THE GEOGRAPHY OF REMOTE WORK IN EUROPE: AN ANALYSIS USING LFS DATA

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Abstract. This paper explores the evolution of working-from-home (WFH) across EU regions, focusing on the period before, during and after the COVID-19 outbreak from 2019 to 2022, to understand the distribution and determinants of remote work (RW) adoption at the regional level. This analysis of the EU Labour Force Survey reveals a widespread increase in the prevalence of WFH across EU countries, regions and territorial typologies. While RW rates have slightly receded from their peak at the height of COVID-19 restrictions, they remain markedly higher than pre-pandemic levels nearly everywhere in the EU, reflecting a lasting shift in work practices. Despite this common trend, substantial regional disparities persist across Member States, NUTS regions and territorial typologies (cities, towns and suburbs, rural areas). Main findings show geographic disparities at all levels in the adoption of WFH: the RW rate has been higher in Northern EU countries compared to Southern and Eastern ones. Similarly, capital regions had higher prevalence of WFH than other regions in the same country. Finally, WFH is more common in cities than towns/suburbs and rural areas.

1. Introduction

The COVID-19 pandemic triggered a large and sudden shift in the location of work around the world. It has indeed led to a significant increase of working from home (WFH), or more generally remote working (RW)[1], in the EU regions in the efforts of capital to address the disruption of production and consumption, involving space as a key, integral factor, in a new "spatial fix", reflecting a "destruction of time through space" (Ward, 2020). Because of this, there has been a growing debate on the implications of RW for the geography and role of large cities. Similarly, there has been substantial debate on the extent to which RW may lead to a structural relocation of workers and advanced economic activities from core urban centres towards less densely populated areas (Crescenzi *et al.*, 2022; Fiorentino *et al.*, 2022;

[1] Although WFH, which is defined by Eurostat (2021) as "*doing any productive work related to the person's current main job at home*" can be performed at home, and RW, which is defined by ILO (2020) as "*any situation where the work is fully or partly carried out on an alternative worksite other than the default place of work*" can be performed across various places, such as coworking places or libraries, in this paper, the terms "WFH" and "RW" are used interchangeably.

Florida *et al.*, 2023; Glaeser, 2022; Grabner & Tsvetkova, 2022; Nathan, 2023; Nathan & Overman, 2020), especially when work is done fully remotely.

Before the COVID-19 crisis, capital regions appear to have been a significant vector of employment polarisation, as they tended to generate a disproportionate share of new employment in well-paid, high-skilled jobs in the services sector, alongside growth in low-paid employment (Eurofound and European Commission Joint Research Centre, 2019). More generally, socioeconomic inequalities have been on the rise in European capital cities, with increasing separation between poor and rich (Musterd *et al.*, 2017). The contribution of global cities to inequality is notably driven by the concentration of financial activities there (Godechot *et al.*, 2023).

Meanwhile, in 2021 only 25% of the EU population lived in rural areas, although they account for more than three-quarters of the EU's territory (Eurostat, 2022).

Because WFH has significant potential implications for regional development and sustainability, it is important to assess how is recent surge has been distributed across European regions. While there is a growing number of studies uncovering the geography of WFH in the United States (Ramani and Bloom, 2021), the cross-country comparative empirical evidence from other Organisation for Economic Co-operation and Development (OECD) countries is, however, still lacking.

This paper contributes to the above literature on the rates and potential of RW from a geographical perspective. Have the levels of RW across regions become more similar after the COVID-19 crisis? Or did the COVID-induced increases in WFH concentrate in some specific regions, exacerbating previous differences?

This paper addresses these questions by using data on the evolution of WFH across European Union regions with a focus on its geographic distribution, from 2019 until 2022, that is before, during and after the COVID-19 crisis.

