



**Home-based telework: usefulness and facilitators**

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## Home-based telework: usefulness and facilitators

### Abstract

**Purpose** – This article aims to analyze individual, organizational and country level factors that determine the use of home-based telework across Europe according to the technology acceptance model (TAM) and the technology-organization-environment model (TOE).

**Design/methodology/approach** – To examine the impact of individual, organizational and country level factors on telework, multilevel models are estimated to prevent problems derived from biased standard errors when micro and macro-level data are combined.

**Findings** – Main findings show that, according to the usefulness side of the TAM, employees with family responsibilities, those that live away from their work and highly qualified workers use more home-based telework. Additionally, and according to the ease of use side of the TAM, empowerment in firms facilitates home-based telework. At country level, lower power-distance, individualism and femininity, better telework regulations and technology developments are also facilitators of home-based telework.

**Research limitations/implications** – The study is limited by the cross-sectional nature of the data. This prevents the estimation of causal effects. Additional research would benefit from the use of panel data and from a more detailed analysis of the effects of country dimensions.

**Practical implications** – From an applied perspective, politics related to cultural dimensions are suggested to stimulate home-based telework.

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3 **Originality/value** – The research contributes to previous literature by: 1) considering a  
4 large sample to conduct an empirical analysis of the use of home-based telework across  
5 Europe; 2) including micro and macro factors; 3) providing a theoretical framework to  
6 explain home-based telework; 4) applying a rigorous definition of home-based  
7 telework; and 5) focusing on employees who are able to adopt home-based telework.  
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## 21 **Introduction**

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24 Telework is, as Aguilera *et al.* (2016) point out, a never-ending promise. While  
25 predictions indicated that the development of information and communications  
26 technology (ICT) would lead to a huge increase in telework, recent data show that this  
27 has not been the case, though there are variations between countries (Aguilera *et al.*,  
28 2016). Until the recent pandemic, approximately 20% of employees worked either  
29 occasionally or regularly outside their employers' premises. However, the percentage  
30 was lower for home-based telework (approximately 5%). Nevertheless, the use of  
31 home-based telework has seen a huge increase during the pandemic. This rise was the  
32 result of the isolation measures put in place by European governments (Eurofound,  
33 2020). Because of the lack of expected growth in the expansion of telework, empirical  
34 research has focused on factors that increase the use of home-based telework (Aguilera  
35 *et al.*, 2016). However, there have been no conclusive results; this may be due, among  
36 other factors, to the heterogeneity of the samples used and to the different types of  
37 telework that exist. Although home-based telework is a particular category of telework  
38 (Eurofound, 2010), the terms are sometimes used interchangeably, which makes it  
39 difficult to compare the two. Whereas some authors define telework as work that is  
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3 conducted at home using ICT, others define it as any work that is carried out outside the  
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5 employers' premises. Moreover, national factors can facilitate or limit telework, but  
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7 previous research has not considered them as determinants of telework, since most of it  
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9 has focused on individual countries. The literature shows that human resource  
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11 management practices are most likely to be influenced by culturally specific procedures,  
12  
13 local regulations and norms (Raghuram *et al.*, 2001).  
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17 Several authors have argued that the literature has failed to develop theoretical  
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19 explanations as to why firms often do not offer telework to their employees (Mayo *et*  
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21 *al.*, 2016). Telework decisions are governed by quite different underlying behavioral  
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23 processes that involve diverse actors: employees, companies, and society (Georgetown  
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25 University Law Center, 2009). Whereas society or governments have to take the  
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27 initiative to promote the use of telework, employers need to propose and offer this type  
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29 of work, and employees need to accept it. Using two established theoretical  
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31 frameworks, the present study considers factors that conflate these three behaviors and  
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33 explains how employees use home-based telework (broadly defined as work regularly  
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35 performed at home using ICT).  
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40 According to the technology acceptance model (TAM; Davis, 1986), the acceptance of a  
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42 new technology (e.g., home-based telework) can be explained by its perceived  
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44 usefulness versus the perceived ease of use. The simplicity of the TAM makes it a  
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46 widely accepted theoretical framework, and previous research has revealed that it has  
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48 superior explanatory power than other models such as the theory of planned behavior or  
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50 the theory of reasoned action (Lee *et al.*, 2003). From the usefulness side, employees  
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52 see home-based telework as a measure that helps them to balance work and family and  
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54 not waste time commuting. For employers, it is a human resource management practice  
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56 that helps them to attract and retain the most committed employees. In terms of ease of  
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3 use, according to the technology–organization–environment (TOE) model (Tornatzky  
4 and Fleischer, 1990), it can be facilitated by technological developments, organizational  
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6 culture, and environmental factors.  
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10 In taking into account all these considerations, the present study seeks to contribute to  
11 the literature by providing a well-developed theoretical framework to analyze the use of  
12 home-based telework. The hypotheses derived for the theoretical framework were tested  
13 using a representative sample of 3,701 workers in 20 European countries. Most of the  
14 empirical research on home-based telework has been based on samples from single  
15 countries (e.g., Sarbu, 2018). Direct comparisons have been difficult because of cross-  
16 cultural variations and different labor market conditions. As a result, generalizability of  
17 results depends on the countries' context. It is also worth noting that information  
18 relating to variables was provided by the employees themselves, and it therefore  
19 captured what they did rather than what employers declared to be the case. The effect of  
20 human resource management practices on employee outcomes is to some extent  
21 dependent on country differences. Finally, the present study tries to draw out the  
22 implications for managers who may wish to increase the use of home-based telework  
23 and enjoy the subsequent win-win outcomes.  
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### 46 **Theoretical framework**

