UNIVERSITÀ POLITECNICA DELLE MARCHE
FACOLTÀ DI ECONOMIA "GIORGIO FUÀ"

Corso di Laurea Magistrale in International Economics and Commerce

EFFECTS OF THE PUBLIC POLICIES ON THE ADOPTION OF THE TELEWORK - AN EMPIRICAL ANALYSIS IN EUROPE

EFFETTI DELLE POLITICHE PUBBLICHE SULL'ADOZIONE DEL TELELAVORO – UN'ANALISI EMPRICA IN EUROPA

Relatore: Chiar.mo
Prof. Stefano Staffolani

Tesi di Laurea di:
Filippo Severini

Anno Accademico 2019 – 2020

INDICE

INTRODUCTION

This thesis aims to answer the research question "What are the effects of public policies on the adoption of teleworking in Europe?". To do this, it is first necessary to investigate the meaning of the term teleworking and what it represents in the world of work and, more generally, today. We will then move our research action on the public policies that a state can implement and that we have considered of interest for our research field. The description of these variables has been designed to be able to perfectly understand the factors that constitute, and therefore can modify, public action in reference to the sphere of influence of teleworking. The interest in this area, and in the answer to our research question, is given both by the importance of adopting teleworking practices in the lives of each of us and by the consequences of the COVID19 emergency. In fact, teleworking was the only way to avoid an economic collapse that would have been of worse impact and magnitude than what happened. It is

therefore necessary that, in light of the difficulties encountered by the private sector following the general decline in turnover as a primary effect of the lock-down, which took place between March and June 2020, the public sector invests part of its funds to enhance remote working and its adoption. This thesis, through an econometric model consisting of a multivariate regression with cross-sectional data, aims to indicate the sectors in which public sector action should focus, in order to maximize the return in terms of the percentage of teleworkers on the total population. The data comes from the Eurostat website. The survey used is called "Community survey on ICT usage in households and by individuals - Variables collected / published 2003-2019", and the data used are easily available on the website www.eurostat.eu, looking for that name. We anticipate a clarification that will be further explored in the first chapter regarding the choice of the public sector instead of the private one as the main driver of the process of adopting telework. Considering the selected variables, which have a

constant and direct impact on the life of an average citizen, only the public institution par excellence, that is the state, can guarantee a profound and effective process of capillarization in society. Furthermore, entrusting such a crucial process as that of the digitization of work to the “benevolence” of a private individual seems objectively too much in the light of current interests. Who is writing, believes that one of the few positive effects of Covid-19 has been to accelerate the process of digitization of society in countries that have historically always rejected this possibility, mainly countries in the Mediterranean area. European countries with less propensity to adopt teleworking practices should invest to exploit the positive moment because, despite cultural barriers and current resistances, the future speaks of teleworking.

CHAPTER 1 – WHAT TELEWORK IS

As known, the development of the digital technology has enabled the spread of some new forms of work organization that permit to sustain the normal daily working tasks outside the typical place of work, with a flexible schedule. This way of working, said telework, exploiting the benefits coming from the usage of ICT technology devices, makes the modern companies and their employees able to have a greater working flexibility and an higher capacity of adaptation to the market changements. For this reason the telework option represents nowadays, one of the pillars of what has been defined as the fourth industrial revolution. In addition, the coming of the new technologies and of a major awareness about the importance of the respect of the willingness and of the satisfaction of the worker, is nowadays evident the need and the benefit from the implementation of an organization that takes into account the matching process between the working

time and the private time. this is called “work life balance”. This thesis aims at investigating, through an empirical analysis, the public factors that have impacted more on the telework adoption, in Europe from the 2015 to the 2019, in order to pick up a pattern that will be useful for future researches. The choice of analysing public policy instead of private ones is driven by three reasons: firstly some investments and actions can be sustained only by the public sector, both for the economic scope and for the degree of penetration over the national population that a public policy can have rather than a private one, which is, for its nature, only for a restricted group of people; secondly the availability and the quality of data is greater for public data rather than for private ones. This can be for privacy reasons or simply for no interest into publishing it. The third reason is that in the scientific literature, there are no analysis like this which tries to investigate the effects of public policies on telework. In addition, considering our age and the Covid-19 time, working in the traditional office has been increasingly difficult. this

historical period will be crucial for the development of the enterprise, moving from the tayloristic/fordistic one to a new way of producing and working. According to this kind of firm, the work organization was based on the natural scientific scheme and on the time, management based on the machines working cycle. No matter for employees and for their needs. Every single decision was based on the absolute sovereignty of the functioning of the machines and, therefore, set up on all the workers. The private life was not considered when setting the working schedule. The tertiarization of the market and the consequent cost reduction for the firms adopting flexible job organization, make the telework a solution not only for the health problem that we are facing nowadays, but also for a ultimately reorganization of the concept of work.

1.1 TELEWORK FRAMEWORK

The adoption of telework over the recent years over Europe (Eurostat, 2018) and in general over high

industrialized countries (Oecd, 2019) has been mainly caused by the technological development that has occurred in the last two decades. In fact, as we can see in our everyday-life, technology has become increasingly sophisticated, with the speed of information exchange enabling many more options for how, when, and where work is conducted **(Manoochehri and Pinkerton, 2003)**. Such changes have resulted in make the organizations more and more virtual. This has caused a general geographical distribution, being electronically linked and functionally/culturally diverse **(DeSanctis and Monge, 1999)**. The impact of technology on individuals and organizations is widespread and has resulted in the ability to do many jobs from anywhere at any time **(Cascio and Shurygailo,2003)**. The first step for the technological advancement has enabled the incremental usage of telework. As a proof, there is the usage of communication technology instead of work-related travel (Verbeke, Growing the virtual workplace, 2008).

The first key consequence of the adoption of telework that creates our framework, is, as obvious, the new way of working itself. In fact, we can talk about a new virtual workplace, that is not affected by the traditional limits of time and space. Thanks to this new work concept, individuals can complete their daily job-tasks simultaneously and mostly everywhere they desire to do it. In fact, the home, is only one of the possible alternatives to the physical office. And often it is not the most appropriate. A conflict between professional and familiar duties can arise. As a solution for these kinds of problems, the exploitation of public spaces can be used. It can be done both inside or outside the traditional business hours. Even more, we have not to consider, as A. Verbeke says in his book, telework as "all or nothing", thereby comparing teleworkers with non-teleworker (office workers). In fact, the author considers that telework does not need to be a full-time work arrangement. Many teleworkers can participate remotely to their workplace activity on a part-time basis. This would provide an effective balance between

the time to be spent in office for face to face activities with colleagues, and tasks which doesn't require physical participation in the office. Before of giving a definition of what the smart work is, we have to consider one last point. The possibility of freely manage the workday, improves significantly the flexibility of the work market, for both female and male workers. The fixed working time is considered as one of the main sources of gender disparity in earning (Bertrand, 2018). The Smart work could represent the first chapter to the gender convergence (Goldin, 2014). A regent work from Gallup (Gallup, 2017) with more than 195,600 employees in OCSE countries, take up the crucial role of flexibility in working decisions. As a proof, according to the sixth European Survey on the working conditions (Eurofound, 2017) workers prefer having the possibility of controlling where and when to work. The 25% of the workers interviewed, both male and female, highlight a problem of matching their professional time with their familiar exigencies. In Europe, 5,6% of employees works in smart conditions

(**Eurostat, 2018**). Moving from this brief introduction, despite researches on telework are increasing, trying into give a unique and complete definition of telework results quite difficult. In fact, there is not a single agreed definition of telework in literature. This is caused by the vastity of this theme and by the several effects that it can have on our life. As we are seeing in this period, due to COVID 19, there are tele work's adoption related effects which can be considered really intensive due to its potential economic, environmental and social benefits.

1.2 DEFINITION OF TELEWORK

Before of entering in detail in the analysis of telework and in the statistical parts of this thesis, in order to answer our research question, how the public policies affect the adoption of telework, we have to look for a satisfying definition of this working model.

Before of start investigating the definitions, we need to clarify an important point: in this historical period, we have seen an overuse of the word “smart work” for indicating what in reality is telework. As the linguist Licia Corborante declared in her interview for the Italian newspaper “La Stampa” in the 17th of March 2020, the term smart work is wrongly used for identifying the option of working from home by using ICT services. She continues defining that the smart work is much more than the simple working from home through a Laptop. It indicates in fact a flexible way of working, both in time and in spaces, with improved processes and the usage of technologies and instruments that make easier and more functional the

job because the act smartly on the tasks. This process affects deeply the daily life of the human being, in fact it comes to modify the position of the human beings in the global environment. There are in fact a lot of public policies that aims at integrating the smart work adoption with the smart urbanism and with the smart life in smart cities. Concluding, despite often the term smart work is wrongly used for indicating the telework process, we use the telework term in his correct meaning, indicating a person who is working from home, through the usage of ICT system. Such a simple definition of telework, is not enough for totally defining this broad concept. Let's analyse which are the suggested interpretations of telework practice in literature. We have selected the ones which are focusing on the most interesting effects and consequences of the telework adoptance inside a firm, according to the point of view that is meant to be highlighted. The first one that we want to propose is the one elaborated by **Clapperton e Vanhoutte, 2014:** "From the outset we had defined 'Telework' as letting

people work where and when as they wished as long as it delivered the right results, saved costs and respected the planet. Space, technology and people management worked together intensely to make the business more effective." From this description of telework is possible to note how crucial is, in the acceptance of telework inside a company, a deep switch in the managerial culture. This have to concern the introduction of the concept of flexibility with a new configuration of the workspace. This is possible thanks to the new technologies' usage, causing new benefits both in terms of effectiveness and of efficiency which, as we will see in the next sections, is said to be an important point for this work practice adoptance.

Another valuable source is the report **Flexibility, 2011**, written by WFD Consulting "Telework is a commitment to modernize work practices, by moving away from the 'command and control assumptions of traditional factory-style work about where, when and how work should be done. It's about doing more with less, work wherever, whenever and however is most

appropriate to get the work done." By this is possible to focus and think about how the strategic approach due to the introduction of this new way of working, is strictly linked with a deep changements also in the working environment also in real terms. In fact, the telework makes possible the redefinition from zero of the places, of the modalities and of the time in which each employee has to perform its own job. All of this is done in a flexible way, in order to obtain the maximum results achievable with the less possible costs.

The definition proposed by the Observatory on the Smart Work of the Polytechnic of Milan, highlight again the aspect of changements in the organization of the work, adding one more relevant aspect related with telework. in fact, "Thanks to the new digital technologies, to the new devices and to the propension of people to the online integration, is today possible rethink the model of organization of the work. The passage to the telework adoptance (and in the future to the smart work one) is even more than a simple technological innovation. It means rethink some

stereotypes about place, time and instruments of work, enabling people to reach a higher professional effectiveness and a better work life balance". And enlarging the definition to the smart work field "Smart work means not only working by home, but also in other environment as airports, cowork spaces, and waiting rooms. These characteristics generate some implications on the urban mobility more than the simple congestion and emissions problem". We can note thus how the application of the flexibility in time and space to the traditional working model is not only an opportunity for both employees and companies, but also a need.

The new job characteristics due to the adoption of telework practices could be an important solution to the problems of urban mobility and to emissions due to the commuting process. There are confirms from the american **Cisco**, leader in the telecommunication industry, specialized in the realization and in the development of network-software. In fact, in the "Cisco Unified Communications" of 2015, we can find the

following definition: “Telework is an act of production performed independent of time and place. In its ultimate form, the “office” no longer exists and traditional work conventions such as work hours are irrelevant.” Always in the same document is expressed another key feature of the managerial mindset needed for the telework introduction and adoption: this practise is asking a “results-oriented approach : it is often social and collaborative, and the result of a networked way of operating, with exchange, collaboration, and co creation processes optimizing work and its output”. Seems clear how the introduction and the independence of the production performances by time and place, is totally possible only if linked with a deep cultural changement of the company, that enables a new approach to the employees and to the control of the company’s results from the top-management. New KPIs have to be introduced, so that abandon gradually the traditional working system in favor of some more resulted than process oriented.

From the different definitions, despite are used different terms for defining the same concept and the subjects selected are broadly different, is possible to realize some important similarities and the key concepts on which telework is based: The collaboration, the flexibility of the working condition, the spaces reconfiguration (both inside that outside the firm), the cultural characteristics of the organization, the degree of autonomy in the choices and the responsibilization of the employees.

All this, is possible only if at the base there is a fecond workforce that is able to complete such a great cultural switch, being helped by the top management actions and, as obvious by a propensity of the public sector.

This thesis aimed at investigating which are the actions and the fields in which the public sector can act in order to promote the telework adoption in the society, both in the private and in the public sector.

1.3 TELEWORK FROM A LEGAL POINT OF VIEW

A last point that we want to briefly touch is the legal one. In fact, from the Law point of view, is interesting to note how modifies to the traditional way of working, are introduced through a single or a group bargaining process. In Several countries (Hegewisch et al. 2009), the telework is regulated by law ad hoc. The aim of this laws is to give workers the right to request (and obtain, where is possible) the possibility of teleworking. in some countries, the regulations is designed for parents (Australia, Finlands, Norway, Sweden). In others (Belgium, France, Germany, Netherlands and UK) is a right for all the workers, regardless of their motivation. In these cases the telework has simply become a new way of working available in the society. As a prove, the employers that refuse in giving this possibility, can be sued by employees, without right motivation for the refutation. An example of recent integration in the body of law, is given by Italy that, in 2917, with the law 81, has introduced the choice of teleworking as a "new method of forming a subordinated employment

relationship without precise constraints on time or location of work and with the use of technological tools in the workers' duties and activities".

After having given and analysed the principal definition of telework and have briefly illustrated the regulatory framework, let's analyse the pros and cons of the adoption of telework practices for both companies and employees and for the society as a whole.

CHAPTER 2 – TELEWORK ADOPTION PROS AND CONS

2.1 TELEWORK INTRODUCTION FOR STAKEHOLDERS

Telework adoption by productive realities affects several stakeholders among our society. These includes the teleworkers themselves, their families, their organizations, various levels of government, and society at large (Illegems and Verbeke, 2003). This for sure is not an exhaustive list of all the subjects related with telework, but are certainly the ones mainly

influences by the choice of this practice. In fact, telework affects first of all individual which are practising it (both employees and contract workers), small and large groups (as families, enterprises, cities) and several form of government. In this chapter we are going to analyse the three main stakeholders and their trade off with telework adoption. These are the teleworkers themself, the enterprises and the society as a whole. The choice of using the work trade-off is considered the optimal one because the above mentioned virtual work arrangement, on one hand has potential economic and noneconomic cost savings and can increase efficiencies and productivity; on the other hand, at the same time, telework has potential negative impacts, and many challenges impede telework full potential. This dualistic situation, gives place to a trade-off for each of the selected stakeholders that we are going to analyse.

Before of entering in details the analysis of the trade-off between benefit and costs due to the adoption of smart work for our three stakeholders categories, is

good to define the concept of value proposition. In order to analyse the relationships occurring due to the telework endorsement in the three selected stakeholders, we want to use this theoretical concept. For value proposition, in fact, is meant a concise and specific description of the benefits (called value) of a particular situation, addressed to specific stakeholders. In our case, as said, we identified three main stakeholders: employees, organizations and society as a whole. These subjects' value proposition, if the telework is integrated properly, will outweigh greatly the costs, according to the point of view of the worker or of the enterprise, and as a consequence of the society. Obviously the advantages obtainable from the three categories, due to the introduction and the implementation of the flexibility measures in the concept of work, as we will see at the end of this chapter, are related to some particular fields, that make the stakeholders extremely connected. After this chapter, we will see that a key basic point will result to be that the public sector policies acts on sectors that are

crucial for the adoptance of teleworking and for the existence of advantages in the telework adoptance. If these same actions would be conducted by private entities (as firms) it would be extremely expensive and unsustainable. But before of analyse it, we have first to better understand what kind of trade off each stakeholders is facing.

Starting from the individuals, the concept of flexibility on which the telework is based, assumes several different meanings in the work organization mindset. There could be different reasons why an employees decide whether to accept or not telework. In the great majority of cases the workers, according to Illegems and Verbeke, 2003, find that the benefits occurring, overweight the costs of the above mentioned adoptance. Obviously the employee's personal life and his own situations, will affect differently the degree and the willingness of adoptance of telework: it will modify the trade-off between benefits and costs.