2. Data and methods

This study aims to document and explain the differences across EU regions in RW rate and how these have changed over time, around the COVID-19 crisis. Of particular interest is the role of geography: to what extent variation in RW rate reflect differences across countries, regions within countries, or between cities and rural areas can be explained by their geographic characteristics. To answer this question, we rely on the European Labour Force Survey (EU-LFS)[2], which is conducted annually and provides a representative sample of the working-age population. The

[2] The dataset cannot be shared since it has restricted access. Interested researchers need to apply to Eurostat for microdata access: https://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey.

EU-LFS cannot be used to track changes over time in individual patterns of WFH, because it is structured as an anonymous cross-sectional survey, not intended for longitudinal analysis. Nevertheless, some aggregate trends emerge on a geographical basis, along three dimensions: national, regional and territorial level. Besides the national level, we consider the NUTS region of the respondent's residence. Additionally, we consider the degree of urbanisation of the respondent's residence, as being either a "city", a "town or suburb" or a "rural area", based on a fine-grained geographical grid of population size and density. This additional classification thus allows to compare similar territories within and across different NUTS regions and countries. In this analysis, we consider the population of interest includes people aged 15 and over, who are employees, excluding self-employed and family workers. The main variable of interest measures how often the respondent reports WFH, with the possible answers "never", "sometimes" or "usually"[3]. From this variable, we derive a binary indicator equal to one when the respondent reports WFH at least some of the time (sometimes or usually) and equal to zero when they do not ("never"), because it is important to understand whether the company has implemented RW, regardless of whether it is hybrid (sometimes) or fully remote (usually). The RW rate is calculated as the number of individuals sometimes or always work remotely as a percentage of total people employed. The analysis begins with the national scale and then estimates the regional RW rate in 2019 and 2022 (a comparison between the year before the pandemic and the year immediately after), in 2020 (first pandemic year) and annual percentage RW rate change between 2019 and 2020 (due to the first pandemic year), to satisfy the research aim, i.e. to examine how RW unfolds unevenly across space. Aiming to detect spatial interactions, spatial autocorrelation indices (*p-value* and *z-score* of Moran I) were calculated for the RW rate in 2020 and RW rate change 2019-2020 variables at the NUTS2 regional level, using ArcGIS Pro 3.3.

3. The geography of remote work in Europe since COVID-19

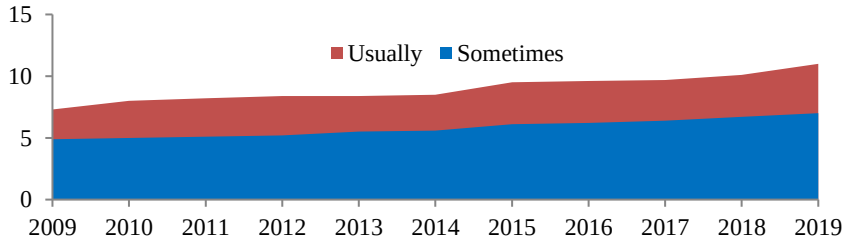
3.1. A brief overview before the COVID-19 pandemic, from 2009 to 2019

In this section, we present a descriptive analysis to outline the evidence for the EU-27 countries on the prevalence of WFH in the workforce before, during and after the COVID-19 pandemic. The focus of the analysis is on dependent employees, i.e.,

[3] WFH "usually" in this context means working at home half of the days in a reference period of four weeks preceding the end of the reference week. WFH "sometimes" means working at home less than half of the days worked, but at least one hour during the four-week reference period.

the population of workers who generally rely on their employer's assent to WFH where the post-covid conditions of WFH will be subject to negotiation and consent between workers, employers and their representatives.

