Study exploring the social, economic and legal context and trends of telework and the right to disconnect, in the context of digitalisation and the future of work, during and beyond the COVID-19 pandemic

Annex 1 Methodology

LOGO

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Annex 1 Methology

2021

Annex 1: Methodology

This section presents the methodology of consultation activities. It also discusses the methodological choices made, in terms of the selection of respondents and outreach strategies.

Desk research

Desk research consisted of a systematic review of the literature, including a bibliographic search through relevant databases (whereby relevant publications were identified using keywords) and the use of 'snowball sampling' technique (where all the references of relevant publications were reviewed to identify additional relevant publications) (mainly used for Chapter 2).

In addition, an analysis of the EU labour acquis in relation to telework and the right to disconnect was performed (mainly used for Chapter 3). The different sources and evidence were triangulated to ensure the reliability and transparency of the results. Labour Force Survey (LFS) 2020 micro-data was used to obtain specific data (mainly used for Chapter 4).

Interviews with national stakeholders

The overall objective of **interviews with national stakeholders** was to obtain an in-depth understanding of the national context as regards four broad issues:

- Past and likely future trends related to telework and work-life balance (right to disconnect);

- Challenges and opportunities (e.g. OSH, decent working conditions, workers' privacy, cross-border telework, regional cohesion, etc.) posed by telework and the need to ensure adequate work-life balance;

- Relevance and effectiveness of national policies and social partners' agreements; and

- Relevance, effectiveness, efficiency and coherence of the existing EU labour acquis as well as perceived needs for change.

The following groups of respondents were targeted for interviews with national stakeholders:

- **National authorities**: At least one interview was conducted with national authorities per country. There are significant cross-country differences in terms of the scope of responsibilities of Labour Inspectorates (or similar enforcement agencies), as well as the division of expertise between Labour Inspectorates and Ministries of Labour. Given these differences, the core project team asked national experts to select the most relevant respondents (i.e. Labour Inspectorate or Ministry of Labour). For some countries, both were interviewed, while in others the choice was somewhat dictated by the availability of respondents.

- **Social partners**: Two interviews with social partners representatives were carried out per EU Member State – one interview with a trade union, and one with the representative of the employers association. On June 28, European social partners reached an agreement on a work programme for the social dialogue 2022-2024 that should include legally binding measures to regulate telework and institute a right to disconnect at the EU-level. Therefore, it was decided not to interview national cross-sectoral social partners. Instead, the interview programme focused on regional/sectoral social partners, which should also provide a sectoral or regional perspective. The core team aimed to coordinate interviews with national experts so that a broad range of sectors were covered.

In total, 83 interviews were carried out. Two additional interviews were carried out with Croatian trade union representatives and Lithuanian national authorities. Table 1 below provides a

distribution of interviews by country, type of national authority and sector, which the interviewed social partners represent.

Table 1. Distribution of interview respondents

Country	National Authority	Trade union	Employer association
		Sector	Sector
AT	Ministry of Labour	ICT, Printing, Journalism, and Paper	ICT, Printing, Journalism, and Paper
BE	Belgian Federal Public Service Employment, Labour and Social Dialogue (FOD WASO DiOVA/DiRACT)	Insurance	Insurance
BG	Labour Inspectorate	Education	Education
CY	Ministry of Labour, Welfare and Social Insurance	Banking	Industry
CZ	Labour Inspectorate	Metalworking	Metalworking
DE	Ministry of Labour and Social Affairs	Banking	Banking
DK	Labour Inspectorate/Ministry	Retail	Retail
EE	Labour Inspectorate; Ministry of Social Affairs	Healthcare	Healthcare
EL	Labour Inspectorate	Industry	Industry
ES	Labour Inspectorate	MSMEs in Catalonia	Public administration in Catalonia
FI	Finnish Institute for Occupational Health	Healthcare	Healthcare
FR	Ministry of Labour	Car manufacturing	Car manufacturing
HR	Ministry of Labour	Telecommunication; Energy	Telecommunication
HU	Ministry of Innovation and Technology	Metalworking	Metalworking
IE	Health and Safety Authority	Financial Services	Financial Services
IT	Labour Inspectorate/Ministry	Manufacturing	Manufacturing

LT	Ministry of Social Security and Labour; State Labour Inspectorate	Healthcare	Healthcare
LU	Ministry of Labour /ITM	Banking and Insurance	Banking
LV	State Labour Inspectorate	Education	Healthcare
MT	Government of Malta, the Department of Industrial and Employment Relations	Banking	Hotels and Restaurants
NL	Labour Inspectorate	Media & Culture	Media & Culture
PL	Ministry	Software development	Software development
PT	The Portuguese Labour Inspectorate (the Authority for. Working Conditions (ACT))	Banking	Banking
RO	Labour Inspectorate	Banking and Insurance	Banking and Insurance
SE	Swedish Work Environment Authority	Industry	Industry
SI	Ministry of Labour	Insurance	Insurance
SK	National Labour Inspectorate (NLI) under the Ministry of Labour, Social Affairs and Family	Automotive	Automotive

Source: Consortium

Expert interviews

The overall objective of expert interviews was to collect insights on existing policy and academic studies relevant to telework. While the broad list of topics was largely the same as for national experts, each interview was tailored to cover specific issues in which the informant is the most knowledgeable. The main criterion for the selection of interviewees was a demonstrated track record exploring issues germane to telework and the right to disconnect in an academic and/or policy environment. In total, 10 interviews with 13 experts were completed.

