NICOLAUS COPERNICUS UNIVERSITY IN TORUŃ

Bulletin of Geography. Socio-economic Series, No. 67 (2025): 165-173
https://doi.org/10.12775/bgss-2025-0010

BULLETIN OF GEOGRAPHY. SOCIO–ECONOMIC SERIES

journal homepages:
https://apcz.umk.pl/BGSS/index
https://www.bulletinofgeography.umk.pl/

Sectoral specialization and telework possibility: the case of Greek regions

Manolis Christofakis[1, CMR], **Maria Ganapi**[2, CDFMR]

University of the Aegean, Department of Business Administration, Chios, Greece, [1]e-mail: mchri@aegean.gr (*corresponding author*), [1]https://orcid.org/0009-0005-7416-0378; [2]e-mail: mariaganapi@gmail.com (*corresponding author*), https://orcid.org/0009-0009-5754-1784

How to cite:
Christofakis, M., & Ganapi, M. (2025). Sectoral specialization and telework possibility: the case of Greek regions. *Bulletin of Geography. Socio-economic Series,* 67(67): 165-173. DOI: http://doi.org/10.12775/bgss-2025-0010

Abstract. Research and policy efforts have focused on the expansion of teleworking over the last few years, especially during the Covid-19 pandemic. However, not all occupations and areas are suitable for teleworking. Using the Location Quotient and Pearson's correlation coefficient index, this study examined the relationship between sectoral specialization and the possibility of telework at regional level in Greece, in order to identify the most suitable economic sectors and regions for telework. Spatial sectoral differentiation is related to the extent of telework diffusion, which appears to be more common in the tertiary sector. Teleworking appears to have exacerbated regional disparities in areas more specialized in trade and tourism activities. A contemporary digital strategy could contribute to a more balanced development of the country. These developments may reverse existing trends in the attractiveness of telecommuting in metropolitan areas and large urban centers.

Article details:
Received: 08 February 2024
Revised: 02 December 2024
Accepted: 27 March 2025

Key words:
telework,
working from home (WfH),
regional sectoral,
specialization,
Covid-19,
Greece

Contents:

1. Introduction

Teleworking constitutes a new way of organizing and managing work (Mahler, 2012). The literature suggests that telecommuting is more suited to collaborative management structures (Taskin & Edwards, 2007), with a large degree of autonomy in achieving goals (Day & Burbach, 2011). Historically, the Greek economy has been dependent on small and medium-sized enterprises (PwC, 2020b) and on economic activities involving interactive service provision – more so than other European countries. Prior to the Covid-19 pandemic, telecommuting was more prevalent in "knowledge-intensive" professions that relied primarily on the use of laptops. Telecommuting was more common in those jobs that needed a lot of expertise and high qualifications (Betz et al., 2012; Berastegui, 2021). It was found to be marginally implemented in European Union member states. The motivations for telecommuting implementation were cited as the individual flexibility of workers, balance between work and family, greater satisfaction, and less distraction at work (Ruth & Chaudhry, 2008). The use of ICTs is a key component of teleworking (Nilles, 1975; Messenger et al., 2017). Despite the evolution of IT technologies, the practice of teleworking was slow to be adopted, mainly due to the work culture (Messenger et al., 2017; Llave & Weber, 2020). The absence of telework in many advanced economies suggests that the spread of ICTs alone is not sufficient to promote telework (Lopez-Igual & Rodriguez-Modrono, 2020). It appears that the Covid-19 pandemic has led to a permanent shift in the organization of work. (OECD, 2020; PwC, 2020a) and also posed a fundamental question regarding the occupations that can be practiced from home. Professions in the field of finance and scientific services can be practiced from home, unlike occupations in the sector of agriculture, accommodation and restaurant services, and trade, which cannot be done from home (Dingel & Neiman, 2020). In this context, a topic of interest, which is also the scope of this paper, is whether the sectoral specialization of the spatial units (regions) in Greece correlates with the spread of teleworking practices in these regions. The added value of the present study is the investigation of the relationship that the sectoral specialization of a region may have with the possibility of WfH. The implementation of teleworking practices in the future could be a shield for the economy in times of crisis, contribute to the economic development of a region or contribute to a more balanced development of the Greek space. Previews research has shown interest in the factors that affect teleworking (Baruch & Nicholson, 1997; Belzunegui-Eraso & Erro-Garces, 2020). The establishment of teleworking does not concern its entire economy but sectors and professions in which its general establishment is possible. The role of teleworking, given its significance in modern work environments, has become increasingly important. The rate of telework in Greece is among the lowest in the EU, estimated at 4.3% in 2009 and 5.3% in 2019 (National Institute of Labor and Human Resources, 2020). As telecommuting becomes more widespread, the factors considered important to telecommuting are changing and new groups of workers are becoming eligible (Ellder, 2019). The prevalence of telecommuting is greater in large urban areas than in smaller areas, and even less in rural areas (Vilhelmson & Thulin, 2016). Weaker socio-economic groups lag behind in the use of the Internet, which means high social inequalities. The gap is more pronounced in the countries of the south of Europe compared to the countries of the north and west of Europe (Rontos et al., 2014). The widespread adoption of telecommuting may contribute to reducing inequality between urban and rural areas, as well as between city centers and their suburbs (Murray Svidronova et al., 2016). However, WfH could have heterogeneous effects in different regions within a country and intensify regional disparities if the share of jobs that can be done from home is unevenly distributed within a country (Irlacher & Koch, 2021). The regional structure of the Greek economy maintains significant regional inequalities that are related to the allocation of population and activities over space and differences relating to a number of significant development indicators (GDP and GDP per capita). The metropolitan regions of Attiki and Kentriki Makedonia constitute 35.5% and 17.5% of the population, respectively, in the years 2020 and 2019. Approximately 35–37% of Greek professions are suitable for teleworking (Pouliakas, 2020).

