Digital Divide from the Regional Perspective: The case of Turkey

While COVID-19 has caused a health crisis in the world, it has also brought with it an economic and social crisis. Due to the danger of infection, countries had to close their workplaces and schools for certain periods during the epidemic to reduce physical contact. The role of information communication technologies (ICT) in social distancing rules has been critical in ensuring the continuity of personal and commercial services (Papagiannidis et al., 2020). Many companies have adapted to the new normal and started the remote working model through digital systems (Carroll & Conboy, 2020 and De et al., 2020).

Developments in ICT cause changes in the economic and social structure of countries. The digital divide deepening in the information age has become a critical policy issue not only for communication tools but also in economic, social and policy areas (Kagami et al., 2004:62). The rapid development experienced on a global scale may cause inequalities between regions in terms of access and use of ICT. In addition to the existing economic and social differences between developed and undeveloped countries, the inequality "digital divide" brought by ICT is due to the difference between those who have access to information and communication technologies and those who do not (Compaine, 2001 and Van Djik, 2006). In the literature, the digital divide is defined at three different levels. The first level of the digital divide is defined by access to the internet and various other ICT tools (Dimaggoi et al., 2004; van Dijk, 2006). The second level is due to the differences in the use of digital resources (van Duerson & van Dijk, 2011; van Deursen & Mossberger, 2018). Although individuals have equal access to the internet, their skills and knowledge in internet use are not the same (Ferreira et al., 2021). The third level of the digital divide stems from different levels of access and use of digital resources (Selwyn, 2004). Studies involving the digital divide at the third level are important because they are intended to explain the social, cultural, economic, political and regional consequences of the digital divide, and these are the offline consequences of the real world (van Duerson and Helper, 2015) Existing studies examining the ICT index for Turkey investigate the relationship between ICT and economic growth (Guvel and Aytun, 2009; Ozkan and Celik, 2018, Tunalı and Guz, 2021). There are studies at the regional level using the ICT index for Turkey (Taso et al, 2015; Rencber, 2019; Koramaz, et al 2019) and studies examining the effect of ICT on Turkey's export performance (Aykulteli and Tongur, 2020).

While the COVID-19 process, which affects the whole world on a global scale, accelerates the digitalization process, this process has revealed the importance of access to ICT tools. In addition to the economic and social inequalities between developed and undeveloped regions, the digital divide that has been on the agenda since the 90s is defined by whether individuals have access to ICT or not. However, the competence of individuals using ICT tools is not the same, which leads to the digital divide. The necessity of accessing and using ICT in remote working and

education conditions during the pandemic period has made digital inequalities even more visible. The previous spatial studies in Turkey explained the differences between regions with topics such as unemployment, income level and education.

The aim of this paper is to analyze the digital divide brought more importance in the COVID-19 period at the spatial level. Spatial analysis was conducted to evaluate the impact of the underdeveloped provinces on the neighboring provinces and the inequalities that caused the negative situation created by this effect. For this purpose, the ICT development index (IDI) produced by the United Nations Organization International Telecommunications Union (ITU) and used to detect the digital divide in the literature was calculated for the years 2012 to 2020 for 81 provinces in Turkey. The data was provided from the Turkish Statistical Institute, Information Technologies and Communication Authority and Ministry of National Education statistics. Since there is no international bandwidth data per Internet user, the final value calculated for Turkey in the International Telecommunication Union (ITU) for all provinces was used. This index is a combined index covering 11 indicators. Fixed-telephone subscriptions per 100 inhabitants, mobile-cellular telephone subscriptions per 100 inhabitants, international Internet bandwidth (bit/s) per Internet user, percentage of households with a computer and percentage of households with Internet access weight 40% and are included in the ICT access sub-index. Percentage of individuals using the Internet, fixed-broadband subscriptions per 100 inhabitants, active mobile-broadband subscriptions per 100 inhabitants are weight 40% and are included in the ICT usage sub-index. ICT skill indicators are mean years of schooling rate, secondary gross enrolment ratio and tertiary gross enrolment ratio. The weight of these determinants is 20%. Each factor including access to ICT has a weight of 20%, and the factors within ICT usage and ICT skills have a weight of 33%. After the IDI was calculated for both Turkey and each province, the ICT data were normalized as in ITU and brought to values between 1 and 10.

Analysis of spatial dependence at provincial level with IDI values was made using Global Moran's I and Local indicators of spatial association (LISA) test statistics. Global Moran's I statistic is one of the most used statistics in spatial statistics. This statistic is a measure of cross-correlation between the spatial weight matrix and the distance matrix. Global spatial autocorrelation is measured by total clustering. As with other spatial autocorrelation methods, LISA statistic also defines a different spatial weight matrix. After the weight matrix is defined, statistics are obtained on the relevant provincial map.

While the Global Moran's I statistic is used to reveal the spatial relationships of the whole area; LISA statistic gives the result of spatial autocorrelation between a particular area and its neighbors at the local level (Anselin, 1995). Spatial studies are mostly carried out on socio-economic indicators and especially on GDP. This study tries to detect the spatial autocorrelation of the effect of technology. It is

important to evaluate spatial dependence through ICT, as access to and use of ICT is associated with development in the new economy.

According to the findings of the study, it is observed that the provinces with high IDI are mostly clustered in the west, while the low values are clustered in the east. The value of the IDI for Turkey in 2020 is 6.6. Istanbul (7.4); Ankara (6.9); Izmir (6.6); Kilis (6.6) and Eskişehir (6.5) are among the provinces with the highest IDI. This situation is similar to the per capita income ranking of the provinces except for Kilis. Provinces in the top rank in terms of income per capita (TL) mostly have a high IDI. However, it is observed that this relationship between two indicators might be different in some of the provinces. For example, although Tekirdağ and Kırklareli provinces have high per capita income, their IDI's are not in the top 10. Kilis, on the other hand, has a lower per capita income than the average in Turkey. The IDI value of the provinces of Mus, Sirnak, Sanliurfa, Bitlis, Van, Diyarbakır and Siirt in the east is below 5, it is seen that the effects of the provinces in this region are negative.

Moran's I value (0.655) shows that there is a positive autocorrelation for the IDI in most of the provinces in 2020. Unlike the Global Moran's index, it is possible to monitor local relations with the LISA index. While 16 provinces in the high-high (HH) region and 16 provinces in the low-low (LL) region have positive autocorrelation, the province of Manisa with low IDI shows a negative spatial association. In addition to the economic inequality between the provinces in the eastern and western regions, the existing digital inequality has deepened during the pandemic period. It has been seen that the ICT access rates of the provinces are higher than the ICT usage rates and that both the access and usage rates of Istanbul are in an outlier position. In the ranking of the ICT talent index, which measures the ability to use ICT tools, lower values are observed mostly in the provinces in the eastern region.

As a result, this study contributes to alleviating the existing spatial inequalities in Turkey, as well as the negative political, cultural and economic consequences that the digital divide may cause, especially during the epidemic period such as COVID-19.

Keywords: digital divide, ICT, Turkey, Moran's I, spatial inequalities

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