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Factors determining teleworking before and during COVID-19: some evidence from Spain and Andalusia

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Abstract

Purpose – This study aims to analyse the inequalities in access to teleworking in Spain. More specifically, the study examines what factors determine remote working in a pre-pandemic period and during the state of alarm (March 2020). Moreover, the study examines whether telecommuting is related to the likelihood of suffering emotional disorders during lockdowns.

Design/methodology/approach – The methodological approach followed to analyse access to teleworking mainly consists of the estimation of ordered response models. Two datasets are used: the first is the Survey on Equipment and Use of Information and Communication Technologies (ICTs) in Households, conducted by the Spanish National Statistics Institute (INE) in the pre-pandemic period (2018). The second is the Social Survey 2020. Habits and Living Conditions of the Andalusian Population during the State of Alarm, conducted by the Institute of Statistics and Cartography of Andalusia (IECA) once the state of alarm was declared in Spain.

Findings – The results obtained indicate that ICT training is a key element in helping to explain the likelihood of working from home. However, some groups of workers might experience difficulties in their transition to teleworking. This could increase labour market segmentation and hinder the transition to the knowledge economy. Moreover, the findings detect that employees working both on the company premises and from home are more likely to suffer emotional disorders.

Originality/value – The paper sheds new empirical evidence on teleworking in Spain and Andalusia, including some novel methodological aspects to estimate the regressors' effects on the probability of working from home.

Keywords Teleworking, ICTs, COVID-19, State of alarm

Paper type Research paper

1. Introduction

The COVID-19 pandemic is the biggest economic challenge society has faced since the Great Depression of the 1930s. The current economic crisis is exceeding the negative consequences generated by the Great Recession (2008–2013). Nationwide lockdowns and the measures

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adopted to control the pandemic have led to a sudden, synchronised global halt in economic activity. This has provoked a profound contraction of gross domestc product for most of the world's advanced countries, which contrasts with optimistic pre-pandemic previsions. According to the IMF (2020), growth in GDP was forecast at -4.4% in 2020. A rebound and recovery is expected in 2021 with global growth predicted at 5.2%. This would imply that in 2021, GDP would only grow 0.6% compared to 2019, which is far from the growth path predicted before the pandemic. Focusing on the labour market, the pandemic has led to high unemployment, involuntary part-time employment, discouraged workers exiting the workforce and the reallocation of employees to economic sectors less affected by social distancing measures. This has put numerous jobs in jeopardy and brought about a global reduction in working hours.

Among the initiatives policymakers proposed to face and mitigate the effects of the pandemic were nationwide lockdowns, voluntary social distancing, reduced contact intensity, safer workplaces and the reallocation of resources towards less-contact intensive sectors. As a result, one of the main recommendations made by governments was to encourage remote working. A recent report by Eurofound (2020) estimates that around 40% of full-time workers have become teleworkers due to the pandemic.

A flexible working system might be the way to sustain the activity economy and preserve jobs, but it is also a desirable strategy for the future, since it creates benefits associated with the transition to a new productive system. From a company's perspective, such benefits are linked to a reduction in production costs and conflicts in the workplace. On the other hand, from the worker's perspective, remote working is an opportunity to foster the conciliation between work and family life or household chores, improve self-management of working time and extend the working life. In addition, home-based work is also expected to reduce commuting costs, which could have positive effects on urban congestion and pollution.

The upsurge in remote working has highlighted the need to address structural challenges to encourage the digital economy and implement the technological bases for the development of Industry 4.0 (I4.0). This transition to the new economic paradigm is associated with the new I4.0 job profiles, that is, workers with new skills and digital competences. Retraining and reskilling are key elements that will allow the workforce to meet the new requirements of growing sectors associated with the digital economy. The technological transformation that has taken place in the economy has meant an increase in the use of information and communication technologies (ICTs) and the demand for e-skills, both keystones for effective remote working. However, the potential demand for a digital workforce might be associated with a digital knowledge gap, since a significant proportion of the workforce may not have sufficient digital competences. This could hinder access to remote work for all potential collectives and could increase exclusion from the labour market of the traditionally most disadvantaged groups. Furthermore, there are other negative consequences, such as technostress, psychological fatigue, non-work life conflict, permanent digital connectivity and inability to switch off, cybersecurity problems, isolation and negative synergies due to lower contact with fellow employees. This last phenomenon is known in the literature as the "autonomy paradox" (Putnam *et al.*, 2014). In fact, remote working could be weakening labour ties, hampering teamwork and diminishing the benefits associated with collective intelligence.

Thus, an analysis of remote working is a starting point with which to observe the deficiencies that exist in the workforce and the current economic system, and which affect the successful transition to the digital and knowledge economy. Moreover, a study of this topic would produce evidence useful for policymakers and allow for a reflection on the solutions that mitigate the negative consequences associated with this type of flexible work. This article focuses on the Spanish labour market as a whole and offers some results for

Andalusia, a region in Spain that is economically deprived when compared with other Spanish regions. Both cases are interesting due to the disadvantages their workforces suffer in comparison with other developed countries. Moreover, teleworking is a current concern for policymakers in Spain. This has led to the regulation of remote working under the Royal Decree-Law 28/2020 of September 22, which establishes its legal framework.

