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Working from Home in European Countries before and during the Covid-19 Pandemic

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Working from Home in European Countries before and during the Covid-19 Pandemic

Abstract

We use data from the EU Labour Force Survey for 8 countries and document the levels of working from home in the sample countries, industries, and occupations in the 2011-2019 period and its changes in 2020, the year when the COVID-19 pandemic started. We show that there are significant differences in working from home across countries, industries, and occupations and that working from home has increased almost everywhere in the 2011-2019 period and more significantly in 2020. Countries that had the lowest levels of working from home in 2019 enacted the most stringent stay-home and workplace closure policies and experienced the largest growth rates in working from home in 2020. Finally, we compute a measure of working from home capacity for the sample countries using the observed working from home levels.

JEL-Codes: J230, J240.

Keywords: working from home, pandemic, occupations, industries.

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1 Introduction

The share of employees who work from home has sharply increased during the COVID-19 pandemic. Lockdown policies, production restrictions, social-distancing measures, and the fear of infection have impelled employees and firms to learn and invest in technologies that allow to work from home. Many employees have adapted a space at home to work remotely and might continue doing so after the pandemic (Barrero et al., 2021).

We use data from the EU Labour Force Survey and provide a descriptive analysis of the evolution of the share of employees who work from home in 8 European countries in the 2011-2019 period and during the first year of the pandemic, 2020. We analyze differences across countries, industries, and occupations.

We show that there are significant differences in working from home across countries, industries, and occupations in the 2011-2019 period and that working from home has increased almost everywhere in this period. Finland and Sweden had the highest levels of working from home in 2011. They have also experienced the highest increases in working from home in the 2011-2019 period among the sample countries. In contrast, Italy and Spain had the lowest levels in 2011. These countries have also experienced almost no changes in working from home during the pre-pandemic years.

Working from home has increased in almost all industries in the 2011-2019 period. The Education and the Information and Communication industries have the highest levels of working from home, while the Accommodation and Food Services industry has the lowest one. In general, industries that have higher levels of utilization of information and communication technologies (ICT) have higher levels of working from home and have experienced larger increases in it as compared to industries with lower levels of ICT utilization (see Jerbashian and Vilalta-Bufí, 2020, Oettinger, 2011, for evidence on the association between working from home and ICT). Working from home has also increased in many occupations in the 2011-2019 period. Managerial and professional occupations tend to have the highest levels of working from home and have experienced the largest increases in it.¹ In turn, crafts, building, and assembling occupations that are specific to

¹Oettinger (2011) shows that working from home has increased more in occupations that use ICT more

the manufacturing, mining, and construction industries tend to have the lowest levels of working from home and have experienced at most small increases in it.

Working from home has sharply increased in 2020 in almost all countries, industries, and in managerial, professional, and clerical occupations. An exception is Sweden, where working from home was the highest among the sample countries in 2019 but has declined in 2020. It has declined in all industries and almost all occupations in Sweden. In the remainder of the sample countries, the growth rate in working from home in 2020 has been higher than the cumulative growth during the 2011-2019 period. Countries with the lowest levels of working from home in 2019 have experienced the highest growth rate in working from home in 2020. This has occurred in all industries and managerial, professional and clerical occupations.

The large increase in working from home was partly due to the non-medical intervention policies such as lockdowns, production restrictions, and workplace safety measures. We obtain indicators measuring the strength of non-medical intervention policies from Hale et al. (2021) and show that the levels of working from home in 2019 are strongly negatively correlated with the stringency of these policies and positively correlated with the growth rate in working from home in 2019-2020. This implies that countries with lower levels of working from home in 2019 have imposed more stringent non-medical intervention policies in 2020 and have experienced the largest growth rates in working from home in 2020.

We also compute the capacities of working from home in sample countries. We use the observed maximum level of working from home in each occupation-industry pair in the sample countries and adjust it to the employment composition in industries and occupations in each country using country-specific hours of employment in the occupation-industry pairs in 2019. According to this measure, Italy and Spain have the lowest capacity of working from home. About 40 percent of the labor force in these countries can work from home. In turn, Sweden and France have the highest capacities of working from. Nearly 50 percent of the labor force can work from home in these countries.

intensively in the US in the 1980-2000 period.

This paper contributes to the growing literature that studies the patterns of working from home and the economic impact of the COVID-19 pandemic. Oettinger (2011), Mateyka et al. (2012), Katz and Krueger (2019), Jerbashian and Vilalta-Bufí (2020) have documented an increase in working from home and other alternative work arrangements in the US and EU before the COVID-19 pandemic (Mas and Pallais, 2020, offer a recent review of literature on alternative work arrangements in the US). The measurement and analysis of working from home has become especially important because of the pandemic. Dingel and Neiman (2020) were the first to propose and utilize a task-based method for evaluating the capacity of working from home in the United States. This method relies on determining tasks that are incompatible with working from home. Gottlieb et al. (2021) utilize a similar approach for several developing countries. There are significant differences in predictions regarding working from home capacity across studies that use such methods. These are mainly due to data limitations and differences in judgments regarding job characteristics that can be compatible with working from home. Nevertheless, the accumulated evidence suggests that these task-based methods can somewhat accurately capture the variation in the working from home capacity when direct measures are not readily available (e.g., see Alipour et al., 2020, Gottlieb et al., 2021). Several studies have also used data from administrative employment statistics and surveys to measure the actual and potential working from home capacity (e.g., Adams-Prassl et al., 2022, Alipour et al., 2020, Brynjolfsson et al., 2020). These studies document significant differences in working from home across industries and occupations in Germany, the UK, and the US. Our paper, in contrast, utilizes data from the individual-level, harmonized EU Labour Force Survey. We document the levels of working from home and their changes in 8 European countries before and during the COVID-19 pandemic. We also report the evolution of working from home across industries and occupations in the sample countries and compute working from home capacities using the observed levels of working from home.

2 Data and Analysis

The data for working from home are from the EU Labour Force Survey (EU LFS). We compute the share of employed individuals who report that they work from home either sometimes or usually in each sample country, industry, occupation, and year, using as weights the number of hours of work together with the sample weights from the survey. Industries have 1-digit NACE Rev. 2 coding, and occupations have 2-digit ISCO-08 coding. We exclude from the sample family workers, and the individuals who are older than 65 (see Jerbashian and Vilalta-Bufí, 2020, for further details regarding working from home variable in the EU LFS).²

Country-Level

Panel A of Table 1 offers the share of employees who report that they at least sometimes work from home in sample countries for the years 2011, 2015, 2019, and 2020. Panel B provides a classification of countries according to the share of employees that work from home. For each year in the period 2011-2020, we rank countries in terms of their level of working from home (i.e., the share of employees who work from home) and classify them using two equidistant percentiles. We construct this ranking in the following way. A country has a high level of working from home in a given year if working from home in that country is above the 67 percentile of the distribution of working from home among all countries in that year. A country has medium and low levels of working from home in a given year if working from home in that country is between the 67 and 33 percentiles or below the 33 percentile of the distribution of working from home among countries in that year, respectively. The columns High, Medium, and Low in Panel B report the frequency that a country has a high, medium, and low level of working from home in the period 2011-2020. The ranking is stable across time. Sweden and Finland consistently rank as the countries with the highest levels of working from home. About 20 percent of the labor force in these countries has at least sometimes worked from home in 2011.

