact for industrial development in Spain.

Whereas all governmental strategies appear to be initiated and led at the central level, connection with territories would be ensured in different forms, such as via pools of facilitators or digital innovation hubs in Spain and Italy, conceived as “local bridges” between public authorities, companies, research centers, universities, start-ups, etc. Interestingly, a relevant focus area of the Swedish “Smart Industry” strategy is the so-called “Test bed Sweden”, whose underlying assumption is the need to lead research in those areas that can contribute to strengthening industrial production in Sweden: subsequently, it is stressed the relevance of targeted and place-based research and innovation investments and the role of public sector in fostering close collaboration between local and regional stakeholders to solve societal challenge. Moreover, the Spanish national report pays particular attention to some important programmes for Industry 4.0, initiated and led directly at the regional level, notably, by the Basque government, the government of Castile and Leon and the region of Murcia. High degree of decentralisation in Spanish administration may partly explain the relevance of these programmes. However, regional initiatives on digital development can be found in all analysed countries.

Finally, an interesting issue regards the scope of application of the above-mentioned strategies. The term “Industry 4.0” evidently emphasises the impact of digital technologies on all industrial sectors. That is why the Swedish strategy generally refers to industrial sectors in outlining its main goals. Conversely, the Spanish plan has predominantly focused on automotive and textile manufacturing so far: among others, the metal sector appears to be overlooked. By contrast, the Italian Industry 4.0 plan has recently changed its denomination in “Impresa 4.0” (*Enterprise 4.0*) plan, so as to encompass as many economic sectors as possible. A similar intention can be found in Germany.

Table 1

	Germany	Italy	Spain	Sweden
Date from which the measures came into force	2011: a working group named “Industrie 4.0” was established	2016: National plan “Industria 4.0”	2015: “Industria Conectada”	2016: “Smart Industry” strategy
Institutional promoters	The Federal Ministry for Education and Research set up the promoter group “Kommunikation”, whose spokesman led the working group “Industrie 4.0”	The Ministry of Economic Development, supported by government, launched the Italian Industry 4.0 plan	The General Secretariat for Industry and SMEs, within the Ministry of Economy, Industry and Competitiveness, launched the strategy “Industria Conectada”	The government launched the strategy, yet with strong involvement of the Ministry of Economic and Innovation
Objectives	Quite homogenous objectives of national strategies: to boost national competitiveness and industrial innovation			
Scope of interest	The Italian Industry 4.0 plan has recently changed its denomination in “Impresa 4.0” (<i>Enterprise 4.0</i>) plan, so as to encompass as many economic sectors as possible. A similar intention can be found in Germany		Particular focus on automotive and textile manufacturing so far	All industrial sectors are covered
Degree of centralization	Whereas all governmental strategies appear to be initiated and led at the central level, connection with territories would be ensured in different forms. E.g. via pools of facilitators or digital innovation hubs in Spain and Italy; the Swedish strategy’s focus area named “Test bed Sweden”, whose underlying			

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	assumption is the need to lead research in those areas that can contribute to strengthening industrial production			
Pivotal topics	Widespread attention to digital transition and skills' development. In Sweden, quite unique focus on environmental sustainability			
Main tools	<ul style="list-style-type: none"> • Fiscal tools (including tax credits in Italy and simplified procurement procedures or public funds for innovation projects in Sweden) • New infrastructures (e.g. open data, data protection and security) • Guidance programmes (e.g. pool of facilitators in Spain and Italy) • Skills and research policies (e.g. increase in the number of industrial 4.0 PhDs in Italy; lifelong learning opportunities) 			
Role of trade unions	A multi-stakeholder governance of the national strategy, via the "Plattform Industrie 4.0" (where business and labour representatives are deeply involved)	A multi-stakeholder governance "wanna-be", via the "Cabina di Regia", which is a sort of consultative-coordinating body	Apparently, scant involvement of Spanish social partners in devising and implementing the national strategy	The Swedish "Smart Industry" strategy was developed in close dialogue with trade unions

Section 2.

Main features of industrial relations in the metalworking sector

The national reports, written within the framework of the SUNI (Smart Unions for New Industry) project, shed light on the differences between the models of industrial relations in the analysed countries (Germany, Italy, Spain and Sweden) with particular regard to the metalworking sector. These findings are consistent with institutionalist and regulation theories, such as the neocorporatist work of Streeck and Schmitter (1985), Varieties of Capitalism (Hall, Soskice, 2001; Molina, Rhodes, 2007), and regulation school (Boyer, 2005) as well as with the typologies of industrial relations' regimes as more recently devised at the EU level (Visser, 2009; Eurofound, 2017). By and large, industrial relations in the metalworking sector in Italy emerge as characterised by the abstention of law and a high level of voluntarism, giving rise to phenomena such as union pluralism, multiplication of NCLAs, and a lack of collective bargaining governability. Although Italy has been positioned within the Southern European cluster as a Mixed Market Economy like Spain (Molina, Rhodes, 2007), our analysis shows some significant divergencies as regards industrial relations: in Spain, the state has a prominent role in the governance and regulation of industrial relations and state intervention is perceived as a precondition for effective industrial relations (Eurofound, 2017); this explains the *erga omnes* efficacy of collective agreements via governmental extension mechanisms, the registration of NCLAs in the Official State Gazette, and the rigorous assessment of trade union representativeness. However, Italy and Spain share some common features, for instance, with regard to the confrontational character of labour relations (no board-level employee representation is envisaged by Italian and Spanish legislation), an irregular and politicised involvement of social partners in public policy choices as well as quite modest union membership rates and quite high levels of collective bargaining coverage. The latter characteristics have recently caught the attention of Mundlak (2016, 2017), who has introduced the category of "hybrid systems of industrial relations" to indicate those systems where relatively high coverage of collective bargaining is not matched by high membership rates in trade unions. According to the Author, whereas the former feature depends on

the role of the state in steering «the regulation of labor and social matters away from the contractual sphere and the domain of state-authored regulation», and instead preferring «governance of work that is based on bipartite and tripartite negotiations» (Mundlak, 2016, 166), the latter feature derives from the fact that trade unions cannot rely on the state to secure membership, which is instead related to a bottom-up type of union power (i.e. internal union legitimacy). In Mundlak's conceptualisation, also Germany is somewhat a hybrid system of industrial relations (even though, as this report will better clarify below, both membership and collective bargaining coverage rates are declining in the country). German industrial relations in the metalworking sector differ from Italian and Spanish ones. Unlike Italy, German labour relations are characterised by a high degree of legalism, proved, for instance, by the Work Constitution Act of 1972 and the German Co-determination Act of 1976. As a result of this legal framework, industrial relations in Germany are highly institutionalised and dominated by an integrative approach to collective bargaining, especially at lower levels. Another country where industrial relations benefit from a high degree of institutionalisation and cooperative labour-management relations is Sweden, which still exhibits quite high rates of trade union membership and collective bargaining coverage. Plus, unlike Germany, the intervention of the state in industrial relations is quite limited in Sweden, which instead relies more heavily on well-established practices of bipartite negotiation and consultation. With reference to employment regimes, Sweden has been described as a corporatist country, given the fact that unions have a highly participation in decision-making also thanks to their influence over the party in government (Visser, 2009)⁴; in addition, Swedish unions continue to play a relevant role in the administration of unemployment funds (although this system has recently come under pressures for change) and job security councils, constituted as a result of collective bargaining, and aimed at providing support for new employment. Furthermore, in all analysed countries, even in those formally characterised by a dual-channel model of employee representation (e.g. Germany and Spain), trade unions do exert their influence on company-level representation bodies. Finally, industry-level collective bargaining is the core of all analysed systems of industrial relations, even though it can take place at either national (e.g. Italy and Sweden) or territorial level (e.g. Germany and Spain). Plus, social partners' attempts to respond to external pressures (e.g. increasing international competition) in an "experimentalist logic" (Behrens, Jacoby, 2004) by controlling and organising decentralisation and flexibilisation trends, can be found in the metalworking sectors of all countries (see, for instance, opening clauses in industry-level

⁴ As it will be explained later, the Swedish trade union confederation, LO, has a representative on the Social Democratic party's executive committee, elected by the party's congress.

collective agreements in Germany and Italy; the transition from detailed provisions on pay to more general principles in NCLAs in Sweden), although latest government reforms have made the Spanish system more at risk of disorganised decentralisation (Leonardi, Pedersini, 2018).

More details regarding the varieties of industrial relations in the analysed countries are described in the following lines.

2.1. Trade unions and employers' associations

Italy

Union pluralism is an important element of industrial relations in Italy. With specific regard to the metalworking sector, there are three main trade union federations (representing both blue-collar and white-collar workers) adhering respectively to the main trade union confederations: the Federation of Employees and Metalworkers (*Federazione Impiegati Operai Metallurgici*, FIOM-CGIL), the Italian Metalworkers' Federation (*Federazione Italiana Metalmeccanici*, FIM-CISL) and the Union of Italian Metalworkers (*Unione Italiana Lavoratori Metalmeccanici*, UILM-UIL). Smaller organisations and independent autonomous unions operating in the sector are: the Italian Federation of Metalworking and Connected Sectors' Unions (*Federazione italiana sindacati metalmeccanici e industrie collegate*, FISMIC), the Intersectoral Union of Self-Organised Workers (*Sindacato lavoratori autorganizzati intercategoriale*, SLAI-COBAS), the metalworkers' federation adhering to the General Union of Workers (*i metalmeccanici dell'Unione Generale del Lavoro*, UGL metalmeccanici) and the Italian Autonomous Federation of Metalworkers and Service workers (*Federazione Autonoma Italiana Metalmeccanici Servizi*, FAILMS-CISAL). According to Leonardi et al., union density in the Italian metalworking sector is 32.8% (Leonardi, Ambra, Ciarini, 2017). This data has been declining over the past ten years (Federmeccanica, 2017). Employer density is estimated at around 50% with several employers' associations: the largest and most influential one is Federmeccanica (affiliated to the main employers' confederation, Confindustria); the second is Unionmeccanica (affiliated to the confederation Confapi), representing small and medium enterprises. In 2013, a new employers' confederation, Confimi Industria, was founded by local and sectoral employers' associations from Confapi and Confindustria. Plus, cooperatives and craft industry have their own sectoral federations.

Finally, it should be noted that to date in Italy, in the private sector, there is no law which establishes the criteria to follow when determining trade union representativeness. An intersectoral agreement on representativeness was reached

on June 28, 2011 by Confindustria, CGIL, CISL and UIL, which set criteria for industry-wide as well as company-level bargaining. These criteria were confirmed in the cross-industry collective agreement signed on January 10, 2014. Nevertheless, the system agreed in these documents has not been fully implemented yet. Indeed, on February 28, 2018, Confindustria, CGIL, CISL and UIL signed another agreement where stressing the relevance to make effective the criteria for the measurement of trade union and employers' association representativeness. To achieve this purpose, social partners agreed on strengthening powers and responsibilities of the tripartite body CNEL (the National Economic and Labour Council) in this field.

