Varieties of telework regimes across European regions: A tale of four different worlds

Abstract

Telework emerged in the 1980s as a new form of organising work, and the share of employees working from home has slowly grown since. Due to the COVID-19 pandemic and the resulting lockdowns, the prevalence of telework has significantly increased across all EU countries. However, beneath the surface of common trends, there is significant variation between European countries in terms of policy responses and the prevalence of telework. This paper aims to increase understanding of cross-country diversity on telework across Europe through an exploratory analysis, which aims to categorise and group countries that share relevant patterns in terms of their telework regimes. Drawing on institutionalist comparative employment relations literature, we define a telework regime as a constellation of environmental aspects, workplace practices and rules that affect each other and frame employers' and employees' choices regarding flexible work arrangements. To identify key components of such regimes, we review literature on those three analytical dimensions that could be useful to classify and group countries across Europe. The operationalisation of theoretical constructs relies on novel indicators for measuring telework rules. Then we carry out principal component analysis to identify empirically relevant factors and perform cluster analysis to identify groups of countries that rely on specific telework regimes. Our empirical results largely align with previous industrial relations and working time regime typologies but also show new country divisions, which reveal the existence of specific telework regimens beyond general industrial relations systems.

Keywords: telework, quality of work life, work-life balance, regulation,

1. Introduction

Telework as a form of work organisation is hardly new. It emerged in the 1980s as part of a broader flexibilisation process, driven by advancements in ICT and was perceived as a solution to the increased competition resulting from global economic and technological changes. It was also associated with different advantages, such as reducing commuting times, decreasing pollution and even favouring the creation of new industries (Messenger and Gschwind, 2016; Nilles, 1975, 1988; Toffler, 1980).

The prevalence of telework has been slowly growing since. However, the pandemic and the resulting work-from-home mandates lifted the share of teleworking employees to new levels. A large number of workers were forced to work remotely, mostly from home. After the lifting of social distancing restrictions, a significant share of workers continues to work from home, at least for part of their working time. There is also evidence that a sizeable proportion of employees and employers wish to keep combining telework and on-site work in the future (Barrero et al., 2020; Criuscolo et al., 2021; Aksoy, et al., 2022).

These general trends, however, mask persistent cross-country variations in the EU in terms of the prevalence of telework and, more generally, flexible work arrangements (Eurofound, 2022a; Chung and Tijdens, 2013; Anttila et al., 2015; Blackhaus, 2022). Before the COVID-19 pandemic, telework was marginal or almost non-existent in most Eastern and Southern European countries. By contrast, in the Nordic countries and several continental European countries (e.g., the Netherlands), over a quarter of employees reported working from home at least some of the time. The outbreak of the pandemic has led to a significant increase in working from home in all EU countries, although there is still wide variation between Member States. Generally, the incidence of working from home in 2021 tended to be higher in those countries where it had been more prevalent previously (Eurofound, 2022b). Research has also shown cross-country variation in terms of employers' management approaches towards telework and working-time flexibility (Brandl et al., 2022; Chung and Tijdens, 2013; Anttila, 2015; Blackhaus, 2022).

Furthermore, European countries have been applying different regulatory strategies aiming at supporting employers' and employees' wishes for higher flexibility while preventing negative impacts

on working conditions and occupational safety and health (OSH). The Nordic countries largely rely on social partner agreements. Some Southern and Eastern European countries have adopted new national legislation approaches that include new rights such as the right to disconnect or the right to request telework (France, Spain, Portugal, Greece, Slovakia). Other EU Member States refrained from policy reforms by arguing that the existing legal framework on telework, combined with collective bargaining, is sufficient (Germany) (EU-OSHA, 2021a, 2023; Eurofound, 2022b).

This paper aims to increase understanding of cross-country diversity on telework across Europe through an exploratory analysis that aims to categorise and group countries that share relevant patterns in terms of telework regimes. The analytical reasoning of the paper follows four main steps. First, drawing on institutionalist comparative employment relations literature, we define the core elements that constitute a telework regime. In particular, section 2 outlines three analytical dimensions through which it is possible to analyse a telework regime (workplace practices, environmental/contextual factors and rules). Second, we develop a dashboard of indicators related to the three analytical dimensions, which are used to categorise telework regimes (see section 3). Indicators are extracted from different surveys and databases (for example, the European Labour Force Survey) and a new dataset of indicators on telework governance/regulation which were built based on a standardised questionnaire answered by the Eurofound Network of National Correspondents (2021/2022). Third, the resulting dashboard of indicators is used to conduct a cluster analysis to map varieties of telework regimes across European regions. The results are presented in section 4, followed by a conclusion in section 5 that discusses and interprets these results through the lens of institutionalist literature on comparative employment relationships. This section also addresses the implications of diverse telework regime configurations for EU regulation aiming to harmonise telework regulation.

2. Conceptualisation of telework regimes across Europe: literature review

Institutionalist literature on international or comparative employment relations has produced several theoretical frameworks useful to identify common patterns across countries. A key organising concept from comparative institutionalist approaches is the notion of a system or regime (Kaufman, 2011), generally defined as a complex set of environmental or contextual factors, rules and established practices that, being more or less interdependent, tend to structure and guide behaviour by enabling or restricting certain actions (Dunlop, 1958; Gallie, 2004; Visser, 2009; Marginson and Welz, 2015; Erne, 2015).

Based on this concept, different theoretical models have been built around distinct core features of the employment relationship, which are then used to set up typologies that classify countries or groups of countries sharing similar patterns. This is the case for the production regimes approach, also referred to as 'varieties of capitalism', which analyses the institutional setting in which companies operate to coordinate their activities, distinguishing between 'liberal market economies' and 'coordinated market economies' (Hall and Soskice, 2001). The employment regimes approach seeks variation in power resources, defined by the organisational capacity of employers and employees (Gallie, 2007). The industrial relations regime approach categorises countries based on variations in power relations between social partners, bargaining levels and styles, and social dialogue outcomes (Visser, 2009; Eurofound, 2023). Finally, the working time regime approach is defined by a cross-country typology based on the patterns and practices of spatial and temporal flexibility (Anttila et al., 2015).

