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THE ROLE OF AUTHORITIES AND ECONOMIC ACTIVITIES IN TELEWORK ADOPTION

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Abstract. In the context in which the authorities implemented or recommended physical distancing measures given the context generated by the COVID-19 pandemic, the teleworking approach was encouraged. Moreover, teleworking was the only solution for some companies to continue their business. Under these circumstances, it was a real challenge for both employees and employers to adapt quickly and successfully to the new context. Similarly, the authorities had an important role to play. This study aims at examining the relationship between the telework adoption in response to the COVID-19 pandemic and two independent factors to the internal organisation of businesses: the existence of a specific legislative framework on telework adopted by authorities, and teleworkability at macroeconomic level, considering that some economic sectors are more flexible than others in terms of their response. For this analysis, an econometric model of multifactorial linear regression is used, including quantitative and qualitative variables for 26 Member States of the European Union (except Sweden) for 2020. The results show that there is a positive relationship between the teleworking in 2020 and the share of the employment in the teleworkable sectors on the one hand, and the level of adoption of teleworking in the pre-pandemic period on the other hand.

Keywords: telework, teleworkability, labour market, teleworking legislation, COVID-19 pandemic.

JEL Classification: J81, J83.

Introduction

The new coronavirus (COVID-19), appeared for the first time at the end of 2019 in China and spread rapidly around the world, has placed the global economies in a new context. Nearly all economic and social sectors experienced new challenges as result of the new rules adopted to avoid the spread of the virus and to protect public health.

In European Union, the first cases of COVID-19 were registered in the first quarter of 2020, and, as a result of the measures imposed by the governments to reduce the human, economic, and social impact, all EU countries registered different contraction rates. All the governments took unprecedent measures to protect the population against the spread of the disease and to reduce the damaging effect on the labour markets and on the economies as a whole, e.g., social distancing measures, closure of schools and entertainment, restriction on travel, movement restrictions, etc.

Both at European Union level and globally, countries have been affected differently depending on the share of different sectors in their GDP. For instance, the airline industry is one of the sectors that has been affected due to travel restrictions and closed borders. Therefore, the economies in which tourism brings important incomes were strongly affected. At the same time, the COVID-19 pandemic has created a negative effect on countries dependent on oil sales because the price of oil registered significant decreases as a result of the reduction in the demand for petroleum products. Moreover, taking into account the interdependence of economies in the context of globalisation, the issue of supply chain disruptions occurred. At the same time, consumption behaviour has changed drastically due to the physical distancing measures recommended or even imposed by the authorities.

The COVID-19 pandemic generated shocks at the level of demand and supply in many economic sectors. As result, the labour markets were also strongly

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affected in 2020. According to the International Labour Organisation, a total of 114 million jobs were lost and the number of global working hours was 8.8% lower in 2020 compared to 2019 (International Labour Organization [ILO], 2021a). Many persons employed in industries such as tourism and hospitality industry, transport, manufacturing, and construction lost their jobs. This situation is due to the fact that companies that activated in industries such as those mentioned above were forced to interrupt their activity in the context of the lockdown.

Also, in terms of labour market, there was an increase in vulnerability for those already vulnerable. The less educated and low-skilled labour force, older and non-natives employees were the most vulnerable groups in the context generated by the pandemic (Pouliakas & Branka, 2020). Furthermore, an even more difficult situation faced workers in the informal economy, as they could not benefit from extended social protection measures (Bottan et al., 2020).

The new pandemic context, increased the pressure on companies 1) to speed the adoption of automation in some processes in specific sectors, like manufacturing and 2) to adopt teleworking in other sectors, where this could had represented a solution, without prenotice for workers or business environment.

In this context, it is important to highlight that, on the one hand, a significant share of the jobs that are not teleworkable is represented by the jobs that imply tasks with a high level of automation. Therefore, in the context of the COVID-19 pandemic, the automation process was accelerated, and certain businesses, such as manufacturers, started to use technological mechanisms, replacing workers (Petropoulos, 2021; Saadi Sedik, 2021). Thus, the physical distance measures were respected, while the activity of companies was not affected because of personnel lack. As a result, these jobs were cancelled, and some low-education workers with low wages lost their jobs. On the other hand, in the case of certain economic sectors, teleworking represented a solution that made it possible to continue the activity, while aligning with the social distancing measures. Consequently, teleworking rates increased significantly worldwide in 2020 (OECD, 2021).