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48 Home-based telework is based on the voluntarism of the participating parts, employees  
49 and employers. From the point of view of employees, the TAM, derived from the theory  
50 of reasoned action (Fishbein and Azjen, 1975), explains employees' behavior in the  
51 context of ICT. It attempts to elucidate the use of ICT, and therefore can be a very  
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3 useful theoretical framework with which to analyze the factors that explain the use of  
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5 home-based telework, since ICT are inherent to it.  
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8 In the initial version of the TAM, Davis (1986) suggests that system use can be  
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10 explained by users' motivation, which in turn depends both on the perceived usefulness  
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12 of the system and on its perceived ease of use. Later revisions of the TAM (Venkatesh  
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14 and Davis, 2000) consider more important to explain factors that affect different  
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16 individuals' perceptions (ease of use and usefulness) than own perceptions (Chuttur,  
17  
18 2009).  
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22 From the point of view of employers, the TOE framework (Tornatzky and Fleischer,  
23  
24 1990) seeks to explain the adoption of technological innovations in organizations.  
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26 According to this framework, three elements affect an organization's decision on the  
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28 adoption of technology. While the technological context is the first element,  
29  
30 organizational factors and environment are also important in explaining technological  
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32 innovation (Baker, 2012).  
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37 Our theoretical framework (Figure 1) is based on the TAM and TOE models and the  
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39 idea that employees, firms, and countries affect employees' behaviors.  
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42 [Insert Figure 1]  
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#### 48 ***Usefulness of home-based telework*** 49

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51 Perceived usefulness is defined as the degree to which a person believes that using a  
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53 particular system will improve their performance. Home-based telework implies the  
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55 confluence of two behavioral intentions: its proposal by employers' and its acceptance  
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57 by employees. Because it can be framed as a 'disruptive' work practice, some  
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3 organizations and managers may decide not to adopt it (Peters *et al.*, 2010) and some  
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5 individuals may not want to use it. To encourage the confluence of proposal and  
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7 acceptance, employees and employers need to perceive home-based telework as useful  
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9 and advantageous.

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12 Employees can benefit from it personally and professionally. It offers the opportunity  
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14 for a better work–family balance, the advancement of their professional careers, and a  
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16 reduction in transportation and commuting costs. For firms, telework increases  
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18 productivity because it helps to attract and retain talented workers, reduces the cost of  
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20 office space, and ensures continuity of daily activities (especially in current global  
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22 pandemic). Certain characteristics of the workforce may increase the probability of  
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24 home-based telework, since they determine usefulness.

### 25 26 27 *Need for work–family balance*

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30 Telework is included among those family-friendly practices that allow employees to  
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32 balance work and family life. Employees with more extensive family needs are more  
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34 inclined to want to participate in work–family programs such as home-based telework  
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36 (Swody and Powel, 2007). Home-based telework offers much greater employee  
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38 autonomy and more control over timetables than flexitime or part-time work (Felstead  
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40 *et al.*, 2002) Autonomy and control over time allow individuals to combine work and  
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42 family commitments and increase the perceived usefulness of home-based telework.  
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50 In accordance with previous research (Gajendran and Harrison, 2007) home-based  
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52 telework is herein regarded as beneficial for employees in their personal lives and also  
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54 for firms, because employees who are better able to accommodate work and family  
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56 demands are more satisfied and productive.  
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3 The social exchange theory (Blau, 1964) explains how the employee/employer  
4 relationship is affected. According with this theory, employees will respond to the  
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6 autonomy and control promised by home-based telework with a more positive attitude  
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8 toward the firm and an increase in performance.  
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13 According to this perspective, employees who have a greater need for a work–family  
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15 balance perceive home-based telework to be useful. Moreover, firms that offer this  
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17 practice to those employees experience greater performance. When both elements fuse,  
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19 the probability that workers with such needs will home-based telework becomes greater.  
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23 Hypothesis 1: Workers with more family needs or responsibilities are more likely to  
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25 home-based teleworking  
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#### 27 28 *Distance to and from work* 29

30 Home-based telework has a great number of advantages from a social point of view. For  
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32 example, it contributes to a reduction in traffic congestion, highway accidents, gasoline  
33  
34 consumption, air pollution, and strain on public transportation systems, because fewer  
35  
36 people are travelling back and forth to work. In addition to these benefits, home-based  
37  
38 telework can avoid that distance is a barrier for employees and employers. Home-based  
39  
40 telework is useful for employees who live far away from the workplace and for the  
41  
42 firms that hire them. From a strategic point of view, it helps to overcome geographical  
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44 constraints and employees' geographical dispersion (Malhotra *et al.*, 2007). It allows  
45  
46 them to attract and retain a talented workforce and to have access to dispersed  
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48 intellectual capital (Daniels *et al.*, 2001) without being limited to the geographical area  
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50 in which they operate. Employees can also choose to work for firms that are more  
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52 aligned with their interests. Thus, home-based telework can increase the fit between  
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54 firm and employee (Shin *et al.*, 2000).  
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3 Savings in travel time and transportation costs and the comforts associated with home-  
4 based telework can be very useful for employees (Sarbu, 2018). Firms can reduce the  
5 cost of office space ensure greater continuity of daily activity (Shin *et al.*, 2000). Gray  
6 *et al.* (1993) note that the use of telework is greater where large geographical distances  
7 exist and where there are low population densities.  
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15 Hypothesis 2: Workers who live far away from the workplace are more likely to home-  
16 based teleworking  
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#### 20 21 *Attracting and retaining valuable employees* 22