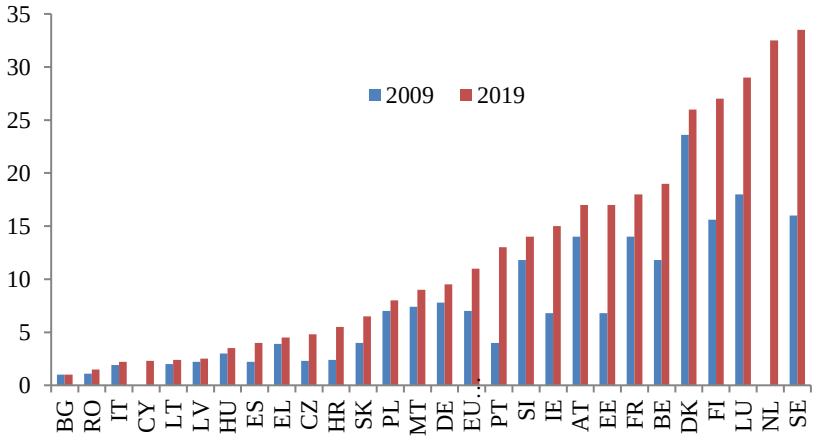
Figure 1 – *RW rate in the EU-27, 2009-2019 (Values are %).*



Source: EU-LFS data, own elaboration. Note: employees only.

Before focusing on the evidence during the pandemic, an overview is provided of the evolution of WFH among employees in the EU-27 from 2009 to 2019. In 2009 less than 8% of employees were WFH sometimes or usually. The rate has gradually increased over the years to reach 11% in 2019, just before the crisis (Figure 1).

Figure 2 – *RW rate in the EU-27 in 2009 and 2019 (Values are %).*



Note: Data on the frequency of WFH in 2009 are not available for the Netherlands and Cyprus. Employees only. Source: EU-LFS data, own elaboration.

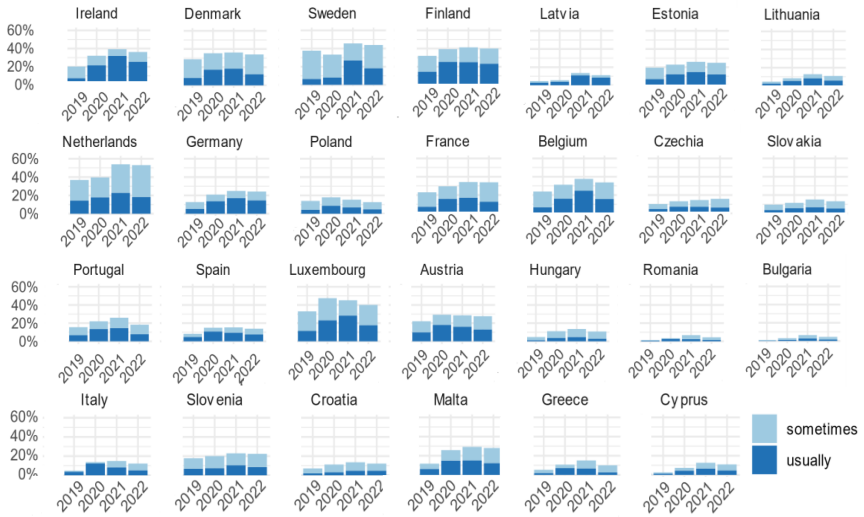
The ability to effectively adapt to large-scale WFH is likely to differ significantly across EU countries. Pre-outbreak, there were large and growing differences in the prevalence of WFH across its Member States. As of 2019, the RW rate was above

25% in most Northern European countries, including Sweden, Finland, Denmark, Luxembourg and the Netherlands, whereas it was below 10% in 15 of the 27 EU Member States, from Bulgaria to Germany (Figure 2). Between these two extremes, there were countries such as Belgium, France and Portugal where the RW rate was between 13 and 19%. Countries in Northern Europe are also those with the largest growth in the prevalence of WFH since 2009, albeit sizable increases also took place in a few other Member States including Portugal, Estonia and Ireland.