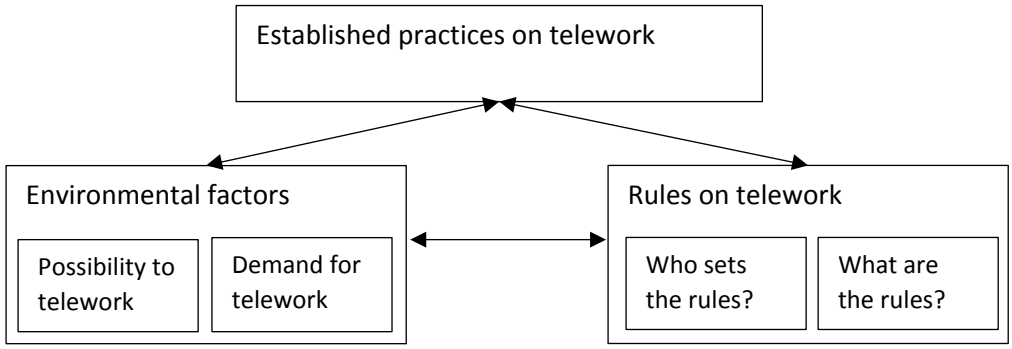
Drawing on early institutionalist literature and, in particular, the industrial relations system theory (Dunlop, 1958), we define a telework regime as a constellation of environmental aspects, workplace practices and rules that affect each other and shape employers' and employees' choices regarding flexible work arrangements. Drawing on this definition, our conceptual framework includes, first, telework arrangements as the main practice under a telework regime, which is defined broadly in line with the European Framework Agreement on Telework (2001), as a form of work organisation where tasks that could be performed at the employer's premises are done remotely using ICT. At the same time, literature shows that telework arrangements vary by intensity (the share of working time spent teleworking); pattern (whether it is carried out regularly, or on an ad hoc basis); location (whether it is predominantly home-based telework or mobile telework, carried out from multiple locations); and

formality (the degree to which telework is regulated) (European Commission, 2024; Eurofound, 2022a; Chung, 2022).

Second, we include two different dimensions as key environmental factors under a telework regime. On the one hand, factors associated with the economic structure and digital infrastructures and capabilities that enable flexible work organisation and teleworkability (Sostero et al. 2020). On the other hand, certain workplace and gender social norms that, according to specialised literature, affect the demand for telework (Chung, 2022).

Third, in line with Dunlop's (1985) conceptualisation of rules, we include both substantive rules that specify the content of telework, as well as procedural rules that govern the interaction and behaviour of the parties when setting up the rules on telework and classify them based on their authorship (unilateral regulation; joint regulation through social dialogue and/or collective bargaining; statutory legislation). Although those rules can be developed at different levels (macro, meso and micro), our focus is on the national (macro) level.

Figure 1. Telework regime



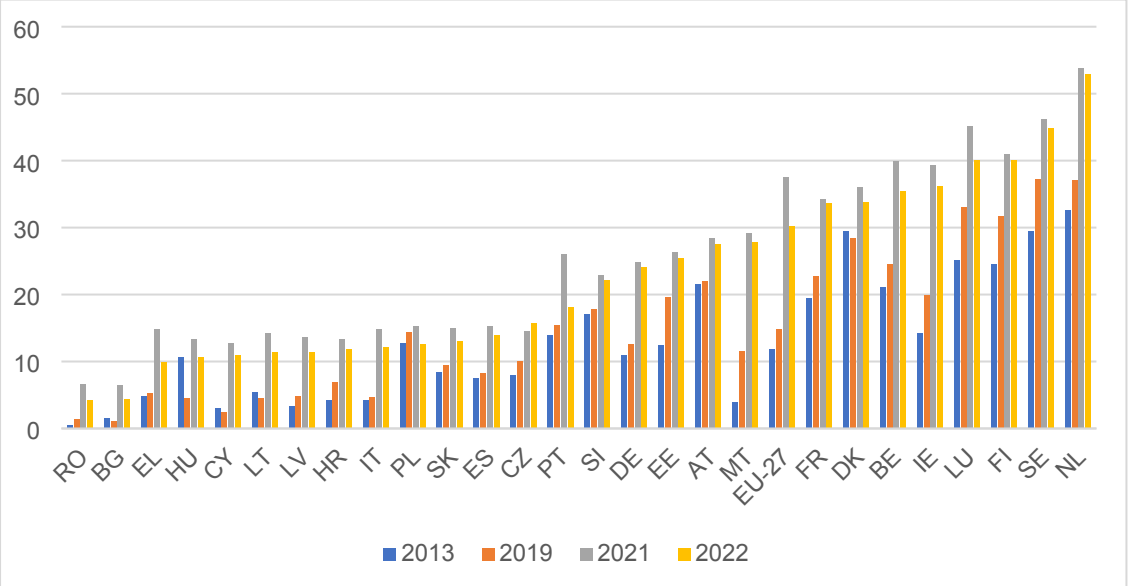
Source: own elaboration

In the following paragraphs, we discuss each of these dimensions in more detail.

Established practices on telework: Prevalence of telework arrangements

Figure 2 below provides data on the prevalence of telework in the EU Member States before, during, and immediately after the COVID-19 pandemic. First, it suggests that changes in the prevalence of telework are rather consistent across countries. More specifically, the share of employees working from home during and after the pandemic tends to be higher in the countries where it had been more prevalent before the lockdowns. Second, the differences within the EU are very significant. The share of employees working from home in most North-Western European countries is at least twice as high than in most Southern and Eastern European states. Even in the face of lockdowns, the prevalence of telework in South-Eastern Europe has not reached the levels of telework witnessed in most North-Western European countries before the pandemic. The persistent regional differences suggest that employees' and employers' choices regarding the place of performing work are embedded within other work organisation practices and prominent institutions.

Figure 2. Share (%) of employees working from home sometimes or usually before, during and after the pandemic



Source: Eurostat Labour force survey [lfsa_ehomp]

The persistent cross-national differences in the prevalence of telework are perplexing because the benefits and challenges of telework do not appear to be country-specific. Literature argues that telework reduces commuting time and allows for a better balance of work and private life (Beauregard & Canonico, 2019). Working from home may be beneficial for employers, who can save on office space (Grossmann et al., 2021), organise more productive and fewer meetings (Eurofound, 2022a), contribute to employee satisfaction and staff retention (McDaniel et al., 2021) as well as engage in hiring talent across the country or even across borders. On the other hand, working from home also poses a number of risks, the chief among them is the blurring of the boundaries between work and private life, developing an always-on culture and resulting in burnout (Dén-Nagy, 2014; Wöhrmann and Michel, 2022; Arntz et al., 2020; Chung and van der Horst, 2018). Flexibility in time and place of carrying out work, reinforces such risks, as it becomes more difficult to (self) monitor overtime and asynchronous implementation of tasks leads to work-related queries beyond standard working hours.

Although cross-national variation in preferences for telework is well established (Da Sila, et. al., 2023), they cannot be explained by the benefits and challenges of the work-from-home arrangements, which are individual- and company-specific. In fact, we have not identified research claiming that some of the benefits or challenges are country-specific and thus could explain cross-national variation in the prevalence of telework or preferences for telework. Thus, the next subsections turn attention to country-level environmental factors. We start with the structure of the economy and ICT capacities, which jointly affect the feasibility of telework arrangements (i.e., employer's offer) and then we analyse those social norms related to workplace working time practices and gender that, according to specialised literature, affect the demand for telework (i.e. employee's preferences for telework).

