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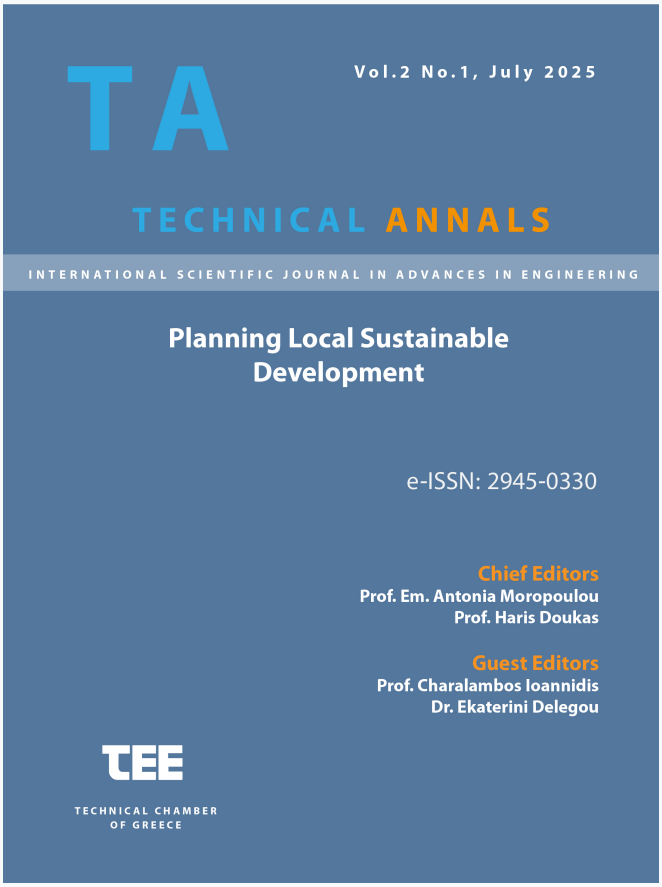

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Sustainable regional development and spatial-social inequalities

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Abstract. In this paper, by theoretically approaching the definition of sustainable regional development, the social inequalities embedded in space and their role in the development of a region are explored. In order to draw conclusions, a comparison of data from the Regional Unity of Xanthi with the national total was made. It is considered that this specific Regional Unity of Greece is of particular interest due to both its demographic composition and its geopolitical location.
Considering that development is directly linked to space and the lagging of certain societies or segments of society in relation to others, and assuming that space has a bidirectional relationship with society, affecting and being affected by it, creating and organizing social relations, while spatial differentiation is a characteristic that defines social inequalities, the theoretical framework is established, and it is investigated whether, in the case of the Regional Unity of Xanthi, social inequalities exist that have spatial expression and lead population groups to social exclusion, while also acting as a hindrance to the region's development.
In this study, data from the Hellenic Statistical Authority (ELSTAT) from the 2021 census were examined and analyzed. The parameters analyzed include: a) the employment rate by sector of economic activity, b) the socio-professional characteristics, and c) the education level of the population, considering that the analysis of these characteristics can address our initial research question.
The study highlights that social inequalities in the Regional Unit of Xanthi have a clear spatial expression, leading to social exclusion of specific population groups and acting as a barrier to the region's development. The data shows that children from poor and disadvantaged groups are less likely to continue to high school or higher education, which intensifies social inequalities. The lack of infrastructure, especially in mountainous areas, creates significant developmental gaps and limits opportunities for economic and social progress. The region exhibits high unemployment rates and low incomes compared to the national average, which exacerbates social and spatial inequalities. To achieve sustainable development, it is proposed to eliminate social and spatial inequalities through improvements in infrastructure, educational programs, strengthening the secondary sector, and supporting agricultural development.

Keywords: Sustainable development, social inequalities, regional development

1 Introduction

Sustainable development was initially defined in the 1987 Brundtland Report of the International Commission on Environment and Development, "Our Common Future," as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Angelidis, 2000). It seeks to reconcile the promotion of economic prosperity with social inclusion and environmental management, and serves as the foundation for all initiatives and policies of the European Union (EU) (Doukas, Y., Maravegias, N., Andreou, G., 2022).

The European Union has played a crucial role in shaping the United Nations' Sustainable Development Goals (SDGs). Since the 1990s, sustainable development has been enshrined in the EU treaties as one of its long-term objectives and a priority in both its external (development cooperation and trade) and internal policies (environment, social exclusion, discrimination) (Doukas, Y., Maravegias, N., Andreou, G., 2022). Priorities for sustainable development have been integrated into the EU's core cross-sectoral agendas as well as sectoral policies and initiatives.