²We have attempted to include a balanced sample of relatively large economies in Southern, Central, and Northern Europe. The UK is not in our sample because we do not have data from the UK for 2020. We use data starting from 2011 because of changes in the occupational classification in the EU LFS.

This percentage has increased to 29 percent in Finland and 36 percent in Sweden by 2019. Austria, Belgium, and France have a medium level of working from home during the entire sample period. The share of employees who work from home ranges from 14 percent in Belgium to 18 percent in France in 2011 and increases to 19 percent in Belgium and 21 percent in France by 2019. In turn, Germany, Italy, and Spain have the lowest levels of working from home during the entire sample period. The share of employees who work from home ranges from 2 percent in Italy to 8 percent in Germany in 2011. It slightly grows in Spain from 3 to 4 percent and in Germany to 10 percent in 2011-2019. It remains virtually constant in Italy during this period. While the share of employees who work from home increases abruptly in 2020 in all countries, except for Sweden, the ranking remains stable.

Working from home has fallen in Sweden in 2020 as compared to 2019. This is puzzling and we have found no straightforward explanation for it. As we report below, working from home has fallen also in industries and occupations and, consequently, it is not because of changes in the industry and occupation composition of employment.³ Moreover, the theoretical models characterizing individual- and firm-level optimal adjustment to the pandemic suggest that social distancing and teleworking, including working from home, should have increased in 2020 even absent non-medical intervention policies such as stay home requirements and workplace closures (e.g., Brotherhood and Jerbashian, 2020, Brotherhood et al., 2020, Kremer, 1996).

Panel C of Table 1 reports the growth rates in working from home in sample countries over the 2011-2019 period and in 2019-2020. In almost all countries, the growth rate in working from home in the pandemic year 2020 is larger than its cumulative growth during the 8 pre-pandemic years. For example, working from home has increased 6% between 2011 and 2019 and 47% between 2019 and 2020 in Austria. The exceptions are Sweden and Finland. Finland has had a high growth in working from home during the whole

³There is a fall in working from home in 2020 also among gender, age, and education-level groups, as well as among employees with temporary and indefinite contracts and married and single employees. The fall in working from home is because of the drop in the number of employees reporting that they only sometimes work from home. We have checked that survey questions regarding working from home have not changed in Sweden in the sample period.

period whereas working from home has declined in Sweden in 2020. The growth rate in working from home in 2011-2019 is positively correlated with the level of working from home in 2011 in sample countries. In contrast, the growth rate in working from home in 2020 is negatively correlated with the level of working from home in 2019.

The significant growth in working from home in 2020 can be attributed to the non-medical intervention policies such as lockdowns, production restrictions, and workplace safety measures. Panel D of Table 1 reports the values of indices of non-medical intervention policies compiled by Hale et al. (2021). These indices are strongly negatively correlated with the level of working from home level in 2019 and positively correlated with its growth rate in the 2019-2020 period as illustrated in Figure 1 and Figure 2. This implies that countries with lower levels of working from home in 2019 implemented more stringent non-medical intervention policies and experienced higher rates of growth in working from home in 2020.

Industry-Level

Panel A of Table 2 reports the share of employees who work from home at least some times in industries averaged across sample countries. Panel B provides a classification of industries according to their working from home level. For each sample year and each country, we rank industries in terms of their working from home level in the following manner. An industry has a high, medium, or low level of working from home in a given country-year pair if its level of working from home is higher than the 67 percentile, between the 67 and 33 percentiles, or below the 33 percentile of the distribution of working from home among industries in that country and year, respectively. We take the average of this ranking over countries and years and report the results in Panel B of Table 2. Columns High, Medium, and Low report the frequency that an industry has a high, medium, and low level of working from home. The Information and Communication industry and Education industries are classified as having a high level of working from home. The Electricity, Gas, and Water Supply industry and the Wholesale and Retail Trade industries appear frequently ranked as industries with a medium level of working

from home. In turn, the Construction, Transport and Storage and the Accommodation and Food Services industries are ranked as industries with the lowest levels of working from home in almost all countries and years.

We report the growth rates in working from home in industries in the sample countries over the 2011-2019 period and in 2019-2020 in Panel C of Table 2. The share of employees who at least sometimes work from home has grown in almost all industries in 2011-2019 and 2020. In the first year of the pandemic, working from home has significantly increased in almost all industries. The exceptions are the Agriculture, Forestry, Fishing, and Mining industry and the Accommodation and Food Services industry. The average growth in working from home across industries in 2020 is almost equal to its compounded growth over the 2011-2019 period.

Panel D of Table 2 offers the maximum share of employees who at least sometimes work from home in each industry. The maximum is taken across countries and years. Arguably, the maximum share of working from home is close to the capacity of working from home in each industry, at least until the adoption of new production technologies and human resource management practices allows for a higher share. The maximum capacity of working from home ranges from 14 percent in the Accommodation and Food Services industry to 81 percent in the Information and Communication industry.

Finally, Panel E of Table 2 offers a measure of information and communication technology (ICT) utilization in each industry. This measure is strongly correlated with the level of working from home in industries in each year and attains higher values for industries that frequently have a high ranking in the level of working from home. It is also strongly correlated with the changes in working from home over 2011-2019 and 2019-2020 (but not growth rates), which implies that industries that utilize ICT more intensively in production have higher shares of employees who work from home and have experienced larger percentage point changes in it (our companion paper Jerbashian and Vilalta-Bufí, 2020, offers robust evidence on the positive association between ICT and working from home).

We report the values of the working from home variable in each industry and sample

country in 2011, 2019, and 2020 in Table 3. There is a high variation in the level of working from home within industries across countries. Italy, Germany, and Spain have the lowest level of working from home in almost all industries, while Finland and Sweden tend to have the highest levels. In line with the country-level results, working from home has fallen in Sweden in 2020 in all industries.