Environmental factors: Possibility of telework and demand for telework

As previously discussed, two different environmental factors have been conceptually identified: economic and technological factors that enable telework; and workplace and societal gender norms that affect the demand for telework.

Possibility of telework: structure of the economy and ICT infrastructure/capabilities

Conceptual explanations of the feasibility of telework focus on the different economic structures and, in particular, sectoral and occupational specifics. Some jobs are more teleworkable than others, depending on the content of tasks, level of required social interaction, work organisation practices and technology used in the delivery of services or production of goods. Based on these parameters Sostero et al. (2020) distinguished between highly teleworkable occupations (e.g., finance and ICT

professionals), teleworkable occupations where remote work may lead to a loss of quality (e.g., managers, teachers) and non-teleworkable occupations that require physical presence of employees (e.g., nurses, bus drivers). As Sostero et al. (2020) demonstrates, European economies sharpy differ in the structure of their economies and share of employment in teleworkable occupations. Northern and Western European countries exhibit significantly higher shares of employment in knowledge intensive services that offer teleworkable jobs, in comparison to Southern and Eastern European regions.

Opportunities to telework also depend on ICT infrastructure and capabilities. Budnitz and Tranos (2022) found that internet speed and occupational structures intersect to explain local differences in the prevalence of teleworking during the pandemic in the UK. Similarly, Ruiz (2022) found that past ICT training and occupation can explain the differences in teleworking prevalence in Spain during the pandemic. Hence, we would expect that the use of ICT for performance of work could contribute to explaining differences in the prevalence of telework in Europe.

Demand for telework: workplace working time and gender norms

Following the literature, we focus on workplace and family social norms which are important for understanding telework demand.

The literature links working time flexibility and prevalence of telework through multiple mechanisms. On the one hand, working time flexibility coupled with telework arrangements allows employees to balance work and family commitments (ILO, 2023). Chung and Tijdens (2013) argue that such arrangements depend on a trust-based culture and a high degree of autonomy in the organisation and implementation of tasks. When these preconditions are met, both employers and employees can benefit from combining flexible working hours with telework. Employees can use greater control of their workday by working during their peak-performance hours while allocating other time to family, household or leisure activities (ILO, 2023). This tends to result in higher job satisfaction, which reduces the costs of retention for employers (Hill et al. 2010). Furthermore, emerging studies (ILO 2020, Eurofound, 2022c) also point out that a combination of flexible working time and telework can lead to higher productivity (at least for some groups of workers) – however, more post-pandemic studies are needed to confirm this

On the other hand, literature on the 'autonomy paradox' (Mazmanian et al. 2016, Lott, 2018, Chung, 2022) argues that flexible working hours coupled with telework arrangements and empowered by ICT technologies lead to work during anti-social hours and overworking. Professionals, who typically enjoy a high level of autonomy, seek to be in a state of permanent connectivity with co-workers and clients to demonstrate their dedication to work and the ethics of an 'ideal worker', which prioritises work over personal/family life. In this regard, working time flexibility and telework arrangements are mutually reinforcing in the diminishment of boundaries between work and leisure and lead to overwork and burnout (Kao, et. al. 2020, Karimikia et. al., 2021, Chung, 2022).

The links between working time flexibility and telework also have some empirical support. Chung (2022) demonstrates, using pre-pandemic data, that cross-national and cross-occupational differences, with regard to long working hours and constant availability, are closely linked to the differences in the prevalence of teleworking. The European Working Conditions Survey (Eurofound's (2022c), carried out in 2021, confirms this with more recent data. It shows that 44% of teleworkers worked overtime, compared to just 20% of on-site workers. At the same time, empirical research shows that telework also tends to enhance workers' autonomy over the organisation of working time, according to their preferences and needs (Eurofound and ILO, 2017; European Commission, 2024). Accordingly, we expect flexibility in working time to be an important factor in the configuration of telework regimes.

There is also significant cross-national variation in the propensity to work non-standard hours and working-time flexibility more generally (Chung and Tijdens, 2013; Anttila, 2015; Blackhaus, 2022). Employees in the Nordic countries are more likely to work under flexible working-time arrangements. Moreover, flexible working-time arrangements implemented in these countries tend to be driven both by employee and employer needs (Chung and Tijdens, 2013; Anttila, 2015; Blackhaus, 2022). On the contrary, employees in Anglo-Saxon and Southern European countries show higher levels of working-time variability and unsocial working time but lower levels of employees' working-time autonomy

(Anttila, 2015; Blackhaus, 2022). The prevalence of those arrangements, which are mainly implemented for the benefit of the employers, has been attributed to a highly fragmented labour market and unbalanced bargaining power between social partners (Blackhaus, 2022).

Literature (Chung, 2022, Gallie & Russell, 2009) has also argued that cross-national differences in gender norms and household structures are closely linked to variation in telework. Countries with dual earner–dual carer models are likely to exhibit higher demand for flexibility. This is because both partners have caring and household responsibilities and request telework arrangements in order to balance work–family commitments. Such family models are the most pronounced in the Nordic countries and are supported by the social-democratic welfare state (Anntila, et. al., 2015). Alternatively, dual earner–single carer family models can seek work-life balance by women taking up part-time work, rather than through flexibility of both partners' full-time schedules. In such cases, we could expect higher demand for telework arrangements among women rather than men. In contrast, telework arrangements are of little relevance when male breadwinner models dominate. Since women are expected to take up caring and household responsibilities, there is limited need for men to seek flexible work arrangements. Figart and Muturi (2000) found this is particularly true for the Southern European countries. Hence, we could expect that the level of gender equality in the labour market could reinforce cross-national differences in the prevalence of telework.

Regulation on telework: Procedural and substantive rules

At the EU level, there is no single Directive regulating telework. Nevertheless, a number of Directives cover some aspects, such as OSH, personal data protection of remote workers, working-time arrangements and others. Importantly, the acquis sets only minimum standards, whereas Member States have large discretion in how to implement them and/or adopt a more extensive regulation. Indeed, the literature shows that there are a wide variety of approaches to governance of telework at national level (EU-OSHA, 2021a, 2023; Eurofound, 2022b).