Table 2. Overview of expert interviews

Organisation	Informant	Date	Special focus on:
Joint Research Centre (JRC)	Enrique Fernández-Macías	13 July 2022	Trends in telework, changes in work organisation processes, algorithmic worker management

European Labour Authority	Irene Mandl	14 July 2022	Trends in telework and the right to disconnect, relevance of EU legislative framework and social partner agreements
Chair of the COST Action grant on The Geography of New Working Spaces and the Impact on the Periphery	Ilaria Mariotti	18 July 2022	Trends in telework, as well as coworking spaces as an emerging form of telework
European Agency for Safety and Health at Work (EU-OSHA)	Lorenzo Munar	19 July 2022	Telework from the perspective of occupational safety and health (OSH)
EU-OSHA	Maurizio Curtarelli	19 July 2022	Telework from the perspective of occupational safety and health (OSH)
European Foundation for the Improvement of Living and Working Conditions (Eurofound)	Óscar Vargas	20 July 2022	Trends in telework and the right to disconnect, relevance of existing EU regulatory framework and social partner agreements
Eurofound	Tina Weber	20 July 2022	Trends in telework and the right to disconnect; relevance of existing EU regulatory framework and social partner agreements
Eurofound	Ricardo Rodríguez Contreras	20 July 2022	Trends in telework and the right to disconnect; relevance of existing EU regulatory framework and social partner agreements
University of Bordeaux	Loic Lerouge	20 July 2022	Telework and the right to disconnect from the perspective of occupational safety and health; EU legislative framework
European Institute for Gender Equality (EIGE)	Jolanta Reingardė	21 July 2022	Telework and the right to disconnect from a gender equality perspective
International Labour Organization (ILO)	Jon Messenger	22 July 2022	Trends in telework and the right to disconnect, the relevance of existing EU regulatory framework and social partner agreements
European Economic and Social Committee (EESC)	Ursula Schwab	25 July 2022	Trends in telework and the right to disconnect; the role of social dialogue in regulating telework/right to disconnect
Hungarian Academy of Sciences Centre of Excellence	Csaba Makó	28 July 2022	Trends in telework and the right to disconnect, the relevance of existing EU regulatory framework and social partner agreements

Employee and employer survey

The overall objective of surveys was to obtain first-hand information from workers and employers regarding their experience and future plans for telework and work-life balance, benefits and challenges of these working arrangements as well as needs for policy improvements. The survey was launched in all Member States on July 7 and remained open until September 26. It was carried out via the Alchemer platform, which is compliant with the relevant GDPR rules. The survey was carried out in 22 languages so that respondents in each Member State have an opportunity to respond in their own national language.

The selection of respondents and questionnaire distribution relied on the following strategy:

- *Distribution through sectoral social partners' organisations*. National experts identified sectoral trade unions and employer associations and asked them to distribute survey invitations to their members. Each social partners' organisation received a unique survey link (for larger countries, 2 organisations received the same unique link). This allowed tracking of whether the invitation to the survey indeed reached the potential respondents. If not, reminders were sent and follow-up calls were made.

- *Distribution through social media*. Each expert identified professional groups on social networks (Facebook, LinkedIn and the like) for which invitations to the survey were sent. These groups typically covered a sector (e.g. construction) or occupation (e.g. group for tax consultants). However, only very few responses arrived through social media.

In some countries, the above-mentioned strategies did not provide sufficient responses. Hence, national experts tried to reach respondents using alternative strategies, such as:

- *Targeted advertisement campaign.* In some countries, the survey was promoted via Facebook advertisement campaigns, targeted at that country's employees and employers. This was the case in Austria, Denmark, Germany, Lithuania, Poland and Romania.

- *Use of internal network*. In some countries survey dissemination through sectoral social partners was extremely difficult; therefore, national experts used their internal networks to spread the message about the survey. This was the case in Austria, Belgium, Germany, France, Lithuania, Latvia, Luxembourg, Hungary, Croatia, the Netherlands, Poland and Sweden.

- *Newsletters*. If it was learned during calls to the sectoral social partners that the organisation has a no-email-spamming policy, we asked if they could share the survey link with their members using newsletters or by sharing it on their organisation's website.

- *Reminder letters and calls*. Sectoral social partners, who did not share the link with their community, received three reminders to fill in the survey and follow-up calls.

Survey dissemination was complicated due to several issues such as the short project timeline, the timing of the survey launch (summer/ holiday season) as well as lost opportunity to contact peak trade unions and peak employer organisations. Despite that, 14081 employees' and 3358 employers' answers were received. After data cleaning, responses from 11010 employees and 2260 employers remained for further analysis. **Data cleaning** proceeded in the following way:

- *Employee survey*: 2427 respondents who did not answer questions about the frequency of teleworking were removed from the analysis since their answers could not be used to analyse teleworking practices (603 of them only agreed with data privacy and did not proceed further; 1839 of them answered the first question but did not continue further). In addition, 41 responses from Austria and Luxembourg were removed from the analysis as

the number of responses was too low to analyse at the country level, even after using weights. After cleaning, the final employee survey dataset consisted of 11010 answers.

- *Employers survey*: 1098 respondents only agreed with the data privacy statement and did not proceed further after seeing the first set of questions; thus, they were removed from the analysis. In addition, one answer from Luxembourg was removed from the analysis. The final employer survey dataset consisted of 2260 responses.

Table 3 below discusses the number of social partners engaged, as well as responses received by each Member State. The above-discussed distribution strategy aimed to ensure good coverage of different sectors and occupations. Nevertheless, since the selection was not based on random sampling, the results of the survey are not generalisable across all employees and employers. The geographical imbalances were dealt with by using post-stratification weights (more information below).