The structure of this paper is as follows: the purpose of this section has been to provide an overview of the literature on telecommuting and the factors that affect the way work is done in this setting. Reference is made to studies that examine the professions that are most suitable for telecommuting, and their spatial spread, while at the same time the position of Greece in relation to other European countries is identified, regarding the application of teleworking. In the next section (2) the data used are described and the research method is presented. Section 3 describes the empirical findings. Finally, in section 4, we come to some conclusions and issues for further research.

2. Data and method

We used time series from the National Statistical Authority of Greece (ELSTAT) at NUTS II level for population distribution and education level in the Greek space for the years 2019 and 2020 (latest available at the time this study was conducted) to examine the comparative position of the Greek regions and establish a correlation between it and the possibility of teleworking. In addition, Work from Home data from the labor force survey conducted by the ELSTAT quarterly survey for the years 2019 and 2020 at NUTS II level were also used. The detailed classification of economic branches was based on the Statistical Classification of Economic Activities (STAKOD 08) (Table 1). Furthermore, we utilized EUROSTATs "Usually" WfH employment data obtained from the Human Resource survey for the years 2019 and 2020 at NUTS II level. The LQ index of Usually WfH was calculated using the data from this survey and is presented in Table 3. For the purposes of our research, we consider that WfH is conducted using information and communication technologies. We used quarterly data of WfH for the six summary sectors (Table 1) and calculated the annual average for each sector for the years 2019 and 2020 at NUTS II level (Table 3). The above-mentioned average (Table 3) was used to calculate WfH at regional level using the branch's employment by region. Pearson's correlation coefficient, as detailed in below, was calculated using the estimated figures.

The regions at NUTS II level within the Greek Territory, as classified by EUROSTAT, are shown in Figure 1. The assignment of EUROSTATs area codes to regions of the Greek territory is shown in Table 2.

2.1. Location Quotient (LQ)

We used the Location Quotient (LQ) index to determine the economic branches in which the Greek regional economy is specialized (compared to the national average). Furthermore, we used data for Usually WfH per region in order to calculate LQ for the Usually WfH data and examine the regions with a greater concentration of WfH than the entire country. In the latter case, EUROSTATs data for Usually WfH were used, instead of data derived from estimates by applying the average WfH rate by economic branch to total employment in each economic branch. We considered that the use of actual data could better describe the conditions that apply in each region, as compared to WfH data derived from estimates. The uniform application of the average WfH rate of each economic branch in each region neglects regional peculiarities that may affect WfH.