Occupation-Level

Panel A of Table 4 reports the share employees who at least sometimes work from home in occupations averaged across the sample countries for 2011, 2015, 2019, and 2020. Panel B provides a classification of occupations according to their level of working from home. For each country-year pair, we rank occupations in terms of the level of working from home and classify them as high, medium, and low levels of working from home occupations using two equidistant percentiles similar to the country and industry classification. We report the frequency that the occupation is in the upper, middle, and lower percentiles in Panel B of Table 4. Managerial and Professional occupations (ISCO-08 major groups 1 and 2), with an exception of the Health Professionals, have the highest levels of working from home in almost all countries and years. From 21 to 54 percent of workers report that they at least sometimes work from home in these occupations in 2019. Health Professionals frequently have a medium ranking in terms of working from home similar to most of the Associate Professionals and Clerical occupations (ISCO-08 major groups 3 and 4). Between 6 and 21 percent of employees work from home at least sometimes in these groups of occupations in 2019. The exceptions among the Associate Professionals occupations are the Information and Communications Technicians and Business Associate Professionals occupations that tend to have high levels of working from home. The Services and Sales and Skilled Agricultural occupations (ISCO-08 major groups 5 and 6) frequently have a medium-low level of working from home (between 5 and 8 percent in 2019). In turn, most of the crafts, building, and assembling occupations specific to the Manufacturing industry and Elementary occupations (ISCO-08 major groups 7, 8, and 9) frequently have a low level of working from home. Between 1 and 6 percent of employees work from home

at least sometimes in these occupations in 2019. The Electrical and Electronic Trades Workers occupation is the exception among the occupations specific to the Manufacturing industry. It frequently has a medium level of working from home.

Working from home has grown in almost all occupations during the 2011-2020 period according to Panel C of Table 4. Similarly to industries, the average growth rate in working from home in 2020 is close to the compounded growth rate in the entire 2011-2019 period. The largest percentage point changes in working from home (but not growth rates) have happened in Managerial and Professional occupations that tend to use ICT more intensively in their core tasks (e.g., see Autor et al., 2003, Goos et al., 2014, Jerbashian, 2019, Oettinger, 2011).

We also compute the maximum share of working from home within occupations across the sample countries and years. This number can be interpreted as the potential capacity of working from home in occupations at least until the adoption of new production technologies and human resource management practices allows for a higher share. This measure suggests that more than 80 percent of employees that hold Managerial and Professional occupations (except for Health Professionals) can at least sometimes work from home. It also suggests that no more than 14 percent of employees that work in occupations typical for the Manufacturing industry and Elementary occupations can work from home.

Table 5 offers the values of the working from home variable in each occupation and sample country in 2011, 2019, and 2020. The results are very similar to the results for industries. There is a significant variation in working from home within occupations across countries. Italy, Germany, and Spain have the lowest levels, while Finland and Sweden have the highest levels in almost all occupations. In line with the country- and industry-level results, working from home has fallen in Sweden in 2020 in almost all occupations.

Working from Home Capacity and Employment

Several studies have attempted to estimate the capacity of working from home in countries using either a set of assumptions regarding the potential number of tasks that can be performed at home within occupations or survey responses on the potential of working from home (e.g., Alipour et al., 2020, Dingel and Neiman, 2020, Gottlieb et al., 2021). Measuring the capacity of working from home in countries is especially relevant in an epidemic/pandemic environment and under lockdowns. It can show the resilience of the countries to such shocks.

We propose a measure of the capacity of working from home in the sample countries using the observed levels of working from home in the nationally representative, harmonized EU Labour Force Survey. In particular, we take the maximum level of working from home in each occupation and industry across the sample countries and adjust it to the employment composition in industries and occupations in each country using the hours of employment in occupation-industry pairs in 2019:

$$\text{Capacity}_c = \frac{\sum_{o,i} \max_{\{\bar{c}, \bar{t}\} \in \{C, T\}} \{ \text{Working from Home}_{\bar{c}, \bar{t}, i, o} \} \times \text{Hours of Work}_{c, i, o}}{\sum_{o,i} \text{Hours of Work}_{c, i, o}}, \quad (1)$$

where C is the sample of 8 European countries and T is the sample period 2011-2020, i and o index industries and occupations, and the $\text{Hours of Work}_{c, i, o}$ is the summation of the hours of work by each employee in country c , industry i , and occupation o in 2019. We derive it using data from the EU LFS database.

Panel A from Table 6 offers the results. The capacity of the labor force to work at least sometimes from home is the lowest in Italy, 37 percent, and the highest in Sweden, 53 percent. It is about 44 percent in Germany and Austria and 50 percent in Belgium and France.⁴

The measure of the capacity of the labor force to work from home at least sometimes is relevant because partial work from home can contribute to maintaining economic activity

⁴These numbers are comparable to working from home capacities estimated by Dingel and Neiman (2020). They use a method that relies on determining the tasks that are incompatible with working from home. The estimate for Germany is also close to the estimate of Fadinger and Schymik (2020).

and mitigate the spread of epidemics/pandemics (Brotherhood and Jerbashian, 2020). Nevertheless, lockdowns can necessitate the performance of work almost entirely from home. Panel B of Table 6 offers the capacity of working from home computed using the share of employed individuals who report that they usually work from home. These numbers are considerably lower than the numbers in Panel A because significantly lower number of employees (can) perform their work almost entirely from home.⁵

Finally, Panel A of Table 7 offers correlations between the growth rate in employment in 2019-2020 and the level of working from home in industries in sample countries in 2019 from a regression that has the following form:

$$\text{Growth in Employment}_{i,c,2019-2020} = \beta_0 + \beta_1 \times \text{Working from Home}_{i,c,2019} + \varepsilon_{i,c}, \quad (2)$$

where i indexes industries, c indexes countries, and $\varepsilon_{i,c}$ is an error term. The estimate of the β_0 is negative implying that employment in industries fell during 2020. In turn, the estimate of β_1 is positive suggesting that industries with higher levels of working from home in 2019 experienced a lower fall in employment. Panel B of Table 7 offers similar correlations and evidence for occupations.

3 Conclusions

We use data from the EU Labour Force survey for 8 European countries and document the levels of working from home in countries, industries, and occupations in the 2011-2019 period and 2020, the first year of the COVID-19 pandemic. Finland and Sweden have the highest levels of working from home while Italy and Spain have the lowest levels among the sample countries. Industries with higher levels of utilization of ICT have higher working from home levels than industries with lower levels of ICT utilization. In turn, Managerial and Professional occupations have higher working from home levels than the remaining occupations. Working from home has increased almost everywhere in the

⁵The estimated capacities in Table 6 can mask heterogeneity in terms of the availability of technologies, the size of the dwellings, commuting possibilities, among other factors.

2011-2019 period. It has increased significantly more in 2020. Countries that had lower levels of working from home in 2019 have implemented more stringent policies aimed at reducing the spread of the pandemic and have experienced higher rates of growth in working from home in 2020.