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24 For employers, home-based telework can be a useful means of attracting valuable  
25 employees, and this naturally increases organizational performance (Beauregard *et al.*,  
26 2019). In line with the resource-based view, highly qualified employees are the most  
27 valuable since they are scarce, inimitable, and more likely to contribute to competitive  
28 advantage and firm performance (Illegems and Verbeke, 2004). Osterman (1995)  
29 observes that firms offer non-pecuniary benefits when high-quality workers are difficult  
30 to find for posts requiring high levels of commitment and unsupervised performance.  
31 Such nonpecuniary benefits include practices that allow for greater flexibility. Home-  
32 based telework is often offered as an incentive when hiring and retaining scarce talent  
33 (Mayo *et al.*, 2016). Currently, flexibility is highly valued by qualified employees. As a  
34 result, firms who do not provide telework find themselves at a disadvantage (Mayo *et*  
35 *al.*, 2009). It is clear, therefore, that home-based telework is a valuable means of  
36 attracting and retaining highly qualified workers. Empirical studies of organizations  
37 have found that the number of teleworkers increases in proportion to educational levels  
38 (Peters *et al.*, 2004).  
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Hypothesis 3: Highly qualified employees are more likely to home-based teleworking

### ***Ease of use of home-based telework***

Perceived ease of use is defined as the degree to which a person believes that using a particular system will make his or her work easier. The perceived ease of use applied to home-based telework can be considered as one of the elements that facilitate and boost its use. In line with the TOE models (Tornatzky and Fleischer, 1990) technological, organizational and environmental factors facilitate the uptake of home-based telework.

#### *Technological factors,*

A lack of access to ICT infrastructure has been cited as a barrier to telework (Scholefield and Peel, 2009), while its availability has been identified as a primary factor in increasing its use. Several articles point out that the development of ICT has had a strong impact on the number of people telecommuting (Johnston and Nolan, 2002). Venkatesh and Johnson (2002) argue that telecommuting programs need to aim towards providing a communication infrastructure that improves communication in real time and ‘telepresence’. If the ICT infrastructure is not developed at the national level, employees will be unable to home-based teleworking.

According to Peters and den Dulk (2003), a manager is more likely to grant a telework request when the organization has open ICT and technical facilities. They believe that technology facilitates communication and the monitoring of job activities. Moreover, ICT can be used to enhance the delegation of authority. All these situations are more likely to occur when a country has a better technological infrastructure. Thus, the availability of ICT at the country level is an enabler and facilitator of home-based telework.

Hypothesis 4: ICT infrastructure is positively associated with home-based telework

#### *Organizational factors*

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3 Home-based telework implies important change in the evolution of work and in the  
4 relationship between employees, supervisors, and firms in general. The non-presence of  
5 employees in the workplace, which implies changes in control over them, is considered  
6 to be one of the main barriers to its implementation. However, it increases job  
7 autonomy and widens the range of tasks that may be undertaken by workers, and this  
8 suits firms with a participative culture (Gajendran and Harrison, 2007) in which direct  
9 control is not important.

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12 As Hamilton (2002) highlights, firms that have a participative culture and are task- and  
13 people-centered and are open to new changes are more successful in the implementation  
14 of teleworking arrangements. Flatter hierarchies and network structures favor telework.

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**Organizational cultures in which employees are empowered in terms of authority and influence can act as a facilitator of home-based telework. Spreitzer *et al.* (1997) argued that the notion of empowerment is derived from theories of participative management and employee involvement. Employees that work in this kind of firms are more likely to use home-based telework.**

Hypothesis 5: Organizational participative culture is positively associated with home-based telework.

#### *Environmental factors*

##### *National culture*

National culture, defined as a collective mindset in several dimensions, is the most analyzed determinant in human resource management practice (Guler *et al.*, 2002) and employees' behavior (Karahanna *et al.*, 2005). National culture influence employees' and firms' attitudes toward home-based telework. Hofstede's (1991) three dimensions

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3 of national culture that can facilitate or obstruct home-based telework are individualism,  
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5 power distance, and femininity.  
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8 Individualism is manifested as autonomy, individual responsibility for results, and  
9 individual-level rewards (Newman and Nollen, 1996). At firm level, home-based  
10 telework is consistent with individualistic countries that espouse autonomy and  
11 individual accountability (Raghuram *et al.*, 2001). Regarding individuals, the main  
12 obstacles to the adoption of home-based telework are isolation and the lack of social  
13 interaction (Shin *et al.*, 2000). In individualistic countries, the need for social  
14 interactions at the workplace is reduced. Then, these disadvantages are felt less keenly  
15 (Raghuram *et al.*, 2001). However, in collectivistic countries, social relations are  
16 important in the workplace, and people act firstly for the benefit of the group rather than  
17 themselves (Pheng and Yuquan, 2002). Home-based teleworking is therefore less  
18 favored.  
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34 The second dimension, power distance, influences the amount of formal hierarchy, the  
35 degree of centralization, and the level of participation in decision making (Newman and  
36 Nollen, 1996). Unlike individualism, this dimension tends not to facilitate home-based  
37 telework. Individuals and firms in countries with high power distance values prefer  
38 decision making to be centralized, and the commands of superiors are more readily  
39 accepted (Pheng and Yuquan, 2002). The introduction of home-based telework means  
40 more flexibility and job autonomy for individual workers (Raghuram *et al.*, 2001) and  
41 dilutes the hierarchical structure of an organization. The association between telework  
42 and the extensive use of direct supervision is negative (Illegems and Verbeke, 2004).  
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55 Finally, femininity tends to facilitate home-based telework and its use. Femininity  
56 countries emphasize the quality of interpersonal relations and quality of working life  
57 issues, good relationships with supervisors, and cooperation (Newman and Nollen,  
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3 1996; Raghuram *et al.*, 2001). This dimension increases the employees' feeling that  
4 they are not going to be punished or penalized by their superiors for home-based  
5 teleworking.  
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10 Hypothesis 6: Individualism, low power distance, and femininity are positively  
11 associated with home-based telework  
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#### 14 *Telework legislation*