This research aims at providing empirical insights that allow us to detect inequalities that exist in accessing remote working, observe the transition to teleworking during the lockdown caused by the COVID-19 outbreak and present some empirical evidence on whether or not teleworking provokes psychological problems in wage earners. In fact, this paper offers novel insights into teleworking and adds to the growing literature on this topic. More specifically, the study focuses on three primary objectives. Firstly, the article aims to assess the factors that determine remote working in a pre-pandemic period, focusing on the influence of ICT training. Data used to reach this objective are obtained from the Survey on Equipment and Use of ICTs in Households (ICTS-H Survey) provided by the Spanish National Statistics Institute (INE, 2018). The period under consideration is the year 2018, because the ICTS-H Survey exclusively includes in this year several questions that allow us to know whether the individuals work from home or not. Secondly, we focus on the Andalusian region and use The Social Survey 2020. Habits and Living Conditions of the Andalusian Population during the State of Alarm. It was conducted by the Institute of Statistics and Cartography of Andalusia (IECA, 2020) and enables us to obtain information about those workers who previously worked on company premises but who started working from home once the nationwide lockdown was declared in Spain (March 2020). This allows us to observe how the workforce with no home-based experience in teleworking adapted to the digital transition provoked by the state of alarm. Thirdly, the latter survey also provides information regarding several emotional problems suffered by the individuals during lockdown, which enables us to quantify the effects of some explanatory variables. In particular, we will observe whether working both from home and on company premises has any effect on these emotional disorders.

The remainder of the paper is organised as follows: Section 2 presents the theoretical background and the main hypotheses to be tested. Sections 3 describes the data and examines the information about the variables included in the analysis. Section 4 develops the econometric methodology proposed, and Section 5 shows the results and discusses the main findings. Finally, the main conclusions are summarised in Section 6.

2. Theoretical background and hypotheses

In the mid-twentieth century, the knowledge economy had already predicted the current spread of teleworking (Drucker, 1959). This theory posited a shift in the productive system to intangible economic assets, which would generate a growth in remote working. Another theoretical approach supporting the development of remote working was proposed by Goodstein (1994). This author pointed out that flexible working is a response of employers to the changing nature of the workforce; in other words, there is an organisational adaptation to employees' new social circumstances. After these two seminal and theoretical works, many scholars have addressed this topic from a multi-disciplinary and empirical point of view. Some articles have focused on the personal and psychological impact of home-based work. Firstly, Madsen (2003) finds that teleworkers experience less work–family conflict than worksite employees. Secondly, Marsh and Musson (2008) suggest that teleworking may have the positive effect of narrowing the distance between gender roles since men working from home might be more integrated into family life. On the contrary, Maruyama *et al.* (2009) indicate that teleworkers could find it difficult to balance work and family life, if

they combine home-based activities with work duties carried out at the traditional worksite. In this vein, Sardeshmukh *et al.* (2012) suggest that telecommuting generates negative effects, such as depersonalisation, feelings of isolation, decreased social support, increased role ambiguity and the difficulties encountered in obtaining a high level of collective intelligence. Unlike the aforementioned studies that use small sample sizes, Felstead and Henseke (2017) support their conclusions through large-scale surveys carried out in the UK. They find that remote workers report high levels of enthusiasm, job-related well-being and less burnout, although they also reveal that these workers find it difficult to switch off at the end of the workday. Charalampous *et al.* (2019) corroborate these main results, revising the qualitative and quantitative evidence in 63 studies. Their main conclusions are that remote working is associated with positive emotions, increased autonomy, job satisfaction and fulfilment of tasks. However, some drawbacks are also reported, such as professional isolation, which could be an obstacle for career advancement. Finally, focusing on the pre-COVID-19 era, it is worth mentioning Rodríguez-Modroño and López-Igual (2021) who analyse teleworking for EU Member States. Their results show that job quality and work–life balance are better for occasional teleworkers.