We compute the capacity of working from home in the sample countries using the observed levels of working from home in 2020. The capacity of the labor force to work from home is the lowest in Italy and Spain, 37 and 39 percent, respectively. It attains intermediate values in Austria and Germany, 43 and 44 percent, respectively. It is the highest in France and Sweden, 50 and 53 percent, respectively.

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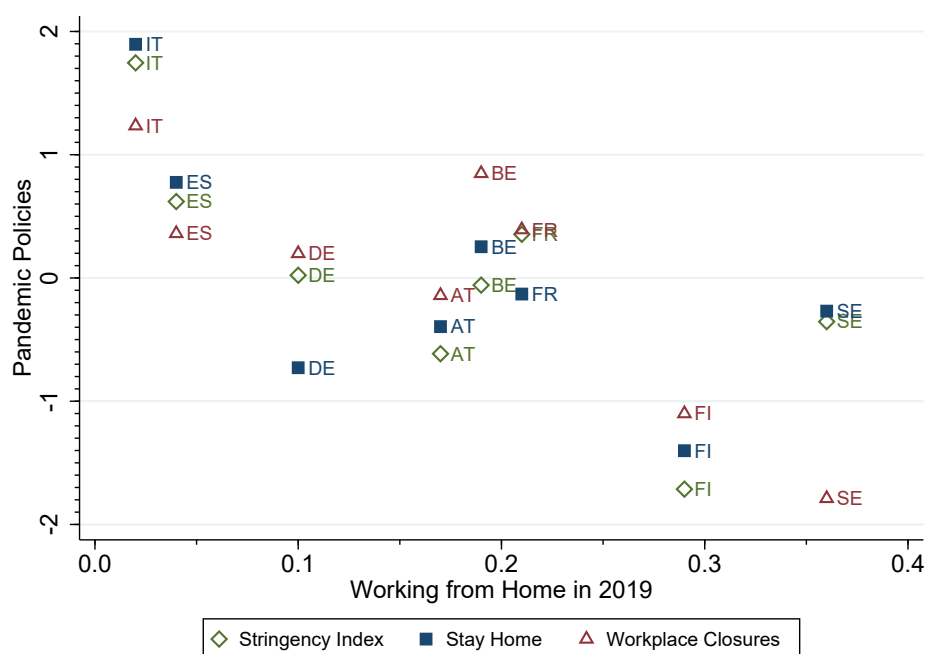
4 Tables and Figures

Table 1: Working from Home in Countries

Country	A. Working from Home					B. Classification			C. Growth Rate			D. Pandemic Policies		
	2011	2015	2019	2020		High	Medium	Low	2011-19	2019-20		Stringency Index	Stay Home	Workplace Closures
AT: Austria	0.16	0.17	0.17	0.25		0.00	1.00	0.00	0.06	0.47		49.79	0.72	1.48
BE: Belgium	0.14	0.16	0.19	0.28		0.00	1.00	0.00	0.36	0.47		54.18	1.00	1.83
DE: Germany	0.08	0.09	0.10	0.20		0.00	0.00	1.00	0.25	1.00		54.81	0.57	1.60
ES: Spain	0.03	0.03	0.04	0.12		0.00	0.00	1.00	0.33	2.00		59.52	1.22	1.66
FI: Finland	0.18	0.23	0.29	0.37		1.00	0.00	0.00	0.61	0.28		41.11	0.28	1.14
FR: France	0.18	0.17	0.21	0.29		0.00	1.00	0.00	0.17	0.38		57.43	0.83	1.67
IT: Italy	0.02	0.02	0.02	0.12		0.00	0.00	1.00	0.00	5.00		68.41	1.71	1.97
SE: Sweden	0.23	0.29	0.36	0.31		1.00	0.00	0.00	0.57	-0.14		51.84	0.77	0.90

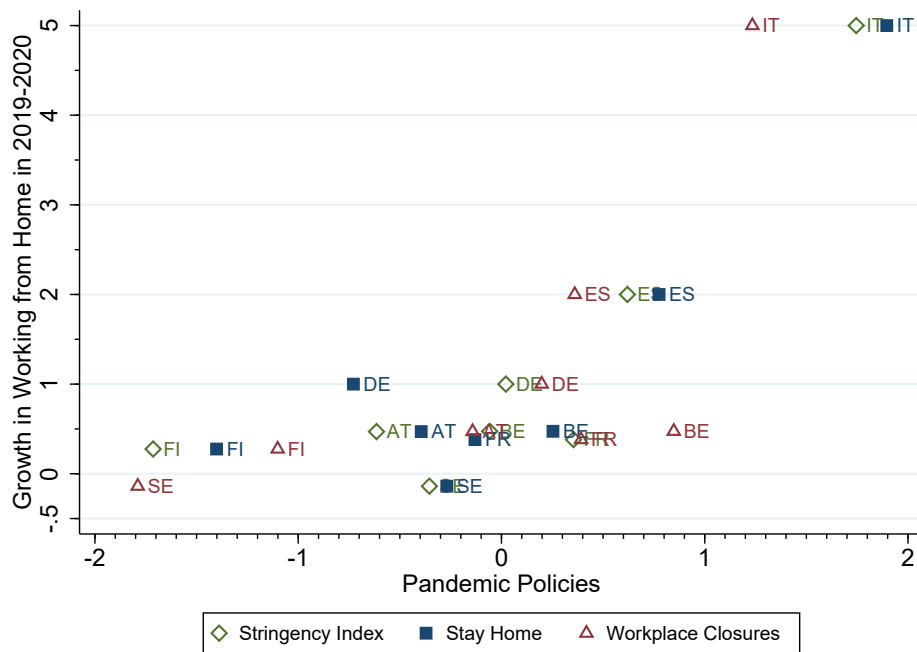
Note: Panel A reports the share of employees who least sometimes work from home in the sample countries and period. Panel B presents the classification of countries according to their working from home level. We create a ranking of countries in terms of their working from home level for each sample year using two equidistant percentiles. A country has a high level of working from home in a given year if working from home in that country is higher than the 67 percentile of the working from home distribution among countries in that year. Countries have medium- and low-levels of working from home in a given year if they have working from home levels either between the 67 and 33 percentiles or below the 33 percentile of the working from home distribution among countries in that year. Panel B reports the frequency that a country has a high, medium, and low level of working from home. Panel C reports the growth rate in working from home in 2011-2019 and 2019-2020. Panel D presents three indicators of the stringency of COVID policies in 2020 taken from Hale et al. (2021). We have normalized the values of these indices to have 0 mean and 1 standard deviation. Higher values are associated with a greater stringency. The Stringency Index measures the overall stringency of the policies during the pandemic. The Stay Home and Workplace Closures indices measure the stringency of the policies regarding stay at home and workplace closures during the pandemic. See Table 8 in the Data Appendix for complete descriptions and sources of variables.