Moving briefly to the organizations side, there are several reasons for enterprises to develop telework. The

most important are the reduction of costs, the increment in productivity and in attractiveness for new employees. There are also negative effects of telework on organizations , in fact telework becomes a possibility only if management perceives that the benefits outweigh the costs. In fact, a telework revolution is possible only if all the organization considers the changements useful and strategic for the future.

Telework adoption also has broader,macro-level,social effects. In fact the magnitude of the adoptance of telework inside organizations, deeply influence public policy and regulations. Telework has many advantages for cities and municipalities. Telework influences the commute trip reductions. Its adoption will have long-,medium- and short-term impacts. These impacts include effects on residential relocation, car ownership, modal splits, non commute trips and latent demand. Now we are going to analyse the main spheres affected positively and negatively by the adoptance of telework both for employees and organizations and we will treat separately the effects on the society. In fact, as clear,

the effects of telework policies on individuals and organizations, is caused by the adoption of the telework practices in a given place of work. So, due to the obvious connection between this two first subjects, also the benefits and the costs are related, touching similar fields. As a consequence, we decided to analyse this two categories together, giving a particular space to the effects on the society due to the adoption of telework.

2.2 POSITIVE EFFECTS FROM TELEWORK ADOPTION ON EMPLOYEES AND ORGANIZATIONS

2.2.1 Joining the organization / Recruiting potential

The telework adoptance can improve deeply the acquisition of new resources that, without telework, could not be part of the firm. Infact, this practice, from the individual point of view, can positively influence the decision to join an organization or not. Researches has found that recruiting potential is a positive impact of telework. For example, in a survey regarding small

and large US organizations 50 per cent of employees stated that having the option to telework was a ‘very attractive’ incentive to join a company (Ceridian, 1999). Telework is thought to give employees more autonomy and control of the working schedule and to allow them to adjust it on their needs, including family demands and obligations and leisure activities (Giovani, 2019). According to these, the positive influence of telework, touches directly the benefit of many individuals. It may also positively influence the decision of joining a company or not. Telework can also increase the attractiveness and the possibility for people with disabilities to join the firm (Illegems and Verbeke,2003). in fact, the advantage of working from home is more suitable with the particular needs of this category.

For what the companies are concerned, the recruiting potential is an organization’s ability to recruit talents. This talents can come from everywhere in our globalized age. For instance, it is not strange that an Italian MNE hires a young

talent from India or elsewhere in the world. In the past talents were mainly attracted by economic incentives while nowadays the incentives are evolving as well as the society. there are new logics that have to power-up the sense of appartence to the company itself (Hiltrop, 1999). The telework has been found to increase the recruiting potential of a firm. In fact, on one hand there is the possibility of creating new labour markets for those who are unable to work full-time in an office (for example, because of young children or elderly dependents) (Illegems and Verbeke, 2003). On the other hand it increases the possibility of having the right person, at the right time, in the right place (Neirotti et al., 2012), despite the private exigencies that that subject can have.

2.2.2 Commitment and loyalty to the organization / Employee retention/loyalty

Managing workforce turnover is critical in the long-term health and success of any company. Nowadays industry leaders recognize that turnover within a company can bring a mixed bag of positive and negative impacts. (Mercer, 2019). In fact, although some turnover is meant to be a way for refresh the workforce, in some cases it causes an unexpected interruption of ongoing projects causing a costly loss. In both cases, HR and top management must pay a lot of attention to this key point. If the company is willing to accommodate the employees situation by allowing telework,then the employees will feel more kept in consideration and will see this acceptance, by the firm, as a demonstration of the company's care. In addition, telework facilitates an employee staying with an organization in cases of employee or employer relocation (Illegems and Verbeke, 2003). So, if the organization decides to relocate, the teleworkers are less affected by where they are attending their job.

Telework can enable to retain workers, despite their change of location even when moving is not an option. Likewise, if an employee needs to relocate, the option of telework provides a means of staying with the organization. Even more the attractiveness of a company is an element extremely influencable by the implementation of a telework model. In fact, thanks to this practice, is easy to obtain an improvement of the reputation and of the public image of the firm, because the capacity of attracting and maintaining talents is ensured by being focused on the satisfaction of the individual (Pitt--Catsouphes et al., 2009).

2.2.3 Job Satisfaction

Telework has generally been found to positively impact employees' job satisfaction (Illegems and Verbeke, 2004). A survey of AT&T teleworkers found that 66 per cent were more satisfied with their jobs since beginning a telework arrangement (with only 1 per cent reporting that they were less satisfied (Roitz et al.,2004). Telework enables workers to have more time

to give to private life. It improves the workers' ability to match professional and private life (Duxbury et al, 1998; Gregory, 2003). We can call the relationship between professional and private life as work-life balance. The improvement of this indicator enables higher satisfaction. In fact, it allows employees to arrange professional needs with private needs (Estes e Michael, 2005)

2.2.4 Autonomy, flexibility and ability to structure one's workday / Working time / Employee contract flexibility

The flexibility side of telework, is meant to be one of the main effects of this working practice. In fact, according to the definition of virtual workplace given above, the teleworkers, is the flexibility that is given to their daily schedule and work-related tasks. As a proof, telework has generally been found to positively impact employees' job satisfaction (Illegems and Verbeke, 2004). A survey of AT&T teleworkers found that 66 per cent were more satisfied with their jobs since beginning a telework arrangement (with only 1 per cent reporting that they were less satisfied (Roitz et

al.,2004). Telework enables workers to have more time to give to private life. It improves the workers' ability to match professional and private life (Duxbury et al, 1998; Gregory, 2003). We can call the relationship between professional and private life work-life balance. The improvement of this indicator enables higher satisfaction. In fact, it allows employees to arrange professional needs with private needs (Beauregard, 2010). Another positive impact of telework is that it increases employees autonomy. Despite several studies has depicted that teleworkers work more (we will analyse this concept later), the fact that job satisfaction increases even if workers apply more effort means that smart-workers have a positive perception of the new form of work organization. It means that they receive an utility from flexibility that is higher than the disutility coming from working more. They are ready to exchange more effort for more flexibility to maintain or even increase their job satisfaction (Angelici and Profeta, 2020). Flexibility is meant to be the possibility for workers to structure their workdays. High on the list

of flexibility related benefits for employees there is the autonomy. it can be defined as the degree of freedom that the workers have in choosing the characteristics of their jobs, in terms of time, distribution of the tasks over the working days and the coordination of these with the other workers (Barrick and Mount, 1993). Flexibility is also one of the most important perceived telework benefits for the employee (Perez et al.,2002). Compared with office work, telework has clearly been associated with employees perceiving greater flexibility in the timing and location of their work (Hill et al.,1998).

For the organizations, another positive impact of telework is the increment increasing employees working time,or the number of hours they work each day. In fact, having the teleworkers less interruption, social interactions, and breaks than their office counterparts, results in an extra effort spent every working days in their tasks. Even more, teleworkers may also increase their work time by applying the saved commute time to their workday (Illegems and

Verbeke, 2003). Increased working time may not always be viewed as a positive impact by employees, but it offers potential productivity advantages from the organization's perspective. Another possible positive impact is that during periods of workload or market fluctuation or particular situations as COVID-19 has shown us, telework offers employers the option of retaining part-time or contract employees, thus meeting HR requirements during demanding or particular periods while providing cost savings, both in terms of full-time salaries and office space costs, during low-demand periods. This also permits the adjustment of the situation to the market evolution (Beauregard e Henry, 2009). Companies such as IBM have adopted telework programs as an alternative to layoffs (Helms et al. 2015). This gives some employees the option to telework rather than be laid off, and has been a successful program overall.

2.2.5 Reduction of absenteeism

Another positive consequence of this increased flexibility is that telework reduces absenteeism. In fact on one hand telework enables employees to work from their homes when they are ill or when they have other personal needs (Illegems and Verbeke,2003). Even when employees are too sick to come into the office (for example, not feeling well enough to commute, or contagious), working from home may still allow them to complete some work. On the other hand, for all that situations which lead to a negative absenteeism (fake illness or similar) the increment of telework related job satisfaction has a direct impact on the improvement of the working life of the smart workers and, as a consequence, a reduction of the working stress. From the literature we have empirical evidence of the inverse relationship between degree of absenteeism and employees satisfaction, which strictly connected to the enterprise context (Allen et al., 2010). Infact, if employees are satisfacted, the collaboration is easier. as

a consequence the effectiveness of the team improves with the stream of ideas (Knoll, 2009).

2.2.6 Organizational culture

The impacts of telework on an organizations (and as a consequence on employees) is affected by the culture's openness to telework. In some cases strong prejudices from top-management and old school employers can make some organizations less open to telework than others. This is the case when work is and is asked to be performed strictly between some fixed schedules (for instance from 9 a.m. to 5 p.m.) or when the productivity of the subordinates is assessed only if they are physically seen and directly controlled (Standen, 2000). By the way, every time that a project of telework implementation is started, the organization needs to encourage and support initiatives aimed at implement the practice, in order to positively affect its culture.

Is clear the need of implement a targeted communication policy by the enterprise to promote the and raise the awareness of the philosophy of smart

working by employees and their managers through training sessions, seminars, and interaction between different stakeholders. The need arises to encourage proactive behaviour in employees and raise their awareness that they can be the agents in the transformation of the enterprise (Fedorova et al 2020).

Another key point of the cultural switch that has to happen inside the organization, is the need for training to be given to individuals, which has been discussed in much of the telework literature, with the general consensus being that teleworkers should be trained on the use of equipment first, then about time management, and how to establishing boundaries between home and work (Greer & Payne; 2014; Haines III, St. Onge, & Archambault, 2002). This kind of practice is often an high cost to be assumed by the company but, its effects, can smooth the negative effects of telework.

2.3 NEGATIVE EFFECTS OF TELEWORK ADOPTION ON EMPLOYEES AND ORGANIZATIONS

2.3.1 Job stress

Telework can either positively or negatively affect an employee's job stress. In fact, being potentially constant exposed to work, can make the individual unable to separate work from non-work life. Stress may result from having to deal with work intruding on home life and vice versa (Smith et al.,2003). Telework may disrupt family relationships and cause new roles to be adopted, which can be experienced as stressful (Ellison, 1999). Conversely, a disrupted usage of telework can increase work stress owing to the previously discussed benefits of increased work/life balance and flexibility, and other positive telework impacts, making telework a factor of the increment of stress (Wheatley, 2012).

2.3.2 Promotion opportunities

Telework is often thought to negatively affect an individual's promotion opportunities, especially if the organization uses subjective as opposed to objective performance evaluations (Illegems and Verbeke, 2003).

Literature on telework reveals that employees worry that their career prospects can be reduced when teleworking because of reduced visibility (Khalifa and Davison, 2000; Maruyama and Tietze, 2012) or social isolation (Golden and Veiga, 2008; Madsen, 2003). In an extensive study examine the promotions of 249 call centre workers it was observed that while workers working from home were 9% more productive they had a lower chance of being promoted than their peer at the office (Bloom et al. 2015). In general studies indicate that workplace relationships influence career advancement (Colbert, Bono, and Purvanova, 2016). This phenomena affects both managers and employees because they both believe it has a negative impact on career advancement (McCloskey & Igbaria, 2003; Bridgeford, 2007). Bridgeford (2007). Thus, if flexible work is a personal choice, the employer taking these options faces an higher risk of becoming marginalized and seen as someone who does not "put in the same time" as the rest of the workers (Epstein et al. 1999). Teleworking represents a major advantage for those

employees, both women and men, who prefer spending more time with family rather then career advancement (Madsen, 2003). Continuing, in many organizations, teleworkers have concerns about the impact of isolation on their career prospects, fearing that they are not only 'out of sight', but also 'out of mind' when it comes time for managers to allocate key assignments or nominate candidates for promotion (Baruch, 2001; Gibson et al., 2002; Khalifa & Davidson, 2000). A study of 76 remote workers at a Canadian subsidiary of a multinational organization found that workers feared that despite strong performance and higher productivity levels due to their ability to work from home, they would be forgotten in terms of career advancement due to their lack of visibility 16 in the office (Richardson & Kelliher, 2015). Research has also found that these fears may not be unfounded (McCloskey & Igbaria, 2003). In Golden et al.'s (2008) study of 261 teleworkers and their managers, self-reported professional isolation among teleworkers was negatively related to their job performance, as rated by

their managers. This effect was particularly present in teleworkers who worked extensively from home and only in few occasions had the chance of practice a face-to-face interaction with colleagues and managers. Another important study considers 394 British Telecom teleworkers. It has been observed that a lack of professional interaction was a popular outcome associated with telework that makes workers concerned about the possibility of having career advancement(Maruyama & Tietze, 2012). In particular, lack of professional interaction reduced employees' opportunities to share knowledge, learn from their colleagues and build their professional networks. Further research will have to examine the contributing factors to concerns about telework and career advancement.

2.3.3 Training possibilities

Telework is usually considered to negative affect the opportunities for the training process of new employees, in particular the informal one, constituted

by mentoring and spontaneous networking (Kurland and Bailey, 1999). Research has found that employees who telework,even if only part of the time, perceived that they had less access to informal development opportunities than their on-site colleagues did (Maruyama and Tietze, 2012) . In addition,teleworkers indicated that when they are out of the office they risk missing information that could support their work and professional development. This study also found that managers felt they were less able to coach and mentor teleworkers owing to fewer opportunities to observe them in action. Indeed, the spatial distance between team members and the use of non-FTF communication can impede the leader's ability to mentor and develop followers (Bell and Kozlowski, 2002). Research shows the importance of the leader building strong relationships with followers by conducting regular one-on-one meetings, investing time getting to know followers,and periodically visiting followers in their own environments if at all possible (Hambley et al., 2005).

Training costs must also be considered. in fact, the costs of training teleworkers represent another potentially negative impact of telework for organizations. Training may be needed to assist the teleworker in setting up a home office, learn to deal with family, friends and neighbours, provide strategies for staying focused on work, and help employees learn to manage their careers as teleworkers (Illegems and Verbeke, 2003).

Also managers may need training on how to effectively supervise teleworkers. Such training might include actions as the implementation of outcome-based performance management, the needs of giving ongoing performance feedback (Illegems and Verbeke, 2003).

2.3.4 Isolation

A greatly discussed topic related with the impact of telework on co-worker relationships are telework outcomes that are associated with isolation. In fact, working in places that are distant from the traditional office can lead to physical, social and/or professional

isolation among teleworkers. Physical isolation refers to an employee conducting work activities in an environment that is separate from the work environment of their colleagues (Bartel, Wrzesniewski, & Wiesenfeld, 2012). Social isolation refers to an individual's feelings of lack of inclusion or connectedness in his work environment (Bentley et al., 2016). In addition, another problem concerns about isolation and telework may actually exceed the degree of isolation experienced. In a study of 394 teleworkers, more than half indicated that before of telework practicing they were concerned about the loss of professional (53.5%) or social (54%) interactions; After the telework adoptance, in the same sample far fewer indicated that they actually experienced the loss of professional (24.2%) or social (32.7%) interactions after initiating telework (Maruyama & Tietze, 2012). Research has tried into explaining the connection between telework, isolation and employee attachment to or identification with their organization. For example, the work of Bartel et al. (2012) has linked

experiences of isolation with employees' perceived respect from their colleagues and organizational identification. Conducting surveys with participants in alternative work programs across two companies, Bartel and colleagues found that at higher levels of physical isolation, workers perceived that they were regarded with lower levels of respect by their colleagues. This, in turn, reduced their own identification with the organization. Belle, Burley and Long's (2015) qualitative study of high-intensity teleworkers further explored factors contributing to employees' 'sense of belonging' in the workplace. The research found three contributing factors to teleworker perceptions of belonging: the sense that they had a choice in their telework arrangement; the sense that they were able to negotiate 17 the specifics of their telework arrangement; and having strong knowledge of how the organization operates prior to engaging in telework. These are important considerations for managers of teleworkers, because organizational identification and attachment have been associated with

positive organizational outcomes such as increased individual performance (He & Brown, 2013).