Within the socio-economic context generated by the COVID-19 outbreak, it is possible to highlight an array of studies. Firstly, Baert *et al.* (2020) observe how Flemish employees perceive remote working during the pandemic. They find that most workers affirm that teleworking will continue once the pandemic is over because it improves efficiency and the work–life balance. However, Okubo *et al.* (2021) find that the efficiency of remote workers in Japan was on average 20% lower during the pandemic compared to non-teleworkers. One reason put forward to explain this result is that telecommuters face several barriers, including lack of experience, lack of a suitable space in which to work from home and insufficient telecommunications devices. Secondly, Schur *et al.* (2020) analyse the collective of American workers with disabilities and conclude that teleworking has favoured their job opportunities. This can be explained because a large number of them chiefly work from home; unfortunately, the study also notes that the wage gap with non-disabled workers will remain since they are more likely to be in low-paying jobs. Thirdly, from a wider perspective, Curzi *et al.* (2021) note that around 50% of European teleworkers present psychological problems and find it difficult to balance telework and family life. This is especially true for women who experience these negative effects more intensely. As pointed out by Buomprisco *et al.* (2021), the future expansion of teleworking after the COVID-19 pandemic should be accompanied by preventive measures that mitigate their potential harmful effects on health. In this normative line, Jenkins and Smith (2021) point out that teleworking has proven to be a resilience factor for the future and should be reinforced through investment in infrastructure that entails greater recognition and protection of women with regards unpaid care and domestic work. Finally, from the company's perspective, Tokarchuk *et al.* (2021) verify that firms with experience in teleworking pre-COVID-19 developed an organisational readiness that favoured their adoption of teleworking during the COVID-19 era.

Regarding the economic literature discussing Spain, the scarcity of statistical sources about the topic has created an obstacle for researchers. However, it is worth focusing on several studies that have approached different aspects of remote working. Firstly, Pérez *et al.* (2004) assert that remote working has some positive environmental impacts due to reduced traffic congestion and decreased air pollution. This would also mean a saving in health costs since illnesses related to these problems would also decrease. Secondly, Roca and Martínez-López (2005) find that ICT companies use telecommuting to undertake work dedicated to software development, document revision and data analysis. Moreover, they

state that the main difficulties facing these firms are the supervision of tasks and the misunderstandings that arise with teleworkers. Thirdly, Martínez-Sánchez *et al.* (2007) observe that workers are more disposed to remote working if they are knowledgeable about their jobs and there is a high level of trust between employees and supervisors. In addition, they prove that remote working is positively related to firm performance. In this regard, Anghle *et al.* (2020) estimate that 30.6% of all jobs could be undertaken from home and that the occupational groups most likely to undertake remote working are directors, managers and professionals. Focusing on work–life balance and personal characteristics, Gálvez *et al.* (2020) carried out an analysis of female Spanish teleworkers. Their results show that remote working increases women's sense of autonomy, independence and control over their lives. Furthermore, Farré *et al.* (2020) designed a representative household survey to analyse the effects of the COVID-19 lockdown on paid and unpaid work. They find that gender inequality increased, since women were more likely to undertake teleworking, and that their participation in housework and childcare increased because of the closure of schools.

In this article, we aim to advance the research around teleworking. The main hypotheses to be tested can be summarised as follows: the first hypothesis is that access to teleworking is not a homogeneous phenomenon among individuals and depends on their personal and job-related characteristics. Moreover, it is clearly associated with technological change. Thus, ICT training and type of ICT activity stand out as key elements with which to explain the likelihood of working from home. The second hypothesis is that COVID-19 might have increased labour market inequalities, the vulnerability of some collectives and occupational segmentation. The third assumption is that insufficient digital disconnection due to a combination of teleworking and working on-site may lead to an adverse effect on workers' well-being and generate emotional disorders.

The main contribution of this article to the socio-economic literature is the analysis of the influence of ICT training on the probability of working from home in a pre-pandemic period. Moreover, it offers additional evidence for the Andalusian region on the characteristics of remote working during the nationwide lockdown and its potential effects on emotional disorders.

3. Data

The primary objective of this article is to analyse teleworking in Spain in a pre-pandemic period. The data set used is the ICTS-H Survey. This study focuses on the year 2018 as this survey includes information about whether individuals are working from home or not. This content is not included in the ICTS-H survey questionnaire for 2019 and 2020. In this regard, this study considers those individuals working from home and using ICTs to perform their job tasks. As such, we focus on the technology-based definition of teleworking, which excludes those manual-based activities undertaken at home.

Wage earners aged 25 to 60 compose the core sample, which rules out young people with precarious employment relationships or older people nearing retirement age. The focus is on individuals using ICTs to perform job tasks (computers, other electronic devices or automated equipment). Thus, two groups of individuals are considered: the first group comprises employees working on-site, while the second includes teleworkers. To be specific, teleworkers are people who work from home. The second group is also divided into three categories according to how often they telework: on a daily basis, on a weekly basis or less often than on a weekly basis.

The explanatory variables chosen to explain remote working include those factors proposed traditionally by the socio-economic literature. In particular, the regressors considered allow for personal characteristics such as gender, age, educational attainment and household composition. Furthermore, the model includes information regarding the job, the type of knowledge acquired through ICT training and the nature of the ICT activity

performed at work. The mean values corresponding to this set of control variables are reported in Table 1.