National governance systems differ in terms of who sets rules and how regarding telework (procedural rules) as well as the substantive content of such rules (substantive rules). As Anxo and O'Reilly (2000) and Gallie (2007) argue, governance of place and time of work is deeply embedded within predominant production regimes (Hall & Soskice, 2001; Thelen 2004). More specifically, economies differ in the way economic actors coordinate their activities and set up rules of work and employment (Meardi, 2018; Author, 2020; Eurofound, 2023). In liberal market economies, employers and employees rely on competitive market mechanisms to agree on wages and working conditions, such as time and place of work. The state merely supports market mechanisms by establishing general frameworks and setting minimum levels of protection for workers. Under such governance models, we would expect the state to establish only basic principles of organising telework and leave significant autonomy for employers and employees.

In coordinated market economies, actors rely on non-market mechanisms: trade unions and employers' associations engage in collective bargaining to agree on wages, working time and other aspects of employment conditions. Given high levels of trust between social partners, the rules regarding time and place of work are flexible to allow for different needs of specific groups of employees as well as work organisation practices in different economic sectors. Due to effective coordination between employees and employers, the state refrains from detailed rule-setting. Trust and flexibility offered by collective bargaining should support a high prevalence of telework.

Lastly, mixed market economies (Hancke 2014) do not have strong trade unions or employer associations to facilitate coordination, nor do they rely on market mechanisms. Hence, the state aims to compensate for the lack of these coordination mechanisms and intervenes in setting wages and employment conditions, such as time and place of work. Due to the significantly higher bargaining power of employers vis-a-vis employees, the state engages in detailed regulation with the view of safeguarding the interests of the weaker side. Under such governance regimes, we would expect a low prevalence of telework because excessive regulation could dampen employers' incentives to offer such modalities of work organisation.

Previous research comparing procedural rules on telework across European countries has found that regulations on telework vary across Member States, as they are strongly connected to industrial relations systems and economic governance traditions. Thus, it is possible to identify countries which follow a market-oriented governance approach because there are no regulations on telework at any level (e.g. Cyprus); countries where telework is exclusively or mostly regulated through social dialogue and collective bargaining at different levels (Denmark, Sweden or Finland); and countries where statutory legislation is the main or only source or regulation (most Eastern and Southern European countries) (Eurofound, 2022b; EU-OSHA, 2022).

In relation to the content of telework regulation (substantive rules), there is a lack of systematic and comprehensive comparative studies across European countries. One exception is the study conducted by Eurofound, which analyses countries' legislative approaches on the basis of the link between so-called ICT-based flexible-working arrangements, work-life balance and the prevention of negative effects (Eurofound, 2021). In this regard, Eurofound identified three groups of countries. First, countries where there is a balanced promoting–protecting approach and there is specific legislation promoting telework as well as legislation protecting workers from the potentially negative consequences of being constantly available (right to disconnect) (Belgium, France, Italy and Spain). Second, countries that follow a promoting approach and legislation only sets up provisions aiming to favour telework access (Czechia or Lithuania). Third, countries where there is either no legislation at all on telework or only very general legislation (including Bulgaria, Croatia, Estonia, Germany, Greece and Hungary).

The next section provides operationalisation of the theoretical dimensions discussed above, as well as data and methods for exploring varieties of telework regimes and classifying countries in groups sharing similar patterns.

3. Data and Methods

Building on the conceptual approach previously described, an exploratory analysis was carried out to analyse telework patterns across European countries. Contrary to an explanatory design, the aim was to identify groups of countries that share relevant patterns in terms of their telework regimes, and indirectly validate the plausibility and pertinence of the conceptual approach. For this purpose, a substantial effort was placed on selecting or building relevant indicators for each of the theoretical dimensions discussed. The internal consistency of the set of indicators was tested through a Principal Component Analysis, which indicated three empirical dimensions in line with the conceptual approach. Finally, in line with our exploratory and classificatory aims a cluster analysis was carried out.

Data: building a dashboard of indicators

The initial search for the most adequate indicators was guided by the conceptual approach, combined with a literature review including the main European statistical sources. In the first step, a dashboard of 10 indicators taken from European statistical and database sources was built (European Labour Force Survey; Structure of Earning Survey; DG for Communications Networks, Content and Technology; European Working Conditions Survey). In the second step, 3 indicators of governance were built based on primary data because of the lack of secondary data sources. For instance, the OECD/AIAS ICTWSS database, which contains the most comprehensive set of indicators on industrial relations (including topics of regulation), does not contain any indicator on the regulation of telework. Thus, a dashboard with a total of 13 indicators was built.

Table 1. Analytical dimensions, indicators and sources

Analytical dimensions		**Indicator**	**Source and year**
Practices	*Prevalence of telework*	Variation of teleworking employees 2019–2022	LFS, Eurostat, 2019–2022

		Ratio between number of teleworking employees and number of employees in teleworkable jobs	LFS, Eurostat, 2020
		Ratio between number of usually teleworking employees and number of employees in teleworkable jobs	LFS, Eurostat, 2020
		Teleworking employees in the most teleworkable occupations as a percentage of the total employees in those occupations	LFS, Eurostat, 2022
Enviromental factors	*Possibility of telework: structure of the economy and ICT capacities*	Share of employees in teleworkable sectors	LFS, Eurostat, 2022
		Share of employees in teleworkable occupations	LFS, Eurostat, 2022
		Connectivity composite indicator measuring both supply and demand of fixed and mobile broadband infrastructure and its quality	EC, DG for Communications Networks, Content and Technology, 2022
		The Digital Economy and Society Index (DESI)	EC, DG for Communications Networks, Content and Technology, 2022
	Demand for telework: working-time flexibility and gender equality	Gender gap in part-time employment	LFS, Eurostat, 2022
		Unsocial working time: Employment at atypical working times (nights, weekends, etc.) as a percentage of total employment	LFS, Eurostat, 2021
Rules	*Procedural rules*	Type of regulation/governance approach: 5 – Statutory definition and specific legislation plus important role of collective bargaining; 4 – Statutory definition and specific legislation plus some collective bargaining; 3 – Statutory definition and specific legislation but no or marginal role of collective bargaining; 2 – Telework regulated within work environment (OSH) legislation plus important role of collective bargaining; 1 – Only light collective bargaining	Own elaboration based on expert reports (Eurofound Network of National Correspondents, 2022)
	Substantive rules	Right to request telework: 5 – Workers are able to freely decide when and where they work for at least part of their working time; 4 – Employer's decision following a telework request must be justified or	Own elaboration based on expert reports (Eurofound Network of National Correspondents, 2022)

		explained in writing; 3 – Employer's decision following a telework request must be justified or explained, but only when it affects workers with care needs or when there is risk to the workers' health; 2 – There is no statutory right to request but collective agreements set up provisions or clauses on this; 1 – There is no statutory or collective bargaining right to request and employers has the right to reject an employee's request to telework without justifying their decision	
		Right to disconnect: 4 – There is a statutory right to disconnect applicable to all workers (regardless company size, etc.); 3 – There is a statutory right to disconnect, but it is only applicable to certain workers (e.g., in terms of company size, etc.); 2 – There is not a statutory right to disconnect but the right to disconnect is regulated through sectoral/multi-employer or company collective agreements; 1 – There is not a statutory right to disconnect and only company policies address the problem of permanent connectivity	Own elaboration based on expert reports (Eurofound Network of National Correspondents, 2022)

Source: Own elaboration

The first dimension refers to the prevalence of telework (i.e. telework practices). Here we used four indicators taken from Eurostat LFS: difference in percentage of teleworking employees (15–64 years of age) between 2019 and 2021; ratio between number of teleworking employees and number of employees in teleworkable jobs (2020); ratio between number of usually teleworking employees and number of employees in teleworkable jobs (2020); and teleworking employees in the most teleworkable occupations as a percentage of the total employees in these occupations (2022).