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16 Although telework is not legally mandated anywhere in the world (Gomez-Mejia *et al.*,  
17 2012), some countries or regions are institutionally inclined to introduce flexible work  
18 practices than others (Daniels *et al.*, 2001). For instance, the European Framework  
19 Agreement on Telework provides a regulatory framework for the employment  
20 conditions, security, and flexibility of teleworkers. It also offers the basis for  
21 negotiations within companies and legislation at a national level. Three ways of  
22 implementation have been identified. The first one is 'hard' law, which denotes the use  
23 of regulations, directives, and decisions (Eurofound, 2010). This practice is linked to  
24 countries where collective bargaining is uncommon. Poland, Hungary, the Czech  
25 Republic, Portugal, Slovenia, Slovakia Belgium, France, and Luxembourg have all  
26 approved specific laws to regulate telework. A second group, consisting of 'medium-  
27 level' countries (Austria, Denmark, Germany, Greece, Italy, and Spain), is characterized  
28 by implementation through collective agreement. The third group (United Kingdom,  
29 Switzerland, Finland, Ireland, and Lithuania) have opted for 'soft' implementation, that  
30 is, guidelines, declarations, and opinions.  
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54 Institutional theory helps to explain how regulation facilitates home-based telework. It  
55 focuses on the rules, norms, and routines that become established as authoritative  
56 guidelines for social behavior. Siha and Monroe (2006) state that government regulation  
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3 provides the impetus for organizations to consider telework strategies. Institutional  
4 pressures and international and national telework regulations also pressurize  
5 organizations to consider the adoption of formal telework in their strategic designs  
6 (Shin *et al.*, 2000). Additionally, Kwon and Jeon (2017) show that some governments  
7 permit telework more than others. Regulation can, then, facilitate the introduction of  
8 home-based telework.  
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27 Hypothesis 7: National regulation of telework is positively associated with home-based  
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## 50 **Data and methodology**

### 51 ***European Working Conditions Survey***

52 The empirical data for the present study came from the Sixth European Working  
53 Conditions Survey (EWCS), conducted by the European Foundation for Living and  
54 Working Conditions in 2015. One of the objectives of this survey was to provide an  
55 overview of labor conditions in 35 EU countries. The EWCS sample was representative  
56 of people in employment (employees and self-employed) during the fieldwork period in  
57 each of the countries covered. The survey was carried out between February and  
58 December 2015.  
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This data set has been enhanced with additional country-level information extracted  
from diverse sources. Since it is not available for all the countries included in the  
survey, data were restricted to 28 countries. Throughout the empirical study, only  
observations of salaried employees were used, so only the time spent on telework  
during normal hours was taken into account. Moreover, in keeping with the definition of

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3 home-based telework that we employed, those who did not use ICT in their job were  
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5 excluded. The initial sample comprised 42,000 observations. However, because of  
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7 missing data and the merging of data from other databases, fewer were used in the  
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9 estimations.  
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### 11 12 13 ***Dependent variables***

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16 Several components need to be taken into account when defining home-based telework  
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18 (Sullivan, 2003). To this end, data from two different questions in the survey were  
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20 combined. The first question related to the use of ICT. Only those who answered that  
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22 they used ICT always or almost all the time were considered. The second question  
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24 related to the location and frequency of work. Those who worked from home at least  
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26 several times a month had a value of one; the others had a value of zero. Then, the final  
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28 measure of home-based telework had a value of one if people used ICT always or  
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30 almost all the time and when they worked from home at least several times a month.  
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32 Other answers had the value zero. Table 1 presents the main descriptive of home-based  
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34 telework.  
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39 [Insert Table 1]  
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### 45 46 ***Independent variables***

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48 According to the theoretical model, the independent variables were related to the  
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50 usefulness and ease of use of telework. Individual and organizational factors were  
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52 extracted from the Sixth EWCS, while country-level factors were extracted from several  
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54 international databases.  
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3 With regard to usefulness, in line with previous literature (Goñi-Legaz and Ollo-López,  
4 2015) three variables were included to measure the need for a work–family balance.

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8 The first variable took into account the gender of the interviewee. The second  
9 considered the civil status as well as the situation of the employee's partner (i.e., single,  
10 dual-earner couples in which both individuals worked, and single-earner couples in  
11 which only one person worked). The third was also a binary variable that indicated  
12 whether the employee interviewed had children.