3.2. Remote work across EU Member States

As shown by figure 3, RW rate before COVID-19 was around 14% on average across the EU. With the introduction of COVID-19 confinement measures in 2020, it increased markedly in every country (20,8% on average across the EU) and increased even further in 2021 in many countries (24,2% on average). In 2022, after confinement measures were lifted, RW rates decreased slightly everywhere, while remaining well above pre-pandemic levels (22,6% on average).

Figure 3 – *RW rate in the EU-27, 2019-2022 (Values are %).*



Source: EU-LFS data, own elaboration. Note: employees only.

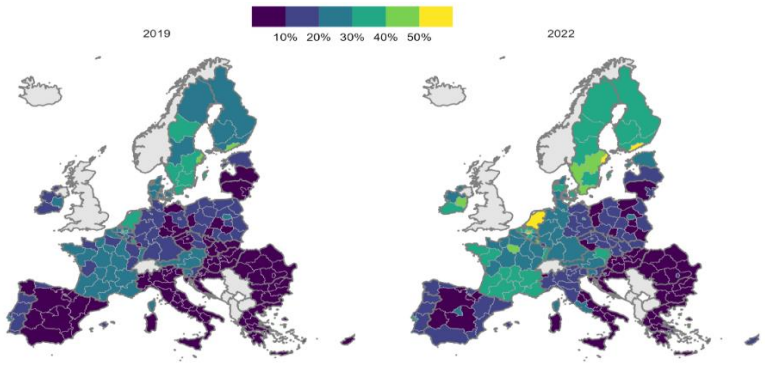
Despite this common trend, the magnitude of changes in RW rates varied across Member States and in some cases so did their timing. Between 2019 and 2020, Luxembourg and Malta recorded the largest absolute increase, over 14 percentage points; they were followed by another small country, Ireland, where the RW rate

increased from 20% to 32%; Italy, Belgium, Germany, Finland and Austria also recorded a noticeable increase (above 7 pp). At the other end, the smallest absolute changes (below or around 2 pp increase) were recorded in Latvia, Romania, Bulgaria, Slovakia and Slovenia. Between 2020 and 2021, with COVID-19 confinement measures still in place and being tightened in some countries, the increases in the RW rate progressively consolidated or remained stable, albeit to a very different extent. Only in three countries the RW rate slightly decreased, notably in Poland (-2,5 pp), Luxembourg (-2,4 pp) and Austria (-0,6 pp); by contrast, in the Netherlands and Sweden, there was a considerable increase (+14 and 13 pp respectively). In 2021, these two countries ranked the highest RW rate (54% and 47%), followed by Luxembourg (45%), Finland (41%), Ireland and Belgium (40%), Denmark (36%) and France (34%). In all other countries the respective rates were below 30%, with most Eastern European, Baltic and Mediterranean countries standing around or below 15%. Romania and Bulgaria continued to record the lowest rate, around 7%, albeit this represents a five-fold expansion on pre-COVID levels, given low starting levels. In 2022, despite of public-health measures were lifted across all Member States, the RW rate reduced only slightly (between 1 and 3 pp in most countries), remaining well above the pre-COVID levels of 2019.

3.3. Remote work across EU NUTS regions

Besides the differences across EU Member States, there was considerable heterogeneity in the prevalence of WFH across regions, as shown by figure 4, based on region of residence of the EU-LFS respondents.