CHAPTER 3 - INTRODUCTION TO THE DESCRIPTIVE STATISTIC

After having described deeply the telework concept, in this part we are going to analyse from a descriptive statistic point of view, the variable of our empirical model. We will focus on the main topics, keeping a more numbers'-oriented speech for the next chapter. All the next sections are describing areas in which public government can (must, in some cases) act directly in order to exploit the advantages of these. These areas are crucial for telework development. These represents, in the opinion of who is writing, the key areas on which the public action must be focused in, in order to favourite the creation of new teleworking possibilities. As a premise, we want to underline that despite also the private sector has the possibility of influencing the field chose, only the public sector can take actions in order to spread these practices and power-up these areas among all the society. The private actions in fact, are often limited to the private's area of

interest and the effects of their actions are only marginally related with the society. After this general outlook we will enter the empirical part of this thesis, entering our statistical model with the description of the relationship between the variables selected and the telework adoption.

3.1 TELE CONFERENCING

We are going to investigate one of the most revolutionary communication media invention: the videoconferencing system. We can easily determine how important the effective use of such communication media is, as well as what systems should be installed for each type of communication. For Teleconferencing or video conferencing system is meant a multimedia system that may simulate face-to-face communication. A definition of videoconferencing is given: the videoconferencing system is a way of displaying images from a remote site on a local monitor. The

monitor can display the faces of conference attendees and conference materials. It is also possible to write over displayed images, like writing on a whiteboard (Nakamura et al., 2009). It is simply a well-functioning, efficient telecommunications infrastructure for voice, video, and data is one of the first and basic requirements for a technology environment that aims at supporting working (and obviously teleworking) activities. We can approach the term teleconferencing through both technological and methodological terms. In relation to the technological aspect, the term teleconference refers to the possibilities of its use. Regarding the methodological point of view the term is related to the creation of two or more learning environments where users communicate, exchange data, files, presentations, graphics and common applications that are shared (Armakolas, Panagiotakopoulos & Fragoulis, 2018). Both In voice and in video communication, the key characteristic of a support system for virtual workers is flexibility: the phone system of an enterprise should be able to connect

a phone call to an employee with one number independently of his location. In order to protect the company's privacy, the adoptance of a Virtual private networks (VPN) which can guarantee a location-independent access to corporate data resources, should be considered. "The promise of videoconferencing has not yet been widely fulfilled except in large organizations, mostly because of the lack of sufficient bandwidth." (Topi, 2015). The framework described by Topi and other important researchers, nowadays is less true than five years ago fortunately. In fact, due to the high demand for videoconferencing systems, Internet-based videoconferencing solutions are nowadays becoming increasingly cheap for enterprises but also for private individuals. An organization that wants to exploit the advantage of using the opportunities offered by video calling arrangements, today can easily build a state-of-the-art telecommunications infrastructure to support it. Thus, any worker has a variety of telecommunications media (e.g., phone, videoconferencing, electronic conferencing, e-mail,

instant messaging) for interacting with the colleagues, even if they are on the other side of the planet (Armakolas, Panagiotakopoulos, Karatrntou, 2018).

Entering in our dataset, we can note that, over Europe, the number of people interviewed which declared of having used teleconferencing for working reason at least once a week, between 2015 and 2019 has regularly increased in all the countries analysed, with no exceptions. Our dataset's trend is coherent with both the global and the European industry analysis of videoconferencing sector. Starting from the world based analysis, the worth of global video conferencing market is of USD 14 billion in 2019 and is expected to register a CAGR of 9.9% from 2020 to 2027, reaching USD 20 billion by 2025. In this report, as in the other quoted, video conferencing is meant to be process of conducting meetings using telecommunication technologies and involves a real-time, two-way transmission of audio and video content. (Video Conferencing Market Size, Share & Trends Analysis Report By Component (Hardware, Software, Services),

By Deployment, By Enterprise Size, By End Use, By Region, And Segment Forecasts, 2020 - 2027 Website GVR).

Going through the European Video Conferencing Market it was valued around USD 3.9 billion in 2019 and is anticipated to grow at over 19% CAGR between 2020 and 2026 (GMI, 2019). According to GMI's industry report , European video conferencing market is more sensible to the advent of new technologies, such as cloud computing connection, IoT, AI, VR, and advanced video compression. This phenomenon will drive the global market growth but will have a deeper market effect in Europe.

Both the global and the European analysis have been done before of the Covid-19 crisis. Before the above mentioned crisis the main European industry players, In the context of the current COVID-19 crisis, market players, such as Huawei Technologies Co. Ltd., Microsoft Corporation, Cisco Systems, Inc., Teliris, Inc., and Sony Corporation, are offering high-end technology to enhance video meeting experience. For

instance, in March 2020, Digital Video Enterprises, Inc. launched HDR Studio Stage for helping companies to create impressive business conferences and live events. The new holographic telepresence will allow it to reach large number of customers and reduce exposure to the coronavirus. Video conferencing aids companies in faster decision making and eliminates travel time and associated costs. Due to the high environmental attention that in the last years has grouped a lot of attention, in a high developed continent as Europe is, we expect a constant increment of the usage of video conferencing instead of business travel. This is the situation that our dataset is depicting. Even more, as we can notice from the same dataset, the highest growth is present in the countries that are the most known for their cultural attention to the environmental themes.

3.2 E-LEARNING

The sector of the online education has the potential for providing the learning process to new audiences before excluded; The e-learning is said to be able to offer the opportunity of transforming learning delivery and the competitive landscape (Poehlein, 1996). Looking at the E-learning process development, while the first computerized training courses were developed in the 1960s, it wasn't until the broad usage of the internet that the eLearning industry took off. One of the pioneers in the distance learning through the usage of digital devices was the Open University (UK) , which wanted to find ways of using the World Wide Web and computers to provide remote learning experiences. The Open University imagined a world in which people were able to have learning experiences in software (tailored to your specific needs) which would have been sold over the internet for a fee (by the Open University itself). However, early attempts of digitalization of the

learning process fell flat because most of their customers didn't have home personal computers. By the 1980s, when Apple had released its “Mac” and, as a consequence, PCs were finally becoming part of homes and company offices. After this, the opportunity of transferring training materials became real and possible. By the late 1990s, some companies and educational institutions were offering courses online, and the modern era of eLearning had begun. Distance learning suddenly became a real possibility thanks also to the serious cost declines that internet-enabled learning delivered. The 2000s were the years of the explosion in companies using eLearning to train their employees. Suddenly, firms were able to provide onboarding courses for new employees and provide top-ups for those who had been with the firm for a lot longer, all at low cost. Employees could take their training home with them or do it at the office. eLearning gave both managers and employees much-needed flexibility.

Among those institutions which have decided of starting digital education process, the reasons for embracing online education can change, but they often are included in one of the following broad benefits addressable to the E-learning usage. The first one is the availability of a new expanded access. Most countries and learning institutions need to expand the possibility of accessing to education in order to meet the training needs of state habitants and companies and to educate underserved populations. As a proof, before of the e-learning's advent, many people were not able to enrol in an academic programme because their work or family's responsibilities were not matching. No options were given them. Online education has provided them the possibility of investing on their career and, at the same time, to continue with their situations. The second main benefit of integrating online learning is the remotion of the capacity constraints to which the educational institutions are subjected in several countries. As we are seeing in the actual pandemy, there are several advantages in using remote learning.

One last less evident benefit, but interesting for better understanding the crucial role of online education and for its integration among the society, is represented by the capitalization on emerging market opportunities. According to the public's growing acceptance of the value of lifelong learning has fuelled an increased demand for higher education services among people outside the traditional 18-24 age range. Emerging student segments, such as executives seeking further education and working adults, may be more lucrative than traditional markets. By capitalizing on emerging market opportunities, many educational institutions hope to generate significant revenue. In addition, the new ways of entering the work market, as the flexibility, require a continuous formation even if the scholar age is over. This last point makes us able of seeing that the countries where the work market is characterized by an higher flexibility among the duration of the work life (changing work also several times during life no matter what you studied at school or university), are facing an higher usage of e-learning

practices. In fact, looking at our database, we can easily notice that countries as Netherland or the Scandinavian ones, are the ones with the highest share of interviewed which are practicing e-learning for all the years analysed. These counties are really affected by flexibility practices. Looking at the eLearning industry, it continues to expand, offering an ever-increasing landscape of eLearning tools to companies, government bodies, and individuals. The reach of eLearning today is greater than ever with the most rapid growth in emerging economies, making these countries able to exploit the e learning in order to close the education gap with the developed countries. Looking at our database this is represented even in some emergent economies of the European Union as the Estonia and the Romania. In fact, the mix of low cost, high convenience, and accessibility are transforming E-Learning into the predominant educational form of the 21st century. While it is not surprising that the E-Learning industry is growing and changing, the precise magnitude of this change can be difficult to perceive

without the aid of some specific data. The global corporate e-learning market size in Europe will be worth $50 billion by 2021. With an annual growth rate of 15% from 2020 to 2026, the market for e-learning solutions will be one of the biggest drivers of the digital industry over the European countries, Germany has the highest e-learning market share in Europe for what is related with the creation of E-learning software (Business Wire 2019). The reasons for this really notable growth can be found on the back of several main e learning drivers: the need to educate vast numbers of people at low cost, the falling price of learning solutions, the needs of the modern workforce to engage in lifelong learning, and the fact that learning through an internet portal is often more convenient than going to school. Really interesting is that one of the main factors which has permitted the growth of the eLearning market is the higher demand digital learning solutions coming from the developing countries. In fact, due to the rapid innovation which is changing rapidly and deeply a lot of former poor countries,

internet access becomes now available to a larger share of the worldwide population. E-Learning provides developing country audiences with access to world-class educational resources which may not be available in-person in their home country. Another key positive factor related with Digital Learning, present in the KPMG report of the 2018 (KPMG 2018) about the usage of digital learning inside European firms, is that the 90% of corporations interviewed, based in Europe, now use e-learning compared to just 4% in 1995. According to this rapid growth of E-Learning adoption, another data of the same report seems to give us one reason of this situation. In fact, in most of the companies interviewed by KPMG in the same year, in the same report, 60% of total training costs are attributed solely to traveling costs. E-learning is also seen as a convenient alternative to the classic face to face training session. Other useful and explicative data are given by an interesting study, promoted by IBM in the 2019, about the relationship between E-learning and employees' productivity through an internal analysis.

IBM has found that even though eLearning fee was more expensive compared with traditional training course in the same fields, it led to substantial improvements in productivity. The company estimated that for every dollar spent in e-learning, profits increased of $30 due to the increased productivity. On one hand this data is affected by the possibility for the workers of returning at their work faster. On the other hand, IBM has shown that productivity gains came from the ability of employees to apply their newly acquired skills straight away. According to the situation above described, results clear that the changements that are happening in the world of education, are partially caused also by the generational switch world-wide recognized for what is concerned the usage of ICT technologies in daily life. In fact, millennials are going to become the largest segment of the workforce in few years, replacing baby boomers who are entering the retirement period. This young generation, due to the high influence of the mobile revolution (and of the fourth industrial revolution as a whole) asks for careers

more than any other before it. In the past, for what a job was considered it was simply addressed among the society as an ending point which was useful for ensure a calm life. Today, the work is something deeply different. It is not considered anymore as a static situation, but it must be dynamical for resulting attractive. In this contest training can play an essential role in the everybody's career. With the education it is vital for progression. The new generation, becoming workforce, wants to work where they can progress and, ultimately, achieve mastery in their chosen field. eLearning, therefore, is the perfect way for firms to attract talent. By offering courses, companies can guarantee easily the opportunity to invest on their skills and build the expertise that they'll need for more lucrative positions in the future. Finding talented people is a significant challenge for many firms, and so by offering a range of courses firms may attract the precise people they want. According To the action of public policy, looking at the future and at the financial capacity of the Country as a society, the power and the

capillarity of the country in reaching students of all the ages through public schools and public universities, must be exploited for making this important switch happening. In fact, on one hand the private sector, which is driven by a saving cost mindset, is already investing in the digital learning for its employees, on the other hand, in some European countries, the public educational sector, is not implementing properly the digital feature in the age of mandatory school. Going over, the notion that eLearning is a powerful learning tool is not widely contested. Most companies and educational establishments accept that it has a role to play. But what is less understood is just how powerful e Learning can be as an intervention. IBM is famous for its implementation of eLearning courses at its headquarters and across its global workforce. eLearning makes a lot of sense for a company like IBM that must continually update and upskill its employees to deal with changes in the marketplace and technology. The company wanted to find out whether it was spending its money wisely or whether it should return to more

traditional styles of training, such as face-to-face. To the shock of company execs, IBM found that those enrolled in eLearning courses learned more than five times as much material compared to traditional lessons, allowing the company to make significant cost savings. The reason for the success of eLearning appears to stem from how it presents materials. New generation learners consume information in smaller, more digestible chunks, making it easier to consign things to memory and understand how concepts interact with each other. IBM employees could get back to their work faster, making the computing giant saving money.

3.3 DIGITAL INTERACTION WITH THE PUBLIC AUTHORITY

In our decades information and information technologies have gained popularity and usefulness in the public sector and nowadays is hard to think about a public problem or government service that provides solutions and services without using them in a substantial way. According to the literature, public

management research now incorporates the effects of the availability and quality of data as well as the technologies used in the public sector. From a public management perspective, digital government must be considered an essential aspect of innovation, co-production, transparency, and the generation of public value. However, there is no great evidence of studies that attempt to understand the role that digital government researches play in public management theory and practice. In fact, the number of these kind of work, is scarce. As a research field, often the digital government emerges from multiple disciplines, as public administration, information science, management information systems, computer science, communication, and political science.

After this brief introduction, is interesting to enter directly what the digitalization of the public society, and the online interaction of citizens with it, are. Looking at the technology is clear that nowadays, mobile applications, open data, social media, technical and organizational networks, the Internet of things,

sensors, data analytics, and more play a key role in the working environment of public administration and in its interaction with the citizens. The usage of these innovation has been labelled as ‘digital government (Garcia, 2017). Digital government, as a phenomenon, involves new styles of leadership, new decision-making processes, different ways of organizing and delivering services, and new concepts of citizenship. Looking for a definition, the most recognized definition of digital government is the one given by the UNESCO: ‘The public sector’s use of information and communication technologies (ICTs) with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process and making government more accountable, transparent, and effective.’ (UNESCO 2011). The digitalization of the public administration and of the society as an ultimate scope (e-banking, e-healthing system, accounting system and e-government as a whole) is the base for what we are looking for. In fact, the interaction of people with the public authorities, all the subjects that

are part of the public administration and of the public body, has, as a prerequisite, the digitalization of the sector itself. Today, the practice of providing government information through the system of state websites and portals is common in most countries. Looking at the continent of our analysis, in Europe, there are several countries where the digital government practices and, as we will see also the interaction with public authorities, result to be focal points. These countries are mainly based in the Scandinavic Area. In fact, as we can see from our dataset, the share of citizens who interact with public authorities through ICT technologies, is higher in Norway, Sweden, Iceland, Finland and Denmark. Other virtuosos

examples are surprisingly given by the three Baltic countries. One of the most well completed project, that we decide to use as example in this paragraph, is the Estonian one, known as E-Estonia. From the project website (E-Estonia, 2020) we can know that E-Estonia project is a coordinated governmental effort to modify

the country from a common and traditional state into a digital society. E-Estonia is one of the most ambitious projects in technological statecraft today. It includes in this changements all the parts of the public society of the Estonia (Justice, PA, Accounting) and it has a deep impact on citizens' daily lives. The normal services that government is involved with (legislation, voting, education, justice, health care, ecc.) have been digitally linked across one platform which is enabling the whole nation to access the now digital services._In the other main European countries, France launched its open data portal, data.gouv.fr, in December 2011, allowing public services to publish their own data. A new version of the data.gouv.fr portal was launched which adds a social and collaborative dimension by opening to citizens contributions. It now also allows civil society organizations to enhance, modify and interpret data with a view to co-produce information of general interest. The portal "www.bund.de is" the main web resource providing citizens and enterprises of Germany with online access to government structures and

services, etc. Also, Italy has launched the digital identity, called “SPID”. Is important to specify that the availability of services is not enough for making this kind of systems working. In fact, if a citizen cannot trust such information so that he cannot act reservedly and safely the digital government will not use by citizens and the interaction with public society as a consequence will decrease. There could be also actions that entail significant legal consequences. The actions that can be taken in order to avoid such a critical situation are both of an organizational and technical nature. Let’s now move to the last and main topic of this paragraph. The issues of public participation, and e-participation, seems to cover a peripheral role in the literature on E-government and of smart-governance. According to the book “Communications in the Computer and information science” , Andrei et al.(2016), is proposed the analysis of citizen participation under three different dimensions: citizens’ input into decision making; citizens’ feedback (output) and citizen-centric smart governance. Citizens’ input

refers to initiatives where e-participation occurs with citizens' direct involvement. Such straight level of involvement may occur through initiatives such as living labs , e-petitions and participation in local communities . That level of involvement may also be endorsed by internal administrative and managerial mechanisms that may foster collaborative governance practices and the development of knowledge networks.