Figure 1: Working from Home before the Pandemic and Pandemic Policies in 2020



Note: This figure illustrates the levels of pandemic policy indices in the Y-axis and the share of working from home in 2019 in the X-axis. The higher values of pandemic policy indices correspond to more stringent policies. See Table 8 in the Data Appendix for complete descriptions and sources of variables.

Figure 2: Pandemic Policies and Growth in Working from Home in 2020



Note: This figure illustrates the rate of growth in working from home in 2019-2020 in the Y-axis and the levels of pandemic policy indices in the X-axis. The higher values of pandemic policy indices correspond to more stringent policies. See Table 8 in the Data Appendix for complete descriptions and sources of variables.

Table 2: Working from Home in Industries

NACE Code: Industry Name	A. Working from Home				B. Classification			C. Growth Rate			D. Maximum	E. ICT Utilization
	2011	2015	2019	2020	High	Medium	Low	2011-19	2019-20	2020		
A-B: Agriculture, Forestry, Fishing, and Mining	0.11	0.11	0.13	0.13	0.13	0.30	0.57	0.18	0.00	0.28	0.04	
C: Manufacturing	0.08	0.10	0.12	0.18	0.03	0.68	0.30	0.50	0.50	0.27	0.35	
D-E: Electricity, Gas, and Water Supply	0.10	0.13	0.16	0.29	0.09	0.78	0.14	0.60	0.81	0.52	0.08	
F: Construction	0.06	0.07	0.09	0.11	0.00	0.01	0.99	0.50	0.22	0.25	0.33	
G: Wholesale and Retail Trade; Repair of Vehicles	0.10	0.11	0.13	0.17	0.00	0.76	0.24	0.30	0.31	0.28	0.70	
H: Transport and Storage	0.05	0.06	0.08	0.12	0.00	0.03	0.97	0.60	0.50	0.20	0.31	
I: Accommodation and Food Services	0.04	0.05	0.07	0.07	0.00	0.00	1.00	0.75	0.00	0.14	0.12	
J: Information and Communication	0.30	0.33	0.41	0.62	1.00	0.00	0.00	0.37	0.51	0.70	2.44	
K: Financial and Insurance Activities	0.16	0.18	0.29	0.49	0.84	0.16	0.00	0.81	0.69	0.73	1.28	
L: Real Estate Activities	0.16	0.19	0.21	0.34	0.56	0.39	0.05	0.31	0.62	0.52	0.01	
M-N: Professional and Support Service Activities	0.16	0.18	0.22	0.32	0.61	0.39	0.00	0.38	0.45	0.48	1.72	
O: Public Administration and Defence	0.10	0.12	0.18	0.31	0.15	0.74	0.11	0.80	0.72	0.64	0.10	
P: Education	0.42	0.42	0.42	0.51	1.00	0.00	0.00	0.00	0.21	0.70	0.40	
Q: Human Health and Social Work Activities	0.08	0.08	0.09	0.11	0.10	0.28	0.63	0.13	0.22	0.33	0.23	
R-T: Other Service Activities	0.14	0.17	0.20	0.26	0.50	0.50	0.00	0.43	0.30	0.45	0.21	

Note: Panel A reports the share of employees who least sometimes work from home in industries averaged across the sample countries. Panel B presents the classification of industries according to their working from home level. We create a ranking of industries in terms of their working from home level for each sample country and year using two equidistant percentiles. An industry has a high level of working from home in a given country and year if working from home in that industry is higher than the 67 percentile of the working from home distribution among countries and industries in that year. Industries have medium- and low-levels of working from home in a given country and year if they have working from home levels either between the 67 and 33 percentiles or below the 33 percentile of the working from home distribution among industries and countries in that year. Panel B reports the frequency that an industry has a high, medium, and low level of working from home across countries and years. Panel C reports the growth rate in working from home in industries in 2011-2019 and 2019-2020. Panel D reports the maximum of working from home in industries taken over the sample countries and years. Finally, Panel E reports the value of ICT utilization measure in each industry taken from Jerbashian and Vilalta-Bufi (2020). See Table 8 in the Data Appendix for complete descriptions and sources of variables.

Table 3: Working from Home in Industries and Countries

NACE Code	A. 2011									B. 2019									C. 2020								
	AT	BE	DE	ES	FI	FR	IT	SE		AT	BE	DE	ES	FI	FR	IT	SE		AT	BE	DE	ES	FI	FR	IT	SE	
A-B	0.32	0.10	0.06	0.00	0.15	0.13	0.01	0.14		0.24	0.15	0.08	0.00	0.20	0.13	0.00	0.20		0.28	0.09	0.13	0.01	0.19	0.14	0.02	0.18	
C	0.10	0.09	0.05	0.02	0.13	0.11	0.01	0.14		0.11	0.14	0.08	0.03	0.22	0.13	0.01	0.26		0.19	0.20	0.17	0.08	0.32	0.21	0.08	0.23	
D-E	0.14	0.12	0.04	0.01	0.11	0.14	0.02	0.22		0.12	0.17	0.10	0.04	0.28	0.16	0.02	0.39		0.26	0.34	0.24	0.15	0.49	0.36	0.16	0.30	
F	0.08	0.05	0.04	0.01	0.09	0.07	0.01	0.12		0.08	0.10	0.04	0.01	0.16	0.10	0.01	0.21		0.11	0.15	0.06	0.04	0.20	0.11	0.03	0.19	
G	0.12	0.10	0.05	0.01	0.15	0.12	0.01	0.20		0.12	0.11	0.06	0.02	0.26	0.14	0.01	0.33		0.17	0.16	0.11	0.05	0.31	0.19	0.06	0.28	
H	0.08	0.06	0.03	0.01	0.08	0.06	0.01	0.10		0.09	0.07	0.05	0.01	0.11	0.11	0.01	0.16		0.16	0.14	0.11	0.06	0.19	0.15	0.06	0.14	
I	0.07	0.04	0.04	0.00	0.06	0.07	0.01	0.07		0.07	0.05	0.03	0.00	0.15	0.08	0.01	0.15		0.08	0.09	0.05	0.02	0.12	0.07	0.02	0.13	
J	0.40	0.30	0.21	0.08	0.49	0.33	0.04	0.52		0.45	0.44	0.33	0.12	0.67	0.47	0.08	0.69		0.70	0.63	0.60	0.49	0.81	0.67	0.48	0.61	
K	0.24	0.20	0.07	0.01	0.21	0.19	0.02	0.31		0.30	0.38	0.19	0.06	0.54	0.26	0.03	0.51		0.57	0.65	0.40	0.28	0.70	0.52	0.37	0.46	
L	0.18	0.18	0.04	0.09	0.26	0.26	0.01	0.26		0.27	0.16	0.13	0.02	0.48	0.19	0.03	0.42		0.44	0.29	0.28	0.19	0.58	0.44	0.17	0.36	
M-N	0.18	0.17	0.10	0.01	0.24	0.21	0.02	0.31		0.20	0.21	0.15	0.03	0.39	0.27	0.02	0.50		0.35	0.32	0.26	0.18	0.47	0.39	0.19	0.42	
O	0.13	0.10	0.05	0.02	0.13	0.12	0.02	0.25		0.14	0.19	0.08	0.02	0.38	0.15	0.01	0.46		0.29	0.35	0.22	0.15	0.57	0.27	0.21	0.40	
P	0.61	0.49	0.43	0.23	0.49	0.61	0.05	0.46		0.58	0.50	0.34	0.30	0.54	0.58	0.05	0.52		0.61	0.56	0.45	0.41	0.65	0.60	0.33	0.46	
Q	0.12	0.08	0.04	0.02	0.09	0.20	0.02	0.09		0.12	0.09	0.04	0.01	0.11	0.16	0.01	0.16		0.12	0.12	0.06	0.04	0.17	0.20	0.05	0.13	
R-T	0.19	0.12	0.11	0.02	0.25	0.16	0.02	0.29		0.19	0.24	0.12	0.03	0.38	0.21	0.02	0.41		0.29	0.36	0.21	0.07	0.48	0.28	0.06	0.37	