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20 Distance to and from work was measured with a continuous variable that indicated the  
21 minutes per day that interviewees spend travelling from home to work and back.

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25 Highly qualified workers, as in previous literature (Goñi-Legaz and Ollo-López, 2015)  
26 were measured by two types of variables (level of education and occupation in the  
27 firm). In the final sample, only employees with two levels of education (undergraduate  
28 and postgraduate) were included. Occupation in the firm was measured by five dummy  
29 variables: managers, technicians and professionals, clerical service employees, skilled  
30 workers, and elementary occupations.

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40 Several variables were used to establish the ease of use of home-based telework. First,  
41 an index measured technological development at the country level. This was extracted  
42 from the Organization for Economic and Cooperative Development (OECD). Data  
43 collection was undertaken by the Centre for Entrepreneurship, Small and Medium-sized  
44 Enterprises (SMEs), Regions and Cities. The statistics were collected through the 2014  
45 annual questionnaire sent to the delegates of the Working Party on Territorial  
46 Indicators, and through access to the websites of the National Statistical Offices and  
47 Eurostat. Internet access was defined as the percentage of all households reporting that  
48 they had access to the internet.



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3 Organizational culture was measured by the degree of empowerment in the  
4 organization. This was determined by the following five items: how frequently  
5 employees were consulted before objectives were set for their work; how frequently  
6 they were involved in improving the work organization or work processes of their  
7 department or organization; how frequently they had a say in the choice of work  
8 colleagues; how frequently they were able to apply their own ideas in their work; and  
9 how frequently they were able to influence decisions that were important for their work.  
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11 The Cronbach's alpha for the factors was 0.888.  
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22 Two environmental factors were measured: national culture and telework-related  
23 legislation. The dimensions of the national culture were obtained from Hofstede's  
24 website. These dimensions have been widely accepted and used in research on  
25 international management (e.g., Newman and Nollen, 1996). The level of regulation  
26 was measured using an index extracted from the European Foundation for the  
27 Improvement of Living and Working Conditions (Eurofound, 2010) that distinguishes  
28 the previously described three levels in the theoretical part (hard law implementation,  
29 middle-level law implementation and soft law implementation).  
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41 Table 2 presents the main descriptives of the independent variables.  
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44 [Insert Table 2]  
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### 50 ***Control variables***

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52 In accordance with the previous literature (Goñi-Legaz and Ollo-López, 2015), a series  
53 of control variables were included. These variables captured personal characteristics  
54 (age), work characteristics (seniority, income, permanent contract, and work-hours), and  
55 firm characteristics (firm size, public or private sector, and ICT sector).  
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3 Table 3 presents the main descriptives of the control variables.  
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6 [Insert Table 3]  
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### 10 11 12 **Methodology** 13

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15 To examine the impact of individual, organizational, and country level factors on  
16 telework, multilevel models are estimated to prevent problems derived from biased  
17 standard errors when micro-level and macro-level data are combined. Merging  
18 aggregated data at a country level with micro data obtained from a survey can give rise  
19 to an intra-group correlation in random errors, leading to a serious downward bias in  
20 estimated errors and causing estimators to be inefficient. This can result in spurious  
21 findings of statistical significance for certain explanatory variables. Multilevel models  
22 avoid this problem. Specifically, taking into account that the dependent variable is an  
23 ordinal variable, multilevel ordered probit models with robust standard errors are  
24 estimated. In addition, estimated models considered the weights that are applied to the  
25 data, both within and across countries.  
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### 44 **Results** 45

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47 Before conducting the multivariate analysis, the basic characteristics of the sample are  
48 described. There is a wide range of differences in the home-based telework adopted by  
49 European countries. The Nordic countries in the sample, especially Denmark, the  
50 Netherlands, and Sweden, use it most, while eastern European and Mediterranean  
51 countries use it least.  
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### **Usefulness of home-based telework**

Three models are estimated to test the determinants of the use of home-based telework. In the first model only control variables are included. In the second, variables relating to usefulness are added. The third add variables relating to ease of use. When home-based telework is analyzed excluding any explanatory variables, 8.89% of the variance was due to country variability.

[Insert Table 4]

**From the usefulness side**, according to hypothesis 1, workers who has a greater need for a work–family balance home-based telework more. Table 4 shows that people with children home-based telework more than those without. Furthermore, in this model, people in dual-earner couples home-based telework more than those with a non-working partner. All these results are in line with hypothesis 1, according to which workers with more family needs are more likely to home-based teleworking, which is consequently accepted.

**In addition, commute times has a positive effect on home-based telework, which supports hypothesis 2, according to which workers who live far away from the workplace are more likely to home-based teleworking**

**With regard to the usefulness of home-based telework for firms**, hypothesis 3 states that highly qualified individuals home-based telework more. The results show that postgraduated individuals use home-based telework more than those undergraduated. Therefore, educational level has a positive effect on the use of home-based telework. Moreover, managers, professionals, and technicians are more positively associated with home-based telework than skilled workers. Thus, employees who are more valuable for firms in terms of qualifications home teleworked more. Hypothesis 3 is confirmed.