Table 3. Overview of responses received after data cleaning.

Country	Employees		Employers	
	No. of org.	No. of responses	No. of org.	No. of responses Total
AT	27	-	108	90
BE	62	1377	76	191
BG	20	74	20	21
CY	30	708	25	173
CZ	39	259	73	346
DE	137	145	65	105
DK	68	722	60	47
EE	35	601	41	137
EL	36	70	39	109
ES	99	111	114	56
FI	67	2117	24	156
FR	58	1272	180	16
HR	65	874	32	14
HU	79	75	41	52
IE	20	269	27	18

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IT	46	**72**	35	**34**
LT	115	**103**	133	**28**
LU	40	**-**	23	**-**
LV	37	**105**	109	**61**
MT	36	**148**	9	**9**
NL	20	**51**	77	**74**
PL	188	**179**	119	**11**
PT	204	**990**	143	**223**
RO	142	**209**	174	**117**
SE	47	**101**	41	**29**
SI	66	**90**	93	**48**
SK	29	**288**	66	**95**
TOTAL	**9202**	**11010**	**1912**	**2260**

Source: Consortium

The response rate in some countries remained lower than expected. The main reasons were:

- Trade unions and employer associations did not agree to share the survey with their members, because it was not requested by the main (peak) trade union or employer association (AT, DE, ES, FR, IT). In one case an organisation had decided to share the link to the survey, although due to the short timeframe and the need to close the survey, responses could not be accepted anymore.

- Organisations have a no-spamming policy, where only important information is shared via emails (AT, DE, DK, FR, SE).

- Given that we could not reach out to the main (peak-level) social partners, in several small countries there are few organisations left which might have relevant insights on the topic (especially those countries for which telework and the right to disconnect are important topics) (LU, MT).

- During the calls, the organisations claimed to have shared the link with their members, but the number of responses had not increased as expected (PL, ES, IT, IE, HR, HU).

Overall, there is relatively good coverage of sectors and occupations. Figure 1 below illustrates the distribution of respondents by economic sector. A significant share of the respondents marked that they are from the 'other' sector. A majority of them indicated 'services' in the follow-up open question. Overall, the sectoral distribution resembles that of the total EU economy. However, knowledge-intensive services (including financial intermediation, ICT, research, and real estate) are overweight, while commerce and hospitality, construction are underweight.