These labour market changes generated increased inequalities between low and high-skilled employees and required appropriate measures to counteract them by public authorities (Cajner et al., 2020; Stantcheva, 2022; Cortes & Forsythe, 2023).

Moreover, there are also inequalities between states in the adoption of telework. Even though all economies were affected by the context of the pandemic, the use of telework varied significantly between countries.

The aim of our research is to identify the causes of variations in the adoption of telework in 2020, when economies were most strongly affected. Thus, the research objectives of the paper are (i) to assess the relationship between the adoption of telework in 2020 and teleworkability and (ii) to evaluate the effect of the existence of specific telework legislation on telework adoption during the pandemic at the level of the European Union member states.

The rest of the paper is structured as follow. The first section covers the theoretical background, being explained telework and teleworkability. The second section highlights the research methodology based on the data extracted from the Eurostat database. The main results of the analysis are presented in the third section and their interpretation is in the fourth section. Detailed findings of this analysis are discussed in conclusions.

1. Theoretical framework

Although the adoption rate of telework increased in the pandemic context, telework has been used in some countries since the end of the 20th century (ILO, 2021b), during the time that digitisation developed and was implemented at the level of companies. A close dependent connection exists between digitisation and telework, the use of information and communication technologies (ICTs) representing the primary condition for telework to be possible.

According to the Framework Agreement on Telework (European Trade Union Confederation, 2002) signed in July 2002, the main regulatory framework on telework in the European Union, telework is "a form of organising and/or performing work, using information technology, in the context of an employment contract/relationship, where work, which could also be performed at the employers premises, is carried out away from those premises on a regular basis".

Two elements are highlighted in the definition of telework: the use of ICTs and the place where the employed person works, which is different from the premises provided by the employer. Although the definition of telework is broadly similar, a series of differences can be observed in how telework is interpreted by researchers, institutions, and organisations.

Firstly, differences are observed in the case of the location of the work in teleworking. On the one hand, according to the Cambridge Dictionary, teleworking is defined as "the activity of working at home, while communicating with your office by phone or email, or using the internet". In this regard, on the other hand, telework is considered the use of ICTs for work outside the employer's premises (Eurofound & International Labour Office, 2017). Therefore, the place where the employee performs his activity is not imposed.

Secondly, according to Messenger (2019), in the literature there is a debate about the essential technologies that must be used in remote work for it to be considered teleworking. Although some researchers consider that the use of a mobile phone is sufficient, other researchers consider that in the case of telecommuting it is necessary to use sufficiently powerful ICTs to ensure the employee's access to the necessary informational resources, being provided

the same working conditions as those at the employer's premises. These discrepancies are mainly explained by the fact that ICTs are continuously and rapidly developing, thus the technology used in telework at a given moment is considered obsolete few years later.

Aspects like those mentioned above, but also others, such as the work schedule, the way in which the employees report their activity, or the way in which the manager observes the realisation of the employee's tasks in telework must be clarified (ILO, 2020). For this reason, a legal framework that establishes these aspects is necessary.

Moreover, in agreement with the ILO (2001), it is mentioned that legislative reforms in labour law are needed over time to ensure an acceptable balance between employee rights and economic efficiency. Thus, due to the work changes, whether these are at the level of process or of the way of work organisation, a new balance must be found in the context of telework adoption.

The adoption of a specific legislative framework for telework has become a priority in recent years, but especially during the pandemic at the level of EU member states (Eurofound, 2021). Considering the Framework Agreement on Telework, most countries follow a similar approach regarding the telework regime. However, there were differences in some aspects, such as working time in telework arrangements (Eurofound, 2022, p. 63).

Taking into account the characteristics of a telecommuting job, not all activities can be performed remotely. Jobs that involve physical presence, either to have physical interaction with other people (for example, the caregiver of children or elderly) or to perform a certain physical task, involving interaction with objects (such as the plumber, builder, or factory worker), are not telecommutable (European Commission, 2020).

From the perspective of the major occupational groups (ISCO-08), the most teleworkable occupations are Clerical and support workers, Managers, Technicians, and Associate Professionals. Over 50% of the jobs included in these groups being teleworkable. On the opposite side are the groups of occupations Plant and machine operations and Elementary occupations (Sostero et al., 2020).

Considering the relation between the level of education or salaries and teleworking, it is observed that the level of teleworking is increased in the case of well-paid jobs, for which a high level of education is necessary (Pigini & Staffolani, 2019; López-Igual & Rodríguez-Modroño, 2020; Pabilonia & Vernon, 2022).