Firstly, it must be pointed out that teleworkers represent 37% of wage earners. Secondly, there are differences in the personal characteristics of teleworkers compared to employees

Regressors	Working from home: On a daily basis	On a weekly basis	Less than on a weekly basis	Not working from home
Age	44.23	44.11	43.19	43.45
Gender				
Female	0.53	0.50	0.47	0.53
Male	0.47	0.50	0.53	0.47
Educational level				
Primary or lower secondary education	0.05	0.05	0.08	0.19
Upper secondary education	0.08	0.10	0.17	0.28
Higher technical education	0.08	0.13	0.17	0.18
Higher education	0.79	0.72	0.59	0.35
Household with children				
Yes	0.53	0.55	0.51	0.50
Not	0.47	0.45	0.49	0.50
Labour characteristics				
Type of contract				
Open-ended	0.81	0.84	0.87	0.84
Fixed-term	0.18	0.16	0.13	0.16
Activity sector				
Agriculture	0.01	0.01	0.01	0.01
Construction	0.01	0.04	0.04	0.03
Industry	0.10	0.09	0.13	0.15
Services	0.32	0.37	0.50	0.48
Public Administration	0.56	0.48	0.31	0.33
ICTs Training				
Marketing online or electronic commerce	0.10	0.08	0.07	0.04
Social networks	0.16	0.11	0.08	0.06
Programming language	0.11	0.10	0.09	0.04
Database management	0.11	0.13	0.14	0.06
Maintenance of computer networks	0.06	0.07	0.06	0.02
Computer security	0.12	0.12	0.11	0.06
Software applications	0.37	0.37	0.35	0.20
Other knowledge	0.25	0.20	0.21	0.12
Type of ICTs activity at work				
Exchanges of emails or data entry in databases	0.91	0.93	0.90	0.66
Creation or edition of electronic documents	0.78	0.78	0.76	0.47
Social networks	0.49	0.37	0.37	0.16
Apps to receive tasks or instructions	0.55	0.50	0.48	0.32
Specific software	0.62	0.64	0.69	0.48
Development of computer systems	0.15	0.17	0.20	0.06
Observations	380	552	641	2671

Source: Own elaboration based on the ICTS-H Survey (INE, 2018)

Table 1. Employees working or not from home and using ICTs: mean of explanatory variables

working on-site. The main divergence appears in the educational level. Specifically, more than 70% of remote workers (working remotely on a daily or weekly basis) have a higher educational attainment, compared to 35% registered for the rest of the workers. Concerning job type, it is noteworthy that employees in public administration are more likely to undertake teleworking, with a percentage reaching 56% for teleworkers on a daily basis (23 percentage points higher than worksite employees). In relation to the knowledge acquired through ICT training, it is possible to detect different patterns among the groups considered. Firstly, the percentages of workers for all categories of training activities are higher for the group of wage earners working from home compared to people working on company premises. This reveals the importance of ICT training to perform job tasks remotely. The category "software applications" is represented most in all groups, but there is a significant positive difference of more than 15 percentage points in favour of remote workers. Regarding the ICT activities associated with job tasks, "exchanges of emails or data entry in databases" and "creation or edition of electronic documents" are the most representative in all cases, but there are huge differences among the different groups of workers. Specifically, the percentages of telecommuters undertaking these activities are about 90% and 75%, respectively, which contrasts with the 66% and 46% observed for non-telecommuters.

The methodology adopted will control the bias sample generated by analysing only workers using ICTs. Thus, it will be necessary to estimate a model that includes all wage earners and distinguishes them according to their performance or not of ICT activities. The regressors considered to determine the selection rule are personal characteristics, having a computer or tablet at home or not and job type (activity sector, type of contract, working hours, manual or non-manual work).

The second primary objective is to examine the determinants of teleworking in Andalusia during the lockdown (March 2020). We will focus on the characteristics of employees who started working from home in Andalusia once the Spanish government imposed the state of alarm. The data set used is The Social Survey 2020. Habits and Living Conditions of the Andalusian Population during the State of Alarm (IECA, 2020). It reports on the living conditions during lockdown and was used by Sánchez-Cantalejo *et al.* (2021) to analyse the impact of COVID-19 on the most vulnerable population. As in the Spanish case, the sample is restricted to wage earners aged between 25 and 60. Unfortunately, the information available does not allow us to observe the influence of the ITC training. However, it is possible to detect whether the individuals perform their job tasks only from home, which is a contribution in relation to the first primary objective. With this approach, individuals are placed in three groups: working only from home, working only at the traditional workplace and working both from home and on company premises. The set of explanatory variables selected is also conditioned by the personal and job-related characteristics collected by the survey questionnaire. In particular, the regressors included are gender, age, educational attainment, household composition, occupation and type of contract.