Figure 1. Distribution of respondents by the main activity organisation

Employees
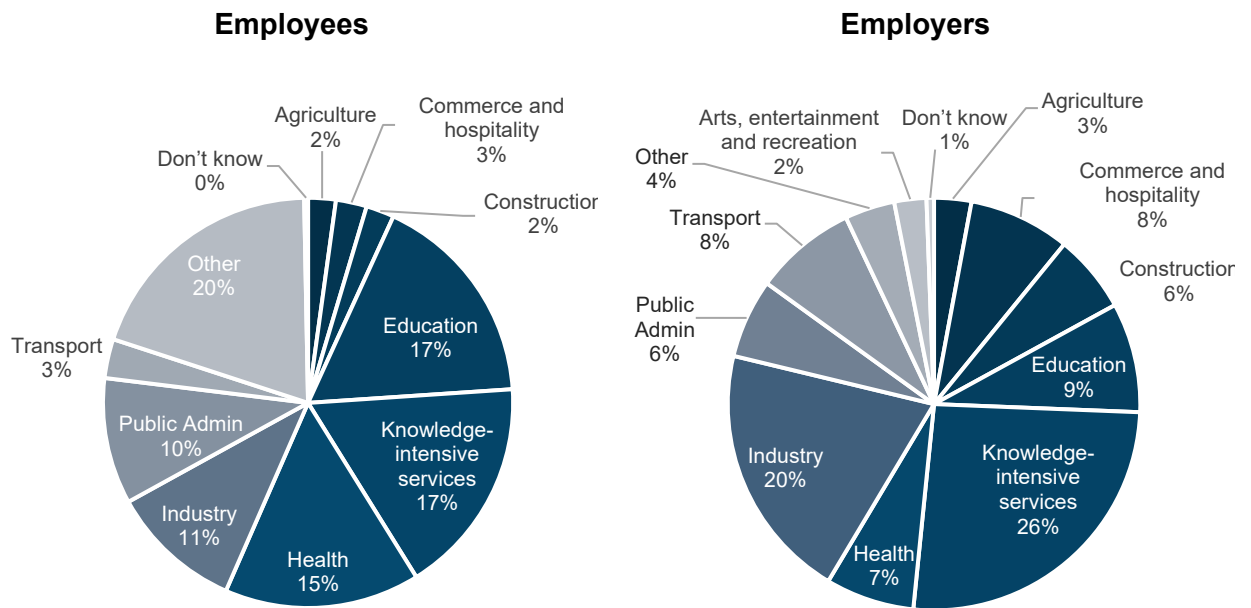
Employers

Source: Consortium. Note: N employees = 9204; N employers = 1709

The distribution of respondents by occupation largely resembles that of the EU total labour force (see Figure 2). The largest share of respondents are professionals (28%) followed by clerical support workers (15%), service workers (15%) and managers (14%).
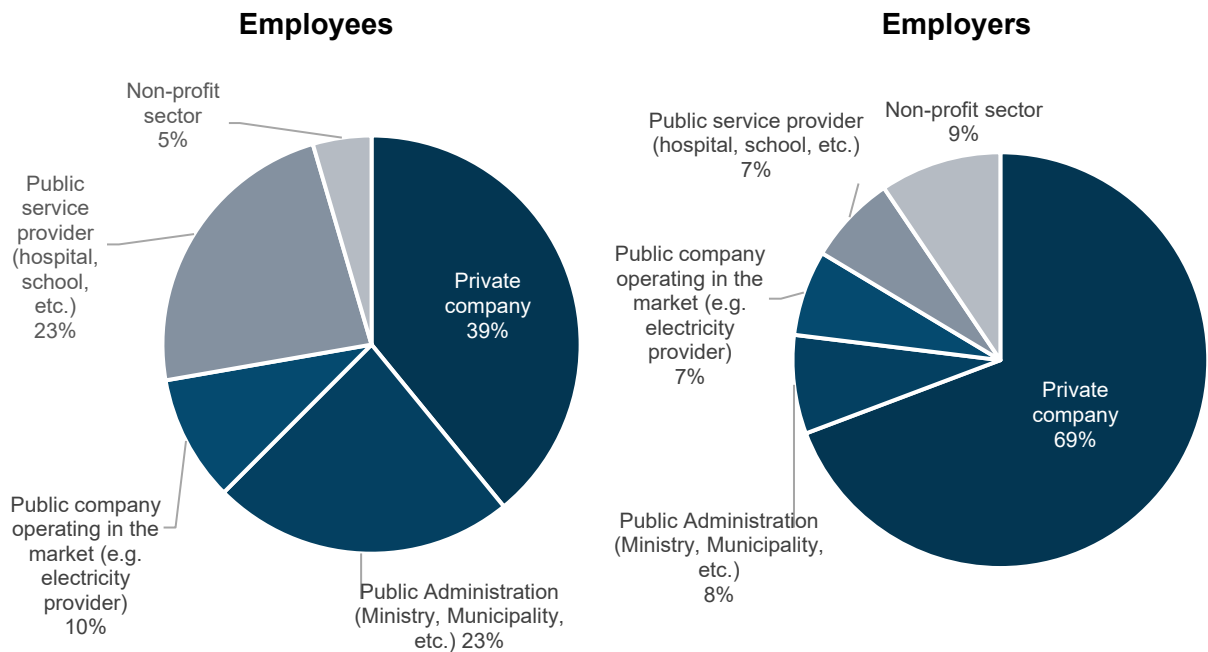
Figure 2. Distribution of respondents by occupation
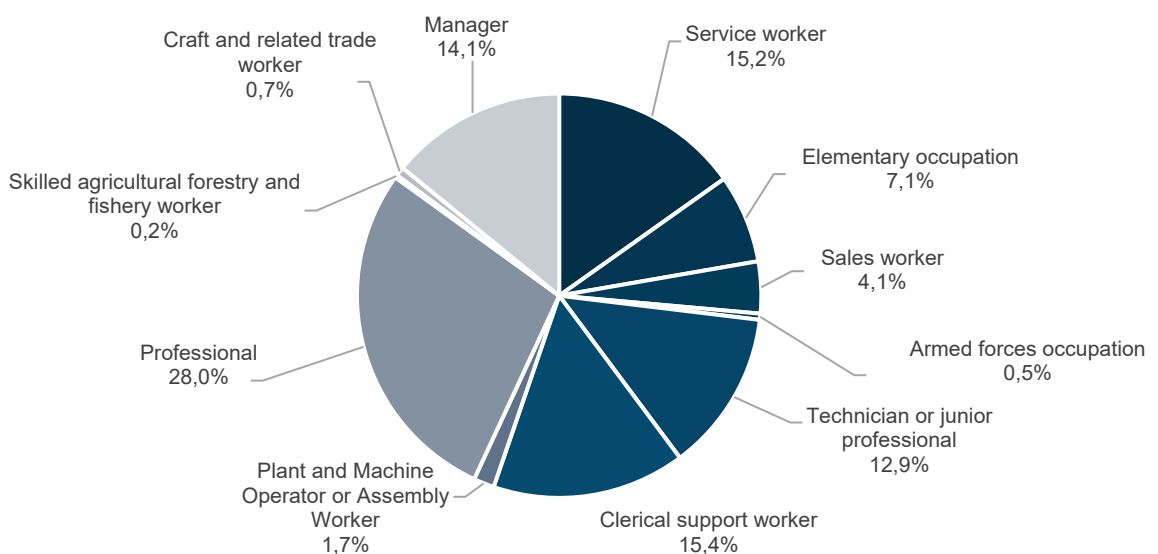
Source: Consortium.   Note: N employees = 9134

Finally, both surveys cover all types of organisations. Respondents from private companies were the most common, while the fewest respondents were from the non-profit sector (see Figure 3).

Figure 3. Distribution of respondents by the type of organisation.

Employees

Non-profit sector 5%

Public service provider (hospital, school, etc.) 23%

Public company operating in the market (e.g. electricity provider) 10%

Private company 39%

Public Administration (Ministry, Municipality, etc.) 23%

Employers

Public service provider (hospital, school, etc.) 7%

Non-profit sector 9%

Public company operating in the market (e.g. electricity provider) 7%

Private company 69%

Public Administration (Ministry, Municipality, etc.) 8%

Source: Consortium.   Note: N $_{employees}$ = 9193; N $_{employers}$ = 1744

Weights

Post-stratification weights have been used to reduce the possibility of over- or under-representation of certain demographic groups and the potential for non-response bias. In the employee survey, the weights were constructed using employees' share by country, gender and education in Europe. Country (employees' population), sector and size of the enterprise information were used in the employer survey.