At the same time, regarding the activities according to the economic sectors, different levels of teleworkability were identified (Brussevich et al., 2020; Sostero et al., 2020). Taking into account these classifications, it is considered that about 37% of the number of employees in the 27 EU member states occupy jobs whose tasks can be performed remotely (European Commission, 2020).

Although the adoption of telework occurred at an accelerated pace in the context of the pandemic, there are a number of barriers that make this transition difficult, such as resistance from management and organizational culture incompatible with telework, data security issues, and the lack of ICT needed for remote work (ILO, 2020). Moreover, overly stringent regulations can impede the adoption of teleworking.

2. Data description and methodology

As the pandemic created an overnight need to start the work from home in some economic activities and to increase it in many others, the particular focus of our paper is on the importance of the type of economic activities in the process of increasing adaptation to the new conditions, by the capacity to switch from traditional working to work from home, considering also the previous existence in working from home.

Telework was slowly adopted until 2019 at the EU-27 level. The share of employed people who worked from home in the total number of employed people was 9.2% in 2002, and increased at low rates, reaching the value of 14.4% in 2019 (Figure 1). In the context of the pandemic, as a result of physical distancing measures to reduce the spread of the virus, a rapid process of implementation of telework has been imposed. The teleworking rate increased by 6.2 percentage points in 2020, being the highest annual rate of telework adoption from 2002 to 2021.

Significant differences regarding the adoption rate of telework at the level of the European Union member states have registered throughout the 20 years. These differences can have structural causes such as the structure of the economy and of the workforce, as well as causes that refer to management practices (Milasi et al., 2021) and use information security tools (Silva et al., 2019).

In our research, we used a multifactorial linear regression analysis to explore the relationship between teleworking adoption and economic structure, based on NACE activities, in 2020. The analysis refers to 26 countries, European Union member states (except Sweden, due to the unavailability of the data), using as data source Eurostat databases (Eurostat, 2023).

The variables included in our model are presented in Table 1.

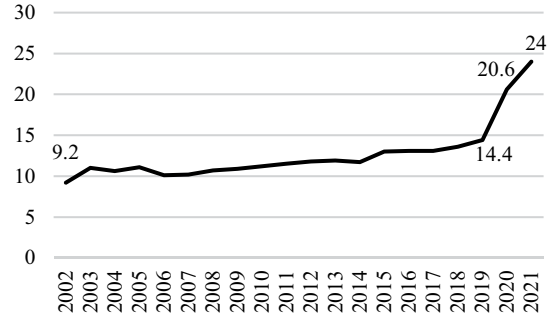

Figure 1. Employed persons working from home in EU-27, 2002–2021 (%)
(source: Eurostat, 2023, LFSA_EHOMP)

Table 1. Used variables (source: authors' own elaboration)

Variable, unit of measurement	Source
Telework, % (endogenous)	Eurostat (2023) (LFSA_EHOMP) *processed by the authors
Telework$_{t-1}$, % (exogenous)	Eurostat (2023) (LFSA_EHOMP) *processed by the authors
Teleworkability, % (exogenous)	Eurostat (2023) (LFSA_ESEGN2) *processed by the authors
Legislation – dummy (exogenous)	Eurofound (2022)

The endogenous variable in the regression model is teleworking, which is calculated as a share of the number of employed persons who worked from home in 2020, as percentage of total employment.

The data include the persons that usually worked from home (the persons working from home more than half the number of days worked in a four-week period) and also the persons that sometimes worked from home (where are included the persons that worked from home at least one day during a period of four consecutive weeks) (Figure 2).

The first econometric model includes two exogenous variables: *employment rate in the teleworkable sectors* in 2020 and *adoption of telework* in 2019.

The first variable, *employment rate in the teleworkable sectors* reflects the share of the number of employed persons in certain economic sectors that involve a large percentage of telecommuting jobs in the total number of employed persons. According to the reports of the international institutions (e.g. European Commission, 2020; OECD, 2021), some economic sectors are more flexible than others in terms of their response to the telework adoption.

Therefore, the most teleworkable economic activities, taking into consideration the NACE classification, are considered followers:

– Information and communication;
– Financial and insurance activities;
– Real estate activities;
– Professional, scientific and technical activities;
– Public administration and defence; compulsory social security;
– Education.