LQ is a reliable and widely used method, despite several methods being used for this purpose. Some traditional methods include minimum requirements technique and Krugman Specialization Index for measuring sectoral specialization, shift-share analysis for assessing competitiveness and interregional input–

Fig. 1. The NUTS II Greek regions
Source: Eurostat — GISCO, 02/2020

Table 1. ELSTAT's Occupational Classification detailed and summarized per STAKOD08

A/A	Description	Detailed	Summarized
1.	Agriculture, forestry, etc.	01–03	01–03
2.	Industry and energy, etc.	05–39	05–39
3.	Construction	41–43	41–43
4.	Trade, transportation, accommodation, etc.	45–59	45–61
5.	Information and communication	61	
6.	Financial and insurance activities	62–66	62–82
7.	Real-estate activities	68	
8.	Professional, scientific and technical activities, etc.	69–82	
9.	Public administration, education, etc.	84–88	84–99
10.	Other services (Arts, entertainment, etc.)	90–99	

Source: ELSTAT and authors

output models for understanding inter-industry linkages across regions. More recent techniques are econometric approaches such as linear or spatial and panel data regression models which assist in quantifying specialization effects, while the time series models such as Autoregressive Integrated Moving Average models, Vector Autoregression and Vector Error Correction Model, capture specialization dynamics over time (Parteka, 2010; Gkouzos & Christofakis, 2018; Masouman & Harvie, 2020).

By combining the LQ calculations of sectoral specialization with data for Usually WfH in the period prior to and during the Covid-19 pandemic, we will examine whether the specialization of each region could be a factor associated with the spread of teleworking. LQ is remarkably effective at quickly identifying industries or occupations that stand out because of their higher-than-average national employment (LQ>1). It is an analytical measure of a region's sectoral specialization compared to a larger geographic unit, usually the nation. It is calculated as a sector's share of a regional total for a used variable (i.e., earnings, employment, etc.) divided by the sector's share of the national total for the same variable. By comparing a sector's or occupation's share of regional employment with its share of national employment, we can draw up some conclusions about the sector's concentration in the region and the nation. It is calculated as follows, (Isard, 1960; Isserman, 1977):

$$\mathrm{LQir} = \frac{Eir}{Er} / \frac{Ein}{En}$$

Eir = Employment of sector *i* in region *r*.
Er = Total employment in region *r*.
Ein = Employment of sector in the whole country
En = Total employment of the country

In this study, the WfH employment represents the sector under examination for its share to the regional and national employment for the year 2020. The 13 NUTS II spatial units of Greece serve as the regions for the calculation of the LQ index.

2.2. Pearson's linear correlation coefficient

The next step in our research is to examine the existence of a correlation between the regional sectoral specialization and sectoral employment of WfH at regional level. In our study, we used Pearson's linear correlation coefficient (Rodgers & Nicewander, 1988), which is usually used for normally distributed data. To calculate the coefficient, we used data obtained from an estimate by applying the average rate of WfH to total employment by sector and region. These data were considered suitable for the calculation of the coefficient, which examines the existence of a linear correlation between the sector and WfH. Correlation examines the relationship between the values of two characteristics without specifying a causal relationship in the formation of

pairs of characteristic values. One of the correlation measures is the covariance given by the formula:

$$r = \frac{\sum_r (x_r - \bar{x})(y_r - \bar{y})}{n \sigma_x \sigma_y}$$

Where:
X_r and Y_r are all pairs of values of the two characteristics in all spatial units;
n is the number of spatial units;
$\bar{x}$, $\bar{y}$ are the sample means of the variables; and
σx, σy are the sample standard deviations of the variables.

The Pearson's linear correlation coefficient examines the relationship between two regional characteristics in terms of a straight line (Papadaskalopoulos, 2000). Its value ranges from -1 to +1. The correlation coefficient is positive if large values of the variable X correspond to large values of Y and vice versa. Accordingly, r takes negative values when the large values of one variable correspond to the small values of the other. The 13 NUTS II regions of Greece serve as the spatial units for the coefficient. For each sector of employment by region, its participation rate in the total employment of the region is the variable X which is examined for a correlation with the variable Y, which is the percentage of WfH per region to total employment of the respective region. The calculation applies to the years 2019 and 2020. Data on telecommuting by economic branch and region were not available at the time of our research. To calculate Pearson's coefficient, a transformation of the employment data was required. The ELSTAT employment data for the years 2019 and 2020 were transformed to match the classification of the summarized branches for which there were WfH data (Table 1). Furthermore, the quarterly WfH rates were converted to annual average, which was applied to each region's employment data in order to estimate the number of home workers for each branch and region.