The second dimension (environmental factors) distinguished two conceptual subdimensions related, respectively, to structural factors enabling telework and social norms affecting the demand for telework. The first subdimension (possibility of telework) was operationalised through four widely accepted indicators (Sostero et al., 2020; Eurofound, 2022c): two indicators measuring the share of employees in teleworkable occupations and sectors based on European Labour Force Survey data[i] (2022); and two composite indicators measuring, respectively, digital performance and the quality of infrastructure for digital connectivity (both developed by EC, DG for Research and Innovation, 2022). For the second subdimension (demand for telework), we used two indicators. First, gender norms were operationalised through one indicator measuring the gender gap in part-time employment, measured as the ratio between percentage of part-time employment for women and men (European Labour Force Survey, 2022). This indicator has been included in dashboards and compositive indicators measuring gender inequality (Eurofound, 2018) as an important cause of job segregation due to the penalties associated with part-

time work for several reasons (such as job security, average hourly earnings and opportunities for training and promotion). Moreover, previous literature suggests that part-time work is a female-dominated flexible work arrangement used to address work-life balance demands, which is more stigmatised than telework and more likely to lead to negative career outcomes (Chung 2020; Arntz et al., 2019). Although more variables could be used to measure gender norms, a higher number of variables could also increase the complexity of finding meaningful clusters. It should be also noted that when selecting this indicator, we do not aim to measure all the complex elements related to telework and gender inequalities identified in previous literature (e.g., reinforcement of traditional gender roles and increasing women's double burden, discrimination related to 'flexibility stigma, etc.) (EU-OSHA, 2024; Chung, 2020). Rather, our aim is to measure cross-country variation in terms of gender norms. Second, flexible working time was measured through one indicator on unsocial working time (i.e., employer-oriented flexibility), which was taken from the European Labour Force Survey (employment at atypical working times, such as nights or weekends, as a percentage of total employment). Indicators on working-time flexibility from the European Working Conditions Survey, which have been previously used in empirical research on working time regimes (Anttila et al., 2015) were disregarded. Some indicators which would enable the measurement of employee-oriented working-time flexibility, such as working-time autonomy, were only available in the previous ECWS survey (2015), while others do not meet statistical quality criteria due to changes in the methodology of the last survey (Eurofound, 2022c).

Finally, for measuring the rules on telework, we built three indicators based on a standardised questionnaire responded to by the Eurofound Network of National Correspondents, which analysed regulatory frameworks of telework in 2021/2022. The procedural rules towards telework (governance approach) were measured through a 1–5 scale which classify countries according to the importance of statutory legislation and its interaction with collective bargaining (The highest value indicates the most prominent role played by statutory legislation and an important role for collective bargaining, while the lowest value indicates that mainly market mechanisms regulate telework). The substantive rules of telework were measured by means of two indicators measuring two complementary approaches or directions of telework regulation identified in previous research: the extent to which regulation promotes telework and how it protects against the main negative effects related to overtime or permanent connectivity (Chung, 2022; Eurofound, 2020, 2022c). To measure how the regulation promotes telework, we built a 1–5 scale indicator which classifies countries of the basis of the scope and coverage of the legal entitlement of employees in teleworkable jobs to request or adhere voluntarily to teleworking (higher values mean the most inclusive legal entitlements). To measure the protection against negative impacts linked to overtime and permanent connectivity, we built a 1–4 scale indicator measuring the strictness and coverage of the right to disconnect (higher values mean the strictest and most universal coverage). When selecting this last indicator, we considered existing EU policy debates and previous literature that has identified the right to disconnect as the main legislative provision which can contribute to mitigating negative effects of permanent connectivity on health, which are strongly associated with telework (Eurofound, 2020; EU-OSHA, 2021b, 2023). We also tried to reflect on the different approaches that have been identified in previous research to establish what constitutes coverage and strictness of the right to disconnect (Eurofound, 2022b).

Methods

Once all the indicators were selected and/or built, the first step was to normalise all the indicators following a min-max method based on the theoretical ranges. For each indicator, the value of each country is subtracted from the minimum value that the indicator can register theoretically, then divided by its range and finally, multiplied by 100. As a result of this process, all the indicators normalised have an identical range [0, 100]. The second step was to carry out a Principal Component Analysis. This multivariate analysis enabled study of the overall structure of the data and identification of the set of indicators that work well together, verifying statistically a structure of dimensions in line with the conceptual framework. In addition, a Cronbach's alpha coefficient was carried out to measure the reliability of the indicators. Finally, a hierarchical cluster analysis for grouping countries according to our concept of telework regimes following the Ward method was applied.

4. Results

Empirical Dimensions of telework regimes

The Principal Component Analysis identified three main empirical dimensions: possibility of telework and telework prevalence; content of regulation and unsocial working time; governance and gender inequality (see Table 2). All the conceptual dimensions stemming from our initial theoretical framework are covered by these empirical dimensions. Moreover, results of the Cronbach's alpha coefficient (0.714) show that the internal consistency, or reliability, of the data is good, and all the goodness-of-fit measures of the model are satisfactory (KMO is above 0.6, explained variance is over 60%, and Bartlett's test of sphericity is significant at the 1% level).

Table 2. Dimensions and indicators of telework regimes

Dimension	Indicator
Possibility of telework and telework prevalence	Share of employees in teleworkable sectors
	Share of employees in teleworkable occupations
	Digital Economy and Society Index (DESI)
	Connectivity dimension of the DESI
	Variation of teleworking employees 2019–2021
	Teleworking employees in teleworkable jobs
	Usually teleworking employees in teleworkable jobs
	Teleworking employees in most teleworkable occupations
Content of regulation and unsocial working time	Right to request telework
	Right to disconnect
	Unsocial working time (%)
Governance approach and gender inequality	Type of regulation/governance approach
	Gender gap in part-time employment

Source: Own elaboration

The first empirical dimension is made up of variables which measure the possibility of telework in terms of teleworkable jobs and digital performance/connectivity. Additionally, it includes those variables measuring telework prevalence and trends, which are highly correlated with those measuring the possibility of telework and, therefore, appear relevant for understanding different patterns of telework.