Employee survey weights. Weighted LFS 2020 micro-data was used to construct weights for the employee survey. Data was collected for all European countries (except Austria and Luxembourg, as they were removed from our survey analysis). The *country x gender x education* crosstabs were created, and proportions from the total number of LFS survey respondents were calculated. The same procedure was made with our survey data. The LFS proportion was divided by our proportions to obtain the survey's individual weight. Where education or gender information was missing, we calculated additional cross-tables with *country x gender* and *country x education* proportions and weights. See Table 4 for an example of how the weighting exercise has been performed.

Table 4. Example of employee survey weights calculation.

Country	Gender	Education	LFS ratio	Our survey ratio	Weight (LFS/our)
PT	Woman	Primary education	0.001941	0.000554	3.51
PT	Woman	Lower secondary education	0.002135	0.001218	1.75
PT	Woman	Upper secondary education	0.003616	0.008415	0.43
PT	Woman	Post-secondary non-tertiary education	0.000078	0.001329	0.06
PT	Woman	Tertiary education (bachelor or above)	0.004896	0.049275	0.10
PT	-	Post-secondary non-tertiary education	0.000235	0.002287	0.10
PT	-	Tertiary education (bachelor or above)	0.007764	0.070028	0.11
PT	Man	-	0.022808	0.027523	0.83
PT	Woman	-	0.026407	0.060794	0.43

Source: Consortium

Employer survey weights. To construct weights, Structural Business Survey (SBS) data and LFS microdata were used to create *country x sector x size* cross-tables and proportions. However, SBS data provides information for only 5 sectors that are used in our survey (industry; construction; commerce and hospitality; transport and knowledge-intensive services). Thus, LFS 2020 microdata was gathered for the remaining sectors since it provides data on the number of employees in the respective size and sector (see Table 5 for an example). Employers data was estimated by dividing the number of employees by the central value of the enterprise size.[1] From this, *country x sector x size* and EU ratio were calculated. Since we know the *country x sector x size* ratio for all countries (LFS data) and have Eurostat official data for only 5 sectors, we had to estimate the number of employers in the rest of the sectors. This was crucial to combine official statistics from Eurostat and estimates from LFS. We checked official statistics – that is, how many employers are in five sectors (grey cells in Table 6) – and what percentage they comprise among other sectors (yellow cells in Table 6). From there, it was possible to estimate the total number of employers in the country, and then estimate the number of employers in other sectors (using LFS ratios). Finally, weights were constructed by dividing the official statistics *country x sector x size*

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[1] Group 1-10 was divided into 5; group 11-49 divided into 30; and group >50 divided into 100. This issue was solved the same way in ESENER survey. See https://oshwiki.eu/images/a/aa/Technical_Report_ESENER3_Final.pdf

ratio by our survey *country x sector x size* ratio. Where data was missing, additional cross-tables with *country x size* and *country x sector* proportions and weights were calculated.

Table 5. Source of data used for population weights calculation

Sector in the survey	Source	Respective NACE
Agriculture	LFS	An Agriculture, Forestry and Fishing
Arts, entertainment and recreation	LFS	R Arts, entertainment and recreation
Commerce and hospitality	Structural Business Survey (SBS)	G Wholesale and retail trade; repair of motor vehicles and motorcycles I Accommodation and food service activities
Construction	Structural Business Survey (SBS)	F Construction
Education	LFS	P Education
Health	LFS	Q Human health and social work activities
Industry	Structural Business Survey (SBS)	B Mining and quarrying C Manufacturing D Electricity, gas, steam and air conditioning supply E Water supply; sewerage, waste management and remediation activities
Knowledge-intensive services	Structural Business Survey (SBS)	J Information and communication K_X_K642 Financial and insurance activities except for activities of holding companies L Real estate activities M Professional, scientific and technical activities N Administrative and support service activities
Public administration	LFS	O Public Administration and Defence
Transport	Structural Business Survey (SBS)	H Transportation and storage

Source: Consortium

Table 6. Employer survey weights calculation

63%	643747.00
100%	1016706

		LFS DATA				EUROSTAT data				FINAL DATA			
		Total	1-10	11-49	50	Total	1-10	11-49	50	Total	1-10	11-49	50
SE	Industry	0.09	0.06	0.02	0.02	51366	45353	4284	1729	51366	45353	4284	1729
SE	Construction	0.09	0.07	0.02	0.00	100497	93100	6516	881	100497	93100	6516	881
SE	Commerce and hospitality	0.20	0.16	0.03	0.01	142548	130091	10459	1998	142548	130091	10459	1998
SE	Transport	0.04	0.03	0.01	0.00	28743	25633	2563	547	28743	25633	2563	547
SE	Knowledge-intensive services	0.21	0.14	0.04	0.02	320593	309954	8469	2170	320593	309954	8469	2170
SE	Agriculture	0.02	0.02	0.00	0.00	1016706 *0,02	...			20711	19210	1443	58
SE	Public administration	0.05	0.02	0.01	0.01	1016706 *0,05				47069	20525	13989	12555
SE	Education	0.11	0.06	0.03	0.01	...				110399	62953	34601	12846
SE	Health	0.16	0.11	0.04	0.01					160955	107395	40102	13458
SE	Arts, entertainment and recreation	0.03	0.03	0.00	0.00					33825	27735	4971	1118
	TOTAL	1.00	0.69	0.21	0.10								

Source: Consortium

In addition, it is important to highlight potential biases in the survey. These include:

- The survey was not based on random sampling, and thus the results of the survey are not generalisable across all employees and employers;

- The dissemination of the survey was mainly performed via trade unions and employer organisations, and thus we reached a low number of employees and employers who are not members of a trade union or an employer's organisation. Despite the fact that we promoted the survey via social media groups, and targeted advertisements, the number of respondents who came from social media was very low; and

- Since the survey was taken online, one could assume that it reached individuals that have at least a basic grasp of digital skills (if not a high level).