Spain

In Spain, where trade unions are formally recognized in Article 7 of the Spanish Constitution of 1978 (according to which «Trade unions and employers associations contribute to the defense and promotion of the economic and social interests which they represent. Their creation and the exercise of their activities shall be unrestricted in so far as they respect the Constitution and the law. Their internal structure and operation must be democratic»), there are two main unions operating in the metalworking sector: UGT-FICA (*Federación de Industria, Construcción y Agro de la Unión General de Trabajadores*) and CCOO (*Confederación Sindical de Comisiones Obreras*) de Industria, both representing workers employed in all industrial sectors as well as in agriculture and construction. Overall, trade union membership in Spain would account for approximately 20%⁵. UGT-FICA and CCOO de Industria are considered as the most representative unions at national level: a status depending on their results in the works council elections and providing them with exclusive rights in the area of collective bargaining.

On the employers' side, the most representative association in the sector is the Confederation of Metal Employer Organisations, Confemetal (*Confederación Española de Organizaciones Empresariales del Metal*), which adheres to both the Spanish Confederation of Employers' Organisations (*Confederación Española de Organizaciones Empresariales*, CEOE) and Spanish Confederation of Small and Medium-Sized Enterprises (*Confederación Española de la Pequeña y Mediana Empresa*, CEPYME). Via its sectoral and territorial member federations,

⁵ Worker Participation, National Industrial Relations, Countries, Spain, Trade Unions, <http://www.worker-participation.eu/National-Industrial-Relations/Countries/Spain/Trade-Unions#note2> (accessed June 5, 2018).

Confemetal would indirectly represent around 90,000 companies, where about 1,5 million workers are employed (EurWork, 2010).

Sweden

In Sweden, trade unions are organised into three larger confederations: the Swedish Trade Union Confederation (*Landsorganisationen*, LO), which organises blue-collar workers in private and public sectors; the Swedish Confederation of Professional Employees (*Tjänstemännens Centralorganisation*, TCO), that organises white-collar workers in private and public sectors; the Swedish Confederation of Professional Associations (*Sveriges Akademikers Centralorganisation*, SACO) which organises academics or graduate professionals with a university or college degree. LO and TCO are structured on an industry basis, while SACO is structured on the basis of its members' occupations. As regards the metalworking sector, there are two main unions: IF Metall (*Industrifacket Metall*), one of the 14 unions affiliated to LO, representing 1,470,000 members (684,000 are women) among blue-collar workers; and Unionen, the largest TCO union, formed in 2008 after the merger of two unions and representing 534,413 members among white-collar workers. It is important to specify that union affiliates have independent status, as union confederations essentially coordinate union activities in the field of wage bargaining, trade union training, social security and so on.

On the employers' side, the main association at the national level is the Confederation of Swedish Enterprise: among its affiliates, there is the Association of Swedish Engineering Industries (*Teknikföretagen*), which represents employers of multinational engineering and industrial manufacturing companies. The Association has 3,900 affiliated companies with over 300,000 employees⁶.

Germany

In Germany, trade unions were founded in the second half of the 19th century and consisted of associations of craftsmen in professional associations. Later, industrial unions and public-servants associations were established. Until the end of the Weimar Republic, the trade union landscape was divided into professional and industrial associations. After the Second World War, trade unions were modelled on the industrial organisations. Union organisations, which later merged

⁶ Cecimo, Publications, Cecimo Magazine Fall 2012, The machine and tool association of Sweden, <http://www.cecimo.eu/site/publications/magazine/the-machine-and-tool-association-of-sweden/> (accessed May 30, 2018).

to form unified multisector trade unions, continue to comprise blue-collar workers as well as white-collar workers. Almost 80% of the approximately eight million German trade union members are organised in the eight single trade unions of the Confederation of German Trade Unions (*Deutscher Gewerkschaftsbund*, DGB). The largest of the DGB unions with over 2 million members is the Industrial Union (*Industriegewerkschaft Metall*, IG Metall), which mainly represents employees from the metal and electrical industry (Schroeder, Greef, 2014, 127f). The overwhelming majority of employees in the metalworking sector are represented by IG Metall. In addition, there is a Christian metalworkers' union (*Christliche Gewerkschaft Metall*, CGM), which belongs to the Christian Federation of Trade Unions in Germany (*Christlicher Gewerkschaftsbund*, CGB), an umbrella organisation with a total of 14 individual unions and 280,000 members, which though plays only a subordinate role in German IR landscape (Greef, 2014, 696f; Müller-Jentsch, 2017, 26).

IG Metall's most important negotiating partner in collective bargaining is the employers' association, Gesamtmetall. Gesamtmetall is the largest member of the Federation of German Employers' Associations (*Bundesvereinigung der Deutschen Arbeitgeberverbände*, BDA) and represents around 3,650 members companies with approximately 372,000 employees. The degree of organisation of Gesamtmetall is around 15%. Since late 1980s, employers' associations and trade unions have both experienced a decline in membership, which in turn has jeopardised the scope of collective bargaining.

Table 2

	Germany	Italy	Spain	Sweden
Trade unions and employers' associations in the metalworking sector	A single main union: IG Metall (affiliated to DGB), that signs sectoral collective agreements with the employers' association, Gesamtmetall (member of BDA). A marginal position is held by the Christian	- Union pluralism. - No law establishing a representativeness threshold to sign NCLAs. Main unions are: FIM-CISL, FIOM-CGIL and UILM-UIL, which sign different NCLAs with the employers'	Main unions are: UGT-FICA and CCOO de Industria. They sign the National Industry, Technology and Metalworking Sector Services Agreement, with the employers' association Confemetal. There's a union representativeness	Labour representation is divided between unions representing blue-collars and unions representing white-collars. In the metalworking sector, IF Metall (member of LO) and Unionen (member of TCO) represent

	metalworkers' union (CGM), affiliated to the confederation CGB	associations, Federmeccanica (adhering to Confindustria), Unionmeccanica Confapi, and Confimi Impresa Meccanica. Plus, cooperatives and craft industry have their own sectoral federations	s threshold (i.e. the number of union delegates in companies) to identify most representative unions	respectively blue-collars and white-collars. They sign different NCLAs with the Association of Swedish Engineering Industries (Teknikföretagen), affiliated to the Confederation of Swedish Enterprise
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2.2. Collective bargaining

Italy

In Italy, the majority of metalworking companies, excluding those belonging to the FCA group and some of its associated companies, apply the national collective agreement of the metalworking industry, signed by Federmeccanica and Assistal (the National Association of Plants' Manufacturers) on the one hand, and FIOM-CGIL, FIM-CISL and UILM-UIL on the other hand. Nevertheless, as observed by Tomassetti (2017a), industrial relations in the metalworking industry have begun to disintegrate and this has led to the rapid multiplication of collective bargaining systems which are in serious competition with one another. Together with FCA's exit from Federmeccanica and the respective national collective agreement, not only was Confimi Industria created as the fourth competing party for the representation of small and medium-sized enterprises in the manufacturing sector, but also the trade union front split in late 2000s. Consequently, a single commodity-related sector is now being regulated by five different collective agreements in addition to that of Federmeccanica, whose latest renewal was in 2016: NCLA Confimi Impresa Meccanica, FIM-CISL, UILM-UIL (latest renewal in 2016); NCLA Unionmeccanica Confapi, FIM-CISL, FIOM-CGIL, UILM-UIL (latest renewal in 2017); NCLA metalworking cooperatives (ANCPL Legacoop, Federlavoro e Servizi, Confcooperative, AGCI Produzione e Servizi), FIM-CISL, FIOM-CGIL, UILM-UIL (latest renewal in 2017); NCLA craft industry, FIM-CISL, FIOM-CGIL, UILM-UIL (latest renewal in 2012); FCA collective agreement, FIM-CISL, UILM-UIL, UGL Metalmeccanici, FISMIC, Quadri e Capi Fiat (latest renewal in 2015, though a welfare plan was agreed in 2017).

As regards collective bargaining structure, national industry-wide collective bargaining is the core of the system. However, «over time, alongside the highly centralized arena for cross-sectoral (or interconfederal) negotiations on very general topics between the union and employers' confederations, the bargaining system evolved a two-tier structure: the national industry (or sectoral) level, which periodically redefined industry-wide pay and conditions and the company (or sometimes also territorial) level, devoted to negotiation on workplace-related issues, usually subject to a favourability principle» (Colombo, Regalia, 2016, 296). This structure was clearly set forth in the so-called "Giugni Protocol", signed by government, Confindustria and trade union confederations in July 1993, and in the following tripartite agreement of December 1993. With specific reference to the metalworking sector, and notably to the main national collective agreement signed by Federmeccanica and Assistal, and covering more than 1.6 million workers (FIM-CISL press release, 2016), it is important to specify that the NCLA expressly requires company collective bargaining to deal with «matters delegated, in whole or in part, by the national collective agreement or by the law» in line with the criteria and modalities indicated therein. The sectors' social partners therefore outline a model of organised decentralisation, recognising, however, considerable room for autonomy in the company-level collective bargaining. Article 5, Section III of the metalworking NCLA, entitled *Agreed modifications to the NCLA*, states that «in order to promote economic and employment development by creating useful conditions and new investments or to launch new initiatives, or better, in order to contain the economic and employment effects arising from situations of company crisis, specific modifications, even experimentally or temporarily, can be made to one or more elements governed by the NCLA and the agreements referred to therein». Such agreements, in order to be valid and effective, must comply with the following procedures: (A) they must be defined at the company level with the assistance of employers' associations and the local representatives of the relevant trade unions; (B) they must indicate the goals to be accomplished, the duration (in the case of an experimental or temporary measure), the exact references to the articles of the NCLA being amended, the arrangements made to guarantee the eligibility of the agreement with measures to be fulfilled by both parties; (C) they cannot relate to wage-tariff minimums, seniority pay and the economic element of guarantee, as well as individual rights deriving from legally binding regulations; (D) where promoted by multi-localised companies, the employers' associations and local trade-union representatives must arrange appropriate means of coordination wherever necessary; (E) in order to be valid, they must be communicated to the NCLA parties and, in the absence of a decision, after 20 calendar days from receiving

them, will enter into effect and modify the relevant NCLA clauses for the matters and duration defined (Tomassetti, 2017b).

Whereas collective bargaining coverage was never esteemed by international and national sources below 80-85% (particularly thanks to voluntary extension mechanisms in individual employment contract and case law, in a context characterised by the lack of a legal extension mechanism), it should be noted that as regards second-level collective bargaining, only 35% of employees in the private sector are covered by company or territorial collective agreements. In smaller companies, most employees are not covered by any workplace representation and subsequently, by any company-level collective agreement. However, it has been reported that due to the higher number of companies in the metal sector with more than 250 employees, second-level bargaining has a higher incidence there than in the rest of the economy (Leonardi, Ambra, Ciarini, 2017).

Importantly, it should be noticed that a problem of vertical coordination of collective bargaining (referring to the lack of conformity between parameters agreed at the central level and what is actually negotiated at subordinate levels; Marginson, Sisson, 2002) persists in Italy, as local trade union representatives and employers' associations tend to negotiate, and sign decentralized collective agreements that are not always coherent with coordination rules established at the central level (Regalia, Regini, 1998; Tomassetti, 2017a). In addition, the problem of vertical coordination between bargaining levels in Italy needs to be analysed by taking into account the issue of low collective bargaining governability (Traxler, Kittel, 2000), deriving from the absence of legal enforceability of collective agreements and the scant diffusion of peace obligations during the validity of collective agreements. The combination of these two factors evidently puts in jeopardy the role of a two-tier collective bargaining system in achieving one of the goals of Italian employers and their associations, namely safeguarding *managerial control*, thus ensuring certainty and governability of labour standards⁷.