Table 2 shows the mean values for these variables. Firstly, the distribution of workers shows that 22.6% perform their jobs task only from home, and 10% on company premises and from home. Concerning personal characteristics, the percentage of women within the group of individuals only working from home reaches 62%, but the gender distribution is practically the opposite for the group performing their tasks only on company premises. Secondly, regarding educational attainment, individuals with higher educational attainments is the most represented group within the collective of remote workers (70% of employees working only from home). With regards job-related characteristics, it is noteworthy that 62% of teleworkers working only from home are managers, technicians or support technicians, which contrasts with the 13% found for

Regressors	Working only from home	Working only on the company premises	Working from home and on the company premises
Age	42.36	42.03	42.06
Gender			
Female	0.62	0.39	0.42
Male	0.38	0.61	0.58
Educational level			
Primary or lower secondary education	0.06	0.42	0.08
Upper secondary education	0.10	0.30	0.11
Higher technical education	0.14	0.15	0.17
Higher education	0.70	0.13	0.63
Household with children			
Yes	0.66	0.67	0.70
Not	0.34	0.33	0.30
Labour characteristics			
Type of contract			
Open-ended	0.81	0.70	0.90
Fixed-term	0.19	0.30	0.10
Occupation			
Managers, scientists or technicians	0.62	0.13	0.51
Administrative type employees	0.10	0.06	0.17
Other occupations	0.28	0.81	0.32
Observations	194	575	87

Source: Own elaboration based on Social Survey 2020. Habits and Living Conditions of the Andalusian Population during the State of Alarm (IECA, 2020)

Table 2. Wage earners in Andalusia according to their workplace during the lockdown: mean of explanatory variables

non-remote workers in these occupations. Another interesting finding is that among administrative workers, the highest percentage (17%) is obtained for those individuals working both on company premises and from home. This could explain the difficulties detected in this type of work to achieve digital disconnection and a good work–life balance.

Finally, the third primary objective assesses whether the job market situation for wage earners during lockdown exerted some influence on the likelihood of suffering emotional problems. To this end, we use information from the Andalusian survey about whether the individual has often experienced symptoms of emotional disorders such as anxiety, anguish or lack of sleep during lockdown. The sample used reveals that 23.38% of the employees had experienced these emotional disorders. The set of explanatory variables considered to analyse such disorders includes a dummy variable indicating whether or not the individual has been temporarily laid off under a temporary workforce adjustment plan, the Spanish *Expediente de Regulación Temporal de Empleo* (ERTE). Furthermore, wage earners who have not been temporarily laid off are classified according to their workplace. Other covariates considered are personal characteristics (gender and age), whether individuals have help with housework or not, and their participation in activities such as video calls, social networks, physical exercise, reading, studying and solidarity activities. Furthermore, various housing characteristics are considered, such as whether the house has enough natural light or a garden.

4. Econometric specification

The methodological approach followed to achieve the first objective consists of the estimation of an ordered response model where data observability depends on a selection mechanism. The sample selection rule is whether or not the individuals use ICTs at work, and the target discrete-outcome variable takes into account the frequency of working from home.

Focusing on the econometric specification, the variable Y_{1i}^{*} represents the unobserved propensity of each individual to teleworking. It depends on a vector of explanatory variables X_{1i}^{*}, and an error term u_{1i}:

$$Y_{1i}^{*} = \beta' X_{1i} + u_{1i} \tag{1}$$

The ordinal response variable Y_{1i} bounds Y_{i}^{*} according to the following threshold model:

$$Y_{1i} = \begin{cases} 0 & if \quad k_0 \leq Y_{1i}^{*} \leq k_1 \\ 1 & if \quad k_1 < Y_{2i}^{*} \leq k_2 \\ 2 & if \quad k_2 < Y_{3i}^{*} \leq k_3 \\ 3 & if \quad k_3 < Y_{4i}^{*} \leq k_4 \end{cases} \tag{2}$$

Y_{1i} takes the value 0 for individuals not working from home, 1 for employees telecommuting less than once a week, 2 for employees working remotely on a weekly basis and 3 for individuals teleworking on a daily basis.

According to the sample design, Y_{1i} is only observed if individuals perform their job tasks using ICTs. Consequently, a sample selection rule is defined through the variable Y_{2i}^{*} that shows the unobserved propensity of ICT use and depends on a set of explanatory variables X_{2i} and an error term, u_{2i}:

$$Y_{2i}^{*} = \gamma' X_{2i} + u_{2i} \tag{3}$$

Through this latent variable, it is possible to generate the following binary indicator Y_{2i}:

$$Y_{2i} = \begin{cases} 1 & if \quad Y_{2i}^{*} \geq 0 \\ 0 & otherwise \end{cases} \tag{4}$$

As a result, Y_{1i} is only observed when Y_{2i} is equal to 1. To identify the model, X_2 must contain at least one variable not included in X_{1i}. This condition is met because the binary variables that show if the worker has a computer or tablet at home and if her/his occupation is manual or not are considered as regressors in the selection model but not in the outcome equation.

The estimation of the model's coefficients relies on a semi-nonparametric procedure, which assumes that the bivariate distribution of error terms u_{1i} and u_{2i} is unknown. Specifically, the estimates are computed using the semi-nonparametric (SNP) estimator for ordered response models (De Luca and Perotti 2011).