3. Findings

3.1. Location Quotient (LQ)

Previous research has indicated that high rates of teleworking are observed in the sectors of telecommunications and financial services, among highly skilled and qualified workers and among employees who primarily work through computers. As shown in Table 2, in the Region of Attiki (where the capital city of Athens is located), most occupations of the tertiary sector show high specialization (LQ>1). The same applies to the Usually WfH LQ index in this region (Table 3), probably due to the high degree of urbanization and the high concentration of professions that could be practiced from home (Vilhelmson and Thulin, 2016). The insular, border islands of Voreio Aigaio specialize in occupations of the primary and secondary sectors and to some extent in the tertiary sector with a lower tourism development than the insular region of Notio Aigaio. The Usually WfH LQ index is less than one in the insular regions of Voreio, Notio Aigaio and Kriti, which could be justified by the sectors in which these regions are specialized (agriculture, trade and tourism). Prior to the Covid-19 pandemic, the Usually WfH LQ index was found to be greater than one in the region of Kentriki Makedonia, which includes the city of Thessaloniki, being the second largest urban center of the country. Within the Attiki metropolitan region, the concentration of tertiary sector occupations is higher than that observed in the rest regions, indicating a greater prevalence of WfH. The prevalence of WfH is less pronounced in regions with a predominant focus on primary and secondary sector occupations. The increase in WfH during the pandemic in the regions dominated by occupations that do not lend themselves to teleworking may be attributed to the generalized, mandatory application of the teleworking measure to all educational levels and public services.

3.2. Pearson's linear correlation coefficient

Table 4 summarizes the Pearson's Coefficient calculations for each of the employment sectors in the 13 regions of Greece in relation to WfH in these regions. Occupations in the primary sector show a negative average linear correlation to WfH both in the years 2019 and 2020 and no linear correlation between the secondary sector and WfH. Our findings are consistent with previous studies, which have shown that teleworking is difficult to apply in primary and secondary industries. A negative linear correlation with WfH appears to exist with the commercial sector of the economy, transportation and tourism before the Covid-19 pandemic. However, at the onset of the pandemic, the negative linear correlation turns to positive. Based on previous literature research, we would expect a negative linear correlation between occupations in this economic activity and WfH in 2020, as these are occupations that require physical presence and are not conducive to telecommuting. The reported WfH

Table 2. LQ of employment per economic sector of Table 1, for the year 2020 at NUTS II

Regions Code	Regions	Agriculture, forestry	Mining, energy	Construction	Trade, transportation, accommodation	Information & communication	Financial & insurance	Real estate	Scientific activities	Public sector	Other services
30	Attiki	0.08	0.96	0.85	1.01	1.83	1.55	1.53	1.42	1.09	1.31
41	Voreio Aigaio	1.12	0.63	1.18	1.04	0.67	0.75	0.77	0.73	1.24	0.66
42	Notio Aigaio	0.59	0.62	1.43	1.49	0.38	0.49	0.69	0.71	0.79	0.60
43	Kriti	1.43	0.72	1.25	1.18	0.45	0.65	0.61	0.76	0.81	0.77
51	Anatoliki Makedonia, Thraki	2.32	0.90	0.86	0.76	0.45	0.57	0.53	0.63	1.16	0.59
52	Kentriki Makedonia	1.15	1.15	0.85	1.01	0.67	0.79	0.67	1.01	0.95	0.95
53	Dytiki Makedonia	1.55	1.82	1.32	0.78	0.21	0.53	0.57	0.60	1.04	0.73
54	Ipeiros	1.61	0.94	1.42	0.90	0.27	0.55	0.69	0.72	1.13	0.59
61	Thessalia	1.94	1.04	1.05	0.84	0.38	0.55	0.61	0.65	1.10	0.75
62	Ionia Nisia	1.00	0.46	1.37	1.40	0.36	0.55	0.79	0.81	0.73	0.80
63	Dytiki Ellada	1.90	0.84	1.14	0.97	0.52	0.64	0.76	0.56	0.94	0.91
64	Sterea Ellada	1.71	1.93	1.17	0.90	0.35	0.71	0.66	0.51	0.76	0.76
65	Peloponnisos	2.50	0.82	1.20	0.87	0.41	0.66	0.82	0.55	0.81	0.97
Min		0.08	0.46	0.85	0.76	0.21	0.49	0.53	0.51	0.73	0.59
Max		2.50	1.93	1.43	1.49	1.83	1.55	1.53	1.42	1.24	1.31
Median		1.55	0.90	1.18	0.97	0.41	0.64	0.69	0.71	0.95	0.76