Spain

In Spain, there is one national collective labour agreement covering the metalworking sector: the National Industry, Technology and Metalworking Sector Services Agreement (*Convenio Estatal del Sector del Metal*, CEM). It was signed by the former MCA-UGT (*Metal, Construcción y Afines de UGT*), CCOO de

⁷ Managerial control refers to the employers' need to secure union assistance «in making and upholding rules to regulate work and wages for the sake of gaining employee consent and co-operation and avoiding costly strikes». See: Flanders, 1974; Sisson, 1987, p. 5.

Industria and the employers' association, Confemetal, on March 29, 2016 and then ratified on April 14, 2016. It was later published in the Official State Gazette (BOE) on August 11, 2016, thus achieving *erga omnes* efficacy and affecting all employers and workers in its scope of application. In this regard, it is worth specifying that at the industry level, the trade unions which can sign agreements on behalf of all employees are exclusively the "most representative unions". This status depends on support in the works council elections. At the national level, a confederation must get 10% of the votes, while in the autonomous regions the threshold corresponds to 15%.

The CEM replaced the former *Acuerdo Estatal del Sector del Metal* (AESM), which though lacked the rank of statutory collective agreement. The CEM was intended to put a bargaining structure, comprising 62 provincial sectoral collective agreements and more than 600 company-level collective agreements, in order. The CEM's main objective was to strengthen and defend the role of provincial collective bargaining, especially in the light of a very heterogeneous sector, which is particularly exposed to fragmentation and the interference of older and new economic sectors as well as new ways of articulating employers' collective interests (cluster, multi-services, outsourcing, etc.). The CEM established that the following matters are the responsibility of national-level collective bargaining: trial period; ways of collective bargaining; job classification systems; maximum annual working day; disciplinary regime; minimum standards in the field of occupational risk prevention; and geographical mobility. Among the issues regulated by the first CEM, there is the responsibility of provincial collective bargaining to set forth minimum wages that should be guaranteed to all workers in the sector irrespective of the existence of collective agreements at lower levels. This provision was particularly important as, following the financial and economic crisis, legal reforms of 2011 and 2012 gave a greater role to company-level collective bargaining, in the sense that they gained complete precedence in key areas (e.g. wages, working hours, work-life balance, etc.) irrespective of the existence and validity of provincial-level agreements covering the industry⁸. A second CEM was signed by trade unions and Confemetal on March 24, 2017 and then published in the Official State Gazette (BOE) on June 19, 2017.

According to Eurofound, Spain has a high collective bargaining coverage rate, which is close to 90%. Conversely, company agreements covered around 7% of all workers, covered by industry-level collective agreements in 2013⁹.

⁸ Worker Participation, National Industrial Relations, Countries, Spain, Collective Bargaining, <http://www.worker-participation.eu/National-Industrial-Relations/Countries/Spain/Collective-Bargaining> (accessed June 5, 2018).

⁹ Eurofound, Countries, Living and working in Spain, <https://www.eurofound.europa.eu/country/spain#collective-bargaining> (accessed June 5, 2018).

Sweden

There are two national collective agreements covering the metalworking sector in Sweden: one affecting white-collar workers and signed by Unionen (affiliated to the union confederation TCO) and the Association of Swedish Engineering Industries; the other affecting blue-collar workers and signed by IF Metall (affiliated to the union confederation LO) and the Association of Swedish Engineering Industries.

Overall, the key level for collective bargaining in Sweden is the industry level. In Sweden, there is no statutory minimum wage; collective agreements and individual labour contracts are the only instruments establishing how much a worker should be paid for the work performed. The Swedish model of industrial relations, that relies heavily on collective bargaining and scantily on the role of legislation, holds in a high union membership rate (about 70% of Swedish workers are affiliated to a trade union) and a high collective bargaining coverage (around 90% of workers). Agreements are legally binding on the signatories and their members. The obligation to maintain industrial peace applies during the term of the collective agreement. The peace obligation means that industrial action may not be resorted to for the purpose of changing the agreement or obtaining benefits that are not included in the agreement. During negotiations for a new agreement, industrial action is allowed. Industrial action must be duly approved by a trade union organisation in order to be regarded as permissible.

National industry-level collective agreements regulate pay issues and general conditions of employment (e.g. topping up sick pay, compensation for accidents or pension levels that exceed state provision, etc.). Besides the industry level, collective bargaining often takes place also at the “local” (i.e. company) level: at this level, company representatives and union representatives (i.e. either the local union club in large companies, or union representatives at the local branch in smaller companies) sign agreements that can regulate any issue (e.g. training, introduction of new technology) following the rules set by law and at the higher levels of negotiation; wage negotiations generally take place at both central and local level, where trade unions usually get a substantial increase of workers’ pay in addition to the centrally agreed rises. However, with specific regard to the metalworking sector, mainly due to considerable increases in wage costs and subsequently, employers’ demands for decentralisation in the latest decades of the twentieth century, the provisions on pay in collective agreements for blue-collar changed: from specific wage increases to a wage pool to be distributed among workers at the local level, by taking into consideration factors such as leadership capacity, judgement and power of initiative, economic responsibility, ability to cooperate, and inventiveness and creativity; accordingly, wage systems at the

workplace level should be designed in a way that makes them a driving force for the development of workers' competence and tasks (Ahlberg, Brunn, 2018).

Germany

German industrial relations can be ascribed to a centrally coordinated neo-corporatist model. This model includes a high degree of regulation through a comprehensive institutional infrastructure (Tüselmann, Heise 2000). It is characterised by a two-tier collective bargaining structure, comprising collective bargaining between employers' associations and trade unions at cross-company/industry level (normally at regional rather than national level) and negotiating processes between management and works councils at the company level. These negotiation levels are both determined by law and delimited from each other. At the cross-company level, collective agreements are concluded between trade unions and employers or employers' associations, which can be constituted in accordance with the principle of collective bargaining autonomy (*Tarifautonomie*). At company level, negotiations between employee representatives and management are legitimised under the Works Constitution Act (*Betriebsverfassung*); in addition, works agreements can be concluded between these parties (Müller-Jentsch, 2017). The right for collective bargaining is assigned to employers' associations and single employers on the one side and trade unions on the other side. Works councils are not allowed to negotiate over matters that are already regulated by collective bargaining, such as pay rates, unless there is an explicit opening clause in the industry-level collective agreement. Once collective agreements have been concluded, they have the force of law, which means that their provisions cannot be undercut and there is a strict peace obligation during their period of validity. Additionally, the agreements can be declared as generally binding to all companies in an industry by the Ministry of Labour, irrespective of whether they are members of employers' associations or not. Furthermore, the state provides a dense legislative framework on the conduct of industrial conflict (Tüselmann, Heise, 2000).

The German collective bargaining system has though come under pressure as the coverage of industry-level agreements has fallen: the proportion of all employees in West Germany covered by industry-level agreements fell from 70% in 1996 to 52% in 2013, according to IAB figures; latest results show that in 2017, 46% of employees (and 73% of companies) are covered neither by industry-level collective agreements nor company-level ones (Kohaut, 2018). This downward trend, whose extent though varies with industry and company size, is in part a result of employers leaving employers' federations, or alternatively staying in them without being bound by the agreements they sign (so-called OT

membership), as well as by the fact that new companies (which are less likely to be bound by industry-level agreements) emerge and existing ones disappear¹⁰.

Table 3

	Germany	Italy	Spain	Sweden
Collective bargaining in the metalworking sector	<p>Industry-level collective bargaining is the core of the system. It takes place at the regional level. Works agreements can be reached by companies and works councils at company level on “integrative” issues.</p> <ul style="list-style-type: none"> - Peace obligation during the validity of a collective agreement. - Declining CB coverage, due to firms leaving employers’ associations or staying in them without being bound by the agreements they sign 	<p>There are 6 NCLAs, signed by FIM-CISL, FIOM-CGIL and UILM-UIL, covering the metalworking sector. However, the most popular is the NCLA Federmeccanica.</p> <ul style="list-style-type: none"> - No <i>erga omnes</i> efficacy of NCLAs. - A two-tier CB structure (national + territorial/company level). - A problem of vertical coordination between levels and CB governability. - Sectoral CB coverage would be about 80/85%, while company-level CB coverage does not generally exceed 35% 	<p>There’s 1 NCLA covering the sector: the National, Industry, Technology and Metalworking Sector Services Agreement (CEM).</p> <ul style="list-style-type: none"> - <i>Erga omnes</i> efficacy of collective agreements. The CEM is published in the Official State Gazette. - Three-tier CB structure (national + provincial + company level) - Labour reforms of 2011/2012 allowed company-level collective agreements to deviate from standards set by higher-level ones 	<p>There are 2 NCLAs in the sector: one signed by IF Metall for blue-collars; another signed by Unionen for white-collars.</p> <ul style="list-style-type: none"> - Two-tier CB structure: national + local (company) level. Local-level agreements can regulate any issue following the rules set by law and national-level CB. - High CB coverage: about 90%

¹⁰ Worker Participation, National Industrial Relations, Countries, Germany, Collective Bargaining, <http://www.worker-participation.eu/National-Industrial-Relations/Countries/Germany/Collective-Bargaining> (accessed June 5, 2018).

2.3. Workplace representation

Italy

As previously mentioned, a peculiarity of the industrial relations system in Italy is the high degree of voluntarism and the abstention of the law. Within this framework, the only broad-ranging law that provides principles and rules in the area of employees' rights is the Workers' Statute, passed in 1970. It establishes the employees' right to elect workplace representatives and freely exercise union rights in companies with more than 15 workers (Leonardi, 2017). Below that threshold, there is no right or obligation to elect union representatives. Notably, according to the Workers' Statute, it is the unions who are signatories to the collective agreement applied in the company that have the right to appoint the members of the RSA, the original form of trade union representation at company level. Even though the RSA continues to exist in some sectors (e.g. banking and insurance), since 1993 social partners have agreed to set up the new structure, RSU, which represents a unified committee for all the unions in the workplace with members elected by the whole workforce. It is important to state that «whether workers are represented through RSUs or RSAs, it is the trade unions that play the central role. Although RSUs are elected by the whole workforce, they remain primarily union committees»¹¹. Once set up, the RSU has both participatory and bargaining rights.

Given this common framework, details can be negotiated by social partners in different sectors. As far as the metalworking sector is concerned, an agreement was reached on November 24, 2016 by FIM-CISL, FIOM-CGIL and UILM-UIL regarding the functioning of the RSUs and democracy at workplaces. Besides confirming the rules established by the confederations, the agreement for the metalworking sector establishes that: bargaining rights at company level are acknowledged to both RSUs and local trade union federations; the referendum represents the tool for the approval of union platforms and the delegation of bargaining powers to the RSU; the RSU decisions are made by majority; it is possible to elect RSAs (with a one-year mandate) only in specific cases (e.g. in newly unionised companies) before setting up the RSU. Health and safety representatives (RLS) and their rights are set forth by law, after the transposition of the EU directives. Accordingly, the RLS have the legal right to access workplaces, receive all documentation concerning risk assessment and prevention measures, and call in the authorities if the prevention/protection measures are not

¹¹ Worker Participation, National Industrial Relations, Countries, Italy, Workplace Representation, <http://www.worker-participation.eu/National-Industrial-Relations/Countries/Italy/Workplace-Representation> (accessed June 5, 2018).

adequate. Alongside the RLS and the RSU, other interesting bodies are represented by joint committees, which may be established via collective bargaining and aimed at promoting non-confrontational relations and dealing with specific issues.