According to the above, we can argue that sustainable development is directly linked to space. We consider that space has a bidirectional relationship with society: it affects and is affected by it, creates and organizes social relations, while spatial differentiation is a characteristic that defines social inequalities (Preteceille, 2006).

Space and society develop dialectical, bidirectional relationships. On the one hand, space is a product of society, and on the other hand, society and its structures are shaped as they develop in space, constituting or reinforcing their distinct characteristics through social interactions. Space, in this sense, is by no means a neutral medium. On the contrary, it serves as a field for the reproduction of social inequalities, intensifies or mitigates social and class differences, and is directly linked to political choices (Rhein, 2003).

In summary, we could argue that space, as a symbolic concept, gives meaning to and organizes social relationships, imposing specific interpretations regarding how we perceive the world and construct our social identity (Checkel, 1999).

Additionally, several scholars (Preteceille 2006) argue about the position of individuals in the productive and, more generally, the economic process, as expressed particularly through the economic and social characteristics of employment, such as unemployment rates and the rates of inclusion in the Economically Inactive Population. For the approach and empirical exploration of this 'social division,' the classification of the employed by the corresponding Statistical Services into 'occupational groups' plays a key role: managerial staff, professionals-scientists-engineers, technicians, traders and salespeople, workers (skilled and unskilled), office clerks, unemployed, etc. Notably, managerial staff and 'professionals-scientists-engineers' have a clearly 'higher' position in the productive process (and consequently higher earnings, etc.) compared to workers and office clerks, while the unemployed and the part-time employed have an even more disadvantaged position in the overall development process. It is assumed from the outset that the groups of 'workers' and 'unemployed' are subject to social division. Additionally, parts of the 'clerical staff' group (especially unskilled workers) are, as an initial assumption, subject to social division.

Within this framework, this paper searches whether social inequalities with spatial expression exist in the case of the Regional Unit of Xanthi, and whether these inequalities constitute an obstacle to the development of the area (Foufri D., 2021).

2 Methods and Materials

In this study a mixed-methods approach was employed to research and analyze the social inequalities and their spatial expression in the Regional Unit of Xanthi. The methodology includes both quantitative and qualitative data collection and analysis.

The study area is the Regional Unit of Xanthi, located in northeastern Greece. This region was selected due to its unique demographic composition and geopolitical significance. The area is characterized by a mix of urban and rural populations, with significant minority groups, including the Pomaks.

The primary source of quantitative data was the Hellenic Statistical Authority (ELSTAT) from the 2021 census. The parameters analyzed include: a) Employment rate by sector of economic activity, b) Socio-professional characteristics and c) Education level of the population.

Qualitative data were collected through interviews and focus groups with key stakeholders in the region, including local government officials, community leaders, and residents. These interviews provided insights into the lived experiences of social inequalities and their spatial manifestations.

The quantitative data were analyzed using statistical methods to identify patterns and correlations between social inequalities and spatial characteristics. Descriptive statistics, such as means and percentages, were calculated to summarize the data. Inferential statistics, such as regression analysis, were used to explore the relationships between variables.

The qualitative data were analyzed using thematic analysis. The interviews and focus group discussions were transcribed, and the transcripts were coded to identify recurring themes and patterns. These themes were then used to contextualize and interpret the quantitative findings.

The study acknowledges certain limitations, including the reliance on self-reported data, which may be subject to bias. Additionally, the cross-sectional nature of the data limits the ability to draw causal inferences.

3 Development of the Regional Unity of Xanthi

The Regional Unity (PE) of Xanthi is located in a strategic geographic position. However, this location, combined with the historical and political circumstances of the area, has acted as a hindrance to its developmental progress.

The borders with Bulgaria remained closed for approximately sixty-five (65) years, while intermittent tensions with neighboring Turkey to the east left little room for development. Additionally, the division of the Regional Unity into mountainous and plain zones, as well as the existence of a coastal strip, clearly shows that there are different

trends and speeds of development, given that the geophysical formation impacts all sectors.

The economic development model followed for many years was primarily based on the concentration of a large percentage of the workforce in the primary sector, while it was characterized by the neglect of key economic factors such as tourism and infrastructure. Since the early 2000s, significant developmental efforts have been made, which were also reinforced by institutional changes related to local governance. However, there is still room for further development (Angelidis, M., Foufri, D., Tsigkas, E., 2018).