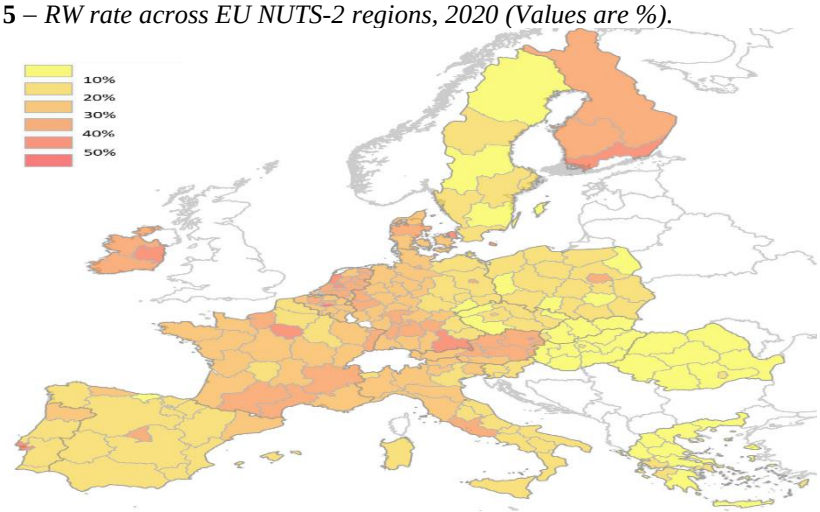
Figure 4 – *RW rate across EU NUTS-2 regions, 2019 and 2022 (Values are %).*



Note: Regions are NUTS-2 where available. NUTS-1 (Austria and Germany) or Country (Netherlands). Employees only. Source: EU-LFS data, own elaboration.

Before COVID-19, Stockholm and Helsinki were the only NUTS-2 regions with RW rate higher than 40%, standing out also compared to other areas of the country. In Denmark instead, the interregional variability was much less pronounced, with consistently high RW rate in all regions, albeit higher in Copenhagen. In Belgium, RW rate in 2019 was highest in the commuting regions surrounding Brussels, that is Flemish Brabant and Walloon Brabant. In most of Eastern European, Baltic and Mediterranean countries with very low pre-Covid RW rates instead, RW rates were not very different in the capitals or surrounding regions. In Romania and Bulgaria for instance, Bucharest and Sofia region ranked third and second within their countries, with only 1,5% and 1,4% of people WFH, respectively. Within countries themselves, the difference between the regions with the highest and lowest RW rate in 2019 was particularly high in Belgium, Poland, Slovenia (above 20 pp difference), Finland, Slovakia and France (above 14 pp). The pandemic crisis resulted in a significant rise in RW rate in most regions: at the peak of WFH in 2021, 195 out of 202 NUTS-2 regions (96%) had higher RW rates than they did in 2019. By 2022, with the retreat of public health measures, this was still the case for 181 NUTS-2 regions (89%), with most of the exceptions concentrated in Poland and Portugal. Between 2019 and 2022, seven out of the ten NUTS regions that increased their RW rates the most (by 15-22 pp) surrounded national capitals. In summary, within countries, EU regions were more unequal in terms of their RW rate in 2022 than they were in 2019, with capital regions tending to have the highest rates within countries.

Figure 5 – *RW rate across EU NUTS-2 regions, 2020 (Values are %).*



Note: employees only. Source: EU-LFS data, own elaboration.

RW rate in 2020, first year pandemic, significantly varied across the EU regions (Figure 5). The highest rates are observed in regions of northern and central-western EU, whereas the lowest in central-eastern and south-eastern EU. The top 5 regions included core, metropolitan and well-developed regions, specialized in services and with high rates of high-skilled: Helsinki-Uusimaa (FI), Bavaria (DE), Région de Paris (FR), Prov. Brabant Wallon and Région de Bruxelles (BE), Eastern and Midland (IE). Peripheral, economically weak regions, specialized in manual-work sectors, such as manufacturing, with lower rates of high-skilled, were in the bottom-5 (in Greece, Romania, Hungary, Slovakia and Poland). Figure 5 also indicates a clustering of RW rates in 2020, highlighting the increased likelihood for strong spatial interactions. Indeed, the results of spatial autocorrelation reveal that RW rates in 2020 were spatially correlated (Table 1), as Moran I of RW rate 2020 was statistically significant with a value of 0,25. Moreover, the *z-score* (22,36) indicates a likelihood below 1% for the clustered pattern to be the result of random chance.