According to this classification and considering our aim of highlighting the level of teleworkability of employment, we computed, using Eurostat data (2023), the share of the employed persons in these six economic sectors in the total number of employed people in 2020, for the 26 European Union member states.

The second exogenous variable of the model, the *adoption of telework* in 2019, refers to the share of employed people who worked from home usually or sometimes from the total employed persons in 2019. Teleworking in 2019 and 2020 have the same meaning and source to ensure the data comparability. This variable reflects the openness of businesses to remote work and the level of telework adoption at the macroeconomic level in the pre-pandemic period. As data show, from 2019 to 2020, the adoption of teleworking increased in the case of all countries considered in the analysis, even the growth rate of telework adoption differs significantly from one country to another (Figure 3).

In the next step, a new exogenous variable is included in the econometric model, *legislation*. It highlights the

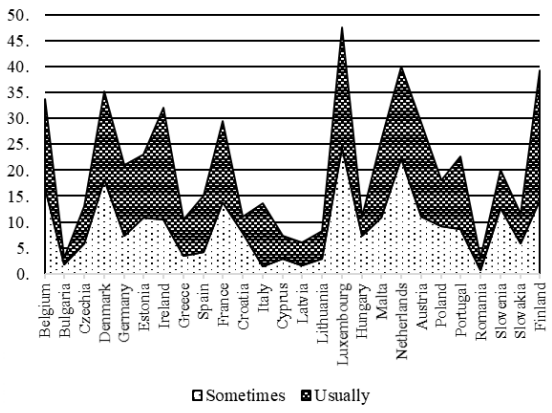

Figure 2. Work from home sometimes and usually in 26 MS (EU), 2020
(source: Eurostat, 2023, LFSA_EHOMP)

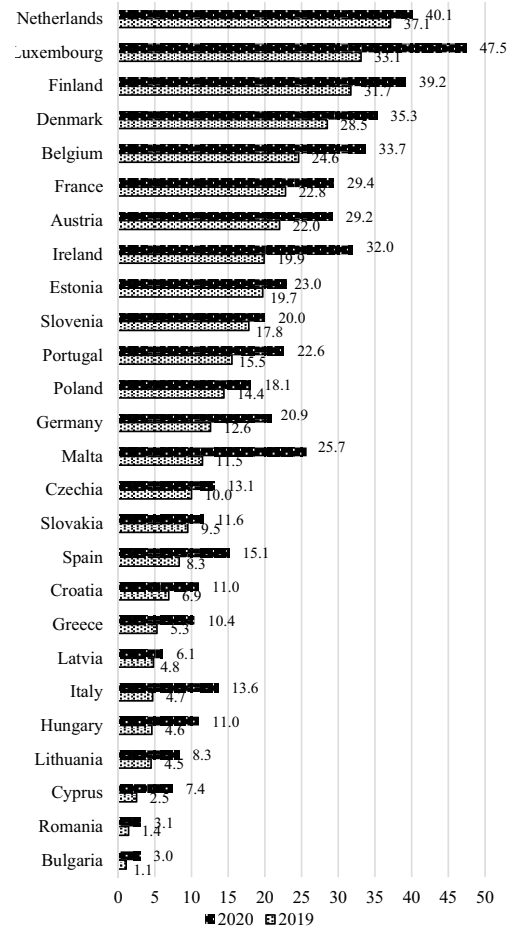

Figure 3. Work from home in 26 MS (EU), 2019–2020
(source: Eurostat (2023), LFSA_EHOMP)

existence or not of the specific legislation of telework. Therefore, according to Eurofound (2022), the 26 European Union member states are categorised into two main groups:

- the countries that have applied statutory definitions and specific legislation on telework starting from 2020 or earlier (Belgium, Bulgaria, Czechia, Germany, Estonia, Greece, Spain, France, Croatia, Italy, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, and Slovakia);
- the countries that have not applied specific legislation or statutory definitions for telework (Denmark, Ireland, Cyprus, and Finland).

The qualitative variable reflecting the application of the specific legislation of telework in 2020 is included in the econometric model with dummy variables, with binary values. As a result, the value 1 is registered for the 22 countries where a specific legislation is applied, and the value 0 is registered for the remaining four countries.

3. Results

The analysis aims to describes the relationship between the adoption of teleworking in 2020 (a period described by instability and even lockdown, in which teleworking was encouraged) and the teleworkability level of the filled jobs during that period, taking into consideration certain economic sectors, according to the literature (Table 2). The importance of teleworking adoption during the previous period for all 26 European Union member states leads to the inclusion of the teleworking adoption rate in 2019 in the econometric model.