In relation to the second objective, the Andalusian survey does not offer information about ICT use at work. Thus, it is not possible to apply the model with the sample selection proposed previously. Nevertheless, we keep the ordered model specified in equations (1) and

(2). Now, the outcome variable Y_{3i} is also considered a discrete variable taking values naturally ordered. The value 0 corresponds to individuals who do not work from home, 1 for teleworkers who also work on company premises and 2 for remote workers only working from home. In this way, we assume that the frequency of teleworking is higher for the last group. Finally, for the third primary objective, the dependent variable is dichotomous taking value 1 if the individual has suffered emotional disorder and 0 otherwise. Consequently, we estimate a traditional logit model to observe the influence of the workplace among other control variables on the probability of psychological risks.

5. Results and discussion

This section discusses the results associated with the models' estimates. Firstly, Table 3 reports the marginal effects corresponding to the main equation of the ordered response model explaining the frequency of working from home in Spain before COVID-19. The marginal effects of the selection rule (usage and non-usage of ICTs at work) are shown in Table A1 of the Appendix.

Concerning personal characteristics, male workers are more likely to work from home than female employees. This reveals that for women, teleworking was not being used as a means of reconciling work and family life as much as it was for men. Before COVID-19, flexible working had not altered the traditional gender roles, since women still undertook most of the housework and childcare, and this might have discouraged their incorporation into teleworking (Chung and van der Lippe, 2018). Secondly, the human capital acquired in the Spanish educational system exerts a positive influence on telecommuting. The probability of working remotely is 5 percentage points higher for individuals with higher educational attainments than for people with less than upper secondary levels of education. The digital transformation of the economy and the diffusion of teleworking are associated with the knowledge society, which is positively correlated with educational attainment. Moreover, as pointed out by other studies (Clear and Dickson, 2005), remote working requires autonomy and soft skills to manage time and solve problems, competences that are acquired through the educational system.

In relation to the economic sector, the results show that flexible working had a higher impact on public administrations. To be specific, individuals working in public administrations had a 2.6 percentage points lower probability of not working from home than individuals working in the service sector. This result shows that the public administration sector was more adapted to teleworking in the pre-COVID era, which eases the widespread implementation of remote working in public services during the lockdown. However, pre-pandemic teleworking was unstable since workers with fixed-term contracts had a 3 percentage points higher probability of working from home than those of workers with open-ended contracts.

Focusing on ICT training variables, the most important knowledge corresponds to "social networks" and "software applications" as they registered the highest influence on the likelihood of teleworking (around 2 percentage points higher than individuals without these types of ICT training). Regarding the type of ICT activity performed at work, "use of social networks", "creation or edition of electronic documents", "exchange of emails" or "data entry in databases" made individuals more likely to telecommute, which is consistent with Roca and Martínez-López (2005).

Once the outcomes obtained in the pre-pandemic period had been analysed, we were interested to verify whether the pattern observed previously had prevailed during the pandemic, or if the increase in teleworking had enhanced the role of some characteristics. Obviously, the conclusions and the extent of the analysis are limited by the statistical

Regressors	Working from home: On a daily basis	On a weekly basis	Less than on a weekly basis	Not working from home
Age	0.001**	0.001**	0.001**	−0.002**
Gender				
Male	0.019**	0.021*	0.022***	−0.063**
Educational level				
Upper secondary education	−0.013**	−0.014**	−0.016*	0.044**
Higher technical education	−0.001	−0.001	0.001	0.003
Higher education	0.046***	0.050**	0.050**	−0.146***
Household with children				
Yes	0.009**	0.009**	0.010**	−0.028**
Labour characteristics				
Type of contract				
Fixed-term	0.027**	0.030***	0.029	−0.086***
Activity sector				
Agriculture	0.006	0.006	0.001	−0.019**
Construction	0.002	0.003	0.003	−0.008
Industry	−0.001	−0.001	−0.001	0.003
Public Administration	0.008*	0.009	0.009*	−0.026**
ICTs Training				
Marketing online or electronic commerce	0.002	0.002	0.002	−0.007
Social networks	0.016**	0.018*	0.018**	−0.053**
Programming language	0.012	0.014*	0.014	−0.040
Database management	−0.002	−0.002	−0.003	−0.005
Maintenance of computer networks	0.004	0.004	0.004	−0.012
Computer security	−0.002	−0.002	−0.002	0.006
Software applications	0.020**	0.022**	0.022**	−0.064**
Other knowledge	0.012*	0.013*	0.013**	−0.038**
Type of ICTs activity at work				
Exchanges of emails or data entry in databases	0.032**	0.035**	0.038**	−0.105***
Creation or edition of electronic documents	0.023**	0.027**	0.027**	−0.076***
Social networks	0.054***	0.057**	0.052**	−0.164***
Apps to receive tasks or instructions	0.007*	0.008**	0.009*	−0.025**
Specific software	−0.012**	−0.013**	−0.014**	0.041**
Development or maintenance of computer systems	0.020**	0.020**	0.022**	−0.064**
Wald test	237.41***			
Observations	5,972			

Table 3.
Ordered response model for the probability of working from home: marginal effects[a,b]

Notes: [a](***) significant at 1%, (**) at 5%, (*) at 10%. [b]The reference is woman living in a household without children, with primary or lower secondary education and working at the Service sector with an open-ended contract
Source: Own elaboration based on the ICTS-H Survey (INE, 2018)

information available in The Social Survey 2020. Habits and Living Conditions of the Andalusian Population during the State of Alarm. The estimates corresponding to the marginal effects of the ordered model proposed to analyse teleworking in Andalusia are shown in Table 4.