Spain

In Spain there is a dual-channel system of employee representation in workplaces. Particularly, elected delegates (in companies with more than 10 employees) or elected works councils (in companies with more than 50 employees) represent the main channel of workplace representation; however, the law also gives a specific role to the unions in workplaces via either the establishment of trade union sections, which gather all union members and are aimed at discussing and promoting union policies in the workplace, or the appointment of trade union delegates in companies with more than 250 employees. Importantly, in practice both elected employee delegates and works councils are dominated by unions: they are largely proposed by UGT and CCOO. «The tasks attributed to works councils cover information and consultation, the provision of limited protection for individual employees, the monitoring of the application of certain labour regulations, and the control of social facilities at the workplace – provided certain conditions are met»¹²; plus, unlike works councils in Germany, works councils in Spain are also involved in collective bargaining. Trade union delegates can also conduct collective bargaining provided they have a majority on the works council. Overall, the relationship between the trade union sections and the works council varies depending on the strength of the union in the workplace.

Sweden

Workplace representation for employees in Sweden is through the local union at the workplace. The legislation, which gives unions consultation and negotiation powers at the workplace, is the 1976 Co-Determination at Work Act (MBL). It sets forth the right of association, the right and obligation to negotiate (which is basically the right of union representatives to be informed and consulted before the employer makes a decision regarding “significant changes”, such as the introduction of a new organisational model, downsizing, hiring of a new manager, etc.), the right to information, peace obligation after a collective agreement is

¹² Worker Participation, National Industrial Relations, Countries, Spain, Workplace Representation, <http://www.worker-participation.eu/National-Industrial-Relations/Countries/Spain/Workplace-Representation> (accessed June 6, 2018).

signed, the unions' right to veto over the engagement of subcontractors, the right of unions to use consultants at the companies' expenses when closures or major changes occur. Some of the provisions of the Co-Determination at Work Act are semi-discretionary, which means that they may be derogated or supplemented by collective agreements (subsequently, called "co-determination agreements").

According to the Swedish Work Environment Act (1977), employers and employees shall cooperate on work environment issues. Cooperation in this field takes the form of Safety committees (composed of company representatives and employees' representatives in companies with at least 50 employees and in smaller companies if employees request it), in charge of planning work environment measures, and Workers' safety delegates (normally appointed for three years by the local labour union) with the task of ensuring that the employer respects standards as regards work environment.

Germany

In Germany, works councils provide representation for employees at workplaces with at least five workers. Although not formally union bodies, union members normally play a key role in works councils; plus, works councils are often supported by trade unions in form of advice and training. IG Metall was represented in 10,380 companies with a total of 52,530 works councils' members in the 2014 elections (Müller-Jentsch, 2017). Works councils have substantial powers in social, personnel and economic matters. These range from mere information to enforceable co-determination rights, particularly in the social sphere (mainly regarding disciplinary rules; starting and finishing times and breaks; any temporary shortening or lengthening of working time – such as overtime or short time working; holiday arrangements; the principles used for the payment of wages and salaries – for example, should they be based on bonus or time work; the setting of bonuses and targets; the time, date and method of payment; the introduction of cameras or other devices to measure work or check the behaviour of employees; the arrangements for the operation of works institutions like canteens or sports grounds; the operation of the works suggestions scheme and the introduction of group work). Over these issues, decisions cannot be taken against the wishes of the works council. By law, works councils should normally not be involved in collective bargaining on issues, such as pay or working time, which are dealt with by the unions. However, recently works councils have had a greater role in these issues, since, as previously mentioned, some agreements include "opening clauses", which allow the works council and

local management to agree variations to the solutions reached by the union and the employers' association at industry level¹³.

Health and safety committees should be constituted in all workplaces with more than 50 employees and in some with between 20 and 50 employees. Members of the works council take part in the meetings of the safety committee. In companies with more than 100 permanent employees, the law requires the establishment of another body, the economic committee, which is generally consulted on economic and financial issues. This committee is chosen by the works council, and in certain circumstances the works council can decide to do without an economic committee, and directly take over its functions¹⁴.

Finally, trade unions are also represented in the bigger companies by shop stewards, who are elected there by the trade union members. In 2012, IG Metall was represented by around 50,000 shop stewards in 2120 companies (Müller-Jentsch, 2017).

Table 4

	Germany	Italy	Spain	Sweden
Workplace labour representation in the metalworking sector	<ul style="list-style-type: none"> - In companies > 5 employees: a works council (only formally independent from unions) is elected and endowed with a wide range of powers (from information to co-determination on social issues). - In companies > 50 	<ul style="list-style-type: none"> - In companies > 15 employees: a unitary workplace union structure, named RSU, can be established and endowed with bargaining rights; its members are elected among union candidates. - Health and safety representatives 	<ul style="list-style-type: none"> There's a dual-channel system of employee representation. - In companies > 10 employees: an employee delegate (only formally independent from unions) can be elected. - In companies > 50 employees: works council (only formally independent 	<ul style="list-style-type: none"> - Union-base employee voice at the workplace level. Union representatives are endowed with a range of rights: the right of association, the right and obligation to negotiate when "significant changes" occur, the right to information, the

¹³ Worker Participation, National Industrial Relations, Countries, Germany, Workplace Representation, <http://www.worker-participation.eu/National-Industrial-Relations/Countries/Germany/Workplace-Representation> (accessed June 6, 2018).

¹⁴ Worker Participation, National Industrial Relations, Countries, Germany, Workplace Representation, <http://www.worker-participation.eu/National-Industrial-Relations/Countries/Germany/Workplace-Representation> (accessed June 6, 2018).

	employees: there is a health and safety committee. - In companies > 100 employees: an economic committee can be established. - In bigger companies, trade unions can be represented by shop stewards	(RLS) and their rights are set forth by law. - Joint labour- management committed can be established via CB and generally deal with specific, “integrative” issues	from unions) can be established and provided with bargaining rights. Moreover, trade union sections (gathering all union members) can be found in workplaces and in companies with more than 250 employees, also trade union delegates can be elected	right to veto over the engagement of subcontractors, the right to use consultants at the companies’ expenses when closures or major changes occur. Moreover, safety labour- management committees and safety workers’ delegates (appointed by unions) deal with work environmental issues
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2.4. Participation rights

Italy

With specific regard to employee participation in Italy, it is essential to mention that although Article 46 of the Constitution is dedicated to workers’ right to collaborate in the management of enterprises, in the ways and within the limits established by law, it never materialized. The reasons behind this condition have been regarded as both semantic and political. On the one hand, the deployment of the expressions “to collaborate” and “in harmony with the needs of production” were interpreted as too close to the Fascist corporatist ideology of idyllic labour-capital relations. On the other hand, the public registration of trade unions as a precondition for signing *erga omnes* collective agreements was also perceived as a legacy of the former regime. Since then, some participatory practices in workplaces have just been established via collective agreements. Nevertheless, any attempt to build any formal system of employee participation in Italy has always failed, probably due to the variety of cultures and objectives (e.g. CISL’s scepticism towards the intervention of the law in industrial relations, CGIL’s

original reluctance for board-level employee representation, the hostile attitude of employers' organisations)¹⁵.

Spain

Except a small number of employees on the boards of some public companies (following a national agreement signed in 1986), there is no overall right to employee board-level representation in Spain.

Sweden

Employee representation at board level is very widespread in Sweden. Under the 1987 Act on Board Representation for Employees in Private Employment, employees in companies with more than 25 employees have the right to elect two board members and two deputy members (three board members and three deputy members can be elected in companies with more than 1,000 employees). The employee representatives, however, can never be in the majority. The employee representatives on the board are chosen by the local union with which the employer has a collective agreement. On most issues, board members representing employees have the same rights as those representing the shareholders of the company. However, they cannot take part in discussions related to collective bargaining or industrial action, or other issues where there is a clear conflict of interest between the company and the union¹⁶.

Germany

Employee representatives have a right to seats on the supervisory board of larger companies – one-third in companies with 500 to 2,000 employees (where employee representatives are company employees and elected by all employees), half in companies with more than 2,000 (where employee representatives are nominated directly by the unions and are usually union officials, even though they are elected by all employees). A special form of corporate codetermination can be found in companies in the coal and steel industry since the Supervisory Board is equally composed of representatives of the capital side and representatives of the

¹⁵ For more in-depth knowledge on employee participation in Italy, see: Leonardi, 2015.

¹⁶ Worker Participation, National Industrial Relations, Countries, Sweden, Board-level Representation, <http://www.worker-participation.eu/National-Industrial-Relations/Countries/Sweden/Board-level-Representation> (accessed June 6, 2018).

employees. This form of co-determination provides the most extensive rights to employee representatives, but it has lost much of its importance over time because these sectors have been shrunk considerably over the last decades (Müller-Jentsch, 2017).

Table 5

	Germany	Italy	Spain	Sweden
Participatory rights in the metalworking sector	In companies > 500, employee representatives have a right to seats on the supervisory board	<ul style="list-style-type: none"> - Article 46 of the Constitution, dedicated to workers' right to collaborate in the management of enterprises, never materialised. - Participation practices can be introduced via industry-level or company-level CB 	No rights to employee board-level representation	In companies > 25, employees have the right to elect two board members and two deputy members (in companies > 1,000, employees can elect three board members and three deputy members)

Section 3.

Overview of the perspectives of trade unions and employers' associations in the metalworking sector on Industry 4.0

3.1. Trade union perspectives

The perspectives of trade unions in the metalworking sector on Industry 4.0 are quite homogeneous across the European countries considered in this research. As national reports regarding Italy, Sweden, Germany and Spain, drafted within the framework of the SUNI (Smart Unions for New Industry) project, demonstrate, trade union organisations generally exhibit a proactive behaviour towards the challenge of Industry 4.0: more specifically, they tend to consider Industry 4.0 as something that could have positive effects, something that could open up opportunities for developing the content of work and improving its environment. Trade unions appear to be well aware that the foundations for good wages and working conditions, and subsequently for better jobs and improved rights can lay in technological innovation and in a positive process of change.