Source: own elaboration

Table 3. Usually WfH LQ index by region, for the years 2019 and 2020

Region	LQ Index	
	2019	2020
Attiki	1.47	1.51
Voreio Aigaio	-	0.68
Notio Aigaio	1.03	0.86
Kriti	0.47	0.65
Anatoliki Makedonia, Thraki	0.59	0.55
Kentriki Makedonia	1.34	0.80
Dytiki Makedonia	-	0.71
Ipeiros	-	0.70
Thessalia	-	0.46
Ionia Nisia	1.08	0.65
Dytiki Ellada	0.74	0.99
Sterea Ellada	0.67	0.47
Peloponnisos	0.78	0.56

Source: own elaboration

rates in the commercial sector probably refer to office workers in this sector. Our analysis indicates that occupations in the tertiary sector, such as Financial, Insurance, Real Estate, public sector, etc., exhibit a strong positive linear correlation with WfH in 2019 and 2020. The possibility of telecommuting is not uniform across the tertiary sector, as it includes professions that are more suited to telecommuting, such as those in the education sector, as well as those that require a physical presence, such as those in the health sector. The majority of the tertiary sector occupations showing a positive correlation with WfH are concentrated in large urban centers, where WfH is more widespread. Our findings appear to be consistent with previous research (Ellder, 2019; Betz et al., 2012; Bartik et al., 2020).

4. Conclusions and issues for further research

The Covid-19 pandemic significantly influenced the delivery of employment, with a shift towards WfH. Recent studies have demonstrated that a significant proportion of occupations in advanced economies are suited to telecommuting. Greece experienced a very low pre-pandemic percentage of WfH. The sectoral specialization of the regions of Greece and possibility of spreading teleworking could be a driving force for the development and strengthening of the regional economy, which show a high degree of concentration of the population around the large urban centers of Athens and Thessaloniki (Christofakis & Gkouzos, 2013). Our study concludes that sectoral specialization is related to the spread of WfH in the region of Attiki, as the literature suggests. In most of the remaining areas of Greece, specialization is observed mainly in the fields of primary and secondary sector, which rank in the bottom of WfH eligibility. Indeed, the LQ value for WfH was found to be less than one, and, moreover, a negative linear correlation between occupations of these sectors and WfH was observed. Furthermore, several regions were found to specialize in the public sector, and a positive linear correlation with WfH was found. With the exception of the Defense and Health sectors, most of them show a high degree of compatibility with teleworking. Our findings suggest that spatial sectoral differentiation is related to the

Table 4. Average (%) WfH and Pearson's correlation coefficient of estimated WfH per sector at NUTS II

Sector	Annual average WfH (%)		Pearson's Correlation Coefficient r	
	2019	2020	2019	2020
Agriculture, forestry, etc.	2.90	3.25	-0.6207	-0.5381
Mining, energy, etc.	2.43	4.83	-01514	-0.1681
Construction	3.23	5.15	-0.5358	-0.5804
Trade, transportation, accommodation, etc.	2.93	5.48	0.0223	-0.0332
Financial & insurance activities	11.98	22.33	0.8860	0.8793
Other services	7.90	17.05	0.7542	0.7858

Source: own elaboration

extent of the diffusion of WfH. The implementation of teleworking appears to have exacerbated regional disparities in areas more specialized in trade and tourism activities. Nonetheless, could it be feasible to rectify this disparity and achieve a more equitable distribution of labor force in the Greek regions? Telecommuting could address spatial divides by reshaping the geography of local employment and reducing urban congestion. The COVID-19 crisis can be seen as an opportunity to accelerate the dissemination of the economic advantages of tourism to lagging regions. Digital Nomads could act as a catalyst for the economic development of a region and reduce disparities. Spatially targeted policies that focus on digital infrastructure (Gbohoui, et al., 2019), a favorable regulatory environment for telecommuting, appropriate public infrastructure (OECD, 2022) and digital infrastructures (Williams et al., 2016) could strengthen businesses and tourism in lagging regions. These developments may reverse existing trends in the attractiveness of telecommuting in metropolitan areas and large urban centers.