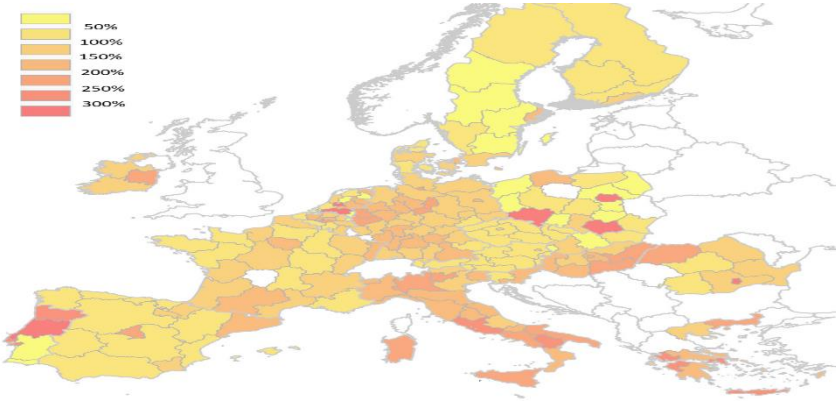
Table 1 – *Spatial autocorrelation statistics: RW rate 2020 and RW rate % change 19-20.*

	RW rate 2020	RW rate % change 2019-2020
Global Moran I	0.25	0.03
p-value	0.00	0.00
z-score	22.36	3.14

Source: EU-LFS data, own elaboration

Focusing on the change of RW rate from 2019 to 2020 (Figure 6), around 90% (189) of the 208 study regions (with available data for both years) saw an increase of RW rate.

Figure 6 – *RW rate across EU NUTS-2 regions, perc. change 2019-2020 (Values are %).*



Note: employees only. Source: EU-LFS data, own elaboration.

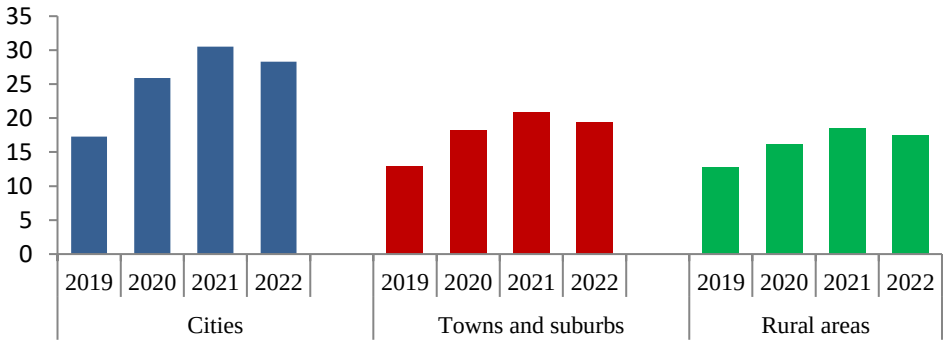
The average change was 152%, clearly indicating COVID-19 as a cornerstone in regional trends of RW (Althoff *et al.*, 2022). RW changes followed clear geographical patterns, with regional labour markets in Italy, France and Greece recording important increases of RW rate, highlighting the significance of the national context.

By contrast, figure 6 also marks stark antitheses among regions within Portugal, Poland and Romania. The change in RW rate from 2019 to 2020 (Figure 6) seems less spatially clustered than RW rate 2020 (Figure 5). This is verified by spatial autocorrelation statistics, indicating the existence of spatial autocorrelation (Moran I = 0,03), which is clearly weaker than for RW in 2020.

3.4. Remote work by degree of urbanisation

As reported in Sostero *et al.* (2020), before the pandemic WFH was much more likely in more densely populated metropolitan areas, than in suburbs and rural areas. During the pandemic, RW rate increased more in cities than in other areas, based on the "*DEGURBA*" variable[4].

Figure 7 – *RW rate by degree of urbanisation in the EU-27, 2019-2022 (Values are %).*



Note: Employees only. Source: EU-LFS data, own elaboration.