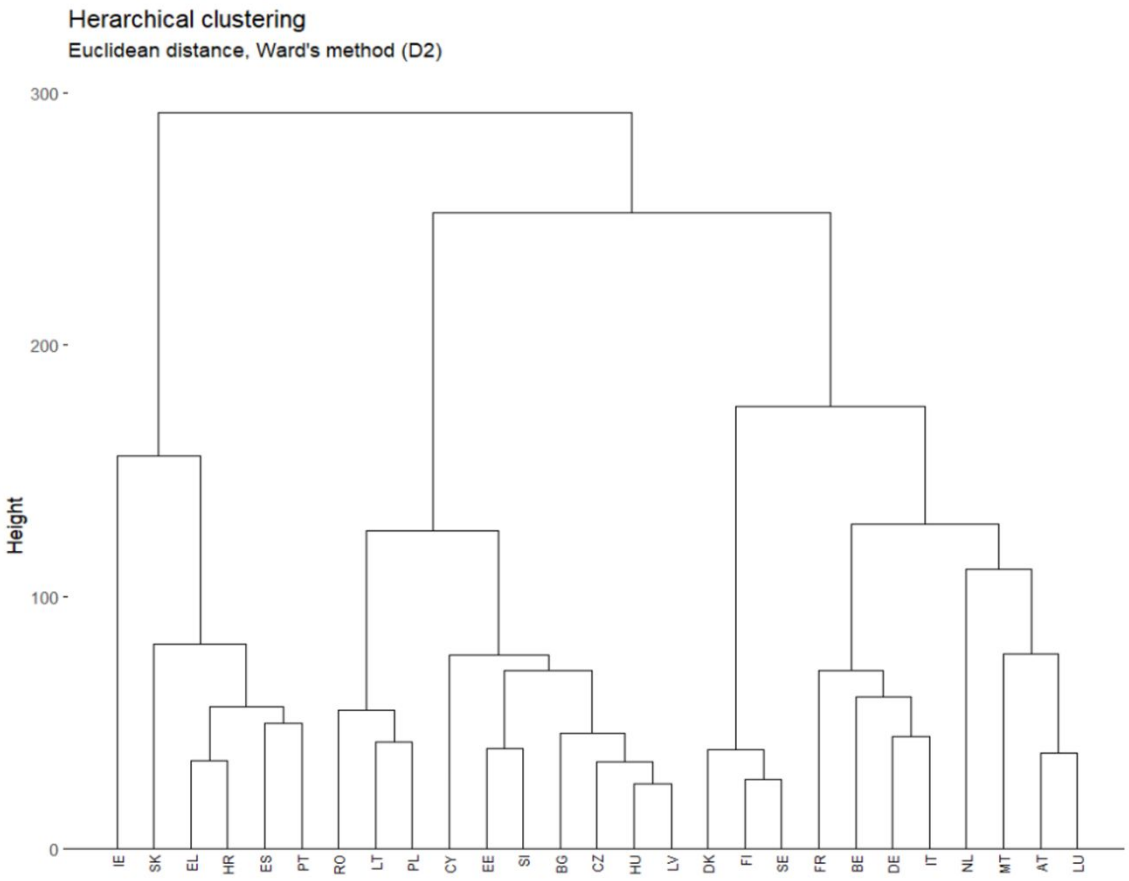
The second empirical dimension builds on three indicators which measure the content of telework regulation (promoting and/or protective approach) and the percentage of employed people working at atypical working times. This dimension shows a particularly positive correlation between unsocial working time and regulatory approaches, either promoting telework or developing rules to protect workers against the negative effects of overtime and permanent connectivity.

The third empirical dimension includes two variables measuring the governance approach towards telework and the gender gap in part-time employment. This dimension shows a positive correlation between the patterns of gender inequality and the main regulatory approach chosen to set up rules on telework (statutory legislation, collective bargaining or market mechanisms).

Telework regimes: cluster analysis results

The next step in our analysis was to cluster EU-27 countries according to those three empirical dimensions measuring telework regimes. As a clustering method, we used Ward's method with squared Euclidean distance and standardised variables. The dendrogram produced by hierarchical cluster analysis is presented in Figure 3 below.

Figure 3. Hierarchical cluster analysis for empirical dimensions of telework regimes in EU-27.



Source: Own elaboration

The dendrogram and agglomeration schedule suggest that a four-cluster solution is adequate. In the first stage, a group of Northern and Central European countries was separated from Southern and Eastern European countries. In the second stage, the first cluster was further separated into Nordic (Finland, Sweden and Denmark) and mainly Central-Western European countries (Austria, Belgium, Germany, France, Italy, Luxembourg, Malta and the Netherlands). Furthermore, a clear Central-Eastern European cluster has emerged. It includes Poland, Romania, Bulgaria, Hungary, Latvia, Cyprus, Lithuania, Slovenia, Czechia and Estonia. The last cluster includes mostly Southern European countries (Greece, Croatia, Spain and Portugal) as well as Ireland and Slovakia. As the dendrogram suggests, the latter two are quite different from the Mediterranean countries. This clustering partly resembles those obtained in early typologies on industrial relations (AUTHOR XXXX; Eurofound, 2018, 2023; Visser, 2009); or working time regimes (Anttila et al., 2015; Chung and Tijdens, 2013; Anttila, 2015; Blackhaus, 2022), especially regarding Southern/Mediterranean, Central and Northern Europe.

To better understand how each cluster differs from one another, an analysis of variance test (ANOVA) was carried out to test the significance of these differences in cluster-level data. These results are presented in Table 3 below. The data presented show clearly different patterns regarding trends in terms of telework prevalence, environmental factors and rules. According to ANOVA tests, the difference between country groups is statistically significant for all the variables used.