Delphi survey

In addition to the employee and employer survey, the Delphi survey was launched on 20 September to gauge experts' views on likely future scenarios. Invitations to the survey were sent to academics and policy experts, and most of them are directly referenced in this report. Invitations to participate were sent to 150 researchers and experts. Overall, 27 respondents answered all or some of the questions. The objective of the Delphi survey was to gain insight into:

- Likely short- and longer-term drivers of telework (i.e. to ascertain which ones are more/less important) and how (positively or negatively) they are likely to affect the prevalence of telework; and

- Likely (positive/negative) impacts of further growth in the prevalence of telework.

The Delphi survey sought to aggregate fragmented individual insights into collective knowledge. Since the future is uncertain and there is a lack of reliable 'hard' data, this method is particularly useful.

This survey provided inputs into:

- Development of scenarios in terms of how the prevalence of telework will evolve (hence, we need to understand the drivers); and

- Understanding what new challenges/opportunities will emerge and/or which of the existing ones will become more or less important.

The results of the Delphi survey were presented and further discussed during the expert workshop, which took place on 11 October. Experts evaluated the likelihood of the scenario and provided comments for further elaboration on future scenarios.

Ideally, the first round of the Delphi survey should have been followed by a second round/follow-up. This was not implemented because:

- We received valuable feedback and inputs during the expert workshop, which was modelled in line with requirements for the second round of the survey;

- Given the relatively low response rate (18%) to the first round, we did not expect wide participation in the second round; and

- The time left for the implementation of the second round was not sufficient, given the deadlines for the study deliverables.

Workshops

The overall objective of the workshops was twofold: a) to obtain feedback and comments on the preliminary results of the study and b) to obtain fresh insights, data and knowledge from experts in the field. Three workshops were carried out in this study. Each had its own unique audience and objectives, as outlined in Table 7. The first expert workshop, which focused on the right to disconnect, took place on 15 July. The second meeting with representatives of national authorities took place on 15 September. The third workshop with academics and research experts was on 11 October. Furthermore, a thematic focus group on cross-border telework and digital nomads was held on 12 October. Finally, the verification workshop took place on 1 December 2022.

Table 7. Meetings and workshops

Meeting	Overview
No. 1: **Thematic meeting on the right to disconnect** Duration: half-day (approx. 4 hours) Date: 15 July	The objective of the workshop was to gain a better understanding of legal and practical difficulties in implementing the right to disconnect. The workshop had 14 presentations, which were structured around two main sessions: • **Challenges and opportunities related to work-life balance and the right to disconnect**. Presentations and discussions largely focused on the extent to which there is a need for an EU / national – level intervention and what specific issues it should address

Participants: 43 participants, of which 15 from the European Commission, 7 from the contractor's core team, 8 national experts (part of the contractor's team). The remaining 12 participants were invited experts knowledgeable on the discussions around implementation of the right to disconnect across different MS.	**Looking forward**. This session focused on experience in selected MS and aimed to take stock of key policy lessons learned for the future.
No. 2 **Meeting with representatives of national authorities** in charge of policy framework related to telework. Duration: full-day Date: September 15 Participants: 32 participants, of which 10 from the European Commission, 5 from the contractor's core team. The remaining 17 participants were invited representatives of national authorities in charge of policy framework related to telework.	The objective of the workshop was to discuss preliminary findings, share experiences between national authorities, discuss remaining challenges and ways forward. The workshop had 7 presentations: 3 from the project team, 3 from national authorities, and one Member of European Parliament (Malta). The discussions were structured around three sessions: **Session I. National approaches**: members of the study team provided an overview of national approaches to regulation of right to disconnect and working time. This was followed by four presentations by participants outlining the legal regime, implementation challenges and policy discussions in Bulgaria, Portugal, Malta, and the Netherlands (respectively). **Session II. EU labour acquis**: tackling new challenges presented by an 'always on' culture. Presentation by member of the study team was followed by in depth discussions at three parallel sessions. **Session III. The future of telework**: drivers, challenges and opportunities. Presentation of initial study findings was followed by in depth discussions at three parallel sessions.
No. 3 **Expert meeting** with **EU and international academic and research experts** Duration: half-day Date: October 11 Participants: 26 participants, of which 13 from the European Commission, 10 from the contractor's core team. The remaining 4 participants were invited international academic and research experts. All participants were selected based on their methodological skills and thematic knowledge relevant to discussing the future trends and scenarios of telework, and adequacy of the current EU legal and policy framework.	The objective of the workshop was to discuss future trends and scenarios and adequacy of the current EU legal and policy framework. The workshop had 7 presentations. The discussions were structured around two sessions: **Session I.** Drivers and evolution of telework in the medium and long term. The core team presented three telework scenarios: (1) the case of a gradual increase in the prevalence of telework; (2) the case of high future prevalence and (3) the case of a decline in the prevalence of telework. This was followed by in-depth discussions on how likely the scenarios to happen and what is the reasoning behind this. **Session II**. Future impacts on telework. The core team presented three provocations on telework's impact on (1) employee well-being; (2) work organisation practices, productivity and competitiveness; (3) social, regional and other inequalities; (4) impacts on cross-border work. This was followed by in-depth discussions on how likely the scenarios to happen and what is the reasoning behind this.