The citizens' feedback dimension relates to a more proactive stand taken by governments when they set out to consider citizens to their initiatives. Examples involve creating conditions for citizens to evaluate the services being provided, which may include a more open relationship of the government with its citizens. Similarly, initiatives to open government data are known to play a role in fostering citizen accountability and innovation. Lastly, the citizen-centric smart governance dimension involves a systematic and coordinated effort to jointly consider the interplay between human factors and technology factors as the key to maximize the results to citizens in a smart city.

This effort could be considered systematic because it involves engineering internal processes and coordinated because it assumes that collaboration among a variety of stakeholders is needed. It is also important to state that those processes are being increasingly designed around data-driven practices and technologies support the data collection for those practices. Although the authors have touched upon many ways in which citizens can contribute to smart governance, the scope is still limited, and more effort is needed to place e-participation and democracy into the smart governance research agenda. These new capabilities have led some to suggest the burgeoning information age is introducing a new type of citizen with different perspectives and distributed responsibilities.

The first necessary (but not sufficient) condition for digital citizenship involves Technical Skills - lower levels of media and information literacy and basic open source intelligence skills (Glassman et al., 2017). The second defined condition of digital citizenship is associated with abilities to search organize and

differentiate information that allow for higher levels of Local/Global Awareness. This factor had the highest mean score other than Technical Skills. One possible reason for this might be that it is relatively easy for the participants to find and/or become consumers of new information sources related to relevant problems in their lives across ecological levels leading to information awareness that is much higher than the pre internet age. The third condition of complexity of digital citizenship is linked with users becoming part of Internet based communities through collaborative and cooperative online activities increasing the thinking of both individuals and goal directed.

3.4 ICT SECTOR

Information and communication technology (ICT) sector is one of the main drivers for development and

economic growth in the EU. According to Eurostat data, the contribution of ICT to EU GDP represents approximately the 5% of all the Gross Domestic Product of the European Union. After the mid-1990s and almost until these current years, there is a significant divergence between the relative productivity levels of the EU and the US (van Ark et al., 2018). While the US economy experienced an increment in productivity growth, the corresponding productivity growth rate of European countries remained constant or even declined. In order to point out the importance of the ICT sector, some studies has indicated that the loss of growth faced by the European Union during the financial crisis of 2009, could also be attributed to the ineffective use of ICT (O'Mahony and van Ark, 2003; Matteucci, et al., 2005; Dahl, et al., 2011). It is nowadays clear that information and communication technologies have a significant impact on trade performance of the producer services under consideration (Lee et al., 2016). Entering the business world, the ICT's application and usage in several

industries has transformed the production process of many existing economic sectors, by facilitating the diffusion of robotization and automation. These technologies, which underpin the overall digital transformation of both the economy and the society (and for this reason has been selected as one variable of our empirical model), have led to the development of entire new processes of production and retail, causing and determining new competitive power in the so called "knowledge economy". Even more, the roles played by ICT sector in the phenomenon of globalization and in the fragmentation of production processes in different stages (the so-called global value chains) is crucial. ICT is considered a key sector for its potential of deeply changing businesses organizations and in enabling innovations in many techno-economic domains. In addition, its impact on people's everyday life is really pervading. This is also proved by the presence of this sector in the EU policy intervention level. In fact, in the Digital Agenda for Europe in 2010, in the perspective of maximising its social and economic potential, ICT

sector has been identified as one of the seven pillars for the Europe 2020 Strategy for growth in the Union. In addition, the achievement of a Digital Single Market (DSM) has been one of the 10 political priorities of the Commission since 2015. Moreover, in the Commission 2017 reflection paper on "Harnessing globalisation", digitalisation is considered as one of the main drivers. Latest and most reliable data about ICT sector in Eu, are available in Eurostat website. In 2018 the EU ICT sector had a Value added of 591 billion euros, employed 6 million people and spent 31 billion euros on Business expenditure on R&D (Eurostat, 2018). In percentage terms, the ICT sector represented 4.0% of the EU value added, 2.6% of total employment and 20.4% of the R&D personnel and researchers in the EU, respectively.

The ICT producing sector is one of the most dynamic sectors in the economy, standing out for its high R&D intensity and for a Productivity that is higher than that of the whole economy. From 1995 until 2018, the EU ICT sector multiplied its VA in real terms by a factor of

3.6, while the one of the total economies increased by 1.4 (Eurostat 2019).

3.5 ABOVE BASIC DIGITAL SKILLS

The last field of study on which our descriptive analysis will focus is the one of digital skills. To be more precise, in literature, the digital skill are used to describe both digital and software skills. In fact, for example, as easily recognizable, nowadays is impossible to learn how to use a computer (Digital Skill), without knowing how to use the Office Package installed inside it (Software Skills). For the aims of our empirical analysis, as we will see in the next chapter, is useful to split them, also in accordance with the Eurostat database (Eurostat 2019). But for what is concerned with the descriptive statistic, we can

consider them. As a proof, of the correctness of this choice we can find the definition of skills proposed by the UNESCO in its web site: Digital skills are defined as a range of abilities to use digital devices, communication applications, and networks to access and manage information. They enable people to create and share digital content, communicate and collaborate, and solve problems for effective and creative self-fulfilment in life, learning, work, and social activities at large. As said, using a PC without knowing how to write a Word document may seem pretty unusual for the generation entering now the work market and for the next ones (digital born) but, is also true that not all the other workers already present in the work market, are able of combining both the digital and the software skills. But we will take into account this difference presenting only the digital skills, being impossible to separate them with the numerical support of the Eurostat database, which has decided of not dividing the

area related with digital skills of the ICT survey inone single category. In order to have an overall idea of what digital skills are, let's move to analyse the digital skills concept coming from the UNESCO's definition. In order to spread the digital skills, digital inclusion policies have been developed across Europe. As Kim Andreasson, states in his book in the 2015, digital skills implementation should be analysed according to three key factors: access skills motivation and engagement. Access is understood broadly in terms of quality, ubiquity, and mobility; skills as having technical, social, critical, and creative elements; motivation and awareness of the benefits as determined by both individual and social circumstances; and engagement as driven by the everyday life needs of individuals through content created by and for them so that engagement with ICT is effective and sustainable (Helsper, Digital inclusion in Europe). Moving to the societal point of view, there is evidence for

the broader economic benefits of digitalisation provided might lead to conclude that furthering digitalisation is in the public interest for preserving overall economic performance whenever market forces do not provide sufficient incentives for investment in digitalisation. Therefore the task would become to identify those areas were market forces are not converging spontaneously to digital skills' integration by trying into achieve such goal of general interest. Going over, if public investments in digitalisation involve positive economic externalities not entirely captured by the private investor, merely private market incentives lead to a sub-optimum level of investment hence justify public intervention to maximise social welfare. Berger and Frey (2016) report that digitalization of the population over Europe, is lacking on several field: for instance, 25 percent of workers have none or low digital skills. Digital illiteracy is also unequally distributed over age cohorts, with the

problem increasing as moving to older groups. Moreover, there is also a regional inequality aspect, with less prosperous regions more affected by digital analphabetism. Will be necessary that Europe will destinate more public funds to education and training to cope with these new challenges. In 2018 the EU spent 5.0% of GDP on education, which is below the OECD average of 5.2% and the US with 6.2% and South Korea with 5.9%. (OECD, 2018). However, there is a substantial heterogeneity across EU countries around this measure, with some countries having a much higher need to spend more than others. But there is not only the need to increase the resources made available for education to increase the skills level for digital technologies but also to provide flexible opportunities to upgrade skills over time.

CHAPTER 4 – THE EMPIRICAL MODEL

The objective of this empirical multiple regression model with cross section data, is to provide an estimation that represents the effects of the public policies on the telework practice adoption over Europe. The selected data are intended for explaining the percentage changes (both positive and negative) in the number of people who decide to adopt teleworking practices in the countries of the European Union from 2015 to 2019. In other words, the goal is to analyse the fluctuation in the number of people who practice telework in relation to the variables listed below. Before listing them, it is appropriate to insert a note: we have decided to include a dummy per country in our econometric model, in order to have a variable that takes the value 1 in the case in which the cross section/time series data refer to the country which the variable refers, 0

in the case they refer to another one. In this way, among the various coefficients, we can also insert the geographical component, which, as we will see, significantly affects the estimates of our model. To make the model working better, we have chosen to exclude the variable that represents Germany. This country was selected because, to date, it represents the most prosperous economy on the European continent. The dummy variables by country will therefore express how much being in a particular country affects the adoption of teleworking among citizens, compared to the German situation. Instead, each non-dummy variable is expressed as a percentage value, indicating in percentage form, the number of people who have practiced a given activity in the period analysed 2015-2019. Before of moving to the list of the variables selected, we divided the empirical part of our thesis in two section: the first based on the research for both

positive and negative correlation between telework and the selected variables, the second which is a proposal of an econometrical model looking for cause-effects relationships. The first one has been realized launching a cross section regression build up having as dependent variable the share of teleworkers and as independent variable all the dummies (in each of the attempt) and one of the non dummy variables. After this clarification, we want to show the variables and to describe what they represent:

1. **Learning**: online learning material. Share of people of the sample who declared of have used at least one time per week internet for learning activities.
2. **Videoconferencing**: telephoning, videoconferencing. Share of people of the sample who declared of have done a videoconference or a video phone through the

internet in the last week (both for personal or for working use).

3. **Public Authorities**: interaction with public authorities. Share of people of the sample who declared of have interacted with the Public Authorities at least one time per week through the internet (not included E-banking).

4. **ICT**: Share of GDP formed by ICT sector per country.

5. **Above basic digital skills**: Individuals who have above basic overall digital skills. Share of people of the sample who declared of have above basic digital skills.

6. **Unemployment Rate**: Share of the labour force that is jobless.

7. **GDP per capita**: national GDP per habitant

8. **Austria**: Dummy for the country

9. **Belgium**: Dummy for the country

10. **Bulgaria**: Dummy for the country

11. **Cyprus**: Dummy for the country

12. **Czech Republic**: Dummy for the country
13. **Serbia**: Dummy for the country
14. **Denmark**: Dummy for the country
15. **Estonia**: Dummy for the country
16. **Greece**: Dummy for the country
17. **Spain**: Dummy for the country
18. **Finland**: Dummy for the country
19. **France**: Dummy for the country
20. **Croatia**: Dummy for the country
21. **Hungary**: Dummy for the country
22. **Ireland**: Dummy for the country
23. **Iceland**: Dummy for the country
24. **Italy**: Dummy for the country
25. **Lithuania**: Dummy for the country
26. **Luxembourg**: Dummy for the country
27. **Latvia**: Dummy for the country
28. **Malta**: Dummy for the country
29. **Netherlands**: Dummy for the country
30. **Norway**: Dummy for the country

31. **Poland**: Dummy for the country
32. **Portugal**: Dummy for the country
33. **Romania**: Dummy for the country
34. **Sweden**: Dummy for the country
35. **Slovenia**: Dummy for the country
36. **Slovak**: Dummy for the country
37. **UK**: Dummy for the country

In order to make clear our two estimations we want to propose an example of how the equations of the two sections are described, starting from the cause-effect analysis. As said before, we want to investigate the correlational effect between Telework adoption, the Dummies and one non-Dummy variable per time:

$$Telework\ adoption = costant + \beta_1 X_i + \beta_2 Austria + \beta_3 Belgium + \beta_4 Bulgaria + \beta_5 Cyprus + \beta_6 Czech\ Republic + \beta_7 Serbia + \beta_8 Denmark + \beta_9 Estonia + \beta_{10} Greece + \beta_{11}$$

$Spain + \beta_{12}\, Finland + \beta 13\ France + \beta_{14}\, Croatia + \beta_{15}$ $Hungary + \beta_{16}\ Ireland + \beta_{17}\ Iceland + \beta_{18}\ Italy + \beta_{19}$ $Lithuania + \beta_{20}\, Luxemburg + \beta_{22}\, Latvia + \beta_{23}\, Malta + \beta_{24}$ $Netherlands + \beta_{25}\, Norway + \beta_{25}\, Poland + \beta_{27}\, Portugal + \beta_{28}$ $Romania + \beta_{29}\, Sweden + \beta_{30}\, Slovenia + \beta_{31}\, Slovak + \beta_{32}\, UK$ $+ s$

where x_i represents one non dummy variable between *Learning*, *Videoconferencing*, *Public Authorities*, *ICT*, *Above Basic Digital Skills*, *Unemployment Rate*, *GDP per Capita*, taken one per time. Moving indeed to the second part of our empirical analysis, in order to formalize the estimation that our regression model wants to present, the equation of the regression curve is described as follows:

$Telework\ adoption = costant + \beta_1\ Videoconferencing +$ $\beta_2\, Public\ Authorities + \beta_3\, Above\ Basic\ Software\ Skills +$ $\beta_4\, Unemployment\ Rate + \beta_5\, Austria + \beta_6\, Belgium + \beta_7$ $Bulgaria + \beta_8\, Cyprus + \beta_9\ Czech\ Republic + \beta_{10}\, Serbia$

$+ \beta_{11} Denmark + \beta_{12} Estonia + \beta_{13} Greece + \beta_{14} Spain + \beta_{15} Finland + \beta_{16} France + \beta_{17} Croatia + \beta_{18} Hungary + \beta_{19} Ireland + \beta_{20} Iceland + \beta_{21} Italy + \beta_{22} Lithuania + \beta_{23} Luxemburg + \beta_{24} Latvia + \beta_{25} Malta + \beta_{26} Netherlands + \beta_{27} Norway + \beta_{28} Poland + \beta_{29} Portugal + \beta_{30} Romania + \beta_{31} Sweden + \beta_{32} Slovenia + \beta_{33} Slovak + \beta_{34} UK + s$

Where xi represent the explanatory variables, þi are the coefficients of these variables, α is the constant of the model, the intercept of the regression curve, and s is the approximation error term of the model.

4.1 DATA

Both our analysis are from the same data pool the first dataset includes each time 124 observations taken from the package of microdata data obtainable from the Eurostat website under the heading Community survey on ICT usage in households and by individuals - Variables collected / published 2003-2019. It is in Access format and can easily be obtained.

After that, the dataset was converted into Excel and processed with the Gretl econometric program. Our research question, that is, how public policies influence the adoption of teleworking by individuals, led us to the following formalization of the two empirical problems. Let's start with the first one.

4.2 CORRELATION ANALYSIS

After having selected our variables, we have decided of test whether exists or not a correlation (both positive and negative) between the dependent variable *Telework* and the variables non dummy variable between *Learning*, *Public Authorities*, *ICT*, *Above Basic Digital Skills*, *Unemployment Rate*, *GDP per Capita*, taken one per time. We have inserted also the geographical dummies in order to control the reliability of the model.

The results, presented in **fig. 1**, **fig. 2**, **fig. 3**, **fig.4**, **fig.5**, **fig.6**, **fig.7**, clearly states that exists a correlation in each of the seven situations. Before of analyse the results, we want to make clear that all the variables, as stated by the p-value reported in each figure, are significant. This is a key point because the absence of significance, despite is itself a result, would not be an acceptable result for our analysis. After this premise we can start analysing one by one the results, according to the variable selected.

As we can see in **Fig. 1**, when running a least squares model considering as dependent variable *telework* and as independent variable one dummy for each country of the European Union and the variable *Learning*, we can note that we have a positive correlation of 0,1237. The meaning of this results is simply that exists a positive correlation between the

variable *Learning* and the dependent variable *Telework,* but the increment is not imputable only to the *Learning* variable. It simply means that, among the individuals of one of the countries, will exists a positive correlation between the degree of adoptance of telework by the individuals in each country if they have used at least one time per week internet for learning activities. This is not a cause effect relationship, but simply a (positive) correlation. What said for the *Learning* variable holds for all the following.

As we can see in **Fig. 2**, when running a least squares model considering as dependent variable *telework* and as independent variable one dummy for each country of the European Union and the variable *Public Authorities*, we can note that we have a positive correlation between *telework* and *Public Authorities* of 0,2002.