### ***Ease of use of home-based telework***

The results show that technological developments facilitate home-based teleworking (Table 4); that is, ICT infrastructure at country level has a positive effect. Thus, hypothesis 4, according to which ICT infrastructure is positively associated with home-based telework, is accepted. Hypothesis 5 (which is related to organization) states that organizational participative culture is positively associated with home-based telework. Table 3 shows that empowerment has a positive and significant effect on the use of home-based telework. Therefore, hypothesis 5 is confirmed. In the case of national culture, individualism has a positive effect on home-based telework, whereas power distance and masculinity (the opposite of femininity) has a negative effect. Then, hypothesis 6 according to which individualism, low power distance, and femininity are positively associated with home-based telework, is accepted. Finally, the results show that higher levels of telework regulation has a positive effect on the use of home-based telework. This substantiates hypothesis 7 that states that national regulation of telework is positively associated with home-based telework.

### **Discussion**

Although home-based telework confers many benefits on users, firms, and society in general, the implementation of telework around the world—and in particular, across Europe—is moving more slowly than expected. This is especially so in the case of home-based telework (Aguilera *et al.* 2016; Eurofound and the International Labour Office, 2017).

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3 The aim of the present research is to contribute to the national and international  
4 literature on home-based telework by providing a well-developed theoretical framework  
5 integrating the TAM (Davis, 1986) and the TOE model (Tornatzky and Fleischer,  
6 1990) to explain its use. Specifically, our research contributes to previous analyses of  
7 the use of telework by: 1) using a large sample to conduct an empirical analysis of the  
8 use of home-based telework across Europe; 2) including both micro and macro factors;  
9 3) providing a theoretical framework to explain home-based telework; 4) applying a  
10 concrete definition of home-based telework; and 5) focusing on employees who are in  
11 the position of being able to home-based telework.  
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24 In terms of theoretical predictions and from the usefulness side of the TAM, the results  
25 demonstrate that employees with more family responsibilities (or more specifically  
26 individuals who are part of dual-earner couples and who have children) home-based  
27 telework more. This supports the conclusions of Vilhelmson and Thuline (2016). Not  
28 only does home-based telework benefit such workers personally, but their companies  
29 achieve better outcomes (Gajendran and Harrison, 2007). The findings can be linked to  
30 the androgyny theory, which argues that men and women are crossing the boundaries of  
31 gender stereotypes and are taking on androgynous roles (Hughes and Seta, 2013). Also,  
32 home-based telework is used more by those who live a good distance from work.  
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45 Finally, and consistent with theoretical predictions, those with higher levels of  
46 education and higher positions in the company hierarchy home-based telework more. In  
47 this respect, home-based telework is seen as a human resource management practice  
48 that can attract and retain highly qualified employees who are usually more valuable to  
49 firms. Low educational levels and lower positions in a company may act as a barrier to  
50 the implementation of home-based telework.  
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3 Therefore, when employee characteristics that benefit the company and the employees  
4 converge, more home-based telework is likely to be implemented. This is consistent  
5 with the usefulness side of the TAM.  
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10 In line with the ease of use side of the TAM and with the TOE model, the present  
11 study's results confirm that people in countries with greater ICT development home-  
12 based telework more. This is also the case for individuals who are empowered in their  
13 companies. The attitudes of management and employees affect the use of home-based  
14 telework (Gani and Toleman, 2006). Firms with an organizational participative culture  
15 that concede more power to employees encourage the use of home-based telework,  
16 unlike those in which employees have lower levels of authority, power and influence.  
17 The present study also shows that individuals in countries that emphasize individualism,  
18 low power distance and higher femininity and which have regulations concerning home-  
19 based telework more.  
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34 All these factors (technological, organizational, and environmental, including national  
35 culture and regulation) facilitate and encourage the use of home-based telework, and are  
36 consistent with the ease of use side of the TAM.  
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42 In general, our findings support the view that the use of home-based telework depends  
43 on three actors: individuals, firms and society. These are provided for in the TOE  
44 model. In addition, the levels of analysis are all interrelated. At a national level, culture  
45 may be a driver of or a barrier to the use of home-based telework. In this vein, high  
46 femininity, which is associated with conciliation, is correlated with the use of home-  
47 based telework. In addition, individualism is a feature of companies who trust their  
48 employees. Information and communications technology infrastructure and national  
49 regulation of telework also influence the use of home-based telework, as do specific  
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3 laws or the inclusion of telework in collective agreements. Each of these reduces  
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5 uncertainty.  
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8 Understanding the dynamics of home-based telework is important for both theoretical  
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10 and practical reasons. In the case of the former, the present study provides evidence that  
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12 reinforces the TAM and TOE model in the context of home-based telework. Applying  
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14 these models, we conclude that telework has individual, organizational, and national  
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16 dimensions, and factors to home-based telework have been identified. Several measures  
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18 can be proposed to boost these. From an applied perspective, it is important that  
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20 organizational and individual measures be complemented with public policies that work  
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22 to adjust the cultural dimensions of home-based telework. Concretely, both national  
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24 regulation and implementation through collective bargaining were considered as  
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26 significant facilitators in the use of home-based telework. Activities to increase the  
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28 interest of unions and political parties in telework may contribute to this commitment  
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30 (e.g., conferences about the advantages of telework, international projects to share best  
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32 practices, news articles, and so on). European Union countries have highlighted the  
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34 positive effect of telework on the work–family balance in their national policies  
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36 (Electronic Commerce and Telework Trends [ECaTT] 2000). Moreover, labor  
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38 regulation should also be considered, because laws that were originally generated for  
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40 industrial economies and that are based on traditional forms of employment should  
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42 include the possibility of working from anywhere at any time. According to Messenger  
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44 (2017), the difficulty in implementing new regulations is related to the problems of  
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46 supervising conditions beyond the conventional workplace. Messenger proposes the  
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48 European Union–European Agency for Safety and Health at Work (EU-OSHA) project  
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50 ‘Foresight on new and emerging risks in occupational health and safety associated with  
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3 ICT and work location by 2025' as a suitable starting point to develop this new  
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5 regulation.  
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8 Additionally, in terms of cultural dimensions, promoting femininity, individualism, and  
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10 the reduction of power distance will encourage the use of home-based telework. Public  
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12 initiatives to treat men and women equally in all respects (e.g., training in the skills  
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14 required to perform housekeeping for men, promoting STEM education programs for  
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16 women, and so on) and social programs to reduce inequality will contribute to the  
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18 advancement of these cultural dimensions. A country's main occupations are also  
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20 relevant. The more employees in managerial positions, the more the use of home-based  
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22 telework. A change in the production model will contribute to adjusting the balance of  
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24 occupations.  
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29 Moreover, ICT infrastructure is also important, and, therefore, public and private  
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31 investment in ICT will facilitate the use of telework. Fifth generation mobile network  
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33 technology, the implementation of cybersecurity measures, interoperability, integrated  
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35 systems, and raising education levels will help to accelerate the use of home-based  
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37 telework.  
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41 As is the case with all research, this article has its limitations. For instance, the cross-  
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43 sectional nature of the data prevents the estimation of causal effects. Further studies in  
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45 this area would benefit from the use of panel data and a more detailed analysis of the  
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47 effects of country dimensions on the use of telework across Europe. Such data would  
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49 allow the causal effects between the variables considered in the present study to be  
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51 evaluated. This would open up new avenues for future research.  
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## 58 **Conclusions**