No. 4 Thematic expert meeting (focus group) Duration: 2 hours Date: October 12 Participants: A focus group on cross-border telework and digital nomads was carried out in a hybrid, asynchronous format (with some online, some in person, some submitting written responses based on themes that emerged in the live meeting); there were a total of 12 participants (2 in person, 6 online and 4 submitting written responses).	The objective of the focus group was to discuss topics that have been highlighted as of interest to the social partners. Topics covered included: flexibility and work-life balance, administrative and taxation issues, professional/career development opportunities, cost of living, personal health and well-being, and office setup/working habits. Other issues that emerged were environmental impacts, and digital nomadism and related visa issues.
No. 5 **Workshop with all relevant stakeholders** Duration: full-day Date: December 1 Participants: 57 participants, of which 15 from the European Commission, 5 from the contractor's core team, 15 national experts (part of the contractor's team), 13 representatives of national authorities, 3 researchers, 4 representatives of national trade unions to whom requests to disseminate employee survey were sent. Two representatives from EU-level social partners attended the workshop (ETUC and SGI Europe) at the invitation of the European Commission.	During the validation workshop, the preliminary findings of the study were presented and discussed with the aim of gathering input from stakeholders. Other than the study findings, other topics touched upon the EU labour acquis, national approaches to telework and the right to disconnect, and future scenarios of telework. Two separate parallel sessions were held with a total of 57 participants, representing stakeholders previously involved in the study's evidence-gathering exercises, including representatives from academia, industry experts, national authorities of EU MS, and the European Commission.

Source: Consortium

Case studies

The objective of the ten case studies was to provide an in-depth assessment of the effectiveness of company-level practices as regards telework and the right to disconnect. Each case study covers the following three questions:

- Background: description of the firm in question. This includes the description of economic activity, size (no. of employees, ownership structure (firm), turnover (firm)), and other 'demographic' variables.

- Policy / company-level agreement: when was it adopted, what are the key provisions, which groups of employees does it cover, and what are the main modalities of implementation and monitoring.

- Assessment of effectiveness: which challenges and to what extent has it addressed, what were the key success factors, what problems and issues remain as well as what enabling conditions are missing, and to what extent does it provide a good practice relevant for others.

The selection of case studies aimed to have the largest variety possible (see Table 8 below).

Table 8. Criteria for selection of case studies

Selection criteria	Overview of the cases
Geographical distribution	Western Europe: 3 Northern Europe: 2 Southern Europe: 2 Eastern and Central Europe: 3
Good mix of public and private entities	Public: 3 Private: 7
Different sizes of establishments	SMEs: 4; large entities: 6
Appropriate sectoral distribution	Manufacturing: 2 Private services: 4 Public government and services: 3 Financial services: 1

Source: Consortium

Case studies relied on desk research and interviews. For each case study two interviews were conducted with:

- A representative of the management of the company (e.g. CEO/Director, COO, HR representative, line manager or similar).
- A representative of the employees of the company.

The case studies were sent to the key stakeholders (representatives of the management and employees) for verification, ensuring that factual data on the company and its policies/ agreements are accurate and complete.

Quantitative methodology for forecasting future prevalence of telework scenarios

This technical section provides details on how the forecasts of the future prevalence of telework were derived. This section of the annex is divided into three sections, with the first one focusing on the data used, the second detailing the estimation procedure, and the third specifying the technical aspects of the three forecasting scenarios (baseline, low-growth and high-growth).

Data

The forecasts were developed using aggregate Eurostat data as well as the micro-level European Union Labour Force Survey (EU-LFS) data on the proportion of employees working from home as a percentage of the total number of employees. Eurostat data was used for forecasting homeworking rates for EU-27 and each of the 27 Member State separately. We chose to use aggregate Eurostat data for country-level forecasts because they involved crucial figures for 2021; at the time of analysis, the available EU-LFS microdata only covered years up until 2020. An extra year of data was expected to increase the accuracy of the generated forecasts. Meanwhile, EU-LFS microdata were used for producing fine-grained forecasts for EU-27 by working pattern (full-time/part-time), gender, age, occupation, economic sector and size of firm. In all cases, forecasts were made for working age (15 to 64 years of age) employees. Self-employed persons and other individuals who do not qualify as employees were excluded from the forecasts.

The following EU-LFS microdata variable was used when developing fine-grained forecasting models:

- Working at home (coded as HOMEWK in EU-LFS microdata). The following variable coding was used in the survey dataset: 1 – Person usually works at home; 2 – Person sometimes works at home; 3 – Person never works at home; 9 – Not applicable; blank – No answer.

Using this variable, separate forecasts were made for the prevalence of two kinds of working at home – regular (when employees usually work at home) and occasional (when employees sometimes work at home).

To correct for sampling imbalances, yearly weighting factor (COEFF) was used when calculating percentage distributions of EU-LFS respondents on HOMEWK variable by working pattern (full-time/part-time), gender, age, occupation, economic sector and size of firm. The following EU-LFS micro-data variables were used to obtain the data breakdowns mentioned above:

- Full-time / Part-time distinction (FTPT). Variable coding: 1 – Full-time job; 2 – Part-time job; 9 – Not applicable; blank – No answer. A time series from 2002 to 2020 was used for building time series models;

- Sex (SEX). Variable coding: 1 – Male; 2 – Female. A time series from 2002 to 2020 was used for building time series models;

- Age (AGE). Variable coded in 5-year age bands: 2 for 0-4, 7 for 5-9, 12 for 10-14, 17 for 15-19 etc. A time series from 2002 to 2020 was used for building time series models;

- Occupation (ISCO1D). ISCO at 1 digit level, coded as 3-digit variable (100, 200, 300 etc.) to distinguish group 9 and not applicable. A time series from 2011 to 2020 was used for building time series models;

- Economic sector (NACE1Y1D). Coded according to NACE Rev. 2. A time series from 2008 to 2020 was used for building time series models;

- Size of firm (SIZEFIRM). Number of persons working in the local unit. Variable coding: 10 – respondent indicated an exact number between 1 and 10; 11 – 11 to 19 persons; 12 – 20 to 49 persons; 13 – 50 persons or more; 14 – Do not know but less than 11 persons; 15 – Do not know but more than 10 persons; 99 – Not applicable; blank – No answer. A time series from 2002 to 2020 was used for building time series models.