As we can see in **Fig. 3**, when running a least squares model considering as dependent variable *telework* and as independent variable one dummy for each country of the European Union and the variable *ICT* , we can note that we have a positive correlation between *telework* and ~~*ICT*~~ of 1,36520.

As we can see in **Fig. 4**, when running a least squares model considering as dependent variable *telework* and as independent variable one dummy for each country of the European Union and the variable *Above Basic Digital Skills* , we can note that we have a positive correlation between *telework* and *Above Basic Digital Skills*-of 0.1160.

As we can see in **Fig. 5**, when running a least squares model considering as dependent variable *telework* and as independent variable one dummy for each country of the European Union and the variable *Unemployment Rate*,

we can note that we have a negative correlation between *telework* and *Unemployment Rate* of -0.3347.

As we can see in **Fig. 6**, when running a least squares model considering as dependent variable *telework* and as independent variable one dummy for each country of the European Union and the variable *GDP per Capita*, we can note that we have a negative correlation between *telework* and *GDP per Capita* of 2,74281e-06.

The results about the correlations are interesting. Before of enter the correlations described by the variables, we want to make clear that all this results, describing as said before a correlation (positive or negative), are not indicating a cause effect relationship. In fact, correlation suggests an association between two variables or more variable, while causality shows that one

variable directly effects a change in the other one. Although correlation may imply causality, that's different than a cause-and-effect relationship. Holding this, we can enter the results.

First, we can see that exists a high positive correlation between the **ICT sector**, the geographical dummies and the telework adoption rate. This positive correlation between ICT, meant to be the share of GDP which is composed by ICT sector, is really valuable and important, both for the really good level of significance (*** p-value) and for the magnitude of the correlation. It describes the percentage of the national GDP made up of the ICT sector. This variable has a positive coefficient of 1.36. For each percentage point of the GDP referred to the ICT sector, there is a positive correlation for the number of people who practice telework.

This result is extremely consistent with the nature of companies operating in the ICT sector. The ICT sector, both in terms of software and hardware, plays a decisive and leading role in teleworking and its adoption. Very often, in fact, it is the ICT companies themselves that favour the adoption of this practice by their employees in the first place. This situation cannot be solely attributable to the cost advantage of having instruments at home or not having to pay the license for their products. In fact, there is a real cultural difference between the players in this sector and those in other economic sectors.

Analysing the results shown in **fig. 2,** the variable **Public Authorities**, also has a positive correlation with the adoption of teleworking. The sphere of influence of this variable is related to the digital approach that the citizen has, or can have, with the most

daily operations. It is clear to understand how greater digitization of society leads to greater familiarity with the digital world itself and therefore a greater propensity to adopt teleworking practices.

The **Learning** variable, whose correlation with telework adoption's results are shown in **fig. 1**, represents the number of people who said they used online material at least once a week during the year for learning reasons, does not seem to have a great impact on the adoption of teleworking. Exists a positive correlation between using digital learning material and the degree of telework adoptance. Similarly, to the variable Interaction with the public authorities, the adoptance and the practise of digital among the society, is useful to start familiarize with the technology itself.

The result of **Above Basic Digital Skills, fig. 4,** is the most surprising one for who is

writing. In fact, at first glance, if the share of population which has an high or above the basic level of digital skills or not, could be seen as a main factor for adoptance of telework. This is true, because exists a good level of positive correlation between the possession of Above Basic Digital Skills but maybe not as high as it could be imagined. The positive correlation can be justified by the fact that the possession of above basic digital skills makes easier the management of the tele-work. As easily imaginable (and also practiced during the lockdown months by who is writing) carrying out your work, even for just one day a week, away from your desk, implies a necessary mastery of the digital tools made available to the employer to make up for the changes due to the adoption of teleworking.

In **Fig. 5** we have the result of the *Unemployment Rate* variable. It states a

negative correlation between the unemployment rate and the degree of teleworkers. This is easily recognizable: the highest the number of unemployment and, consequently, lower the number of teleworkers.

Finally, in **Fig. 6** we face the GPD per capita. It presents a small positive correlation with the telework adoption. From our point of view this is confirmed by the reality. In fact, an higher GPD per capita, means that in average the GDP is highly distributed between the population. This indicator is used commonly for depicting the wealth situation among countries. The coefficient, and the correlation, consequently, can be so low, because most of the companies, both public and private, which propose telework to their employees, give them their own pc and items for perform the daily work. So GDP per capita seems not to

have a great correlation with telework adoptance. For what is concerned the positivity of the correlation, richer people often aim at higher level working positions, which can allow telework better than lower one

The relevancy of this first analysis is that it gives a general idea of what are the factors to which is addressable a correlation to the telework adoptance. Given that the correlation relationship is different from the cause effect one, we must understand that in this historical moment, after COVID 19 crisis, the world has changed a lot. For what is related with our research questions and this thesis, remote working and teleworking have become the routine, moving from a scarce adoption rate, especially in some countries of the Mediterranean area. This has opened a debate on the importance of the telework and on its

benefits on the work-life Balance. The scientific importance of this analysis is that, given the focus and the willingness of increase telework usage in companies and in public administration, is good to know what factors and areas can give the best results in terms of correlations.

4.3 REGRESSION MODEL

The second part of this chapter is represented by the creation of a regression model with some of the variables used analysing correlation. Before of entering the model, we want to specify why we decided of using only some of the selected variables. Looking at figure 7, we can note that there are some problems of significance with most of the

variables, explained by the p-value higher than 0.05. This means that the variables which have this characteristic are not significant and, therefore, are not expressing a result. The cause can be investigated in the collinearity that can be caused by the usage of country-based dummies. In fact, some of the variables can repeat some of the characteristics of the country. Our decision has been the drop this kind of variables (ICT, Learning, Average GDP) es in order to obtain significant results. Looking figure 8, we can see that we have reached our goal. In order to be clear, the equation of regression is the one that allows us to approximate in the best possible way the cause effect relationship between the dependent variable and the explanatory variables. In fact, the values of the regressors are those that reduce the variance to a minimum, managing to explain the reality with the margin of smaller error. We are therefore

able to evaluate with a good approximation what will be the variation that the dependent variable will undergo if in our model one of the regressors taken into consideration is increased by a unit of measurement, keeping all the others fixed (Ceteris Paribus). These the formalization of the results from **figure 8:**

Teleworker adoption = 0,0498 + 0.0254 Videoconferencing + 0.0192 Public Authorities + 0.0486 Above Basic digital Skills – 0.1153 Unemployment rate + 0.0109 Austria + 0.0097 Belgium -0.0449 Bulgaria - 0.0593 Cyprus - 0.0453 Czech Republic + 0.0293 Denmark + 0.0320 Estonia + 0.0084 Greece + 0.0213 Spain + 0.0605 Finland + 0.0373 France -0.0346 Croatia - 0.0199 Hungary - 0.0047 Ireland +0.1320 Iceland -0.0123 Italy - 0.0190 Lithuania + 0.0289 Luxembourg +0.0089 Latvia + 0.0394 Malta + 0.0935 Netherlands + 0.1268 Norway - 0.0156 Poland + 0.0047 Portugal - 0.0521 Romania + 0.1195 Sweden + 0.0233 Slovenia + 0.027 Slovak + 0.0577 UK – 0.0061 Serbia

The equation just obtained is the one that allows us to approximate in the best possible

way the relationship between the dependent variable and the explanatory variables, in fact the values of the regressors are those that reduce the variance to a minimum, managing to explain the reality with the margin of smaller error. We are therefore able to evaluate with a good approximation what will be the variation that the dependent variable will undergo if in our model one of the regressors taken into consideration is increased by a unit of measurement, keeping all the others fixed (Ceteris Paribus). So specifically:

Videoconferencing: all other things being equal, keeping the other regressors fixed, if the value of this coefficient increases by one unit, the number of people who telework increases by *0.0254 %.* For everyone who participates in video calls at least once a week, the number of individuals who engage in telework increases by 0.0254 *%.*

Interaction with the public authorities: all other things being equal, keeping the other regressors fixed, if the value of this coefficient increases by one unit, the number of people who telework increases by 0.0192 %. For everyone who interacts with public authorities through the internet at least once a week, the number of individuals practicing telework increases by 0.0192 %.

Above Basic digital skills: all things being equal, keeping the other regressors fixed, if the value of this coefficient increases by one unit, the number of people doing telework increases by 0.0486 %. For everyone who possesses a level of digital skills beyond basic, the number of individuals who practice telework increases by 0.0486 %.

Unemployment Rate: all other conditions being equal, keeping the other regressors fixed, if the value of this coefficient increases

by one unit, the number of people who telework decreases by 0.1153 %. For each percentage point higher than the unemployment rate, the number of individuals who engage in telework decreases by 0.1153 %.

Dummies: all things being equal, keeping the other regressors fixed, if the variable takes value 1, the number of people who practice telework increases / decreases by the value of the coefficient, compared to the German labour market.

4.4 GOODNEES OF THE MODEL

The analysis cannot stop here, since after interpreting the coefficients it is necessary to establish whether they are statistically

significant or not. That is to define if their impact on the dependent variable is useful or if it distorts the observable data. To this end, two evaluation methods have to be considered. The first is based on the P-value criterion. The value of the P-value of each regressor must in fact be less than our reference alpha, that is, our confidence level (which we arbitrarily take equal to 5%).

Comparing the p-value data in the table with the confidence level chosen we find that all the coefficients are are largely significant and, according to the econometrical evaluation, *** regressors (the value of the p-value has to be > of 0.05, compared with **fig. 8**).

The second method is good to test the real goodness of the model. In order to find out this last value, the second method is the chosen one. In fact, in order to test the goodness of adaptation to reality and the ability to explain

the variability of the dependent variable, the multiple coefficient of determination or R-quadro index is used.

Looking at **figure 8** This index is based on the decomposition of the total deviance and is calculated as the ratio between the sum of the squares of the regression and the sum of the squares of the totals. Gretl's output in Table 1 provides this index. As we can see the R-square value is 0.9620. This ensures the significance and goodness of our model.

Let's then proceed with a more detailed analysis of the R-squared. In our case, the R-square has a value of 0.9620. This means that it can explain about 96.20% of the total variability of the dependent variable. The R - square index fluctuates between the values 0 and 1. When it is 0 it means that the model cannot describe the existing relationships between the data series, while when it is equal

to 1 it means that it can perfectly explain the existing relationships. In our case of analysis, the value is positioned at a level well above half and in the last percentile. We therefore conclude by saying that, being an optimal value, our model is a good approximation of the relationship between the dependent variable and the numerous selected variables. The table provides another particularly interesting data that can be useful for judging the significance of the entire model built. This is the Static-F and its P-value. Based on this last value, we can evaluate the significance by comparing it with our reference alpha (once again chosen arbitrarily). We immediately note, looking at the table, that the P - value of the F statistic is less than 0.01, being 3,28e-94 thus guaranteeing the significance of the model at each of the three confidence levels α most used in practice. Using the value of the F-statistic, we can make a further test to verify

the significance by comparing it with Fisher's F. Fisher's F (Fr, n – r – 1, α) in the case of this analysis is equal to F38, 89, 0.01 whose value extracted from the tables is about 2.02. Fisher's F is largely less than the value of the F-statistic, 686.2142. So, without a doubt we can conclude that the whole model is significant. The last analysis necessary for the evaluation of the model is the one on the collinearity of the regressors. If an explanatory variable were to be linearly dependent on the others (perfect collinearity), it would mean that the information it contains is already present in the dataset through the other variables. Therefore, the elimination of this variable would not result in loss of information. We have linear dependence between two explanatory variables when the correlation coefficient between the two is close to 1. Figure 9 is the collinearity matrix of the variables present in our model. In some cases, we have some problems of

collinearity but, what really matters is the significance of the coefficient. Using so much dummy variables for each European country, some collinearity can be taken in account in every similar analysis.

4.5 ECONOMETRICAL CONCLUSIONS:

Summarizing by points the statistical results that the analysis in question gave, we argue that:

- All Beta coefficients are largely significant
- The model has an excellent Box value.
- The model developed is statistically significant, as can be seen from the F-statistic and its P-value.
- Correlation problems are mainly imputable to the presence of many dummies variables and therefore are attributable to similarities between countries

4.5 EMPIRICAL CONCLUSION

The model we created describes a credible overview of the situation regarding the

adoption of the practice of teleworking in Europe. Starting from the geographic component, and therefore from our dummies, taking as a benchmark what is globally recognized as the strongest European economy, Germany, we can see how few countries, compared to Berlin, have a greater adoption of teleworking. These are, in increasing order of coefficient, Iceland, Sweden, Norway, Holland, Finland and Estonia.

It is impossible not to notice how all these countries belong to the northern area of Europe and therefore are exposed to worse climatic conditions than the Mediterranean countries. Furthermore, the digitization of the society presents in these countries, about which we have also discussed in the previous chapters, as can be seen from our model, it has a clearly positive effect on the adoption of the

practice of teleworking. It is then necessary to devote a few lines to the interpretation of **dummies** and their coefficients. In fact, these results can be interpreted as the impact that being in a certain state or not has on the adoption of teleworking practices by the individuals who reside there. A positive coefficient indicates that among the inhabitants of a country, by virtue of their simply living there, the adoption of the practice of teleworking has increased by equal percentage points. For example, in our database the Variable Sweden has a coefficient of 0.109, which means that Swedish citizens have 11.9% more teleworkers than in Germany. In the case of a negative coefficient, like that of Romania, -0.05, the interpretation is that working in Romania negatively affects the number of teleworkers by 4.1%. In addition to the selected variables, there is something else that affects the adoption of

teleworking. This other can be defined as the obstacle deriving from work cultural barriers. In fact, the employer's need to control the worker only through the time he physically passes working, rather than on the results he achieves, it is an obstacle that can only be overcome through profound cultural change. As regards the measures that a state can undertake and their effect on teleworking, it is necessary to analyse the variables one by one and comment on the results obtained.

The **videoconferencing variable**, which indicates the number of people who have used videoconferencing at least once a week over a year, has a positive impact on the number of people who telework. In fact, for each additional percentage point that this variable obtains, the percentage of people who practice teleworking increases by 2.54%. Considering that in many European countries, especially

those in the Mediterranean area such as Italy, the adoption of the practice of teleworking is influenced by a strong cultural barrier linked to a conception of work that is based on the control of the worker by the employer through physical presence in the office, even a small percentage increase is a very important signal to better coordinate future policies (especially the post-COVID ones, which we will focus on in the final part of this chapter). Returning to our variable, after the months of lock-down to which much of Europe has been subjected, teleworking is directly influenced by the use and familiarity with software and programs that allow videoconferencing.

The same goes for the **Above basic digital skills variable**. In fact, our analysis shows that being in possession of basic software skills does not have a significant impact on the practice of teleworking. While having software

skills above the basic level affects 6.5% more on the adoption of the practice of teleworking.

The most interesting cause effect relationship is represented by the Variable **Public authorities**. What our model states is that increasing people who interact with the Public authorities through internet of one percentual point, gives 1,9 percentage of teleworkers more. Despite the increment can be done simply by digitalising the PA, what is really challenging is training both the worker and the user. In fact, can happen that the traditional way of interaction can be preferred, because easier, because simpler and because "we have always done it in this way". Here is the challenge. Here is where the society and the attitudes can change. Making the digitalisation present in the everyday life means to make clear and available to everybody the enormous advantage of the new technologies. The effort

is finding the correct way of training and of make the user comfortable with the new way of action. The target should be not only to digitalize the services, but also to think how to train both the worker and the users. Lockdown experience has shown us that distance learning, despite differences with the traditional one, is effective and possible. This can be a useful system for spread the instructions to use properly the new systems that could be created in order to favour the digital interaction with the public authorities.

Our model is a snapshot of the pre covid-19 situation in Europe. The countries whose dummies have a negative coefficient, such as Italy, are those that showed strong cultural resistance to the adoption of teleworking. Unfortunately, being forced to work from home for a few months due to the before mentioned health emergency was, for what

concerns our field of research, a unique opportunity to experience the positive effects of teleworking on our daily lives. I had the opportunity to experience the advantage of reducing the commuting time on my daily routine. It became clear that cultural resistances are nothing more than prejudices linked to an era dating back to before the revolution constituted by the WEB. In this the public sector cannot exempt itself from the role of guide and guarantor of public affairs. States need to invest part of their funds to create a new work culture in which time spent in the office is no longer at the centre, but the results achieved. So, answering our initial research question, the effects of public policies on teleworking are relevant and fundamental in favouring the change in the resulting work culture. In detail, following the results of our model, it will be necessary to structure public action on the following issues:

- Increase the usage of videoconferencing as an instrument that can develop telework adoptance
- Investing in high-level digital education from early school grades
- Digitalizing the public administration in order to start creating a digital environment around the citizen.