However, this bright future perspective cannot be realised without conditions: as the comparative analysis shows, trade unions' main idea is that in order to successfully shape the future of work in an Industry 4.0 era, they don't have to infringe their traditional roles and responsibilities. In Italy, for example, despite the ideological differences still existing between the three main trade union confederations, on March 13, 2017, CGIL, CISL and UIL drafted and published a document entitled *An Italian way to Industry 4.0 that takes inspiration from the most virtuous European models (Una via italiana a Industria 4.0 che guardi ai modelli europei più virtuosi)*, where they expressed the urgency to adequately manage employment dynamics in relation to technological transformations, re-skill and up-skill workers so as to allow them to keep the pace with these innovations, design and spread flexible working time solutions and measures for a better work-life balance, develop company-level collective bargaining to boost productivity and further stimulate employee participation not only at the organisational but also strategic level. The most important instrument trade unions have at their disposal to reach this objective is traditionally collective bargaining

and, within an Industry 4.0 scenario, Italian unions affirm that they need to anticipate the times when negotiating with managers and engage in what has been called as “contrattazione d’anticipo”, which means for unions to stay one step ahead and bargain with management not only over the effects of technological innovations but also before the introduction of those new technologies in workplaces. This concept, particularly advanced by CGIL, appears to be coherent with CISL’s emphasis on employees’ and their representatives’ participation, conceived as a vehicle to discuss and share with management not only the economic gains from production but also strategic objectives and decisions. Similarly, in Sweden, in March 2017, the largest trade union for industrial workers, IF Metall (which is affiliated to the confederation of blue-collar workers, LO), proposed a programme for future industrial work, which essentially welcomes technological development since underdevelopment is conceived as threatening the job security of union members. Therefore, IF Metall exhibits a positive view of Industry 4.0 and, like Italian union organisations, it supports the idea that unions should act as progressive and proactive participants in technological change and that collective bargaining can be a venue to strengthen workers’ employability and career development, thus ensuring a successful, sustainable transition to the new industrial context. Lifelong learning is pivotal in IF Metall’s discourse (accordingly, the union describes the worker of the future as a “practical theoretician and theoretical practitioner”, hence stressing the relevance of learning at work) as it is for Italian metalworkers’ organisations, which enshrined the so-called “individual right to training” in the 2016 renewal of one of the most representative national collective agreements in the sector. Interestingly, in its own programme for future industrial work (released in April 2017 during the trade union Congress), IF Metall calls for specific actions to be carried out by institutional players other than social partners, such as government. More specifically, IF Metall claims that government needs not only to continue developing its research and innovation policies through increased collaboration between industry, research institutes and universities, but also to make targeted investments that primarily encourage small and medium-sized industrial companies to develop products, services and business ideas via digital technology, new materials and climate-conscious production. Accordingly, the Italian metalworkers’ organisation UILM-UIL stresses the need of a new industrial policy project on Industry 4.0 that doesn’t leave workers behind, and advocates overcoming austerity policies. The afore-mentioned union approach can be found even in Germany, where IG Metall (the largest union federation affiliated to DGB and the largest representation of employees in the metal working sector) pursues the goal of anchoring a human-policy with a socio-technical mission in the change processes of companies, and in Spain, where UGT-FICA (Federation of Industry,

Construction and Agriculture General Workers) stresses the need of a fair transition to Industry 4.0, that should be guaranteed via a redistribution of companies' profits to the benefit of workers, in terms of increased wages, R&D policies, and more and better jobs.

Trade unions' willingness to proactively approach to Industry 4.0 is clearly reflected in the various actions and programmes that they have launched in all analysed European countries. Among others, the national reports drafted within the framework of the SUNI (Smart Unions for New Industry) project, shed light on: the IF Metall's programme for future industrial work (2017); the IG Metall's advisory board "Zukunft der Arbeit" (ZdA), composed of executive committees and works councils' members from companies in the metal and electrical industry as well as scientists and state secretaries; CGIL's project "Work 4.0", encompassing the online cooperative platform "Idea Diffusa" (gathering more than 200 experts to exchange views and materials) and an industrial committee (a community of about 99 experts in industrial policy willing to give advice and suggestions to CGIL); the CISL's so-called "Laboratorio Industria 4.0", launched in 2017 and primarily aimed at investigating the effects on workers and their conditions of the introduction of Industry 4.0-related technologies in some innovative workplaces, then deriving some suggestions and guidelines about future collective bargaining.

Finally, it must be noted that despite the general positive attitude towards Industry 4.0, there is no shortage of criticisms or concerns within the union movement. In Italy, for instance, the approach of the three confederations is not always perfectly embodied in all the sectoral federations adhering to CGIL, CISL and UIL: notably, as far as the metalworking sector is concerned, whereas FIM-CISL tends to interpret digital development as a chance for the union to renovate itself and play a crucial role in shaping the future of work, in FIOM-CGIL's website, some articles direct the attention also to the potential negative drawbacks of Industry 4.0, such as the increasing precariousness of employment contracts, the spread of an economy of gigs and the perspective of a digital Taylorism, the blurring of boundaries between work and life and subsequent pressures on workers (see, for instance, Mahnkopf, 2017). In Spain, UGT-FICA warns about another risk: that of an increasing gap between the ideal perspective of Industry 4.0 as triggering improved wealth and wellbeing and the actual, persisting problems of income and wage inequalities.

3.2. Employers' associations perspectives

As far as the employers' side is concerned, Industry 4.0 is generally conceived as a huge opportunity to boost competitiveness in different sectors, ranging from

manufacturing and services (HORECA, tourism, etc.) to agriculture and craft industry. However, some differences in terms of the degree of employers' associations commitment to the challenge and the content and targets of their discourse, can be found across the analysed countries.

German and Italian employers' associations emerge from the national reports as particularly engaged in the public debate on Industry 4.0. In Italy, the main goal of employers' associations would be to participate in Industry 4.0, by adequately assisting their affiliated companies. That is why, Federmeccanica, the main employers' association in the metalworking sector, has already organised different initiatives and projects connected to this issue. In 2015, it established a Task Force (called "Liberare l'ingegno", *Free the intelligence*), composed of managers, professors, and employers' representatives, and intended to accompany manufacturing companies in the path towards the full digitalisation; in 2016, it conducted a survey on a sample of 527 metalworking companies with the aim of investigating the degree of employers' awareness of Industry 4.0 and the level of introduction of new technologies in workplaces. Overall, thanks to the aforementioned initiatives, Federmeccanica started to acknowledge the need to raise companies' awareness of three main dimensions that need to be developed and connected to each other in an Industry 4.0 scenario: technologies, workers' skills and work organisation. As a result, Federmeccanica, with the support of the Task Force, has recently launched other two initiatives. Firstly, a website (<https://ricomincioda4.fondirigenti.it/>) has been created to gather articles, documents and information material on Industry 4.0, uploaded every 40 days and mainly targeted to employers and managers. Secondly, short videos, named "Industry 4.0 webcast", are regularly uploaded to Federmeccanica's website so as to make employers familiar with Industry 4.0 by looking at images and listening to the testimonies of some other employers and managers. Interestingly, Federmeccanica was the leading applicant of an EC co-funded project entitled "INDUSTRY4EU – Industry 4.0 for the future of manufacturing in Europe" (VS/2015/0327) and aimed at boosting social dialogue among European employers' associations on the issue. In Germany, the employers' association in the metalworking sector, Gesamtmetall, shares with Italian colleagues a very positive view of Industry 4.0, regarded as a huge opportunity for German industrial competitiveness; plus, it emphasises the outstanding importance of the qualification of employees and the relevance of flexible working regulations to enhance companies' performance. Therefore, Gesamtmetall has significantly contributed to the public debate on Industry 4.0, by criticising the Green Paper on Work 4.0 (produced in 2015 by the Federal Ministry of Labour and Social Affairs after a close dialogue with associations, trade unions, companies, research institutions, etc.) for focusing on workers' rights and largely neglecting the

employers' demands for flexibility in labour legislation. Gesamtmetall's approach thus ends up revealing a drawback of highly institutionalised employment regimes: the low degree of organisational flexibility and a quite rigid labour market (Regini, 2000). Within the Swedish context, the Association of Swedish Engineering Industries would seem to exhibit a proactive approach to Industry 4.0, as it has formulated a number of position papers and it has participated in several projects concerning the issue. Among others, the programme "Produktion2030", launched in 2013 with the financial support of VINNOVA (the Swedish Agency for Innovation Systems), the Swedish Energy Agency and the Swedish Research Council Formas, is mentioned, given its goal to make Sweden a frontrunner in investments in sustainable production by 2030 and given the involvement of the Association of Swedish Engineering Industries in many projects financed via this channel. However, as stressed in the Swedish national report, companies tend to compete with one another to keep the pace with digital transformation: this attitude is regarded as jeopardising the development and implementation of a common strategy, which individual employers could be oriented to.

In Spain, the discourse of employers' associations is particularly directed to government, which is asked to provide an industrial policy for the metalworking sector, capable to guarantee companies' survival and competitiveness even in the light of the challenges that internationalisation and digitalisation would bring. The peculiar condition of SMEs dealing with digital innovation is, instead, raised by the Italian employers' confederation Confapi, whose president has reminded that Industry 4.0 is not a panacea and that structural plans and strategic choices by government are demanded to allow also SMEs to embrace the digital transformation (for details, see: Confapi, 2018). Overall, the attention to the difficulties faced by Italian SMEs to keep the pace with technological innovation, the concerns expressed by Spanish employers about increasing international competition and dumping practices from third countries, and the Gesamtmetall's emphasis on the need to renew labour legislation in accordance with employers' demands for flexibility, contribute to shedding light on the various issues that despite the above-mentioned employers' positive stand on Industry 4.0, are still open and from the employers' perspective, need to be addressed to successfully embrace digital development.

Section 4.

The role of trade unions in Industry 4.0: the cases of FIM-CISL (Italy), IF METALL (Sweden), IG METALL (Germany) and UGT-FICA (Spain)

4.1. Brief overview of the national trade unions selected as case studies

4.1.1. Scope of representation

For the purposes of this report, the following are the metalworkers' organisations selected as case studies: FIM-CISL, the Italian Metalworkers' Federation, adhering to the Italian Confederation of Workers' Trade Unions (CISL), founded in 1950 after the split of the former General Italian Confederation of Labour (*Confederazione Generale Italiana del Lavoro*, CGIL); IG Metall emerged after the Second World War from the former German Metalworkers' Association, founded in Frankfurt am Main in 1891 and banned by Nazis; UGT-FICA, the Federation of Industry, Construction and Agriculture, adhering to the General Workers' Union (founded on August 12, 1888) and established after the merger of the former unions MCA (*Metal, Construcción y Afines de UGT*) and FITAG (*Federación de Industria y Trabajadores Agrarios de UGT*); and IF Metall, formed in 2006 by the merger of the Swedish Industrial Union (*Industrifacket*) and the Swedish Metalworkers' Union (*Metall*).

Though all representing workers employed in the metal industry, the above-mentioned trade unions exhibit different scopes of representation: for instance, whereas FIM-CISL operates in sectors such as aerospace and defence, motor vehicles and car parts industry, shipbuilding, household appliances, train units, ICT, electronics, semi-conductor products, machine tools, mechatronics and steel industry, the German IG Metall represents workers employed also in the textile, wood and plastics processing industry (following the integration of the Textile Clothing Union and the Wood and Plastics Union at the end of the 1990s). Quite similarly, the Swedish IF Metall operates in a variety of sectors, including mechanical engineering and the plastics industry, the building material industry, the mining sector, the ironworks sector, the textile industry, automobile repair shops, etc. Conversely, UGT-FICA extends its scope of representation beyond industrial sectors, up to include agriculture and construction. Plus, whereas IF

Metall represents only blue-collar workers in the afore-mentioned sectors, FIM-CISL, IG Metall and UGT-FICA represent also white-collar workers. Both IG Metall and UGT-FICA are open to self-employed members, and the Spanish federation organises also workers who are members of co-operatives, students in vocational training, and early pensioners. Pensioners are also represented by IF Metall and IG Metall.