Note: This table reports the share of employees that work from home at least sometimes in industries of the sample countries in 2011, 2019, and 2020. See Table 2 for industry titles and Table 8 in the Data Appendix for complete descriptions and sources of variables.

Table 4: Working from Home in Occupations

ISCO-08 Code: Occupation	A. Working from Home					B. Classification			C. Growth			D. Maximum	
	2011	2015	2019	2020		High	Medium	Low	2011-19	2019-20		2020	
	0.35	0.38	0.39	0.49		1.00	0.00	0.00	0.11	0.26		0.81	
11: Chief Executives, Senior Officials and Legislators	0.36	0.40	0.45	0.58		1.00	0.00	0.00	0.25	0.29		0.94	
12: Administrative and Commercial Managers	0.31	0.35	0.40	0.50		0.99	0.01	0.00	0.29	0.25		0.85	
13: Production and Specialized Services Managers	0.24	0.28	0.30	0.35		0.81	0.19	0.00	0.25	0.17		0.93	
14: Hospitality, Retail and Other Services Managers	0.23	0.25	0.31	0.48		0.97	0.03	0.00	0.35	0.55		0.68	
21: Science and Engineering Professionals	0.13	0.14	0.12	0.16		0.19	0.81	0.00	-0.08	0.33		0.38	
22: Health Professionals	0.52	0.53	0.54	0.59		1.00	0.00	0.00	0.04	0.09		0.82	
23: Teaching Professionals	0.28	0.31	0.39	0.57		1.00	0.00	0.00	0.39	0.46		0.82	
24: Business and Administration Professionals	0.31	0.32	0.42	0.67		1.00	0.00	0.00	0.35	0.60		0.83	
25: Information and Communications Technology Professionals	0.28	0.28	0.33	0.47		1.00	0.00	0.00	0.18	0.42		0.69	
26: Legal, Social and Cultural Professionals	0.09	0.12	0.14	0.20		0.01	0.97	0.01	0.56	0.43		0.35	
31: Science and Engineering Associate Professionals	0.05	0.05	0.06	0.08		0.01	0.56	0.42	0.20	0.33		0.15	
32: Health Associate Professionals	0.15	0.18	0.23	0.41		0.74	0.26	0.00	0.53	0.78		0.64	
33: Business and Administration Associate Professionals	0.13	0.13	0.15	0.22		0.01	0.96	0.03	0.15	0.47		0.40	
34: Legal, Social, Cultural and Related Associate Professionals	0.19	0.22	0.30	0.49		0.90	0.10	0.00	0.58	0.63		0.65	
35: Information and Communications Technicians	0.07	0.09	0.11	0.26		0.05	0.90	0.05	0.57	1.36		0.42	
41: General and Keyboard Clerks	0.05	0.05	0.08	0.21		0.00	0.81	0.19	0.60	1.63		0.31	
42: Customer Services Clerks	0.06	0.08	0.12	0.24		0.00	0.93	0.07	1.00	1.00		0.51	
43: Numerical and Material Recording Clerks	0.05	0.06	0.08	0.20		0.01	0.75	0.24	0.60	1.50		0.30	
44: Other Clerical Support Workers	0.04	0.05	0.05	0.05		0.00	0.36	0.64	0.25	0.00		0.12	
51: Personal Services Workers	0.04	0.05	0.06	0.06		0.00	0.60	0.40	0.50	0.00		0.10	
52: Sales Workers	0.09	0.09	0.08	0.08		0.23	0.54	0.24	-0.11	0.00		0.33	
53: Personal Care Workers	0.04	0.03	0.05	0.06		0.01	0.36	0.63	0.25	0.20		0.10	
54: Protective Services Workers	0.06	0.08	0.08	0.07		0.06	0.59	0.35	0.33	-0.13		0.24	
60: Skilled Agricultural, Forestry and Fishery Workers	0.02	0.02	0.02	0.02		0.00	0.00	1.00	0.00	0.00		0.05	
71: Building and Related Trades Workers	0.01	0.02	0.02	0.03		0.00	0.00	1.00	1.00	0.50		0.06	
72: Metal, Machinery, and Related Trades	0.02	0.03	0.04	0.05		0.00	0.21	0.79	1.00	0.25		0.11	
73: Handicraft and Printing Workers	0.04	0.05	0.06	0.08		0.00	0.65	0.35	0.50	0.33		0.12	
74: Electrical and Electronic Trades Workers	0.02	0.03	0.03	0.05		0.00	0.16	0.84	0.50	0.67		0.11	
75: Other Craft and Related Trades Workers	0.01	0.01	0.01	0.01		0.00	0.01	0.99	0.00	0.00		0.03	
81: Stationary Plant and Machine Operators	0.01	0.01	0.01	0.01		0.00	0.05	0.95	0.00	0.00		0.02	
82: Assemblers	0.02	0.02	0.02	0.02		0.00	0.01	0.99	0.00	0.00		0.04	
83: Drivers and Mobile plant Operators	0.02	0.02	0.01	0.01		0.00	0.16	0.84	-0.50	0.00		0.03	
90: Elementary Occupations													

Note: Panel A reports the share of employees who least sometimes work from home in occupations averaged across sample countries. Panel B presents the classification of occupations according to their level of working from home. We create a ranking of occupations in terms of their working from home level for each sample country and year using two equidistant percentiles. An occupation has a high level of working from home in a given country and year if working from home in that occupation is higher than the 67 percentile of the working from home distribution among countries and occupations in that year. Occupations have medium and low levels of working from home in a given country and year if they have working from home levels either between the 67 and 33 percentiles or below the 33 percentile of the working from home distribution among occupations and countries in that year. Panel B reports the frequency that an occupation has a high, medium, and low level of working from home across countries and years. Panel C reports the growth rate in working from home in occupations in 2011-2019 and 2019-2020. Panel D reports the maximum of working from home in occupations taken over the sample countries and years. See Table 8 in the Data Appendix for complete descriptions and sources of variables.