Table 3. Country-cluster means of standardised indicators

Indicator	CL1	CL2	CL3	CL4	Sig.
Type of regulation	25.0	84.4	47.5	62.5	**
Right to request telework	0.0	15.6	17.5	45.8	*
Right to disconnect	0.0	29.2	0.0	100.0	**

Share of employees in teleworkable sectors	59.0	56.3	41.7	47.4	**
Share of employees in teleworkable occupations	59.0	59.8	49.3	50.9	**
Digital Economy and Society Index (DESI)	68.1	55.9	46.2	50.7	**
Connectivity dimension of the DESI	66.0	58.9	52.5	55.0	*
Unsocial working time	29.9	34.4	29.1	39.3	**
Variation of teleworking employees 2019–2021	35.8	52.2	22.5	29.9	**
Teleworking employees in teleworkable jobs	75.0	51.3	21.4	37.3	**
Usually teleworking employees in teleworkable jobs	63.7	45.2	16.5	37.4	**
Teleworking employees in most teleworkable occupations	58.0	45.0	18.6	26.5	**
Gender gap in part-time employment	42.7	72.2	40.4	46.8	**

*Significance Levels: ** (p<0.05) * (p<0.1)*

CL1: DK, FI, SE; **CL2:** AT, BE, DE, FR, IT, LU, MT, NL; **CL3**: BG, CY, CZ, EE, HU, LT, LV, PL, RO, SI; **CL4**: EL, ES, HR, IE, PT, SK

Source: Own elaboration

Taking into consideration all the empirical dimensions together, the following features of telework regimes can be highlighted in each cluster.

Cluster 1. High flexibility complementing existing economic structures + limited regulation albeit important role of social partners

This cluster groups the Nordic countries. It records the highest values in all the indicators measuring telework prevalence as well as in those measuring performance on digitalisation and the proportion of teleworkable jobs. High prevalence occurs in a context where there is negligible statutory legislation (telework is only dealt with in OSH legislation) and only collective agreements regulate telework. None of these countries have regulated the right to disconnect and the right to request telework. This regulatory approach goes in parallel with a comparatively low proportion of employees working at atypical working times (working time flexibility tends to be more driven by employee needs) and comparatively egalitarian gender norms (low gender gap in part-time employment), as reflected in previous literature (Chung and Tijdens, 2013; Anttila, 2015; Chung, 2022).

Cluster 2. Fast growth in prevalence of telework with supportive regulation and structure of economy + gender gap in part-time employment

This cluster includes the Central-Western European countries (Austria, Belgium, Germany, France, Luxembourg and the Netherlands) plus Italy and Malta. A defining feature of this cluster is related to the important role played by statutory legislation to regulate telework. In all these countries, legislation provides statutory definitions for telework, establishes a basic set of rules for the telework regime (such as the information to be provided to the teleworker and the right to return) as well as other provisions related to Occupational Safety and Health or digital monitoring (EU-OSHA, 2021b; Eurofound, 2022b). In most of these countries, statutory legislation is also combined with regulation established through multi-employer and company collective agreements (Eurofound, 2022a). This regulatory approach coexists with a particular pattern of gender inequality: this group of countries records the highest gender gap in part-time employment. This cluster also records the highest increase in telework since 2019 and shows a comparatively high prevalence of telework (particularly for employees in teleworkable jobs), although lower than Cluster 1. Similar to cluster 1, the economy of this group of countries is also well prepared for the development of working-from-home arrangements (high performance in terms of digitalisation and connectivity, and high proportion of teleworkable jobs). Finally, despite the prominent role played by statutory legislation, this cluster is also distinctive for lacking the most up-to-date telework rights: only the Netherlands has the right to request telework; and in terms of protecting workers against overtime or permanent connectivity, only Belgium, France and Italy have the right to

disconnect, where in Belgium and Italy this right does not even cover all the teleworkers (only 'agile workers' in Italy and companies bigger than 50 employees in Belgium).

Cluster 3. Low telework prevalence and digital performance under a state-centred telework regulatory framework

This cluster includes mainly Eastern European countries (Bulgaria, Cyprus, Czechia, Estonia, Hungary, Lithuania, Latvia, Poland, Romania and Slovenia). These countries record the lowest values in all the indicators measuring telework prevalence as well as in those measuring performance on digitalisation, digital connectivity and the proportion of teleworkable jobs. In terms of governance approach, this cluster gathers countries where there is specific legislation on telework (such as telework statutory definition and rules on telework regimes), although collective bargaining plays a negligible role in the regulation of telework in a context where collective bargaining coverage is very low and trade unions are comparatively weaker (AUTHOR XXXX). This regulatory approach goes in parallel with high participation from women in full-time work: the cluster records the lowest gender gap in part-time employment. Similar to cluster 2, this cluster gathers countries that do not have a legally established (through legislation or collective bargaining) right to request telework nor the right to disconnect. Furthermore, unsocial working time is comparatively low in this cluster (the lowest value).

Cluster 4. Medium telework prevalence and digital performance, employer-oriented working time flexibility and a 'balanced 'promoting-protective' telework regulatory approach

This cluster brings together Ireland, Slovakia, Greece, Croatia, Spain and Portugal. Statutory legislation plays a very prominent role in regulating telework in this cluster. In recent years, all of these countries also developed reforms in telework legislation that introduced new protections. In 2022, these were the only countries which had established the right to disconnect. This is also the cluster where the most countries have regulated the right to request telework. Those provisions are developed in the cluster which records the highest proportion of employees working during unsocial working time. The cluster is also characterised by exhibiting more gender inequality than clusters 3 and 1, measured in terms of the gender gap in part-time employment (although differences between clusters 1, 2 and 3 are relatively minor compared to cluster 4). In terms of the prevalence of telework, digital performance and connectivity, this cluster records higher values compared to cluster 3, although lower than clusters 1 and 2.

It is also worth noting that the dendrogram suggests that Ireland differs from the remaining countries in this cluster. This country records a comparatively higher prevalence of telework, however, it shares very similar patterns with the other countries in this cluster in terms of the content of telework regulation and unsocial working time (second empirical dimension). That is, Ireland has regulated the right to disconnect as well as the right to request telework and records the fourth highest percentage of employed people working at atypical working times. These features of the telework regime make this country distinct from the remaining clusters, where collective bargaining plays either a more prominent role in the regulation of telework (clusters 1 and 2) or, as in the case of cluster 3, statutory legislation exists but has not addressed the most up-to-date rights aiming to promote equal access to telework (right to request) and protect workers from permanent connectivity (right to disconnect). Moreover, these findings are in line with previous typologies or working time regimens, which have clustered Ireland together with Mediterranean countries (Spain, Italy and Portugal) due to its comparatively lower level of workplace flexibility and autonomy, and higher level of unsocial work hours.

5. Conclusions and discussion

Since the outbreak of COVID-19, telework has been extensively discussed within European countries and at the EU level. There is evidence that a sizeable proportion of employees and employers wish to keep implementing telework in the future (Criuscolo et al., 2021; Aksoy, et al., 2022). In this context, national social partners and governments are discussing the best regulatory approaches to promote telework while protecting workers against negative impacts on working and living conditions.

Moreover, at the EU level, in 2024 the European Commission launched the first-stage consultation of European social partners to gather their views on the possible direction of EU action to ensure fair telework and the right to disconnect, as per the rules and procedures for social policy legislation.