In addition to capital regions having notably high levels of remote work, since 2020 there has been a more general divergence across EU NUTS regions: between cities on the one hand and towns, suburbs and rural areas on the other. At EU27 level, RW rate in cities increased from 17,3% in 2019 to 30,5% in 2021, before

[4] DEGURBA, degree of urbanisation. This LFS variable differentiates between three settlement types with respect to their degree of urbanisation based on population density at Local Administrative Unit level (https://ec.europa.eu/eurostat/web/nuts/local-administrative-units). The three categories are "*Densely populated / cities*", "*Intermediate / towns and cities*" and "*Thinly populated / rural*".

dropping slightly to 28,3%; this amounts to an overall increase of approximately 9 percentage points between 2019 and 2022 (Figure 7). This compares with an increase of approximately 6,5 percentage points in towns and suburbs and around 4,8 percentage points in rural areas. This relates on the one hand to differences in employment structure: more densely populated, metropolitan areas are richer in the knowledge-based, white-collar services jobs that lend themselves to remote working, while in other area-types jobs that cannot be performed remotely are more common (e.g., agricultural labour in rural areas). On the other hand, it could also be influenced by the availability of digital infrastructure required for much WFH (for example, high speed broadband is more commonly available in cities than in remote rural regions). Moreover, employees working in urban areas usually have higher commuting time than workers working in non-urban areas and are more likely to work from home to avoid commuting (Eurofound, 2022).

4. Discussion and conclusions

This paper investigates the differences in RW rates across country and regions of the European Union (EU-27) from a geographical perspective. Using individual-level microdata from the EU Labour Force Survey, at the country level, RW rate for employees almost tripled from 2009 (the earliest year that Eurostat provides data) to 2022 (from less than 8% to 22,4%), highlighting the significant implications of the pandemic on RW (De Filippis *et al*., 2020). Around 1 out of 5 employees sometimes or usually worked from home in 2020, with the pandemic-driven increase continuing in 2021 although with some declining trends in 2022, indicating that the COVID-19 effects on RW could be longstanding (OECD, 2020). The countries with the lowest RW rate before 2020, mostly in South-Eastern Europe and the Baltics, grew proportionally faster, hinting at a process of cross-country convergence, though large differences still remain across regions and countries. We also find that nearly every NUTS-2 region in the EU has seen an overall increase in RW rate: in 2021, at the peak of COVID-related confinement measures, the highest RW rates were found in and around Northern European capital regions, where 40-50% of the population works from home at least some of the time, while the lowest rates were found in rural regions of South-Eastern countries. Throughout the EU, RW rate grew more in cities, compared to towns/suburbs and rural areas. This might pose a risk of a territorial divergence, with urban and capital areas disproportionately reaping the benefits of the digital revolution. The closing remarks refer to suggestions for future research. Could WHF lead to an influx of urban workers into rural areas, revitalising them? Certainly, it is worth further examining remote work, when accounting that while a “big exodus” from the cities is not so possible (OECD, 2021), the relocation of

companies in the new, less spatially fixed organization of work could provide valuable insights on the future of socio-spatial inequality. In this context, in Italy many workers are reconsidering their priorities and would like to be able to work from anywhere (Cardone, 2023). A new phenomenon has emerged as result of these changes: *south-working*, people that work mainly remotely for employers located elsewhere, in Northern Italy or abroad. This may represent a positive input for Southern economies, which could attract talent both among those who were part of the "brain drain" and among people who are not originally from the South. An emerging form of remote work that allows employees to work from anywhere (WFA), so that the worker can choose to live in a preferred geographic location, in internal or remote areas and the Southern regions of Italy, in which the educated face continuous pressure for internal migration from South to North.

In conclusion, the rise in WFH has potentially profound implications for the spatial organisation of economic activity and the structure and morphology of regions in the coming years. However, as employers' and workers' preferences are still evolving, long-lasting effects are challenging to predict.

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