Given these differences in the scope of representation, membership data varies from 225,422 workers affiliated to FIM-CISL (2015 data), to 2,270,000 members of IG Metall (2015 data); conversely, IF Metall represents around 313,000 workers (66,500 are pensioners), standing for the large majority of all blue-collar collars in the sectors. Interestingly, IG Metall membership fees (amounting to one percent of gross monthly income) are described as tax-deductible under income-related expenses.

4.1.2. Organisational structure

All trade unions selected as case studies in this research, adhere to national confederations (FIM-CISL adheres to CISL; IG Metall adheres to DGB; IF Metall adheres to LO; UGT-FICA adheres to UGT), though benefitting from political and organisational autonomy. Moreover, the four trade unions are affiliated to international organisations, such as industriAll Europe at the EU level, and IndustriALL Global Union at the international level, which are venues for international trade union cooperation. FIM-CISL, IF Metall, IG Metall and UGT-FICA are all vertically organised, which means that they are articulated in territorial and regional structures. For instance, the structure of IG Metall is divided into three levels (regional, district and federal); IF Metall is also articulated in regional branches, composed of members and clubs (company-level union structures) of one or more municipalities or local communities; the backbone of UGT-FICA is represented by autonomous region federations, which in turn gather provincial, inter-district, district and island unions. Like the above-mentioned unions, FIM-CISL is articulated in regional and territorial federations, whose actions must be oriented towards regional and territorial confederations in a spirit of collaboration, though maintaining their political, organisational and administrative autonomy.

At the national level, these union organisations consist of some important decision-making bodies: a Congress (the highest decision-making body) and a National Committee (leading the activities of the union between congressional meetings) are mentioned in the case of IF Metall; as far as FIM-CISL is concerned, besides a National Congress and a General Council, an Executive Committee (entitled to implement the decisions made by the General Council), a

National Secretarial Body (in charge of ensuring the normal functioning of the federation), a Statutory auditors' board (ensuring the administrative control of FIM-CISL) and a board of probiviri (ensuring the respect of the Statute) are listed. The composition of the organisational structure of all analysed trade unions is decided upon a complex democratic process, which usually starts at the lower levels with meetings/assemblies of members in workplaces or geographical areas and concludes in the national trade union congress, with the election of the national secretary.

4.1.3. Values and mission

All analysed trade unions have similar missions. They all work for the interests of their members in the workplace and society, for the promotion of a democratic and equal society (as stressed by IF Metall, UGT-FICA and IG Metall) and for the development of the human personality via the satisfaction of its material, intellectual and moral needs (as in the case of FIM-CISL). Interestingly, the General Secretary of FIM-CISL, Marco Bentivogli, has recently stressed some essential features of workers' representation, including: the ethical dimension of trade unionism, as an organisation which promotes social, moral and democratic values in society; the human-centred perspective of collective action, intended to promote human wellbeing and development; the concept of sustainability in industrial relations against a short-term approach aimed at avoiding contingent problems; the principles of solidarity and cooperation against the affirmation of an individualistic society (Bentivogli, 2016). Solidarity is also emphasised by UGT-FICA, which is quite uniquely committed to struggle against labour precariousness.

Some concepts underpinning trade unions' mission and identities are: autonomy from all external powers, whether they be economic, political or cultural (a value emphasised by both FIM-CISL and IG Metall, whereas the relationship between LO, the confederation which IF Metall is affiliated to, and the Social Democratic Party is more complex, since LO has a representative on the party's executive committee elected by the party's congress); collective bargaining as the main method of all trade unions' action; and participation, that in the form of co-determination is particularly stressed by IG Metall, and in the form of workers' involvement in decision-making processes at company level is highlighted by FIM-CISL. The latter organisation embodies a further relevant principle inherent to CISL's identity, that contributes to distinguish it from the other most representative trade union confederation in Italy, CGIL. The reference is to associationism, founded on the belief that the trade union is made through the will of workers and composed only of those workers who join the organisation as

members, thus directly contributing to the definition of the trade union directives. This concept is at odds with the *logic of class* embodied by CGIL, which traditionally makes little distinction between members and non-members and acts as representative of the whole working class.

All the above-mentioned trade unions are responsible for collective bargaining, advancing and defending workers' interests in workplaces (e.g. occupational health and safety, gender equality, increased wages, etc.) and providing services to workers (e.g. legal consultancy or, as regards IG Metall, financial support in cases of industrial action).

Table 6

	IG Metall (emerged after the Second World War from the former German Metalworkers' Association, which was founded in Frankfurt am Main in 1891 and banned by Nazis)	FIM-CISL (the Italian Metalworkers' Federation, adhering to the Italian Confederation of Workers' Trade Unions, CISL, founded in 1950 after the split of the former General Italian Confederation of Labour, CGIL)	UGT-FICA (the Federation of Industry, Construction and Agriculture, adhering to the General Workers' Union, UGT, which was founded on August 12, 1888)	IF Metall (formed in 2006 by the merger of the Swedish Industrial Union, Industrifacket, and the Swedish Metalworkers' Union, Metall)
Scope of representation	IG Metall represents blue-collar and white-collar workers employed not only in the metalworking sector but also in the textile, wood and plastics processing industry (following the integration of the Textile Clothing Union)	FIM-CISL operates in sectors such as aerospace and defence, motor vehicles and car parts industry, shipbuilding, household appliances, train units, ICT, electronics, semi-conductor products, machine tools, mechatronics	UGT-FICA extends its scope of representation beyond industrial sectors, up to include agriculture and construction. It represents both blue-collar and white-collar workers. It is open to self-employed	IF Metall operates in a variety of sectors, including mechanical engineering and the plastics industry, the building material industry, the mining sector, the ironworks sector, the textile industry,

	and the Wood and Plastics Union at the end of the 1990s). It represents also self-employed and pensioners	and steel industry. It represents both blue-collar and white-collar workers	members.	automobile repair shops, etc. It represents only blue-collar workers. It organizes also pensioners
Organisational structure	<ul style="list-style-type: none"> - All trade unions adhere to a national confederation, though maintaining their autonomy; plus, they are affiliated to international union organisations - They are all articulated in territorial and regional branches - The composition of decision-making bodies at the national level is generally decided upon a long, complex democratic process, which starts at the lower levels and concludes in the national trade union congress 			
Values and mission	<ul style="list-style-type: none"> - All analysed unions have similar missions: to work for the interests of their members, promote a democratic and equal society, support the development of the human personality (see particularly FIM-CISL) - Some important concepts in unions' identity are: autonomy from external powers (although the Swedish confederation LO has a complex relationship with the Social Democratic Party); collective bargaining; workers' participation 			
Core activities	All the above-mentioned trade unions are responsible for collective bargaining, advancing and defending workers' interests in workplaces, and providing services to workers			

4.2. Trade union discourses

In order to illustrate the trade unions' discourse on Industry 4.0 and to identify influencing factors in the debate, the approach of the SWOT analysis is used. As clearly explained in the German national report, the central idea behind the SWOT analysis is to combine promoting and inhibiting internal and external factors of a situation in order to analyse possible strategies to pursue a specific goal. A common pitfall when it comes to SWOT analysis is the missing declaration of a target situation. Therefore, the topic at hand is the description of an objective with regard to the unions' position towards Industry 4.0. In the case of FIM-CISL, the goal is «to anticipate change so as to be protagonist in designing the new digital ecosystem in a way that places the worker at the heart of this transformation»¹⁷. With regard to IG Metall, the challenges mainly regard two levels: the strategic influence of the union on labor policy topics in politics and

¹⁷ As revealed by FIM-CISL's General Secretary when interviewed for this report. The interview was conducted on March 21, 2018.

research; and the operative provision of competence for workers' representatives to strengthen co-determination in Industry 4.0 on the company level. As stated by Susanne Kim, the head of the development department of IG Metall, the union «wants to make further progress from a good support union to a successful development union». In Sweden, IF Metall wants to act as a progressive and proactive participant in technological change so as to counter the threat of layoffs and job reductions due to technological underdevelopment, thus ensuring a good level of union membership and strengthening workers' employability and career development via collective bargaining. Finally, in Spain, UGT-FICA wants to promote a fair transition to Industry 4.0, via a fair redistribution of companies' profits that should benefit workers, in terms of increased wages, R&D policies and more and better jobs.

The aim of the SWOT analysis is thus to identify relevant constellations to pursue these goals.

4.2.1. Strengths

Main internal drivers or strengths in analysed trade unions, that have been found with more emphasis in Italy, Sweden and Germany, are: i) a good knowledge of Industry 4.0 and an idea on how to tackle it; ii) an approach to Industry 4.0 that considers it not merely as a technological phenomenon, conversely as a human and social one; iii) a proactive role of the union in the public debate on Industry 4.0, in order to drive the direction of change; iv) training activities and qualification programmes targeted to workers' representatives in order to enable them to act in an Industry 4.0 scenario; v) fruitful relationship with other relevant players (e.g. research centers and experts, employers' associations, companies, politics and institutions, etc.).

High membership data is regarded as an internal union strength by IF Metall whose density stands for approximately 80%.

4.2.2. Weaknesses

As emerged in the national reports, internal weaknesses likely to jeopardise the achievement of unions' goals are mainly related to: declining membership rates and the difficulty to organise young people (stressed by all unions except IF Metall); the quite general low level of education and skills in trade unions' members (particularly emphasised by IF Metall and UGT-FICA). IF Metall points out also a slow decision-making process due to the traditional hierarchical organisational structure; IG Metall stresses the below-average labour

representation in SMEs; UGT-FICA warns about the increasing gap between (declining) membership data and (quite steady) collective bargaining coverage in Spain, thus suggesting that a problem of internal union legitimacy does exist. As previously mentioned, the latter issue has been recently highlighted by Mundlak (2016, 2017) in his description of so-called “hybrid systems of industrial relations”.

4.2.3. Opportunities

With reference to external conditions potentially favouring the achievement of union objectives in relation to Industry 4.0, the national reports generally mention: i) the benefits that Industry 4.0 potentially brings to economy, labour and society (e.g. safety at work, better working conditions, new opportunities for workers’ training and career development; among others, job security is particularly emphasised by IF Metall); ii) a favourable political constellation at governmental level and subsequently, public policy choices focused not only on technological development but also on labour issues; iii) assertiveness and pervasiveness of results from collective bargaining (mainly stressed by IF Metall and IG Metall).

4.2.4. Threats

External threats, highlighted in all analysed countries, generally concern: i) an unfavourable political constellation at governmental level and the scant institutional involvement of trade unions in outlining national strategies for Industry 4.0 (particularly highlighted by UGT-FICA); these hypotheses could result in a poorly implemented Industry 4.0 scenario, where managerial control is enhanced and workers’ pressures increase; ii) gaps in workers’ representation and collective labour regulation (e.g. multiplication of trade unions and employers’ associations, engendering social and pay dumping via collective bargaining, as in the case of Italy; regulation “blind spots” due to the emergence of new and hard-to-organise workers, as explained in the German national report; decentralisation trends in collective bargaining weakening the role of NCLAs in guaranteeing equal conditions). IF Metall points out the risk of a white-collarisation of workforce.