Our article's main aim has been to provide an innovative and up-to-date empirical exploration of telework across European countries by asking if European countries can be clustered according to specific features of telework regimes. To this end, first, we developed a conceptualisation of the telework regime. Drawing on previous institutionalist approaches, our conceptualisation of the telework regime aims to explore differences across European countries in three analytical dimensions: workplace telework practices; environmental aspects potentially related to the possibility to telework and the demand for telework; and procedural and substantive rules regulating telework. Thus, unlike much of the previous comparative work on telework, our study has looked at various analytical dimensions at the same time, with the aim of capturing a more comprehensive understanding of telework diversity across Europe. Second, we have built a dashboard of 13 indicators related to each of the three analytical dimensions which were used to categorise telework regimes. Indicators were taken from European statistical and database sources. At the same time, we built three new indicators on regulation based on primary data; due to the lack of secondary data sources on telework rules enabling comparative analysis in this crucial dimension. Third, we conducted a cluster analysis based on this dashboard of indicators to map varieties of telework regimes across European regions.

The empirical findings of our study are clear and enable us to identify four clusters of telework regimes which show different constellations in terms of telework practices, economic and social telework environments, and specific procedural and substantive rules on telework. First, we identify a Northern cluster (Cluster 1) in which there is a high prevalence of telework. In Cluster 1, there is an economic and ICT infrastructure that supports flexible working arrangements; a dual-earner/dual-carer family model; a low prevalence of unsocial working time; and a regulatory framework characterised by limited statutory legislation, but with social partners playing an important role. Second, we identify a cluster which groups Western-Central European countries (Austria, Belgium, Germany, France, Luxembourg and the Netherlands) plus Italy and Malta (Cluster 2). In Cluster 2, there is also a high prevalence of telework and economic structures which favour teleworkable jobs and digital performance. However, in contrast with the Northern cluster, there is a gendered pattern of working-time flexibility in which women are overrepresented in part-time work, and a regulatory framework on telework which combines both collective bargaining and statutory legislation (in some countries under Cluster 2, there is even the right to disconnect). Third, we identify an Eastern (post-communist countries) cluster (Bulgaria, Cyprus, Czechia, Estonia, Hungary, Lithuania, Latvia, Poland, Romania and Slovenia) (Cluster 3). Cluster 3 combines the lowest prevalence of telework with an economic structure less supportive of telework (a low proportion of teleworkable jobs and low rates of digitalisation); working time norms characterised by a comparatively low prevalence of unsocial working time and a gender gap in part-time employment; and a regulatory approach towards telework which provides only general legislation and where collective bargaining barely addresses telework provisions. Finally, we identify a fourth cluster which groups Ireland, Slovakia, Greece, Croatia, Spain and Portugal (Cluster 4). This combines moderate telework prevalence and digital performance; employer-oriented working time norms; an asymmetrical gender division of work; and a regulatory approach resting on statutory legislation, which provides the most comprehensive and balanced regulation (the right to request telework combined with the right to disconnect).

The results of our cluster analysis are partially in line with earlier studies on industrial relations regimes (Eurofound, 2023; Eurofound, 2018; Visser, 2009) and working-time regimes (Anttila et al., 2015), which identified significant cross-national differences in industrial relations' processes and outcomes and flexible work arrangements, respectively. This validates the robustness of our typology and confirms that telework practices and rules are highly embedded in national institutional contexts. At the same time, our results show that contrary to earlier findings of industrial relations typologies, the division into southern or liberal regimes is not straightforward. Some Mediterranean countries (Italy) are clustered with Western European countries, while others (Greece, Portugal and Spain) are clustered with Croatia, Slovakia and Ireland. We suggest that this is because, compared to traditional industrial relation typologies, we are including analytical dimensions specific to telework regimes which, in some

cases, resonate more closely with previous working time regime typologies, which already cluster Mediterranean countries together with liberal countries such as the United Kingdom or Ireland (Anttila et al., 2015). Also, this could reflect a convergence of policy strategies towards telework in the field of legislation, triggered by common internal challenges identified through our analytical approach (i.e. prevalence of employer-oriented flexibility leading to problems of unsocial working time, etc.).

Our results also raise new questions for further research in relation to the areas of study and the methodological approach. First, an important focus for future research is to analyse the question about the complementarity nature of structural economic factors, social norms, telework rules and telework practices. New institutionalist literature has argued that relevant institutions are complementary, in that they enhance each other's performance through mutual reinforcement and form a coherent regime. Following the results of our cluster analysis which shows how high prevalence of telework arrangements can coexist with different constellations of environmental factors and rules, further research could empirically test the issue of complementarities between environmental factors, rules and telework practices. Second, new indicators exploring differences in terms of employee-oriented flexibility could be built on the basis of the ongoing new edition of the EWCS, thus filling an important gap in our typology. Also, more elaborated indicators measuring different variants of telework (in terms of frequency, patterns, etc.) as well as gender inequality could be tested to improve our typology. Regarding gender inequality, the limitation of our model to only one indicator (gender gap in part-time employment) hinders more complex analysis on the characteristics of gender norms within the different telework regimens identified. Thus, further improvements on this dimension could enrich our current typology. Third, further research could look at the regional and local variations. Although institutional and regulatory environments are usually set up at national level, we can expect different patterns of industrial relations' interventions at sectoral and local level. Similarly, the structure of the economy is likely to vary across regions. Unfortunately, most of our indicators are not available at regional and local level. Accordingly, this kind of analysis would require some methodological innovations, either exploring new indicators or developing further qualitive analysis which could be oriented to research and explain regional and local differences within clusters or countries.

Finally, our study also raises practical implications for current policy debates at the EU level. The results of our typology suggest that policy interventions aimed at promoting telework and/or preventing negative impacts on working conditions as a result of this telework need to consider the institutional contexts (rules on telework) and environmental factors. Policymakers should focus not only on legislative frameworks but also on enhancing digital infrastructure or addressing working time factors that are fuelling gender inequalities in employment. Furthermore, our findings highlight the need for tailored approaches with a view to promote telework quality, which can be difficult to achieve through a European regulatory approach that would only address the basic regulation of telework. For example, countries under cluster 2 with a higher gender gap in part-time employment may benefit from policies that address both telework and gender equality in the labour market, reflecting the interdependence of these policy areas (Chung, 2022).

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[i] Less teleworkable sectors comprise NACE sections A to I (Agriculture, industrial sectors, construction, and retail and transport services). Less teleworkable occupations covers ISCO groups 5 to 9 (personal services workers, agriculture and fishery workers, craft and industrial workers, and elementary occupations).