Table 5: Working from Home in Occupations and Countries

ISCO-08 Code	A. 2011								B. 2019								C. 2020							
	AT	BE	DE	ES	FI	FR	IT	SE	AT	BE	DE	ES	FI	FR	IT	SE	AT	BE	DE	ES	FI	FR	IT	SE
11	0.45	0.50	0.30	0.10	0.52	0.31	0.03	0.60	0.54	0.41	0.36	0.22	0.61	0.32	0.05	0.58	0.58	0.72	0.43	0.31	0.81	0.40	0.24	0.47
12	0.46	0.45	0.25	0.09	0.54	0.44	0.05	0.61	0.49	0.48	0.32	0.10	0.87	0.49	0.10	0.77	0.61	0.64	0.49	0.29	0.94	0.59	0.47	0.63
13	0.40	0.43	0.28	0.07	0.45	0.32	0.03	0.52	0.43	0.46	0.22	0.15	0.68	0.48	0.07	0.73	0.57	0.59	0.30	0.27	0.85	0.56	0.27	0.62
14	0.30	0.28	0.03	0.01	0.59	0.29	0.02	0.40	0.27	0.11	0.13	0.09	0.80	0.23	0.04	0.70	0.32	0.29	0.11	0.19	0.93	0.22	0.16	0.55
21	0.28	0.28	0.13	0.05	0.34	0.33	0.03	0.44	0.31	0.40	0.21	0.07	0.45	0.36	0.04	0.64	0.53	0.54	0.43	0.29	0.68	0.54	0.30	0.56
22	0.28	0.15	0.09	0.02	0.13	0.22	0.03	0.13	0.13	0.10	0.10	0.02	0.24	0.21	0.02	0.18	0.13	0.20	0.10	0.04	0.38	0.22	0.04	0.16
23	0.73	0.58	0.58	0.28	0.62	0.74	0.06	0.59	0.72	0.62	0.53	0.35	0.58	0.82	0.06	0.66	0.71	0.64	0.47	0.46	0.65	0.82	0.38	0.58
24	0.36	0.31	0.16	0.05	0.41	0.39	0.04	0.49	0.38	0.45	0.30	0.08	0.71	0.46	0.05	0.71	0.65	0.59	0.54	0.36	0.82	0.62	0.41	0.60
25	0.38	0.26	0.20	0.12	0.50	0.39	0.04	0.56	0.47	0.44	0.33	0.14	0.72	0.43	0.11	0.70	0.74	0.69	0.66	0.55	0.83	0.72	0.56	0.61
26	0.43	0.25	0.27	0.05	0.41	0.41	0.04	0.38	0.41	0.40	0.25	0.06	0.58	0.41	0.07	0.49	0.57	0.49	0.42	0.29	0.69	0.47	0.38	0.43
31	0.13	0.09	0.05	0.02	0.12	0.07	0.01	0.24	0.13	0.13	0.06	0.02	0.25	0.11	0.01	0.42	0.23	0.20	0.18	0.09	0.32	0.16	0.10	0.35
32	0.07	0.06	0.03	0.00	0.04	0.04	0.02	0.11	0.09	0.04	0.02	0.01	0.06	0.04	0.01	0.20	0.10	0.09	0.03	0.04	0.11	0.03	0.05	0.15
33	0.20	0.16	0.08	0.05	0.24	0.16	0.02	0.31	0.22	0.25	0.14	0.07	0.46	0.19	0.03	0.51	0.40	0.47	0.35	0.29	0.64	0.36	0.28	0.45
34	0.23	0.13	0.07	0.00	0.20	0.15	0.02	0.23	0.17	0.08	0.06	0.04	0.30	0.15	0.01	0.38	0.27	0.21	0.15	0.11	0.40	0.24	0.14	0.29
35	0.22	0.20	0.07	0.04	0.30	0.20	0.04	0.41	0.30	0.37	0.28	0.12	0.56	0.18	0.05	0.53	0.60	0.37	0.51	0.48	0.65	0.38	0.40	0.50
41	0.10	0.06	0.05	0.02	0.07	0.08	0.01	0.16	0.11	0.12	0.07	0.02	0.18	0.07	0.01	0.30	0.28	0.30	0.20	0.21	0.42	0.18	0.22	0.29
42	0.08	0.09	0.03	0.00	0.03	0.04	0.01	0.09	0.09	0.08	0.06	0.02	0.16	0.04	0.01	0.16	0.28	0.22	0.20	0.16	0.31	0.13	0.17	0.17
43	0.13	0.04	0.03	0.01	0.07	0.05	0.01	0.15	0.12	0.11	0.07	0.03	0.31	0.06	0.01	0.24	0.27	0.26	0.14	0.14	0.51	0.28	0.12	0.21
44	0.07	0.07	0.05	0.00	0.10	0.04	0.01	0.05	0.05	0.11	0.09	0.01	0.20	0.06	0.01	0.16	0.14	0.26	0.21	0.11	0.30	0.23	0.18	0.19
51	0.07	0.04	0.02	0.00	0.05	0.08	0.01	0.06	0.07	0.03	0.02	0.00	0.10	0.08	0.01	0.08	0.06	0.07	0.02	0.01	0.12	0.08	0.01	0.07
52	0.07	0.06	0.02	0.00	0.05	0.04	0.01	0.09	0.05	0.04	0.03	0.00	0.11	0.08	0.01	0.14	0.07	0.04	0.04	0.01	0.10	0.10	0.01	0.10
53	0.09	0.08	0.03	0.05	0.09	0.28	0.02	0.06	0.09	0.08	0.03	0.02	0.05	0.32	0.02	0.07	0.07	0.07	0.03	0.01	0.05	0.33	0.02	0.05
54	0.07	0.05	0.01	0.00	0.04	0.03	0.03	0.05	0.07	0.07	0.02	0.00	0.03	0.02	0.01	0.14	0.09	0.07	0.05	0.02	0.10	0.04	0.02	0.08
60	0.25	0.03	0.02	0.00	0.05	0.05	0.01	0.09	0.22	0.10	0.04	0.00	0.11	0.04	0.00	0.11	0.24	0.02	0.07	0.00	0.08	0.04	0.01	0.08
71	0.04	0.01	0.01	0.00	0.02	0.01	0.00	0.04	0.03	0.02	0.01	0.00	0.02	0.00	0.00	0.06	0.04	0.00	0.01	0.01	0.03	0.03	0.00	0.05
72	0.04	0.01	0.00	0.00	0.02	0.01	0.01	0.03	0.03	0.02	0.01	0.00	0.02	0.02	0.01	0.05	0.05	0.02	0.02	0.01	0.02	0.02	0.00	0.06
73	0.05	0.02	0.00	0.00	0.02	0.02	0.01	0.07	0.06	0.04	0.03	0.00	0.06	0.01	0.00	0.12	0.06	0.06	0.11	0.02	0.09	0.02	0.01	0.05
74	0.06	0.03	0.01	0.00	0.05	0.03	0.01	0.09	0.07	0.06	0.04	0.01	0.09	0.09	0.00	0.13	0.11	0.10	0.07	0.04	0.11	0.08	0.01	0.12
75	0.05	0.03	0.02	0.00	0.03	0.01	0.01	0.04	0.05	0.06	0.01	0.01	0.01	0.03	0.01	0.05	0.06	0.11	0.02	0.01	0.09	0.01	0.01	0.08
81	0.03	0.01	0.01	0.00	0.02	0.01	0.01	0.03	0.02	0.01	0.01	0.00	0.02	0.02	0.00	0.03	0.03	0.01	0.02	0.00	0.00	0.01	0.01	0.02
82	0.01	0.01	0.00	0.00	0.01	0.02	0.01	0.02	0.02	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.01	0.01	0.02
83	0.03	0.01	0.00	0.00	0.04	0.02	0.01	0.02	0.02	0.01	0.01	0.00	0.05	0.02	0.01	0.04	0.02	0.02	0.01	0.00	0.04	0.02	0.01	0.03
90	0.03	0.01	0.01	0.00	0.02	0.05	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.03	0.01	0.02