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Our findings support the view that home-based telework depends on three actors: individuals, firms and society. According to the results from a representative sample of European countries regarding the usefulness of home-based telework, employees with more family responsibilities, those that live far away from their workplaces, and highly qualified workers tend to home-based telework more. With regard to the ease of use side of the TAM, we find that individuals who are more empowered in organizations and those who live in countries where there is a greater emphasis on individualism, lower power distance and higher femininity home-based telework more. Greater development of ICT at the country level and national regulation of telework are facilitators of home-based telework.

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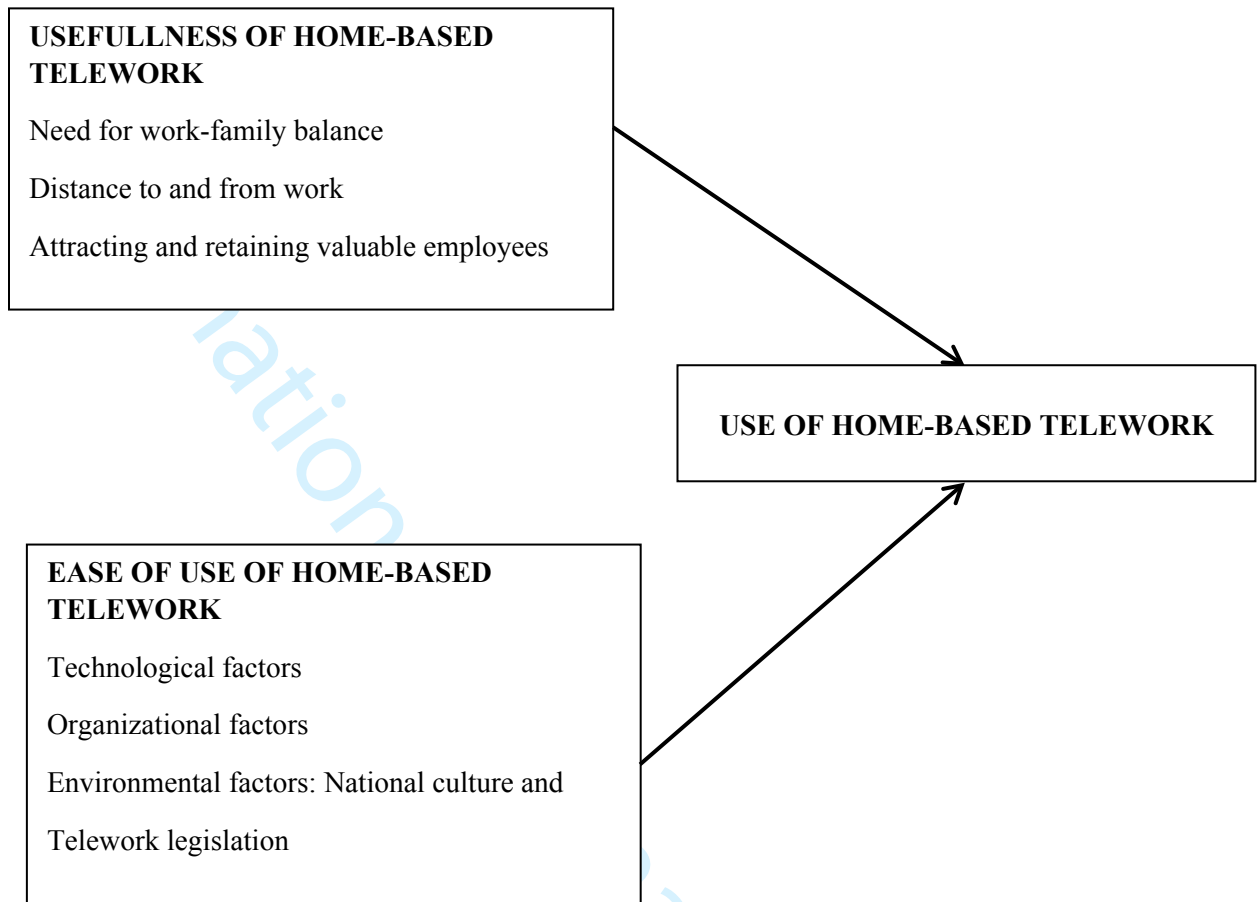
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Figure 1. TAM and TOE applied to use of home-based telework