Additionally, EU-level and country-level Cedefop Skills Forecast Data on employment structure by occupation were used, covering the period from 2000 to 2030. The data indicate past and future employment structures by occupation in EU-27 overall and in each Member State using ISCO at 1 digit level. This variable was used as an external predictor of homeworking rates as future changes in occupational structure are expected to have an effect on the prevalence of homeworking. The second external predictor used in the forecasting models was the pandemic. More specifically, we used a dummy variable with 1 indicating the presence of a pandemic and 0 designating the years when it was absent. Years from 2000 to 2019 were all coded as 0, while

2020 and 2021 were coded as 1. It was important to include this variable into the forecasting models in order to account for the spike in homeworking rates in 2020 and 2021. The 2022-2030 values of this variable differed depending on scenario (see below).

Forecasting method

The forecasts provided in the report are automatic, meaning that the best time series model was selected automatically in each case using an automatic forecasting algorithm rather than relying on ad hoc decisions made by researchers. The key feature of automatic forecasting algorithms is their applicability to large numbers of time series without user intervention (Hyndman and Khandakar, 2008, p. 1). Since we were dealing with a very large number of time series, automatic forecasting was a suitable approach. *Forecast* package in R statistical software was used for forecasting, relying on the estimation algorithm developed by Hyndman and Khandakar (2008). The key features of the algorithm are described below.

1) Automated Autoregressive Integrated Moving Average (ARIMA) models were fitted using the *auto.arima* function. These models covered the available data on homeworking in the past (until 2021 for Eurostat data and until 2020 for EU-LFS) and included two external predictors described above – pandemic and employment structure by occupation. One of the key challenges when running ARIMA models is that model parameters need to be selected in each case so that they fit the unique time series under study – a procedure that entails a degree of subjectivity. Also, this is not a viable approach when a large number of forecasts need to be made. This is why automated ARIMA models were favoured in this case.

Using automated ARIMA estimation procedure, three key parameters of ARIMA model (p, d, q) are estimated. The definitions of each parameter are provided below:

p: the number of lag observations in the model, also called the lag order;

d: the number of times that the raw observations are differenced; also known as the degree of differencing;

q: the size of the moving average window, also known as the order of the moving average, referring to the number of lagged forecast errors in the prediction equation.

To make sure that the key condition of time series forecasting ('stationarity') is satisfied, a time series might need to be differenced. The degree of differencing (d) is selected so as to make the time series stationary. Using the *auto.arima* function, d parameter is determined using KPSS (Kwiatkowski–Phillips–Schmidt–Shin), ADF (augmented Dickey–Fuller) and PP (Phillips–Perron) stationarity tests.[2] Once d is selected, models with alternative combinations of p and q are compared. The best model was selected according to the values of Akaike information criterion (AIC) and Bayesian information criterion (BIC).[3]

2) the selected time series model was then used to produce forecasts using the *forecast* function. The expected values of the same two external predictors – pandemic and employment structure by occupation – were included in the forecasting models. Using Eurostat data, forecasts for 2022-2030 were produced; EU-LFS microdata necessitated predictions for one additional year (2021). For each prediction, 80% and 95% confidence intervals were estimated.[4]

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[2] As a general rule, no constraints were imposed on the d parameter. For most time series, the optimum order of differencing was selected based on stationarity tests. However, there were three time series models (homeworking sometimes in France and Slovakia, and homeworking usually in the Netherlands) where d parameter was manually set to 0. This adjustment was made due to unrealistically optimistic homeworking forecasts that would have been generated if the time series models selected by the usual procedure (ARIMA(1,1,0) for homeworking sometimes in France and Slovakia; ARIMA(0,1,0) for homeworking usually in the Netherlands) had been used.

[3] The automated ARIMA algorithm is described in full by Hyndman and Khandakar (2008), p. 11.

[4] In the reported forecasting graphs, the 80% confidence intervals are shown in dark purple and the 95% confidence intervals are marked with light purple (see the relevant annex).

Scenarios

From a quantitative analysis point of view, the main difference between the three scenarios lies in the specification of future values of the pandemic variable. In the baseline scenario, we presumed that due to significant lessons on the part of both employers and employees, half of the "pandemic effect" would remain from 2022 to 2030. The pandemic variable was therefore coded 0.5 in those years. In the low-growth scenario, it was assumed that these "learning effects" would not be felt beyond 2022. As such, the pandemic variable was coded 0.5 in 2022 and 0 thereafter. Finally, the high-growth scenario presumed that the pandemic variable will be as high as 0.7 in 2022-2024, 0.8 in 2025 and 1 in 2026-2030. This could be justified both by substantial lessons and shifts in behaviour after the pandemic as well as technological progress that is expected to increase the teleworkability of certain occupations.

References

Hyndman, R. J. and Khandakar, Y. (2008). "Automatic time series forecasting: the forecast package for R." *Journal of Statistical Software*, 26(3), 1–22. doi:10.18637/jss.v027.i03.

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