Regressors	Working only from home	Working only on the company premises	Working from home and on the company premises
Age	−0.001	0.001	−0.001
Gender			
Male	−0.048**	0.091**	−0.043**
Educational level			
Upper secondary education	0.056	−0.106	0.049
Higher technical education	0.199**	−0.325***	0.125**
Higher education	0.321***	−0.488***	0.167***
Labour characteristics			
Type of contract			
Fixed-term	−0.039**	0.075**	−0.036**
Occupation			
Managers and technicians	0.109**	−0.197***	0.088**
Administrative type employees	0.080*	−0.144***	0.064**
Wald test	67.84 ***		
Observations	856		

Table 4.
Ordered response model for the probability of working from home in Andalusia: Marginal effects[a,b]

Notes: [a](***) significant at 1%, (**) at 5%, (*) at 10%. [b]The reference is woman with primary or lower secondary education, and working with an open-ended contract in an occupation different from managers, technicians or administrative employees
Source: Own elaboration based on The Social Survey 2020. Habits and Living Conditions of the Andalusian Population during the State of Alarm (IECA, 2020)

Firstly, we can observe that the influence of gender has changed since the pandemic period, with female workers showing the highest probability of remote working (around 4.5 percentage points higher than male workers). These results are contrary to those of the pre-pandemic period and might indicate that the economic sectors most adaptable to the lockdown, and consequently to teleworking, were those with the highest proportion of women. For example, in 2020, this percentage represented 43% of employees in public administration while the proportion of female wage earners reached only 38% in the food industry, which is considered as an essential economic sector and unaffected by mobility restrictions. Secondly, the role of human capital is intensified, which corroborates the fact that transversal skills and knowledge acquired in the educational system are important elements with regards flexicurity, resilience and lifelong-learning in a changing labour market. The probability of working only from home for individuals with higher educational attainments is 32 percentage points higher than for wage earners with less than upper secondary level education. It is worth remembering that this differential of probability was around 5 percentage points in the pre-pandemic period. Another advantage of the Andalusian survey in relation to the Spanish one (ICTS-H Survey) is that it allows us to observe the association between job occupations and teleworking. The results confirm the hypothesis that white-collar workers (managers, technicians and employees in administrative jobs) are less linked with the traditional worksite.

Concerning the article's third primary objective, Table 5 shows the marginal effects associated with the probability of suffering emotional problems (anxiety, anguish or lack of sleep) during lockdown. Focusing on the individual labour market situation, employees who were laid off under the temporary workforce adjustment plan are more likely to experience

Regressors	Marginal effects[a,b]
Age	−0.002*
Gender	
Male	−0.112***
Labour market situation	
With a ERTE	0.090**
Only working from home	−0.012
Working from home and on the company premises	0.097**
Housework without help	
Yes	0.070**
Participation in other activities	
Video calls	
Yes	0.121**
Use social networks	
Yes	−0.048
Physical exercises	
Yes	−0.049**
Reading or studying	
Yes	0.070**
Solidarity activities	
Yes	0.099**
Household characteristics	
Enough natural light	
Yes	−0.139**
Garden	
Yes	−0.084**
Wald test	93.83 ***
Observations	1188

Table 5.
Probability of psychological risks during the lockdown

Notes: [a](***) significant at 1%, (**) at 5%, (*) at 10%. [b]The reference is woman, working only on the company premises, doing housework without help, not participating in activities and living in a house without enough natural light and without garden
Source: Own elaboration based on The Social Survey 2020. Habits and Living Conditions of the Andalusian Population during the State of Alarm (IECA, 2020)

emotional disorders. Specifically, they show a probability of psychological risks 9 percentage points higher than the one observed for wage earners who work only on the company premises. This demonstrates that economic uncertainty causes negative effects on health and emotional stability. Concerning wage earners who were not laid off under the temporary workforce adjustment plan, the results show that there are no differences between individuals working only from home and those performing their job tasks only on company premises. The only significant impact on the probability of emotional disorders is detected for employees working both on the traditional work site and from home. These individuals register a probability of psychological risks 10 percentage points higher than the rest of wage earners not laid off under the temporary workforce adjustment plan. This result is consistent with those obtained by Maruyama *et al.* (2009). These authors find that teleworkers may encounter difficulties in balancing work and family life if they also perform

job tasks at the conventional workplace, which would generate emotional disorders and burnout. In this sense, the adoption of measures to monitor and regulate digital disconnection would be key to setting boundaries between paid employment and personal life and improve workers' welfare. However, this negative effect is not present for employees working only from home. This is coherent with Sardeshmukh *et al.* (2012), Felstead and Henseke (2017) and Charalampous *et al.* (2019), who obtain that teleworking diminishes time pressure and mental fatigue and increases job-related well-being.