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Table 1. Descriptive statistics of home-based telework

	Home-based telework	
	No	Yes
Austria	82.08%	17.92%
Belgium	77.32%	22.68%
Czech Republic	87.01%	12.99%
Denmark	57.75%	42.25%
Finland	70.00%	30.00%
France	83.24%	16.76%
Germany	89.40%	10.60%
Greece	86.00%	14.00%
Hungary	84.51%	15.49%
Ireland	83.96%	16.04%
Italy	95.40%	4.60%
Latvia	84.71%	15.29%
Luxembourg	84.42%	15.58%
Netherlands	64.40%	35.60%
Poland	83.33%	16.67%
Portugal	88.76%	11.24%
Slovakia	89.69%	10.31%
Slovenia	83.33%	16.67%
Spain	89.81%	10.19%
Sweden	71.30%	28.70%
Total	79.92%	20.08%



Table 2. Descriptive statistics of independent variables

		Mean / %	St. Dev.	
<i>Usefulness</i>				
Need for work-family balance	Female	57.44%		
	Single	17.64%		
	Partner doesn't work (omitted)	19.56%		
	Dual earner	62.79%		
	Child	64.39%		
Distance to and from work	Time to work	48.909	38.032	
Attracting and retaining valuable employees	Undergraduate (omitted)	46.23%		
	Postgraduate	53.77%		
	Managers	8.67%		
	Professionals and technicians	50.80%		
	Clerical services	32.67%		
	Skilled craft workers (omitted)	6.03%		
	Elementary occupations	1.84%		
<i>Ease of use</i>				
Technological factor	ICTs 2014	78.140	10.605	
Organizational factor	Empowerment	0.304	0.907	
Environmental factors	National Culture	IDV	62.748	15.086
		PDI	49.105	20.470
		MAS	43.417	24.343
	Telework legislation	Implementation soft	22.94%	10.605
Implementation medium (omitted)		58.47%		
Implementation hard		18.59%		

Table 3. Descriptive statistics of control variables

	Mean / %	St. Dev.
Age	43.478	10.439
Seniority	12.631	10.069
Income	2034.112	1589.685
Permanent contract	37.692	8.923
Work hours	92.65%	
Employees less than 9	11.51%	
Employees between 10 – 249 (omitted)	36.48%	
Employees over 250	52.01%	
Public sector	33.02%	
ICT sector	10.02%	

Table 4. Multilevel probit models to estimate the determinants of home-based telework

	Model I		Model II		Model III	
Female		-0.076	0.071	-0.054	0.070	
Single		0.144 *	0.082	0.157 **	0.079	
Partner doesn't work (category omitted)						
Dual earner		0.081	0.056	0.081	0.051	
Child		0.144 **	0.057	0.144 **	0.057	
Time to work		0.002 ***	0.001	0.002 ***	0.001	
Postgraduate		0.449 ***	0.046	0.447 ***	0.046	
Managers		0.641 ***	0.165	0.574 ***	0.163	
Professionals and technicians		0.420 ***	0.161	0.407 ***	0.157	
Clerical services Skilled craft workers (category omitted)		-0.044	0.148	-0.029	0.148	
Elementary occupations		-0.079	0.308	-0.091	0.305	
ICTs 2014				0.012 ***	0.003	
Empowerment				0.182 ***	0.025	
IDV				0.009 **	0.004	
PDI				-0.004 *	0.002	
MAS				-0.004 ***	0.001	
Implementation soft				-0.162 *	0.085	
Implementation medium (category omitted)						
Implementation hard				0.246 **	0.100	
Age	0.001	0.002	0.001	0.002	0.001	0.002
Seniority	-0.008 **	0.003	-0.004	0.003	-0.004	0.003
Income	0.000 ***	0.000	0.000 ***	0.000	0.000 ***	0.000
Permanent contract	-0.100	0.116	-0.178	0.130	-0.193	0.127
Work hours	0.015 ***	0.004	0.010 ***	0.003	0.010 ***	0.003
Employees less than 9 Employees between 10-249 (category omitted)	-0.012	0.108	0.114	0.111	0.101	0.118
Employees over 250	0.031	0.070	0.029	0.071	0.041	0.069
Public sector	0.238 ***	0.062	0.123 *	0.072	0.132 **	0.067
ICT sector	0.282 ***	0.079	0.216 **	0.086	0.211 **	0.087
_cons	-1.719 ***	0.163	-2.160 ***	0.218	-3.287 ***	0.440
N	3701		3701		3701	
Log pseudolikelihood	-1706.864		-1599.281		-1572.047	
ICC (country)	6.235%		5.164%		0.305%	

\*\*\* p < 0.001    \*\* p < 0.01    \* p < 0.05    + p < 0.1