Table 7

Internal origin	Strenghts	Weaknesses
	<ul style="list-style-type: none"> i) A good knowledge of Industry 4.0 and an idea on how to tackle it ii) An approach to Industry 4.0 that considers it not merely as a technological phenomenon but also as a human and social process iii) A proactive role of unions in the public debate on Industry 4.0, oriented to drive the directions of change iv) Already initiated training activities and qualification programmes targeted to workers' representatives v) Fruitful relationships with other relevant players (e.g. research institutes, employers' associations, companies, public authorities) 	<ul style="list-style-type: none"> i) Declining membership rates (all unions except IF Metall) and the difficulty to organise young workers; partly related is the increasing gap between membership rate and collective bargaining coverage (UGT-FICA) ii) The quite general low level of education and skills in trade unions' members (IF Metall, UGT-FICA)
External origin	Opportunities	Threats
	<ul style="list-style-type: none"> i) The benefits that Industry 4.0 potentially brings to economy, labour and society ii) A favourable political constellation at governmental level and public policy choices, focused not only on technological development but also on labour issues iii) Assertiveness and pervasiveness of the results from collective bargaining (IF Metall, IG Metall). 	<ul style="list-style-type: none"> i) An unfavourable political constellation at governmental level ant the scant institutional involvement of trade unions in decision-making processes on Industry 4.0 (UGT-FICA) ii) Gaps in workers' representation and collective labour regulation (e.g. multiplication of signatory parties and NCLAs (FIM-CISL); regulation "blind spots"; decentralisation trends at the expense of NCLAs) iii) A white-collarisation of workforce (IF Metall)

4.3. Trade union actions

4.3.1. Research (and Development)

All the analysed trade unions, except the Spanish UGT-FICA, are involved in research activities linked to Industry 4.0. However, the content of these activities considerably varies across the four European countries. Indeed, the Italian FIM-CISL has been mainly involved in qualitative researches on the impact of organisational and technological innovation on workers and their conditions. On the one hand, it commissioned an empirical (action-)research, conducted by a team of lecturers and experts from the Polytechnic of Milan and Turin, on the effects of the methods of World Class Manufacturing (combining lean manufacturing and Total Quality Management), applied in 30 establishments of the group FCA (Fiat Chrysler Automobiles) and CNHI (Case New Holland Industrial) since 2006, on work and workers' conditions (Various Authors, 2015). On the other hand, FIM-CISL has recently contributed to gathering data and information for a research conducted within the framework of the above-mentioned "Laboratorio Industria 4.0" and aimed at investigating the impact on work of the implementation of Industry 4.0-related technologies in 24 Italian companies.

By contrast, both IG Metall and IF Metall have engaged in more concrete research and development projects, that involve also companies and employers' associations. The former organisation, for instance, was a partner in a project named "APPsist" (2014-2016), funded by the Ministry of Economics and led by the Educational Technology Lab at the German Center for Artificial Intelligence (DFKI, founded in 1988 as a non-profit public-private partnership), aimed at developing an intelligent, adaptive, mobile and context-sensitive assistance system, which uses augmented and virtual reality technologies alongside the methods of artificial intelligence to enable workplace-centred information, knowledge and expertise management when using cyber-physical systems in the digitally networked factory of the future (Reuter et al., 2017). Similarly, IF Metall engages in a close dialogue with the Association of Swedish Engineering Industries, companies and research institutes, within the framework of the Strategic Innovation Programme "Produktion2030", supported by VINNOVA (the Swedish Agency for Innovation Systems), the Swedish Energy Agency and the Swedish Research Council Formas, and intended to collect ideas, relevant players and funding opportunities to create valuable solutions for the future manufacturing industry. Plus, in 2005 IF Metall, along with the Association of Swedish Engineering Industries, one research institute and six universities, launched a comprehensive national programme, named "The production lift" and aimed at introducing lean production in SMEs in a very responsible manner, by

encouraging skills development and creating a good work environment. Finally, IF Metall participates in the Smart Production Project in Manufacturing and Processing Companies, initiated by Blekinge county council and funded by the European Regional Fund. The project is intended to bring together traditional manufacturing companies and ICT firms, thus fostering digitalisation of production.

4.3.2. Communication and dissemination directed to workers and public opinion

The topic of Industry 4.0 was embedded in many union campaigns and communication initiatives held by the analysed trade unions and usually targeted to workers and union members. The objective of these activities seems to be two-fold: firstly, to raise the rank-and-file's awareness of Industry 4.0, thus ensuring internal legitimacy for union action in this field; secondly, to show union proactive attitude towards Industry 4.0 and search for external recognition. For instance, both FIM-CISL and UGT-FICA organise conferences and seminars that bring together employers, researchers and unionists in a view of exchanging opinions and strategies to address the future of work. In addition, both FIM-CISL and IG Metall rely on mass media and the Internet to promote their initiatives and raise people's awareness on Industry 4.0. Interestingly, some communication initiatives can be exclusively addressed to union members. This is the case of official union internal meetings (i.e. General Council's meetings, Congresses), organised by several local structures of FIM-CISL in the form of conferences, workshops and seminars where both trade unionists and local stakeholders (e.g. entrepreneurs, representatives of employers' associations, researchers, etc.) are invited to discuss Industry 4.0-related aspects and their impact on territories and companies.

Finally, the Swedish IF Metall has directed a communication initiative to young students, in an attempt to increase the attractiveness of technical professional careers and disseminate knowledge on industrial digitalisation across young people. The initiative is entitled "Smart Factories" and carried out in cooperation with schools and companies; it is aimed at building two so-called "mini-factories" for skills development and training activities in this field.

4.3.3. Lobbying towards public institutions

Lobbying constitutes an important part of the activities carried out by the analysed trade unions, notably by the Mediterranean UGT-FICA and FIM-CISL. Indeed,

the former organisation is depicted as working hard to claim a place for union participation in Industry 4.0 as well as to create bodies of union representation within public administrations so as to study and analyse technical aspects related to Industry 4.0. A relevant example is the UGT-FICA's attempt to set up an industry observatory characterised by different multi-stakeholder working groups focused on Industry 4.0 and its related challenges. Moreover, as previously mentioned, on November 28, 2016, the *Declaración de los Agentes Sociales instando al desarrollo de un Pacto de Estado por la Industria* (*Declaration of Social Partners for the development of a Social Pact for Industry*) was signed by four trade union federations representing workers in industrial sectors, construction and services, and by all the employers' associations included in the so-called "Alliance for the Competitiveness of Spanish Industry". The Declaration contains nine policies aimed at boosting industrial competitiveness (via technological and digital development, new infrastructures, labour law reforms, etc.) in accordance with the need to create good work and ensure environmental sustainability. Similarly, FIM-CISL has committed itself to provide hints and suggestions to the policy makers dealing with the perspective of an Industry 4.0 scenario. More specifically, in 2016 and 2017, along with ADAPT (research partner in this EC-funded project), FIM-CISL drafted a *Green Paper on the role and functions of Competence Centers* (*Industria 4.0: Ruolo e funzione dei Competence Center*) and a *White Paper on work and competences in Industry 4.0* (*Libro Bianco su lavoro e competenze in impresa 4.0*). Plus, the General Secretary of FIM-CISL, Marco Bentivogli, took part in some parliamentary hearings on Industry 4.0, by offering the viewpoint of the union on the topic, and engaged in a fruitful dialogue with Carlo Calenda, Minister of the Economic Development from May 2016 to March 2018.

4.3.4. Training activities targeted to workers representatives

With regard to training activities, the experiences of FIM-CISL and IG Metall are worth mentioning. Since 2009, the Italian FIM-CISL has been working on the project "REWIND", aimed at providing workers representatives with the necessary skills to promote the culture of lifelong learning among the workforce and to outline and manage training plans for workers at company level: within the framework of this project, around 3,000 union delegates and 200 unionists were informed and trained. Even though the main focus of the project is not on Industry 4.0, its activities devoted to lifelong learning acquire a huge relevance in the light of Industry 4.0, given the need to develop workers' skills so that they are not left behind by current technological transformations. Moreover, many local structures of FIM-CISL have recently organised training activities aimed at providing

unionists with the necessary skills to represent workers and bargain over different issues (i.e. welfare provisions, performance-related pay, training, work organisation, working times, job classification schemes, etc.) within an Industry 4.0 scenario. Sometimes, these activities are held with the support of external experts; they are financed either directly by the union or via regional and European funds. Similarly, IG Metall has recently designed, often in collaboration with other unions and research centres, different projects (e.g. “Arbeit 2020” and “Arbeit+Inno>ation”), aimed at training workers’ representatives to make them able to deal with Industry 4.0: the main idea underlying these projects is that unionists and works councils’ members should proactively act and shape technological and organisational innovation processes at company level in a sustainable and participatory manner (further information on “Arbeit+Inno>ation” are provided in Reuter et al., 2017).

Finally, the project “SUNI – Smart Unions for New Industry”, within which also this report is drafted, is being carried out by an international consortium involving FIM-CISL as leading applicant, and UGT-FICA and IF Metall as some of the co-applicant organisations; its main goal is to provide metalworkers’ organisations with the necessary skills to deal with Industry 4.0.

4.3.5. Collective bargaining

As regards collective bargaining, industry-level (which is the core of all analysed systems of industrial relations, as explained before) appears to be a crucial venue for enshrining new generation rights and advance workers’ conditions in the light of Industry 4.0. Notably, workers’ training appears to be the main collective bargaining issue when referring to Industry 4.0 in all four European countries. In Sweden, the national-level collective agreement, signed by IF Metall and the Association of Swedish Engineering Industries, sets forth the company’s fundamental responsibility for continuously meeting employees’ needs for skills; this sentence entails the obligation to initiate a labour-management dialogue process whenever either of the parties observes a need for skills development. In Spain, the necessity of negotiations over workers’ training is made even more relevant by the legislation on objective dismissal, according to which an employment contract may be extinguished because of the worker’s failure to adapt to the technical modifications of the job when those changes are reasonable (Article 52.b, Workers’ Statute). Coherently, in Italy, the 2016 renewal of the NCLA Federmeccanica enshrined the so-called “individual right to training”, that materialises in 24 hours in three years devoted to training, due to each metalworker employed in the companies applying the above-mentioned collective agreement. Other relevant topics discussed by metalworkers’ organisations and

employers' associations at industry level are: working time (notably, in February 2018 IG Metall signed a landmark agreement with Gesamtmetall in Baden-Württemberg, according to which workers are allowed to reduce their working week to just 28 hours for a temporary period of up to two years and employers cannot oppose to individual workers' choice); employee participation (especially in Italy, where no participatory rights are guaranteed by law, joint consultative committees are usually introduced via collective bargaining); job classification systems and validation of competences. In this regard, it is important to highlight that IF Metall and the Association of Swedish Engineering Industry have developed a system for validating basic and professional workers' competences, counting on the work of about 94 validation centres (composed of both large companies and educational institutions) across the country.

The relevance of decentralised collective bargaining within an Industry 4.0 scenario emerges particularly from the Italian and German report. With regard to the first case, there are some issues, potentially related to the current transformations in the world of work, that are specifically negotiated at company level. The reference is to: smart-working, welfare provisions, performance-related pay schemes and employees' direct participation in work organisation. As far as the German case is concerned, the archive on works agreements, managed by the Hans-Böckler-Foundation (a research centre supported by the union confederation, DGB) in Düsseldorf, is described as particularly important in providing workers' representatives with competences to bargain over certain topics: among these, attention has been recently paid to workers' burnout and work-life balance as well as to data protection.