Finally, some issues for further research should be highlighted. During the course of conducting this study, there were some data limitations. First, there were no available data in ELSTAT at NUTS III level for the population and employment for the reference years. Second, instead of regional Usually WfH and quarterly sectoral WfH, there were no other (sectoral and regional) available teleworking employment data for Greece in ELSTAT or EUROSTAT for the reference years. We believe that it would be of scientific interest for the findings of our research to be re-examined in the future, in the light of sufficient statistical data on teleworking in Greece at a higher level of analysis both in terms of quality and quantity.

References

Baruch, Y. & Nicholson, N. (1997). Home Sweet Work: Requirements for Effective Home Working. *Journal of General Management,* 23(2): 15-30. DOI: http://doi.org/10.1177/030630709702300202.

Bartik, A., Cullen, Z., Glaeser, E., Luca, M., & Stanton, C. (2020). What Jobs are Being Done at Home During the Covid-19 Crisis? Evidence from Firm-Level Surveys. *National Bereau of Economic Research,Working Paper,* 27422: 1-16. DOI: http://doi.org/10.3386/w27422.

Belzunegui-Eraso, A. & Erro-Garces, A. (2020). Teleworking in the Context of the Covid-19 Crisis. *Sustainability*, 12(9): 1-18. DOI: http://doi.org/10.3390/su12093662.

Berastegui, P. (2021). Teleworking in the aftermath of the Covid-19 pandemic, European Trade Union Institute (ETUI), Covid-19 impact series. European Economic, Employment and Social Policy Brief.

Betz, F., Riegler, J., & Schwartz, I. (2012). Deployment of Telework in European Public Administrations (an overview). Eurofound (Vienna: Center of Social Innovation).

Christofakis, M. & Gkouzos, A. (2013). Regional Specialization And Efficiency Of The Agricultural Sector In Greece: The Relationship With Regional Funding Allocation. *Regional and Sectoral Economic Studies*, 13(1): 119-130.

Day, F.C. & Burbach, M.E. (2011). Telework considerations for public managers with strategies for increasing utilization. *Communications of the IBIMA*, 1-18.

Dingel, J. & Neiman, B. (2020). How many jobs can be done at home? *Journal of Public Economics*, 189: 1-8. DOI: http://doi.org/10.1016/j.jpubeco.2020.104235.

Ellder, E. (2019). Who is Eligible for Telework? Exploring the Fast Growing Acceptance of and Ability to Telework in Sweden 2005–2006 to 2011–2014. *Social Sciences*, 8(7): 1-16. DOI: http://doi.org/10.3390/socsci8070200.

Gbohoui, W., Lam, W.R., & Lledo, V.D. (2019). *The great divide: Regional inequality and fiscal policy*. International Monetary Fund.

Gkouzos, A. & Christofakis, M. (2018). Multiplier effects under adisaggregate economic base model: Evidence from Greek non-metropolitan prefectures. *Journal of Economic Studies*, 45(2): 383-400.

Irlacher, M. & Koch, M. (2021). Working from Home, Wages, and Regional Inequality in the Light of COVID-19. *Journal of Economics and Statistics*, 241(3): 1-31. DOI: http://doi.org/10.1515/jbnst-2020-0030.

Isard, W. (1960). *Methods of Regional Analysis: An Introduction to Regional Science*. Massachusetts Institute of Technology (USA).

Isserman, A. (1977)\. The Location Quotient Approach to Estimating Regional Economic Impacts. *Journal of the American Institute of Planners*, 43(1): 33-41. DOI: http://doi.org/10.1080/01944367708977758.

Llave, O. & Weber, T. (2020). *Regulations to address work–life balance in digital flexible working arrangements*, Eurofound (Luxembourg: Industrial Research Report).