Even more, as said at the beginning of this thesis, in chapter one, in order to develop telework, smart working is needed. According to the results of our model, what is stated is that exists a positive cause effect relationship, among the European countries, between some practices that involve the digitalization of the several aspects of our life (as the digital learning, the diffusion of digital skills and the digitalization of the public administration) and the telework adoption. Remarking again that the telework should be an opportunity that each worker should have (according to his job), is up to the governments to favour this

practice. An empirical prove is given by the fact that some countries have invested in this three areas for several years (let's think at Scandinavian countries)

4.6 FURTHER RESEARCH

However, it is necessary that we move from the Telework perspective to the broader one of Smart work. In fact, in the light of the proposed results, there is a need for joint action by the public administration, in all its components, in order to invest in the three areas listed above, not only for the practice of teleworking itself, but also for the improvement of the so called work life balance. This analysis is referred to the pre COVID age, during which telework was not even considered in many European countries. Entering in a practical case, before of COVID-19, in Italy, less than 9% of working population (ISTAT 2018) was practicing

telework at least once per week. The recent pandemy that has forced our routing in becoming smarter, has speeded up the diffusion of the telework among the society. Another important research field, given that we have analysed in which area a government should invest in order to increase the share of teleworkers, should be how to maintain those key markets that have developed their business thanks to the traditional work. For example, the real estate market. This area, as noted after the first months of telework, is one of the most affected by the switch from traditional to telework. For what is concerned the real estate market, a recent report of the Deutsche Bank there are different interests in this situation. Holding the great benefits for commuters and for the work-life balance, there could be the possibility of a new financial crisis. In fact, a natural consequence of the adoption of the telework is the space. Moving the job routine

to the house from the desk, open to a great inevitable revolution (as broadly described in this thesis). The report, states that, if given the possibility to half of the German traditional workers of practicing telework for two days per week, could reduce the German demand for office spaces of the 13% (2.4 millions of square meters per year), while it growths of 1 million of square meters per year. This situation is similar for other markets, as the catering one. A lot of restaurants and canteen has been founded near the offices. What scenarios for those activities if office workers are becoming tele workers? A gradual conversion of these (and the other involved) sectors can be an hypothesis in order to ensure both the telework switch and the the survivance of millions of employees over Europe

Concluding, on one hand is surely important to understand how to improve telework and which are the factors that more affect this revolutionary practice. New and more precise data will be available in the next months both from a European Perspective and from a national Perspective “thanks” to COVID situation. But on the other hand, telework must be inserted in one existing eco-system, which must be gradually switched and reconverted to the new practices that are advancing without possibility of been stopped. light of the proposed results, there is a need for joint action by the public administration, in all its components, in order to invest in the three areas listed above, not only for the practice of teleworking itself, but also for the improvement of the so called work life balance.

CHAPTER 5 - CONCLUSION

To date, we are in a historical period of great impact for our area of analysis. In fact, for the writer, one of the greatest difficulties has been to find reliable data and sources both in terms of quantity and quality of the surveys conducted. The European Union, in the guise of the Eurostat community data collection site, made this work possible, making data and analysis available free of charge. What is clear in this era of economic uncertainty is that data will soon be available that will represent the results of the "forced" adoption of telework to which most countries have been subjected during these first months of 2020. In fact, the worldwide spread of the virus has led to the adoption of teleworking practices on all continents. The collection of such data on a global level will allow new studies similar to this one, with the difference that they will be able to count on new databases and also on a daily and

widespread diffusion of telework that would never have been possible in normal times. We therefore recommend future research, as surely will happen, in order to investigate the effects of such a radical adoption, such as the one that took place for obvious reasons, of teleworking on the daily life of the worker and on the work-life balance. Furthermore, it would be interesting to be able to collect the public actions that have been carried out in the short term by the various national governments, to verify whether, in the light of our studies, the depicted model has confirmed the estimate carried out in time. The availability of new and more detailed data and the history of governments' actions, with the related results, will lead to the birth of new studies that can be exploited by the international scientific community to develop and spread the adoption of teleworking practices among the population. . However, it is necessary that both the merits and the defects of adopting teleworking practices be

analysed. In fact, for clarity, it will also be necessary to evaluate the problem of isolation from one's work context, paying attention to identifying the effects due to lockdown and social distancing and those directly attributable to teleworking.

Ringraziamenti

Mi sembra doveroso ringraziare quanti hanno permesso la stesura di questo lavoro di tesi e che, più in generale, mi hanno sostenuto fino alla fine del mio percorso accademico. In primis la mia famiglia che ogni giorno, nonostante le difficoltà, non ha mai smesso di credere in me e nelle mie capacità. La mia fidanzata Giorgia, che sempre mi ha sostenuto ed incoraggiato nel raggiungere i miei obiettivi. I miei amici, che ci sono sempre stati per strapparmi un sorriso anche quando non avevo voglia di sorridere. Questo lavoro di tesi non sarebbe stato possibile senza il grande supporto, e la pazienza, del mio relatore chiar.mo Stefano Staffolani il quale è sempre stato disponibile e di supporto nei miei confronti.

BIBLIOGRAFIA

- Angelici, M., & Profeta, P. (2020). Smart-Working: Work Flexibility without Constraints. CESifo.
- Armakolas, S.; Panagiotakopoulos, C.; Magkaki, F.; (2018) Interaction and Effectiveness - Theoretical Approaches in a Teleconference Environment. International

Journal of Science Vol. 7 - September 2018. DOI: 10.18483/ijSci.1785

- Barrick, M.R. and M.K. Mount (1993), ‘Autonomy as a moderator of the relationships between the big five personality dimensions and job performance’, Journal of Applied Psychology, 78 (1), 111–18.
- Beauregard, A,. & Henry, L;. (2009). Making the Link between Work-Life Balance
- Beauregard, T. A. (2010). Corporate Work-Life Balance Initiatives: Use and Effectiveness. Creating Balance?, 193–208. doi:10.1007/978-3-642-16199-5_11
- Beauregard, T. Alexandra and Basile, K.A. and Canónico, E. (2019) Telework: outcomes and facilitators for employees. In: Landers, R.N. (ed.) The Cambridge Handbook of Technology and Employee Behavior. Cambridge, UK: Cambridge University Press, pp. 511-543. ISBN 9781108649636.
- Beeler, A., (2003), "It takes two", Sales & Marketing Management, 155(8), 38-41.
- Bel, G. & Joseph, S., 2018. Climate change mitigation and the role of technological change: Impact on selected headline targets of Europe's 2020 climate and energy package. Renewable and Sustainable Energy Reviews, 82, pp.3798-3807.
- Berger, T. & Frei, C. B. (2016). Digitalisation, jobs, and convergence in Europe: Strategies for closing the skills gap. Paper for the European commission, DG Internal Market, Industry, entrepreneurship and SMEs, January 2016.
- Bloom, Nicholas & Liang, James & Roberts, John & Jenny Ying, Zhichun (2015). Does Working from Home Work? Evidence from a Chinese Experiment. The Quarterly Journal of Economics, Oxford University Press, vol. 130(1), pages 165-218

- Bourhis, A., & Mekkaoui, R. (2010). Beyond Work-Family Balance: Are Family-Friendly Organizations More Attractive? Relations Industrielles, 65(1), 98. doi:10.7202/039529ar
- Bridgeford, Lydell C. (2007). Out of sight, out of mind: Employer attitudes stifle telework adoption. Employee Benefit News, 1
- Ceridian, E.S. (1999), 'Companies with virtual environments find success in retaining workers', Wall Street Journal,5 October.
- Chapman, L., 2007. Transport and climate change: a review. Journal of transport geography, 15(5), pp.354-367
- Choi, M., Glassman, M., & Cristol, D. (2017). What it means to be a citizen in the internet age: Development of a reliable and valid digital citizenship scale. Computers & Education, 107, 100–112. doi: 10.1016/j.compedu.2017.01.002
- Christmann P., (2000), "Effects of "best practices" of environmental management on cost advantage: the role of complementary assets", Academy of Management Journal, 43(4), 663-680.
- Cisco, (2007), "Cisco Unified Communications e l'architettura smart business communications", http//cisco.com (gennaio2015)
- Clapperton, G., Vanhoutte, P., (2014), "Il Manifesto dello Smart Working. Quando, dove e come lavorare meglio", Sunmakers.
- Colbert, Amy & Bono, Joyce & Purvanova, Radostina (2016). Flourishing via Workplace Relationships: Moving Beyond Instrumental Support. Academy of Management Journal, Vol. 59, No. 4, 1199–1223
- Creutzig, F., Roy, J., Lamb, W.F., Azevedo, I.M., De Bruin, W.B., Dalkmann, H., Edelenbosch, O.Y., Geels, F.W., Grubler, A., Hepburn, C. & Hertwich, E.G., 2018. Towards

demand-side solutions for mitigating climate change. Nature Climate Change, 8(4), p.260.
- Current trends in Smart City initiatives: Some stylised facts. (2014) (Vol. Cities).
- Dahl, C.M., Kongsted, H.C. and Sørense, A. (2011). ICT and productivity growth in the 1990s: panel data evidence on Europe. Empirical Economics, 40, 141–164
- Dixon, M., & Ross, P. (2011). VWork: Measuring the benefits of agility at work. Regus/Unwired
- Drago, R., Hyatt, D., (2003), "Symposium: the effect of work-family policies on employees and employers", Industrial Relations, 42(2), 139-145
- Dubois, G., Sovacool, B., Aall, C., Nilsson, M., Barbier, C., Herrmann, A., Bruyère, S., Andersson, C., Skold, B., Nadaud, F. & Dorner, F., 2019. It starts at home. Climate policies targeting household consumption and behavioral decisions are key to low-carbon futures. Energy Research & Social Science, 52, pp.144-158.
- Duxbury, L. (1998). Telework and the balance between work and family: is telework part of the problem or part of the solution?
- Economic Review, 104(4):1091–1119.
- Eom, S.-J., Choi, N., & Sung, W. (2016). The use of smart work in government: Empirical analysis of Korean experiences. Government Information Quarterly, 33(3), 562–571. doi: 10.1016/j.giq.2016.01.005
- Epstein, Cynthia Fuchs & Seron, Carroll & Oglensky, Bonnie & Saute, Robert (1999). The Part-time Paradox: Time Norms, Professional Life, Family and Gender. Routelage : New York
- Equality and Human Rights Commission Manchester.

- EUROSTAT 2018 https://ec.europa.eu/eurostat/statistics-explained/index.php/ICT_sector_-_value_added,_employment_and_R%26D
- Eurofound (2017). Working anytime, anywhere: The effects on the world of
- EUROSTAT DIGITAL SKILLS 2019 https://ec.europa.eu/eurostat/web/products-datasets/product?code=tepsr_sp410
- Fedorova, A., Koropets, O., & Menshikova, M. (2020). Introduction of Smart Working in the Enterprises of Russia and Italy: Case Study. IOP Conference Series: Materials Science and Engineering, 753, 042007. doi:10.1088/1757-899x/753/4/042007
- Flexibility, (2011), "The Smart Working Handbook" WFD Consulting http//.flexibility.co.uk/flex-work/time/time-¬-options.htm
- Gil-Garcia, J. R., Dawes, S. S., & Pardo, T. A. (2017). Digital government and public management research: finding the crossroads. Public Management Review, 20(5), 633–646. doi:10.1080/14719037.2017.1327181
- Giovanis, E. (2017). The relationship between teleworking, traffic and air pollution. Turkish National Committee for Air Pollution Research and Control. doi: https://doi.org/10.1016/j.apr.2017.06.004
- Giovanis, E. (2019). Do the Flexible Employment Arrangements Increase Job Satisfaction and Employee Loyalty? Evidence from Bayesian Networks and Instrumental Variables. SSRN Electronic Journal. doi:10.2139/ssrn.3411504
- Glassman, M., & Kang, M. J. (2016) Teaching and learning through open source educative process. Teaching and Teacher education, 60, 281-290

- Glassman, M., & Kang, M. J. (2016). Teaching and learning through open sources educative and evolution of Open Source Intelligence (OSINT). Computers in Human Behaviour, 28(2), 673-682. https://doi.org/10.1016/j.tate.2016.09.002
- Golden, T.D. and Veiga, J.F. (2008), "The impact of superior-subordinate relationships on the commitment, job satisfaction, and performance of virtual workers", The Leadership Quarterly, Vol. 19 No. 1, pp. 77-88.
- Goldin, C. (2014). A grand gender convergence: Its last chapter. American
- Greenhaus, J., & allen, T. D. (2011). Work-Family Balance: A Review and Extension of the Literature (2nd ed., Vol. Handbook of Occupational Health Psychology). APA.
- Greer, T. W., & Payne, S. C. (2014). Overcoming telework challenges: Outcomes of
- Gregory, A., & Milner, S. (2009). Editorial: Work–life Balance: A Matter of Choice? (1st ed., Vol. 16).
- Haines, V.Y. III, St. Onge, S., & Archambault, M. (2002). Environmental and person antecedents of telecommuting outcomes. Journal of End User Computing, 14(3), 32-50
- Hart S. L., (1995), "A natural-resource-based view of the firm", Academy of Management Review, 20(2), 986-1014.
- Hegewisch, A. et al. (2009). Flexible working policies: a comparative review.
- Heikki Topi (2015) Supporting Telework: Obstacles and Solutions, Information Systems Management, 21:3, 79-85, DOI: 10.1201/1078/44432.21.3.20040601/82481.12
- Helms, M. M., & Raiszadeh, F. M. E., Thorne (2008). Virtual offices: understanding and managing what you cannot see. Work Study,

51(5), 240–247.
doi:10.1108/00438020210437259

- Hill, J.E., B.C. Miller, S.P. Weiner and J. Colihan (1998), 'Influences of the virtual office on aspects of work and work/life balance', Personnel Psychology, 51 (3), 667–83.
- Hiltrop J. M., (1999), "The quest for the best: human resource practices to attract and retain talent". European Management Journal, 17(4), 422-430.
- Hook, A., Court, V., Savacool, B., & Sorrel, S. (2020). A systematic review of the energy and climate impacts of teleworking. IOP Publishing Ltd. (SOCIETY)
- Hopkins, J.L. & McKay, J., 2019. Investigating 'anywhere working'as a mechanism for alleviating traffic congestion in smart cities. Technological Forecasting and Social Change, 142, pp.258-272.
- Horner, N.C., Shehabi, A. & Azevedo, I.L., 2016. Known unknowns: Indirect energy effects of information and communication technology. Environmental Research Letters, 11(10), p.103001.
- https://elearningindustry.com/top-elearning-statistics-2019 (CONSULTED)
- https://e-student.org/e-learning-statistics/ (CONSULTED)
- https://www.oecd.org/els/soc/PF1_2_Public_expenditure_education.pdf (OECD 2018)
- Illegems,V.and A.Verbeke (2003),Moving Towards the Virtual Workplace: Managerial and Societal Perspectives on Telework,Cheltenham,UK and Northampton, MA, USA: Edward Elgar.
- Kazekami, s., 2020. Mechanisms to improve labor productivity by performing telework. Telecommunication Policy, 2-15,45

- Khalifa, M. and Davison, R. (2000), “Exploring the telecommuting paradox”, Communications of the ACM, Vol. 43 No. 3, pp. 29-31.
- Kiyoh Nakamura, Toshihiro Ide & Yukio Kiyokane (2009) Roles of multimedia technology in telework, Journal of Organizational Computing and Electronic Commerce, 6:4, 385-399, DOI: 10.1080/10919399609540286
- Knoll (Ed.). (2009). Future Work and Work Trends.
- Lachapelle, U., Tanguay, G.A., & Neumark-Gaudet, L., 2018. Telecommuting and sustainable travel: Reduction of overall travel time, increases in non-motorised travel and congestion relief? Urban Studies, 55(10), pp.2226-2244
- Larson, W. (2016). Telework: Urban Form, Energy consumption and Greenhouse Gas Implication. Economic Inquiry. doi: https://doi.org/10.1111/ecin.12399
- Lee, S., Nam, Y., Lee, S., and Son, H., (2016). Determinants of ICT innovations: A cross country empirical study. Technological Forecasting and Social Change, 110, pp 71-77
- Madsen, S. (2003). The effects of home-based teleworking on work-family conflict. Orem, Utah: Utah Valley State College. doi: https://doi.org/10.1002/hrdq.1049
- Madsen,S.R.(2003), “Theeffectsofhome-basedteleworkingonwork-familyconflict”,HumanResource Development Quarterly, Vol. 14 No. 1, pp. 35-58.
- Marshall, K., (1997), "Job sharing", Statistics Canada, 75(1), 160-187
- Maruyama, T. and Tietze, S. (2012), “From anxiety to assurance: concerns and outcomes of telework”, Personnel Review, Vol. 41 No. 4, pp. 450-469.