The linear multifactorial regression equation is the following (Eq. 1):

$$TLW_i = \beta_0 + \beta_1 EMPL\,NACE_i + \beta_2 TLW_{i,t-1,} + \varepsilon_i, \quad i = 1,\ldots,26, \tag{1}$$

where TLW is teleworking adoption rate in 2020 (t) and 2019 (t-1), EMPL_NACE is teleworkability of the employment in 2020, (considering NACE).

Finally, to check whether specific legislation played an important role in the adoption of telework, a qualitative variable completes the linear regression model.

Therefore, the equation becomes (Eq. 2):

$$TLW_i = \beta_0 + \beta_1 EMPL\,NACE_i + \beta_2 TLW_{i,t-1,} + \beta_3 LEGi + \varepsilon_i, \quad i = 1,\ldots,26, \tag{2}$$

where LEG_i is equal to 1 if a specific legislation on telework exists or equal to 0 if it does not.

The estimation results of the first linear multifactorial regression model are presented in Table 3. The model passed all the five key assumptions, being characterised by linearity, independence of errors, multivariate normality, homoscedasticity, and absence of multicollinearity. With a p-value less than 0.05, the result shows that there is a non-zero correlation between the endogenous and independent variables.

Table 2. Descriptive statistics (source: authors' own computation using Eviews 10.0)

	TLW	TLW(t-1)	EMPL_NACE
Mean	0.204000	0.144154	0.279073
Median	0.190500	0.120500	0.274204
Maximum	0.475000	0.371000	0.432563
Minimum	0.030000	0.011000	0.158507
Std. Dev.	0.123563	0.105179	0.047480
Observations	26	26	26

Table 3. Results of linear regression (source: authors' own computation using Eviews 10.0)

Dependent Variable: TLW Method: Least Squares Sample: 1 26 Included observations: 26				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EMPL_NACE	0.490979	0.138569	3.543220	0.0017
TLW_T_1	1.017554	0.062553	16.26697	0.0000
C	–0.079703	0.035412	–2.250771	0.0343
R-squared	0.951562	Mean dependent var		0.204000
Adjusted R-squared	0.947350	S.D. dependent var		0.123563
S.E. of regression	0.028352	Akaike info criterion		–4.180042
Sum squared resid	0.018489	Schwarz criterion		–4.034877
Log likelihood	57.34055	Hannan-Quinn criter.		–4.138240
F-statistic	225.9147	Durbin-Watson stat		2.310047
Prob (F-statistic)	0.000000			

Therefore, according to the results, a positive relationship is established between the adoption of telework in 2020 and each of the exogenous variables.

The resulted equation after the application of the linear multifactorial regression model is the following (Eq. 3):

$$TLW = -0.079703 + 0.490979 \cdot EMPL\,NACE + 1.017554 \cdot TLW_{t\text{-}1}. \tag{3}$$

The estimation results of the linear multifactorial regression model with quantitative and qualitative variables are presented in Table 4.

In this case, the model satisfies four of the five key assumptions, the variables being multicollinear (according to the VIF test). This situation can be accepted as an exception, considering the fact that the dummy series with binary values (0 and 1) was added to the model. However, the p-value is greater than 0.05 in the situation where the legislation variable takes the value 1.

Moreover, although it is considered a significance level of 0.1, taking a 10% risk of false positive probability, the qualitative variable being statistically significant in

Table 4. Results of linear regression with dummy variables (source: authors' own computation using Eviews 10.0)

Dependent Variable: TLW Method: Least Squares Sample: 1 26 Included observations: 26				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EMPL_NACE	0.484388	0.142368	3.402367	0.0026
TLW_T_1	1.013604	0.064652	15.67782	0.0000
LEG=0	–0.072172	0.041455	–1.740976	0.0957
LEG=1	–0.078226	0.036317	–2.154001	0.0425
R-squared	0.951860	Mean dependent var		0.204000
Adjusted R-squared	0.945296	S.D. dependent var		0.123563
S.E. of regression	0.028900	Akaike info criterion		–4.109303
Sum squared resid	0.018375	Schwarz criterion		–3.915749
Log likelihood	57.42093	Hannan-Quinn criter.		–4.053566
Durbin-Watson stat	2.266720			

this case, the difference between the coefficients related to the legislation is very low, approximately 0.006.