Concerning the rest of the explanatory variables, we can highlight some interesting results. Firstly, age has a negative effect on the probability of suffering emotional disorders, and this probability also increases by 11 percentage points for women. This result could be explained by the traditional gender roles in Spanish society where there is an unequal allocation of household duties, and caring for children and other family members. This hypothesis is reinforced by the results associated with the dummy variable showing whether the individuals do housework without help. More specifically, the probability of emotional disorders increases by 7 percentage points.

Further interesting results are related to the participation of the individuals in other activities. In particular, individuals who made video calls during the pandemic increased their probability of suffering emotional disorders by 12 percentage points. On the other hand, physical exercise exerts a positive effect on health, decreasing the probability of psychological trauma by 7 percentage points. Finally, concerning household characteristics, living in houses with enough natural light or a garden reduces the likelihood of emotional disorders by 14 and 8 percentage points, respectively.

6. Conclusions

Remote working was an essential instrument with which to sustain economic activity during the state of alarm declared in Spain (March 2020). This category of flexible working could be a cornerstone to encourage the technological changes associated with the future digital economy. This article has aimed to provide empirical evidence about the main personal and job-related characteristics of teleworkers both in a pre-pandemic period (2018) and during the lockdown. The methodology followed to achieve these objectives was the estimation of ordered response models using SNP estimators. The results have tested the hypotheses proposed. Firstly, access to teleworking depends on personal and job-related characteristics. Thus, the conclusions corresponding to the pre-pandemic period indicate that individuals who are most likely to work from home are male, with higher educational attainments and working in public administration with a fixed-term contract. With regards ICT training, acquiring knowledge about social networks and software applications exert the highest positive influence on the probability of teleworking. Moreover, the job tasks that use ICTs where remote working is most likely are "use of social networks", "exchange of emails or data entry in databases" and "creation or edition of electronic documents". This indicates that workers with digital skills are better positioned to face the demands of teleworking and highlights the need to increase ICT training to meet the challenges stemming from flexible working. Secondly, COVID-19 might have increased the inequalities already present in the Spanish labour market, as access to remote working has not been homogenous among workers. For example, during lockdown, the influence on human capital has increased significantly, which highlights the importance of knowledge in the transition to the future digital economy. Thirdly, emotional disorders are related to the individual's work situation. Thus, the risk of suffering psychological problems increases if employees work both on the company premises and from home. This could be associated with the autonomy paradox. In other words, an increase in autonomy can generate several negative effects related to longer and more irregular working hours. This hybrid work

arrangement is expected to continue during the post-COVID normality; thus, adequate legislation is needed to protect the non-working time of employees, guaranteeing their privacy and their right to disconnect.

In sum, these results show that some groups of workers may encounter difficulties in transiting to teleworking. In this regard, the conclusions obtained are an initial guide to policymakers and stakeholders since this article provides empirical evidence about what type of workers are having most problems, and about what ICT training should be fostered to increase the adaptability of the workforce to new technological changes. This takes on special relevance in the current situation, as the recovery plan proposed by the EU to overcome the economic crisis brought about by COVID-19 is linked with reforms to boost the socio-economic digital transition and improve ICT infrastructure.

Clearly, these conclusions are just a starting point to complement other results already obtained by the economic literature. Future research is essential to shed more light on this topic, assessing its pros and cons and examining remote workers' careers in comparison to those of worksite employees. This should be accompanied by conducting nationally representative surveys showing in detail how job tasks are developed and the ICT training required to undertake them. More specifically, it is necessary to classify which jobs can transit or not to teleworking, the skills required for I4.0 job profiles and the investment in equipment and software necessary to enhance remote working. In fact, it is essential to advance in the concept of teleworkability; that is, the degree to which a job task can be performed remotely.

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Further reading

EUROSTAT (2020), *European Union Labour Force Survey*, EUROSTAT, Luxembourg.

Appendix

Regressors	Marginal effects[a,b]
Personal characteristics	
Gender	
Male	0.072***
Age (years)	−0.002**
Educational level	
Upper secondary education	0.128***
Higher technical education	0.169***
Higher education	0.316***
Computer or tablet at home	
Yes	0.159***
Labour characteristics	
Activity sector	
Agriculture	−0.049*
Construction	−0.013
Industry	0.032**
Public Administration	−0.025**
Type of occupation	
Manual	−0.214***
Type of contract	
Fixed-term contract	−0.074***
Working time	
Part-time	−0.077***
Observations	5972

Table A1.
Probability of using or not ICTs at work

Notes: [a](***) significant at 1%, (**) at 5%, (*) at 10%. [b]The reference is woman, with primary or lower secondary studies, not having computer or tablet at home, working part-time at the Service sector, in a non-manual occupation and with an open-ended contract
Source: Own elaboration based on the ICTS-H Survey (INE, 2018)

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