- Matteucci, N., O'Mahony, M., Robinson, C. and Zwick, T. (2005). Productivity, Workplace Performance and ICT: Industry and Firm-Level Evidence for Europe and the US. Scottish Journal of Political Economy, 52, 359-386
- McCloskey, Donna W. & Igbaria, Magid. (2003). Does "out of sight" mean "out of mind"? an empirical investigation of the career advancement prospects of telecommuters. Information Resources Management Journal, 16(2), 19-34
- Mercer (2019), “Workforce turnover around the world”
- Muruyama, T. (2009). A Multivariate Analysis of Work-Life Balance Outcomes from A Large-Scale Telework Programme. New Technology Work and Employment. doi: 10.1111/j.1468-005X.2008. 00219.x
- Nakrošienė, A., Bučiūnienė, I., & Goštautaitė, B. (2019). Working from home: characteristics and outcomes of telework. International Journal of Manpower. doi:10.1108/ijm-07-2017-0172
- Neirotti, P., Paolucci, E., Raguseo, E., (2012), “Telework Configurations and Labour Productivity: Some Stylized Facts”, International Journal of Engineering Business Management, 4(7), 1-10.
- Nilles, J.M. (1997), “Telework: enabling distributed organizations: implications for IT managers”, Information Systems Management, Vol. 14 No. 4, pp. 7-14.
- O’Mahony M, van Ark B (eds) (2018) EU productivity and competitiveness: an industry perspective. Can Europe resume the catching-up process? Office for Official Publications of the European Communities, Luxembourg.

- Osservatorio Smart Working, (2014), “Smart Working and Smart Workplace”, Politecnico diMilano.
- Perez Perez, M., Martinez – Sanchez, A. and Pilar de Luis Carnicer, M. (2003), “The organizational implications of human resources managers’ perception of teleworking”, Personnel Review, Vol. 32 No. 6, pp. 733-755.
- Perez, M.P., A.M. Sanchez and M.P. Carnicer (2002), ‘Benefits and barriers of telework: perception differences of human resource managers according to company’s operation strategy’, Technovation, 22, 775–83.
- Pitt-Catsouphes, M., Sweet, S., Lynch, K., (2009), “Talent management study: The pressures of talent management”, Sloan Center on Aging and Work at Boston College.
- Plantronics, (2010), “Home Working: Lost in Translation”, Northern Europe.
- Practices and Organizational Performance. (2009) (Vol. Human Resource Management Review). doi: 10.1016/j.hrmr.2008.09.001
- Roitz, J., B. Nanavati and G. Levy (2004), ‘Lessons learned from the network-centric organization: 2004 AT&T employee telework results’, AT&T Telework White Paper, Bedminster, NJ: AT&T.
- Shrivastava P., (1995), “Environmental technologies and competitive advantage”, Strategic Management Journal, 16(7), 183-200.
- Stavrou, E., (2010), "Flexible work bundles and organizational competitiveness: a crossnational study of the European work context", Journal of Organizational Behavior, 26(1), 923-947.successful telework strategies. The Psychologist-Manager Journal, 17(2), 87-
- UNESCO DIGITAL SKILLS https://en.unesco.org/news/digital-skills-

critical-jobs-and-social-inclusion#:~:text=Digital%20skills%20are%20defined%20as,to%20access%20and%20manage%20information.

- Weichhart, G., Molina, A., Chen, D., Whitman, L. E., & Vernadat, F. (2016). Challenges and current developments for Sensing, Smart and Sustainable Enterprise Systems. Computers in Industry, 79, 34–46. doi: 10.1016/j.compind.2015.07.002
- Wheatley, D. (2012). Employee satisfaction and use of flexible working arrangements. doi: https://doi.org/10.1177/0950017016631447
- Wirthlin Worldwide (1999), 'Americans on the Job Part 2: Rebuilding the Employer/Employee Relationship', The Wirthlin Report, retrieved January 1999 from http://www.ebri.org.work
- Worrell E., Laitner J. A., Ruth M., Finman H., (2003), "Productivity benefits of industrial energy efficiency measures", Energy, 28(7), 1081-1098.
- IBM 2019 https://www.ibm.com/services/learning/W961341C20522X82
- E-ESTONIA https://e-estonia.com
- ELEARNING https://www.businesswire.com/news/home/20191015005810/en/E-Learning-Market-Europe-2019-2023-Rising-Prominence-Data (Business wire)
- KPMG 2018 https://assets.kpmg/content/dam/kpmg/pdf/2015/09/corporate-digital-learning-2015-KPMG.pdf

Figure 1

Modello 2: OLS, usando le osservazioni 1-124
Variabile dipendente: Teleworkers

	Coefficiente	*Errore Std.*	*Rapporto t*	*p-value*	
Learning	0,123778	0,0218762	5,658	<0,0001	***
Austria	0,0825246	0,00964514	8,556	<0,0001	***
Belgium	0,0938457	0,00932178	10,07	<0,0001	***
Bulgaria	0,0269244	0,00938393	2,869	0,0051	***
Cyprus	0,0181941	0,00937641	1,940	0,0554	*
CzechRepublic	0,0283874	0,00950219	2,987	0,0036	***
Denmark	0,110802	0,0102981	10,76	<0,0001	***
Estonia	0,116220	0,00936275	12,41	<0,0001	***
Greece	0,0503476	0,00989877	5,086	<0,0001	***
Spain	0,0623660	0,0108293	5,759	<0,0001	***
Finland	0,139919	0,00964778	14,50	<0,0001	***
France	0,104571	0,00946645	11,05	<0,0001	***
Croatia	0,0329220	0,00934276	3,524	0,0007	***
Hungary	0,0600338	0,00952039	6,306	<0,0001	***
Ireland	0,0332501	0,0127383	2,610	0,0105	**
Iceland	0,235829	0,00949221	24,84	<0,0001	***
Italy	0,0407676	0,00975180	4,181	<0,0001	***
Lithuania	0,0416576	0,0104417	3,990	0,0001	***
Luxembourg	0,116488	0,00961939	12,11	<0,0001	***
Latvia	0,0795153	0,00967838	8,216	<0,0001	***
Malta	0,114297	0,00976302	11,71	<0,0001	***
Netherlands	0,175254	0,0101062	17,34	<0,0001	***
Norway	0,228385	0,00934872	24,43	<0,0001	***
Poland	0,0415150	0,0101077	4,107	<0,0001	***
Portugal	0,0596690	0,00955174	6,247	<0,0001	***
Romania	−0,00736196	0,0108576	−0,6780	0,4994	
Sweden	0,204065	0,00977576	20,87	<0,0001	***
Slovenia	0,0954813	0,00940257	10,15	<0,0001	***
Slovak	0,0641455	0,0104053	6,165	<0,0001	***

UK	0,141660	0,00970986	14,59	<0,0001	***
Serbia	0,0582286	0,00938804	6,202	<0,0001	***

Media var. dipendente	0,106993	SQM var. dipendente	0,058719
Somma quadr. Residui	0,031236	E.S. della regressione	0,018327
R-quadro non centrato	0,983057	R-quadro centrato	0,926346

Figure 2

Modello 6: OLS, usando le osservazioni 1-124
Variabile dipendente: Teleworkers

	Coefficiente	*Errore Std.*	*Rapporto t*	*p-value*	
Publicauthorities	0,200241	0,0119638	16,74	<0,0001	***
Austria	0,0301297	0,00673336	4,475	<0,0001	***
Belgium	0,0528066	0,00610863	8,645	<0,0001	***
Bulgaria	0,0191280	0,00542711	3,525	0,0007	***
Cyprus	−0,00567878	0,00570388	−0,9956	0,0620	*
CzechRepublic	0,0102069	0,00564637	1,808	0,0739	*
Denmark	0,0283145	0,00840255	3,370	0,0011	***
Estonia	0,0564431	0,00677865	8,327	<0,0001	***
Greece	0,0495079	0,00546476	9,059	<0,0001	***
Spain	0,0402708	0,00623154	6,462	<0,0001	***
Finland	0,0525634	0,00818936	6,418	<0,0001	***
France	0,0464281	0,00681362	6,814	<0,0001	***
Croatia	0,0160051	0,00554780	2,885	0,0049	***
Hungary	0,0281090	0,00598858	4,694	<0,0001	***
Ireland	0,0268064	0,00628738	4,264	<0,0001	***
Iceland	0,120100	0,00939258	12,79	<0,0001	***
Italy	0,0269716	0,00565178	4,772	<0,0001	***
Lithuania	0,0337081	0,00572968	5,883	<0,0001	***
Luxembourg	0,0329535	0,00799347	4,123	<0,0001	***
Latvia	0,0521327	0,00594669	8,767	<0,0001	***
Malta	0,0887670	0,00593547	14,96	<0,0001	***
Netherlands	0,0896295	0,00843338	10,63	<0,0001	***
Norway	0,114788	0,00911528	12,59	<0,0001	***
Poland	0,0320459	0,00567128	5,651	<0,0001	***
Portugal	0,0363135	0,00578389	6,278	<0,0001	***
Romania	0,0133071	0,00535451	2,485	0,0147	**
Sweden	0,114262	0,00840232	13,60	<0,0001	***
Slovenia	0,0412140	0,00661599	6,229	<0,0001	***
Slovak	0,0313468	0,00642503	4,879	<0,0001	***

UK	0,0867082	0,00687159	12,62	<0,0001	***
Serbia	0,0500822	0,00543297	9,218	<0,0001	***

Media var. dipendente	0,106993	SQM var. dipendente	0,058719
Somma quadr. Residui	0,010465	E.S. della regressione	0,010608
R-quadro non centrato	0,994323	R-quadro centrato	0,975323

Figure 3

Modello 5: OLS, usando le osservazioni 1-124
Variabile dipendente: Teleworkers

	Coefficiente	*Errore Std.*	*Rapporto t*	*p-value*	
const	0,0391371	0,0121328	3,226	0,0017	***
GDPICT	1,36520	0,279380	4,887	<0,0001	***
Austria	0,0134220	0,00505985	2,653	0,0094	***
Belgium	0,0127511	0,00475150	2,684	0,0086	***
Bulgaria	−0,0725793	0,00551270	−13,17	<0,0001	***
Cyprus	−0,0345116	0,00806131	−4,281	<0,0001	***
CzechRepublic	−0,0555322	0,00463475	−11,98	<0,0001	***
Denmark	0,0347037	0,00480317	7,225	<0,0001	***
Estonia	0,0212662	0,00501795	4,238	<0,0001	***
Greece	0,00457851	0,00756573	0,6052	0,0466	*
Spain	0,0119913	0,00535109	2,241	0,0274	**
Finland	0,0533899	0,00485839	10,99	<0,0001	***
France	0,0240647	0,00464186	5,184	<0,0001	***
Croatia	−0,0535523	0,00461957	−11,59	<0,0001	***
Hungary	−0,0432969	0,00640785	−6,757	<0,0001	***
Ireland	−0,0197811	0,00482688	−4,098	<0,0001	***
Iceland	0,169169	0,00560996	30,16	<0,0001	***
Italy	−0,0239649	0,00529210	−4,528	<0,0001	***
Lithuania	−0,00833617	0,00589693	−1,414	0,0608	*
Luxembourg	0,0708720	0,00836159	8,476	<0,0001	***
Latvia	−0,000905388	0,00463303	−0,1954	0,0455	*
Malta	−0,00741861	0,0102180	−0,7260	0,4697	
Netherlands	0,0977754	0,00474662	20,60	<0,0001	***
Norway	0,153380	0,00511551	29,98	<0,0001	***
Poland	−0,0170018	0,00539030	−3,154	0,0022	***
Portugal	−0,0137030	0,00487379	−2,812	0,0060	***
Romania	−0,0604411	0,00506845	−11,92	<0,0001	***

Sweden	0,0981548	0,00751053	13,07	<0,0001	***
Slovenia	0,0188809	0,00488053	3,869	0,0002	***
Slovak	−0,00453930	0,00461874	−0,9828	0,0283	**
UK	0,0411021	0,00652024	6,304	<0,0001	***
Serbia	−0,00707168	0,00608823	−1,162	0,2484	

Media var. dipendente	0,106993	SQM var. dipendente	0,058719
Somma quadr. Residui	0,003924	E.S. della regressione	0,006531
R-quadro	0,990747	R-quadro corretto	0,987629
F(31, 92)	317,7487	P-value(F)	8,70e-81
Log-verosimiglianza	466,4237	Criterio di Akaike	−868,8474
Criterio di Schwarz	−778,5984	Hannan-Quinn	−832,1861

Figure 4

Modello 1: OLS, usando le osservazioni 1-124
Variabile dipendente: Teleworkers

	Coefficiente	*Errore Std.*	*Rapporto t*	*p-value*	
const	0,0202749	0,00698365	2,903	0,0046	***
Abovebasicdigitalskills	0,116027	0,0100495	11,55	<0,0001	***
Austria	0,0104600	0,00336927	3,105	0,0025	***
Belgium	−0,00139476	0,00339637	−0,4107	0,0823	*
Bulgaria	−0,0407578	0,00362850	−11,23	<0,0001	***
Cyprus	−0,0654680	0,00331403	−19,75	<0,0001	***
CzechRepublic	−0,0448454	0,00339812	−13,20	<0,0001	***
Denmark	0,0249097	0,00359849	6,922	<0,0001	***
Estonia	0,0275672	0,00332425	8,293	<0,0001	***
Greece	−0,00713429	0,00364493	−1,957	0,0533	*
Spain	0,00674171	0,00338300	1,993	0,0492	**
Finland	0,0544396	0,00335699	16,22	<0,0001	***
France	0,0358260	0,00352845	10,15	<0,0001	***
Croatia	−0,0381310	0,00355379	−10,73	<0,0001	***
Hungary	−0,0234430	0,00331591	−7,070	<0,0001	***
Ireland	−0,00941924	0,00332588	−2,832	0,0057	***
Iceland	0,123210	0,00423092	29,12	<0,0001	***
Italy	−0,0153165	0,00379018	−4,041	0,0001	***
Lithuania	−0,0198352	0,00335836	−5,906	<0,0001	***

Luxembourg	0,0222990	0,00354248	6,295	<0,0001	***
Latvia	0,00245264	0,00331474	0,7399	0,0612	*
Malta	0,0356555	0,00331445	10,76	<0,0001	***
Netherlands	0,0886813	0,00354068	25,05	<0,0001	***
Norway	0,121173	0,00379773	31,91	<0,0001	***
Poland	−0,0128224	0,00365192	−3,511	0,0007	***
Portugal	−0,0105898	0,00343981	−3,079	0,0027	***
Romania	−0,0491260	0,00380048	−12,93	<0,0001	***
Sweden	0,114397	0,00348991	32,78	<0,0001	***
Slovenia	0,0269247	0,00358219	7,516	<0,0001	***
Slovak	−0,000723887	0,00332566	−0,2177	0,8282	
UK	0,0503014	0,00350641	14,35	<0,0001	***
Serbia	−0,0125487	0,00352431	−3,561	0,0006	***

Media var. dipendente	0,106993	SQM var. dipendente	0,058719
Somma quadr. Residui	0,002018	E.S. della regressione	0,004684
R-quadro	0,995241	R-quadro corretto	0,993637
F(31, 92)	620,5993	P-value(F)	4,83e-94
Log-verosimiglianza	507,6474	Criterio di Akaike	−951,2949
Criterio di Schwarz	−861,0459	Hannan-Quinn	−914,6336