Lopez-Igual, P. & Rodriguez-Modrono, P. (2020). Who is Teleworking and Where from? Exploring the Main Determinants of Telework in Europe. *Sustainability,* 12(21): 1-15. DOI: http://doi.org/10.3390/su12218797.

Masouman, A. & Harvie, C. (2020). Forecasting, impact analysis and uncertainty propagation in regional integrated models: A case study of Australia. *Environment and Planning B: Urban Analytics and City Science*, 47(1): 65-83. DOI: http://doi.org/10.1177/2399808318767128.

Mahler, J. (2012). The Telework Divide: Managerial and Personnel Challenges of Telework. *Review of Public Personnel Administration*, 32(4): 407–418. DOI: http://doi.org/ 10.1177/0734371X12458127.

Messenger, J., Llave, O., Gschwind, L., Boehmer, S., Vermeylen, G., & Wilkens, M. (2017). *Working anytime, anywhere: The effects on the world of work*. Luxenburg and Geneva: Joint Report Eurofound and the International Labour Office.

Murray-Svidronova, M., Mikusova-Merickova, B. & Nemec, J. (2016). Telework in Public Sector Organizations: The Slovak National Library. *International Public Administration Review*, 14(2–3): 121–137. DOI: http://doi.org/10.17573/ipar.2016.2-3.06.

National Institute of Labor and Human Resources (2020). Teleworking in EU before and after the Covid-19 pandemic (in Greek) Newsletter No 3.

Nilles, J. (1975). Telecommunications and Organizational Decentralization. *IEEE Transactions on Communications*, 23(10): 1142-1147.

OECD. (2020). Productivity gains from teleworking in the post Covid-19 era: How can public policies make it happen?, Tackling coronavirus (Covid-19): Contributing to a global effort. Available at: https://www.oecd.org/coronavirus/policy-responses/productivity-gains-from-teleworking-in-the-post-covid-19-era-how-can-public-policies-make-it-happen-a5d52e99/ (Accessed: 10 January 2023).

OECD. (2022). Assessing teleworking strategies for local development: a framework proposal. Available at: https://www.oecd.org/cfe/leed/Assessing-teleworking-strategies-for-local-development-PAT.pdf. Accessed: 10 January 2023.

Papadaskalopoulos, A. (2000). *Regional Analysis Methods* (in Greek). Papazisis Publications, Athens.

Parteka, A. (2010). Employment and export specialisation along the development path: some robust evidence. *Review of World Economics*, 145: 615–640. DOI: https://doi.org/10.1007/s10290-009-0037-y.

Pouliakas, K. (2020). Working at home in Greece: Unexplored Potential at Times of Social Distancing. Institute of Labor Economics (IZA), DP No. 13408.

PwC. (2020a). The future of work. Thinking beyond: How the pandemic is rewiring a new world of work.

PwC. (2020b). The effects of the pandemic in Greek businesses (in Greek).

Rodgers, J & Nicewander, A. (1988). Thirteen Ways to Look at the Correlation Coefficient. *The American Statistician*, 42(1): 59-66. DOI: https://doi.org/10.1080/00031305.1988.10475524.

Rontos, K., Nagopoulos, N. & Tsapala, F. (2014). Social Elites and New Communication Methods/ Information Technologies: The Digital Devide. *Archives of Business Research*, 2(5): 29-46.

Ruth, S. & Chaudhry, I. (2008). Telework: A Productivity Paradox? *IEEE Internet Computing*, 12(6): 87-90. DOI: https://doi.org/10.1109/MIC.2008.132.

Taskin, L. & Edwards, P. (2007). The possibilities and limits of telework in a bureaucratic environment: lessons from the public sector. *New Technology, Work and Employment*, 22(3): 195–207. DOI: https://doi.org/10.1111/j.1468-005x.2007.00194.x.

Vilhelmson, B. & Thulin, E. (2016). Who and where are the flexible workers? Exploring the current diffusion of telework in Sweden. *New Technology, Work and Employment* 31(1): 77-96. DOI: https://doi.org/10.1111/ntwe.12060.

Williams, F., Philip, L., Farrington, J & Fairhurst, G. (2016). Digital by default and the hard to reach: Exploring solutions to digital exclusion in remote rural areas. *Local Economy*, 31(7): 757-777. DOI: https://doi.org/10.1177/0269094216670938.