4.3.6. Other initiatives

A relevant area of union action, sometimes mentioned in the analysed national reports, is represented by international union cooperation. On the one hand, the Spanish report highlights the importance of a "Protocol for Common Action", signed by UGT-FICA and CCOO for Industry with IG Metall: it regards several topics, including digitalisation and Industry 4.0. On the other hand, the "Frankfurt Paper on Platform-Based work", signed in December 2016 by different unions from Germany, Austria, Denmark, Sweden, USA and Canada (including IG Metall) and calling for transnational multi-stakeholder cooperation to ensure fair working conditions in digital labour platforms, is mentioned in the German report. Finally, the Swedish report stresses the role of IF Metall in promoting industrial-oriented upper secondary education. Notably, along with the Association of Swedish Engineering Industry, the union contributed to the development and affirmation of the so-called Technology Colleges, now consisting of around 150

education centres across the country where about 16,000 students are enrolled and acquire technical competences, also thanks to the support of a network of about 3,000 companies.

Table 8

Scope of intervention	Main content
Research (and Development)	<p>All the analysed trade unions, except the Spanish UGT-FICA, are involved in research activities linked to Industry 4.0. However, the content of these activities considerably varies across the four European countries.</p> <p>Indeed, the Italian FIM-CISL has been mainly involved in qualitative researches on the impact of organisational and technological innovation on workers and their conditions. By contrast, both IG Metall and IF Metall have engaged in more concrete research and development projects, that involve also companies and employers' associations (See, "APPsist", "Production Lift", "Produktion2030", etc.)</p>
Communication and dissemination for workers and public opinion	<p>The topic of Industry 4.0 was embedded in many union campaigns and communication initiatives held by the analysed trade unions and usually targeted to workers and union members.</p> <p>Interestingly, some communication initiatives can be exclusively addressed to union members. This is the case of official union internal meetings (i.e. General Council's meetings, Congresses), organised by several local structures of FIM-CISL in the form of conferences, workshops and seminars where both trade unionists and local stakeholders are invited to discuss Industry 4.0-related aspects and their impact on territories and companies.</p> <p>Finally, the Swedish IF Metall has directed a communication initiative (named "Smart Factories") to young students, in an attempt to increase the attractiveness of technical professional careers and disseminate knowledge on industrial digitalisation across young people</p>
Lobbying towards public authorities	<p>Lobbying constitutes an important part of the activities carried out by the analysed trade unions, notably by the Mediterranean UGT-FICA and FIM-CISL</p>
Training activities for workers' representatives	<p>With regard to training activities, the experiences of FIM-CISL (with the project "REWIND") and IG Metall (with the projects "Arbeit 2020" and "Arbeit+Inno>ation") are quite relevant</p>
Collective bargaining	<p>As regards collective bargaining, industry-level (which is the core of all analysed systems of industrial relations, as explained before)</p>

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	<p>appears to be a crucial venue for enshrining new generation rights and advance workers' conditions in the light of Industry 4.0. Notably, workers' training appears to be the main collective bargaining issue when referring to Industry 4.0 in all four European countries. Other relevant topics discussed by metalworkers' organisations and employers' associations at industry level are: working time; employee participation; job classification systems and validation of competences.</p> <p>The relevance of decentralised collective bargaining within an Industry 4.0 scenario emerges particularly from the Italian and German report</p>
Other	<p>A relevant area of union action, sometimes mentioned in the analysed national reports, is represented by international union cooperation. In this regard, the experiences of UGT-FICA and IG Metall are worth noting</p>

Conclusions

Given the relevance attributed to societal players in industrial innovation and techno-economic transitions by both work-sociological approaches and evolutionary perspectives, this report has examined the role of four metalworkers' organisations (whose scope of representation though slightly varies across countries with reference to the totality of economic sectors covered and the type of workers organised) in influencing the direction of change towards Industry 4.0 in their respective countries (Germany, Italy, Spain and Sweden).

Though operating within different institutional settings, all analysed trade unions (i.e. the German IG Metall, the Italian FIM-CISL, the Spanish UGT-FICA and the Swedish IF Metall) appear to exhibit a similar, proactive approach to Industry 4.0, which essentially derives from the acknowledgment that Industry 4.0, with its controversial, possible effects, is here to stay and an essential task for unions would be to play a part in it so as to make the transition sustainable to all. This sort of homogeneity across analysed trade unions may be explained by a similarity in their identities, encompassing their fundamental values (i.e. democracy, equality, etc.) and their "socially constructed" interests (Dufur, Hege, 2010; Hodder, Edwards, 2015; Hyman, 1994), as well as in their degree of *market-orientation* (Hyman, 2001), which refers to the unions' inclination for labour market and economic governance. This attitude is sensitive to external changes and challenges and may positively interact with the environmental context and its players. In this case, unions' knowledge on the topic under investigation and unions' awareness that action is needed to tackle the related challenges, may have partly derived from the interaction with experts and researchers (as in the case of FIM-CISL), entrepreneurs and employers' associations (as in the case of IF Metall), as well as from the impact of governmental plans for Industry 4.0 and more specifically, the role that governmental actors devolved to unions in this field (as in the case of IG Metall).

However, when deepening trade unions' discourses as regards Industry 4.0 and asking them about their internal strengths and weaknesses as well as the external opportunities and threats that could facilitate or hinder the achievement of their goal, some differences in the answers provided by the analysed metalworkers' organisations do emerge and are essentially due to differences in their organisational structures and varieties of institutional frameworks where they

operate. The first aspect, indeed, can explain why declining membership rates are considered as internal weaknesses by German, Italian and Spanish unions and to a lesser extent, by the Swedish IF Metall (boasting a density of about 80%); and why, conversely, the perspective of white-collarisation of workforce is an issue of greater concern to IF Metall (representing only blue-collar workers) rather than the other organisations. Interestingly, though, more relevant differences can be ascribed to institutional varieties and they generally impact on the OT (external Opportunities and Threats) part of the SWOT analysis. For instance, elements such as the assertiveness and pervasiveness of the results from collective bargaining, and the political constellation at governmental level, are regarded as favourable external conditions by the Swedish and German unions, and not by the Italian FIM-CISL (which, instead, underlines the negative effects, notably in the form of social and pay dumping via collective bargaining, of a condition of *quasi-anomie* in industrial relations), nor the Spanish UGT-FICA (which particularly complains about the lack of unions' involvement in public policy choices). Importantly, the various degree of trade unions' institutional embeddedness has significant implications for trade unions' actions. It is not by chance, for example, that FIM-CISL and UGT-FICA appear to be more dedicated to lobbying activities towards public authorities, rather than their colleagues from Germany and Sweden, whose requests, by contrast, seem to be considered by governmental actors within the framework of more formalised procedures and structures of social partnership. Furthermore, although all unions assert to be willing to participate in technological and organisational innovation with companies, more remarkable multi-stakeholder projects are currently being developed with the cooperation of the sole IF Metall and IG Metall. However, it must be said that, even in such a complex and multi-faceted scenario, collective bargaining keeps on being depicted by all unions as the most important tool that they have at their disposal to achieve concrete results and solutions for workers, also with regard to new generation rights such as skills development, working time flexibility, strategic employee participation, validation of competences, and so on. After all, a feature common to all analysed systems of industrial relations is the centrality of industry-level collective bargaining and its quite high rate of coverage. The same, though, cannot be said of company-level collective bargaining, whose underdevelopment is a characteristic common to almost all analysed countries and whose potential in boosting productivity and innovation (Bisio, Cardinaleschi, Leoni, 2018; Tomassetti, William, Veersma, 2017) is seriously jeopardised by possible drifts towards either a disorganised decentralisation (especially in Spain) or a dysfunctional collective bargaining coordination (especially in Italy).

By and large, it is worth noting that by promoting an interpretation of Industry 4.0 as both a trigger of economic competitiveness and a potential enabler of union

goals (e.g. maximisation of workers' welfare and personal development as in the case of FIM-CISL; increased job security as regards IF Metall; the transition from a support union to a development union as suggested by IG Metall), the four metalworkers' organisations are expected to overcome some of the cleavages (i.e. between environmental and subjective goals, between functional and organisational interests) that institutionalist perspectives have regarded as inherent to the non-unitary nature of unions and responsible for unions' "lagged behaviour" in the face of external transformations (Craft, 1991). The potential for unions to challenge these theories and engage with a proactive behaviour is particularly highlighted in the Italian report but cannot be excluded in the other cases. Nevertheless, other cleavages, strictly related to union internal structure, are brought to the readers' attention in this report and invite to caution when forecasting the role of unions in an era of change: the reference is to the gaps between centre and periphery, and between leadership and membership, which clearly emerge in the form of unions' concerns about decreasing membership rates (as in the case of UGT-FICA) or low level of the rank-and-file's education (as in the case of IF Metall), as well as in the lack of vertical coordination of collective bargaining (as in the case of FIM-CISL). It thus sounds reasonable to claim that no bright future for unions in Industry 4.0 can be foreseen if they won't be able to close these fundamental gaps, mediate contending interests and articulate action across different levels, by effectively converting national-level discourses and narrations into concrete experiences for workers at all places of representation and negotiation. This in turn would need to accompany unions' internal, discursive capacity (intended as the ability to provide overarching narratives as a frame of reference for union action) with other dimensions of union power, such as network embeddedness (or external solidarity, referring to the degree to which unions have horizontal and vertical links with other unions, community groups, social movements of other types of actors) and infrastructural resources (covering the material and human resources, also coming from outside of the union, and their allocation through processes, policies and programmes) (Lévesque, Murray, 2010). Whereas, as regards the latter dimension, significant experiences have been already initiated by both FIM-CISL and IG Metall (especially in the field of union organisational innovation and training), the theme of network embeddedness appears to be downplayed in the initiatives undertaken by the Mediterranean UGT-FICA and FIM-CISL. By contrast, unions located in countries with a long tradition of social partnership and interest associations' embeddedness in public policy, would seem to boast a considerable advantage, which already reflects in a number of multi-stakeholder innovation projects where IG Metall and IF Metall have been involved at the national and local levels. However, the relevance of this source of power should be particularly emphasised

as it's precisely by network embeddedness, that unions could succeed in «inserting concerns with identity, activism, and democracy into structures of social partnership, and seeking to “connect the spots” of local activism into renewed forms of social bargaining» (Mundlak, 2017, 316). This, subsequently, would mean for unions to overcome the mismatch between leadership and membership, by temporarily bridging the presumed gap between the *organising* and *partnership* logics of labour's association.

To conclude, no paradigm shift will occur unless new technology systems give rise to structural changes in the economy, society and institutions (Valenduc, 2018) and no Industry 4.0 will materialise unless it is pervasive and embedded in a knowledge ecosystem, composed of companies, research centres, public authorities, civil society organisations and people, interacting and learning from one another thanks to the disruptive capacity of digital technologies (Butera, 2018). Trade unions' awareness of this era of change and their willingness to proactively participate, are a good start but more effort is needed to integrate their initiatives into a broader framework of co-designed and co-implemented paths of development at the national, regional and workplace level.

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