Figure 5

Modello 4: OLS, usando le osservazioni 1-124
Variabile dipendente: Teleworkers

	Coefficiente	*Errore Std.*	*Rapporto t*	*p-value*	
UnemploymentRate	-0,334790	0,137344	2,438	0,0167	**
Austria	0,0820632	0,0125536	6,537	<0,0001	***
Belgium	0,0815143	0,0136982	5,951	<0,0001	***
Bulgaria	0,0189494	0,0130212	1,455	0,0490	*
Cyprus	−0,00370624	0,0170580	−0,2173	0,8285	
CzechRepublic	0,0333252	0,0109827	3,034	0,0031	***
Denmark	0,119061	0,0127530	9,336	<0,0001	***
Estonia	0,108345	0,0128550	8,428	<0,0001	***
Greece	0,00315058	0,0298837	0,1054	<0,0001	***
Spain	0,0396117	0,0249553	1,587	0,0158	**

Finland	0,130634	0,0149357	8,746	<0,0001	***
France	0,0871301	0,0163286	5,336	<0,0001	***
Croatia	0,0102534	0,0170033	0,6030	0,0580	*
Hungary	0,0609198	0,0117390	5,190	<0,0001	***
Ireland	0,0613030	0,0136982	4,475	<0,0001	***
Iceland	0,239799	0,0110938	21,62	<0,0001	***
Italy	0,0232351	0,0181434	1,281	0,0235	**
Lithuania	0,0469653	0,0139733	3,361	0,0011	***
Luxembourg	0,113880	0,0129584	8,788	<0,0001	***
Latvia	0,0699383	0,0151862	4,605	<0,0001	***
Malta	0,120133	0,0116416	10,32	<0,0001	***
Netherlands	0,184388	0,0119946	15,37	<0,0001	***
Norway	0,225641	0,0116416	19,38	<0,0001	***
Poland	0,0503343	0,0120655	4,172	<0,0001	***
Portugal	0,0466327	0,0155172	3,005	0,0034	***
Romania	0,00977166	0,0121741	0,8027	0,0442	*
Sweden	0,200819	0,0138349	14,52	<0,0001	***
Slovenia	0,0871492	0,0132340	6,585	<0,0001	***
Slovak	0,0668455	0,0145914	4,581	<0,0001	***
UK	0,145685	0,0118223	12,32	<0,0001	***
Serbia	0,0247497	0,0211503	1,170	0,0249	*

Media var. dipendente	0,106993	SQM var. dipendente	0,058719
Somma quadr. Residui	0,039467	E.S. della regressione	0,020600
R-quadro non centrato	0,978592	R-quadro centrato	0,906938
F(31, 93)	137,1353	P-value(F)	6,97e-65
Log-verosimiglianza	323,3109	Criterio di Akaike	−584,6218
Criterio di Schwarz	−497,1931	Hannan-Quinn	−549,1062

Figure 6

Modello 3: OLS, usando le osservazioni 1-124
Variabile dipendente: Teleworkers

	Coefficiente	*Errore Std.*	*Rapporto t*	*p-value*	
GDPpercapita	2,74281e-06	8,40426e-08	32,64	<0,0001	***
Austria	−0,00301151	0,00435214	−0,6920	0,0490	*
Belgium	0,00658203	0,00422940	1,556	0,0230	*
Bulgaria	0,0207378	0,00305874	6,780	<0,0001	***

Cyprus	−0,0346753	0,00359490	−9,646	<0,0001	***
CzechRepublic	−0,00570592	0,00335504	−1,701	0,0923	*
Denmark	0,00606487	0,00502557	1,207	<0,0001	
Estonia	0,0867396	0,00325468	26,65	<0,0001	***
Greece	0,0232237	0,00335486	6,922	<0,0001	***
Spain	0,0276697	0,00365004	7,581	<0,0001	***
Finland	0,0569818	0,00429604	13,26	<0,0001	***
France	0,0286811	0,00406899	7,049	<0,0001	***
Croatia	0,0109131	0,00316933	3,443	0,0009	***
Hungary	0,0409919	0,00318237	12,88	<0,0001	***
Ireland	−0,0697746	0,00557387	−12,52	<0,0001	***
Iceland	0,144182	0,00442105	32,61	<0,0001	***
Italy	−0,0131165	0,00374626	−3,501	0,0007	***
Lithuania	0,0343598	0,00320241	10,73	<0,0001	***
Luxembourg	−0,0949770	0,00760793	−12,48	<0,0001	***
Latvia	0,0647611	0,00316992	20,43	<0,0001	***
Malta	0,0750453	0,00350093	21,44	<0,0001	***
Netherlands	0,0870109	0,00457351	19,02	<0,0001	***
Norway	0,0491517	0,00654639	7,508	<0,0001	***
Poland	0,0323807	0,00317857	10,19	<0,0001	***
Portugal	0,0259976	0,00336324	7,730	<0,0001	***
Romania	0,00233830	0,00309381	0,7558	0,0256	**
Sweden	0,104055	0,00473515	21,98	<0,0001	***
Slovenia	0,0534871	0,00343415	15,58	<0,0001	***
Slovak	0,0502449	0,00327170	15,36	<0,0001	***
UK	0,0705585	0,00406772	17,35	<0,0001	***
Serbia	0,0557975	0,00304099	18,35	<0,0001	***

Media var. dipendente	0,106993	SQM var. dipendente	0,058719
Somma quadr. Residui	0,003372	E.S. della regressione	0,006021
R-quadro non centrato	0,998171	R-quadro centrato	0,992049
F(31, 93)	1637,274	P-value(F)	1,9e-114
Log-verosimiglianza	475,8316	Criterio di Akaike	−889,6631
Criterio di Schwarz	−802,2344	Hannan-Quinn	−854,1475

Figure 7

Modello 1: OLS, usando le osservazioni 1-124
Variabile dipendente: Teleworkers

	Coefficiente	*Errore Std.*	*Rapporto t*	*p-value*	
const	−0,0294216	0,0204859	−1,436	0,1545	
Learning	−0,0100790	0,00973019	−1,036	0,3031	
Videoconferencing	−0,0100540	0,0137565	−0,7309	0,4668	
Publicauthorities	0,00688344	0,0154166	0,4465	0,6563	
GDPICT	1,87993	0,236611	7,945	<0,0001	***
Abovebasicdigitalskills	0,108817	0,0257871	4,220	<0,0001	***
UnemploymentRate	−0,0194932	0,0822737	−0,2369	0,8133	
GDPpercapita	−2,93305e-07	3,75112e-07	−0,7819	0,4364	
Austria	0,0143455	0,00570008	2,517	0,0137	**
Belgium	−0,00244457	0,00660375	−0,3702	0,7121	
Bulgaria	−0,0776464	0,0103610	−7,494	<0,0001	***
Cyprus	−0,0306205	0,00786059	−3,895	0,0002	***
CzechRepublic	−0,0625458	0,00774512	−8,076	<0,0001	***
Denmark	0,0124296	0,00869099	1,430	0,1562	
Estonia	−0,00118755	0,00695568	−0,1707	0,8648	
Greece	0,0220305	0,00994566	2,215	0,0293	**
Spain	0,0150214	0,00839739	1,789	0,0771	*
Finland	0,0348938	0,00607420	5,745	<0,0001	***
France	0,0272761	0,00538637	5,064	<0,0001	***
Croatia	−0,0543388	0,00545982	−9,952	<0,0001	***
Hungary	−0,0685688	0,00903908	−7,586	<0,0001	***
Ireland	−0,0195575	0,0108079	−1,810	0,0738	*
Iceland	0,136546	0,00981582	13,91	<0,0001	***
Italy	−0,00974775	0,00540877	−1,802	0,0749	*
Lithuania	−0,00786283	0,00537834	−1,462	0,1473	
Luxembourg	0,0745486	0,0245356	3,038	0,0031	***
Latvia	−0,0146060	0,00564406	−2,588	0,0113	**
Malta	−0,0380819	0,00973983	−3,910	0,0002	***
Netherlands	0,0740784	0,00610392	12,14	<0,0001	***
Norway	0,136267	0,0165512	8,233	<0,0001	***
Poland	−0,0105875	0,00832587	−1,272	0,2069	

Portugal	−0,0148360	0,00467664	−3,172	0,0021	***
Romania	−0,0512911	0,00961978	−5,332	<0,0001	***
Sweden	0,0685331	0,00724310	9,462	<0,0001	***
Slovenia	0,0217779	0,00601767	3,619	0,0005	***
Slovak	−0,0148141	0,00554623	−2,671	0,0090	***

Media var. dipendente	0,106993	SQM var. dipendente	0,058719
Somma quadr. Residui	0,003974	E.S. della regressione	0,006720
R-quadro	0,990631	R-quadro corretto	0,986904

Figure 8

Modello 9: OLS, usando le osservazioni 1-124
Variabile dipendente: Teleworkers

	Coefficiente	*Errore Std.*	*Rapporto t*	*p-value*	
const	0,0498943	0,0107210	4,654	<0,0001	***
Videoconferencing	0,0254649	0,00916553	2,778	0,0067	***
Publicauthorities	0,0192172	0,00965410	1,991	0,0496	**
Abovebasicdigitalskills	0,0486177	0,0170610	2,850	0,0054	***
UnemploymentRate	−0,115326	0,0505328	−2,282	0,0249	**
Austria	0,0109628	0,00307111	3,570	0,0006	***
Belgium	0,00971263	0,00409840	2,370	0,0200	**
Bulgaria	−0,0449100	0,00457686	−9,812	<0,0001	***
Cyprus	−0,0593509	0,00527666	−11,25	<0,0001	***
CzechRepublic	−0,0453086	0,00364191	−12,44	<0,0001	***
Denmark	0,0293116	0,00413669	7,086	<0,0001	***
Estonia	0,0320310	0,00328458	9,752	<0,0001	***
Greece	0,00840944	0,00832419	1,010	0,0351	**
Spain	0,0213649	0,00659134	3,241	0,0017	***
Finland	0,0605582	0,00420656	14,40	<0,0001	***
France	0,0373334	0,00362388	10,30	<0,0001	***
Croatia	−0,0346589	0,00446339	−7,765	<0,0001	***
Hungary	−0,0199341	0,00334064	−5,967	<0,0001	***
Ireland	−0,00478752	0,00329770	−1,452	<0,0001	***
Iceland	0,132047	0,00503574	26,22	<0,0001	***

Italy	−0,0123662	0,00429137	−2,882	0,0050	***
Lithuania	−0,0190399	0,00413484	−4,605	<0,0001	***
Luxembourg	0,0289489	0,00403156	7,181	<0,0001	***
Latvia	0,00894487	0,00402461	2,223	0,0288	**
Malta	0,0394151	0,00334698	11,78	<0,0001	***
Netherlands	0,0935302	0,00389063	24,04	<0,0001	***
Norway	0,126812	0,00440660	28,78	<0,0001	***
Poland	−0,0156585	0,00373502	−4,192	<0,0001	***
Portugal	−0,00477041	0,00367055	−1,300	0,0971	**
Romania	−0,0521215	0,00436679	−11,94	<0,0001	***
Sweden	0,119577	0,00426948	28,01	<0,0001	***
Slovenia	0,0233300	0,00336519	6,933	<0,0001	***
Slovak	0,00275582	0,00356552	0,7729	0,0416	*
UK	0,0577478	0,00360767	16,01	<0,0001	***
Serbia	−0,00613137	0,00619075	−0,9904	0,0347	*

Media var. dipendente	0,106993	SQM var. dipendente	0,058719
Somma quadr. Residui	0,001612	E.S. della regressione	0,004255
R-quadro	0,962000	R-quadro corretto	0,964748
F(34, 89)	686,2142	P-value(F)	3,28e-94
Log-verosimiglianza	521,6016	Criterio di Akaike	−973,2031

Figure 9

	Learning	Videoconferencing	Publicauthorities	GDPICT	Aboveskillsdigital	Unemployment Rate	GDPper capita	Austria	Belgium	Bulgaria	Cyprus	CzechRepublic	Denmark	Estonia	Greece	Spain	Finland	France	Croatia	Hungary	Ireland	Iceland	Italy	Lithuania	Luxembourg	Latvia	Malta	Netherlands	Norway	Poland	Portugal	Romania	Sweden	Slovenia	Slovak	UK	Serbia	
	1	0,0185	-0,0126	0,0587	0,0104	-0,0205	0,116	-0,0322	-0,1442	-0,1173	-0,1204	-0,0749	0,1133	-0,126	0,031	0,2057	-0,0515	-0,0869	-0,1346	-0,0691	0,4708	-0,0782	-0,0041	0,1398	-0,0394	-0,0232	-0,0013	0,0757	-0,132	0,076	-0,0593	0,2102	0,0018	-0,11	0,1392	-0,0149	-0,1157	Learning
		1	0,3553	0,0957	0,6262	-0,2898	0,195	-0,1611	-0,0316	0,1284	0,2686	-0,1115	0,2503	-0,0002	-0,0959	-0,1695	-0,0343	-0,2019	-0,033	0,0468	-0,109	0,1802	-0,2022	0,1864	0,11	0,0354	0,016	0,0699	0,1564	-0,1707	-0,2092	-0,1577	0,1573	-0,1375	0,0152	0,0669	0,133	Videoconferencing
			1	0,1424	0,8148	-0,3792	0,7345	0,0475	-0,053	-0,222	-0,1368	-0,1513	0,2605	0,0541	-0,2071	-0,0313	0,2356	0,0591	-0,1792	-0,0754	-0,0219	0,3715	-0,1499	-0,1305	0,2122	-0,0836	-0,0859	0,2641	0,3411	-0,1449	-0,118	-0,2594	0,2605	0,0301	0,0006	0,0674	-0,2196	Publicauthorities
				1	0,2153	-0,4295	-0,0975	-0,0825	-0,0398	0,1779	-0,3154	0,0436	0,0912	0,1242	-0,2839	-0,1151	0,1009	-0,0005	0,0292	0,2514	0,0955	-0,1399	-0,1091	-0,1646	-0,3541	0,0425	0,4911	0,0798	-0,0894	-0,1191	-0,0564	-0,0836	0,3273	-0,0575	0,0271	0,2596	-0,18	GDPICT
					1	-0,4757	0,6331	-0,0671	0,1369	-0,1956	0,0078	-0,0881	0,2343	0,0674	-0,2015	-0,0776	0,1064	-0,1561	-0,1667	0,0488	-0,0202	0,4167	-0,2492	-0,0578	0,212	0,005	0,0438	0,2112	0,3015	-0,204	-0,1133	-0,2524	0,1886	-0,1781	-0,0198	0,1963	-0,1543	Aboveskillsdigital skills
						1	-0,2447	-0,088	-0,0269	-0,062	0,1234	-0,1987	-0,0767	-0,071	0,5993	0,4241	0,0319	0,0929	0,1212	-0,1388	-0,0269	-0,1886	0,1675	-0,0133	-0,0653	0,0432	-0,1456	-0,1219	-0,1456	-0,1173	0,0579	-0,1106	-0,0201	-0,0507	0,016	-0,1332	0,284	Unemployment Rate
							1	0,0946	0,0739	-0,2173	-0,0466	-0,1046	0,2002	-0,1339	-0,1047	-0,0347	0,0852	0,046	-0,1634	-0,1585	0,2801	0,1059	-0,0149	-0,1512	0,5552	-0,1632	-0,0679	0,1305	0,4146	-0,1599	-0,1024	-0,1967	0,1559	-0,0841	-0,1286	0,0457	-0,2307	GDPper capita
								1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Austria
									1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Belgium
										1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Bulgaria
											1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Cyprus
												1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	CzechRepublic
													1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Denmark
														1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Estonia
															1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Greece
																1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Spain
																	1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Finland
																		1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	France
																			1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Croatia
																				1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Hungary
																					1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Ireland
																						1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Iceland
																							1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Italy
																								1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Lithuania
																									1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Luxembourg
																										1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Latvia
																											1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Malta
																												1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Netherlands
																													1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Norway
																														1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Poland
																															1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Portugal
																																1	-0,0333	-0,0333	-0,0333	-0,0333	-0,0333	Romania
																																	1	-0,0333	-0,0333	-0,0333	-0,0333	Sweden
																																		1	-0,0333	-0,0333	-0,0333	Slovenia
																																			1	-0,0333	-0,0333	Slovak
																																				1	-0,0333	UK
																																					1	Serbia

•