Note: This table reports the share of employees that work from home at least sometimes in occupations in the sample countries in 2011, 2019, and 2020. See Table 4 for occupation titles and Table 8 in the Data Appendix for complete descriptions and sources of variables.

Table 6: Working from Home Capacity in Countries

Country	A. At Least Sometimes	B. Usually
Austria	0.39	0.25
Belgium	0.44	0.29
Finland	0.43	0.29
France	0.45	0.30
Germany	0.40	0.26
Italy	0.33	0.22
Spain	0.36	0.24
Sweden	0.49	0.33

Note: This table offers the capacities of working from home in the sample countries. These capacities are computed using equation (1) and in the following way. We take the maximum level of working from home in each occupation-industry pair across the sample countries and years and adjust it to the employment composition in industries and occupations in each country using the hours of employment in occupation-industry pairs in 2019. Panel A reports the capacity of the labor force to work from home at least sometimes. It utilizes our baseline measure of working from home which is defined as the share of employees who at least sometimes work from home. Panel B reports the capacity of the labor force to work from home usually. It utilizes the share of employees who report that they usually work from home. See Table 8 in the Data Appendix for complete descriptions and sources of variables.

Table 7: Working from Home in 2019 and Changes in Employment in 2019-2020

	A. Industries	B. Occupations
Working from Home	0.180*** (0.052)	0.112*** (0.042)
Constant	-0.047*** (0.013)	-0.041*** (0.011)
Obs	120	264
R2	0.091	0.027

Note: Panel A of this table reports the results from an OLS regression of the growth in total hours of work in industries in sample countries during 2019-2020 and the level of working from home in 2019. Panel B of this table reports the results from an OLS regression of the growth in total hours of work in occupations in sample countries during 2019-2020 and the level of working from home in 2019. The regressions have the following form: $\text{Growth in Employment}_{j,c,2019-2020} = \beta_0 + \beta_1 \times \text{Working from Home}_{j,c,2019} + \varepsilon_{j,c}$ where j indexes either industries or occupations and c indexes countries. See Table 8 in the Data Appendix for complete descriptions and sources of variables.

A Data Appendix

Table 8: Definitions and Sources of Variables

Variable Name	Definition and Source
Working from Home (WFH)	The share of employed individuals who report that they work at home least sometimes out of the total number of employed individuals in countries, industries, occupations, and years. We use usual hours of work to weight the observations together with individual-level sample weights from the EU LFS. We exclude family workers and individuals older than 65 when computing this measure. See Jerbashian and Vilalta-Bufí (2020) for further details regarding this measure. Source: Authors’ calculations using data from the 2021 release of the EU Labour Force Survey database.
Working from Home Capacity	This is a measure of the capacity of labor force to work from home. We compute it using Equation 1. Source: Authors’ calculations using data from the 2021 release of the EU Labour Force Survey database.
Hours of Work	The total number of hours of work in an occupation-industry pair in a country in 2019. Source: Authors’ calculations using data from the 2021 release of the EU Labour Force Survey database.
Stringency Index	This index measures the strictness of “lockdown style” policies that primarily restrict peoples’ behaviour. It is calculated using containment and closure policy indicators, as well as indicator recording public information campaigns. It has daily frequency. We take the average over 2020 in each sample country and normalize it to have a 0 mean and 1 standard deviation across sample countries. Source: Hale et al. (2021).
Stay Home	This index takes value 0 if no measures are applied, 1 if it is recommended not to leave the house, 2 if it is required not to leave the house with exceptions for daily exercise, grocery shopping, and essential trips, 3 if it is required not to leave the house with minimal exceptions (e.g., allowed to leave once a week, only one person at a time). It has daily frequency. We take the average over 2020 in each sample country and normalize it to have a 0 mean and 1 standard deviation across sample countries. Source: Hale et al. (2021).

Table 8 – (Continued)

Variable Name	Definition and Source
Workplace Closures	This index takes value 0 if no measures are applied, 1 if it is recommended to close (or work from home), 2 if it is required to close (or work from home) for some sectors or categories of workers, 3 if it is required to close (or work from home) in all (but essential) workplaces. It has daily frequency. We take the average over 2020 in each sample country and normalize it to have a 0 mean and 1 standard deviation across sample countries. Source: Hale et al. (2021).
ICT Dependence	The share of ICT capital in total capital in US industries averaged over the 2008-2017 period. ICT includes computing and communications equipment and computer software and databases. Source: Jerbashian and Vilalta-Bufi (2020) using the EU KLEMS database.