Therefore, according to the estimation results, there is no relationship between the adoption of telework in 2020 and the existence of specific legislation for telework.

4. Interpretation of estimated results

According to the econometric model, there is a linear and positive relationship between the telework adoption in 2020 and the teleworkability level of the filled jobs, during the analysed period. The teleworkability was calculated as a share of the number of employed persons in the six economic sectors that are the most teleworkable in the total number of people employed for the same period of time. As a result, for 1 percentage point increase in the value of teleworkability, telework adoption increases by half a percentage point at the country level.

At the same time, the results highlight a linear and positive relationship between the telework adoption in 2020 and the telework adoption in 2019. A change in telework adoption in 2019 with 1 percentage point influences the change in the same direction of the adoption of telework in 2020 by 1 percentage point.

The lack of a relationship between the adoption of telework in 2020 and the existence of specific legislation for telework can be considered in addition to the results obtained from the first linear regression, from the perspective of their interpretation.

In this regard, it is important to note that countries like Denmark and Finland have not applied specific legislation or statutory definitions for telework in 2020. These countries are also the most digitalised in Europe, but also in the world, with a digital skilled labour force and an impressive interest in the integration of digitalisation in the public and private sectors. Moreover, these countries reported teleworking rates higher than the average rate of the EU even before the pandemic context.

Taking into account the above mentioned, it seems that the previous experience at the level of the companies and the familiarisation of management and employees with this new way of work, teleworking, along with the well-developed infrastructure and the digital skills of the employed workforce, had a significant impact, contributing to increasing flexibility and reaction in the unusual situation generated by the COVID-19 pandemic.

We consider that this was the beginning of a new normality in many fields of economic and social life, in terms of teleworking. The increased adoption of teleworking during pandemic has no way back. This is supported by the linear and positive relationship between the telework adoption in 2020 and 2019, the teleworkability level in different economic sectors being a very important aspect.

Conclusions

According to our econometric model, the economic structure played an important role in the ability to adopt teleworking in 2020, some economic sectors being more flexible than others. Those economic sectors where the activity is predominantly based on services that do not involve physical contact were able to use teleworking as a real, fast, and viable solution, maintaining their activity constant as much as possible in 2020.

Furthermore, the positive relationship between the adoption of telework in 2020 and the previous experience in teleworking could have several interpretations. For example, familiarization with the new form of work, teleworking, could have contributed to a better ability of companies and institutions to quickly adopt telework.

Another explanation could be the positive attitude toward this type of work at the level of management and employees, which is insured by suitable digital skills and a certain culture of work which is difficult or even impossible to establish in a short time.

Nevertheless, countries' capacity to adopt telework differs significantly in unforeseen situations characterized by pressure. In exceptional situations, such as the COVID-19 pandemic, this evolution is likely to generate deeper inequalities across economies.

According to the regression results, the specific legislation of telework did not play an important role in the adoption of telework in 2020. On one hand, it is possible that the role of authorities in telework adoption is reflected at the level of other indicators, different than legislation – for instance, a strategy that ensures a strong internet connection across the country. On the other hand, a part of these factors might be reflected in the level of telework adoption in the pre-pandemic period.

Also, the effects of the COVID 19 pandemic have been so pressing at the societal level that the need for solutions has overpassed the need for adoption a specific legislation. Countries with no previous legislation on teleworking had a high share of telework in the total employment even before the pandemic. This confirms the assumption that the role of authorities was reflected in other specific actions to support teleworking.

As limitation of our study, we should mention the low number of observations included in the econometric model. Moreover, the result of an analysis applied for a period of a few years might be more relevant. In this case, the research would analyse the telework adoption over time, alongside with the changes registered at the level of exogenous variables for EU member states. Also, in regard to independent variables, a series of more factors could influence the evolution of telework adoption. For example, the size of the companies, the type of ownership, private or public, the digital skills of the employed persons could be added to a future more complex econometric model.

Considering the results of the present econometric model, taking into account the need of companies to adapt in a short time due to the unpredictable and unstable context caused by the COVID-19 pandemic, the existence or not of the legislation could not play such an important role in 2020. Nonetheless, in this regard, the role of the authorities would increase in the next period, because teleworking would remain a practice, especially in the case of certain economic sectors. Therefore, more rigorous research would be necessary at the level of quality of the legislative framework, including the evaluation of the conditions for teleworking at the level of EU member states.

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