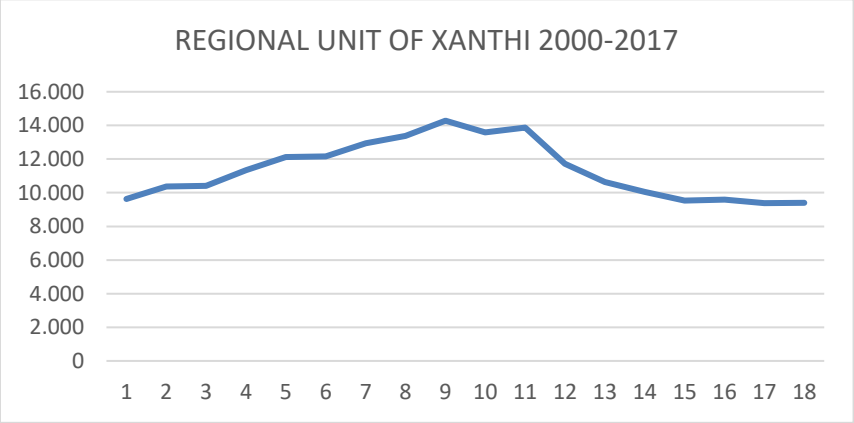

Fig. 1. GDP per capita in the Regional Unity of Xanthi 2000-2017.
Source of data: ELSTAT (2017), own processing 2025

It is worth noting that, as shown in the above chart, until the year 2008, that is, for a seven-year period, the GDP per capita of the Regional Unity of Xanthi showed an upward trend. However, with the outbreak of the economic crisis, and until 2017, the GDP per capita of the Regional Unity continued to decrease.

Specifically, in 2001, the GDP per capita of the area reached 10,710 euros per year, while in 2008 it had increased to 14,537 euros. However, from 2009, a decline began to occur, with the GDP per capita falling to 13,861 euros annually, and by 2017, according to ELSTAT data, it dropped to 9,554 euros.

According to ELSTAT's data from the 2021 census, in the Regional Unity of Xanthi, the percentage of employed people in the primary sector is 13.5%. The corresponding percentage of the employed population in the secondary sector is 26%, while in the tertiary sector, 60.3% are employed, a particularly high percentage compared to the other two sectors. The unemployment rate as a percentage of the economically active population is 20.7%, which is considered very high.

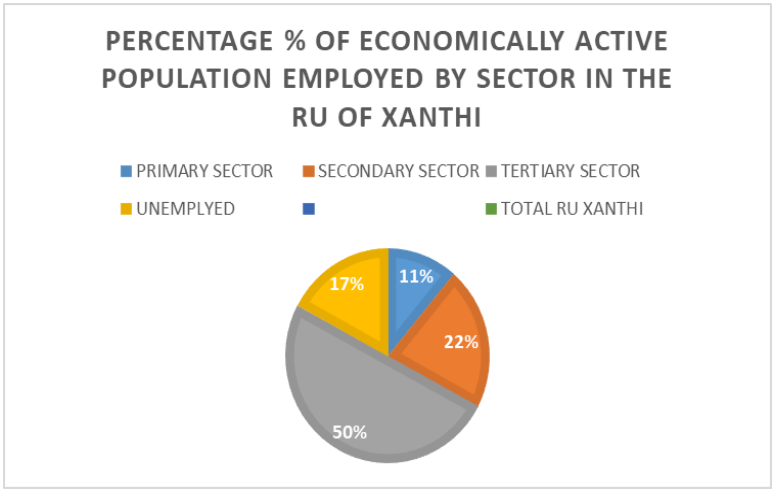

Fig. 2. Employment percentage by sector of economic activity in the Regional Unity of Xanthi. Source of data: ELSTAT (2021), own processing

Regarding the manufacturing sector, it is noted that the completion of the Egnatia Highway project, with its vertical axes, contributed to overcoming the obstacle of reduced competitiveness of the produced goods due to the region's remoteness from the rest of the country. However, it should be noted that the ten-year economic crisis faced by the country during the period 2008-2018 led to the relocation of many businesses in the sector to neighboring countries (e.g. Bulgaria). Additionally, businesses face a lack of skilled personnel, as well as a lack of organized information on modern production and marketing methods.

Finally, in the services sector, as evident from the data, development is observed. However, in the tourism sector, there are issues related to the lack of hotel infrastructure and the promotion of tourism resources. In the commercial sector, there is a lack of organized commercial businesses and established markets, and there is also a significant lack of infrastructure in the areas of Education and Healthcare.

When comparing the data of the Regional Unity of Xanthi with the national total (NT or TC), we observe that at the national level, the percentage of the economically active population employed in the primary sector is 7.8%, in the secondary sector 12.7%, and in the tertiary sector 65.1%, while the unemployment rate as a percentage of the economically active population at the national level is 14.1%.

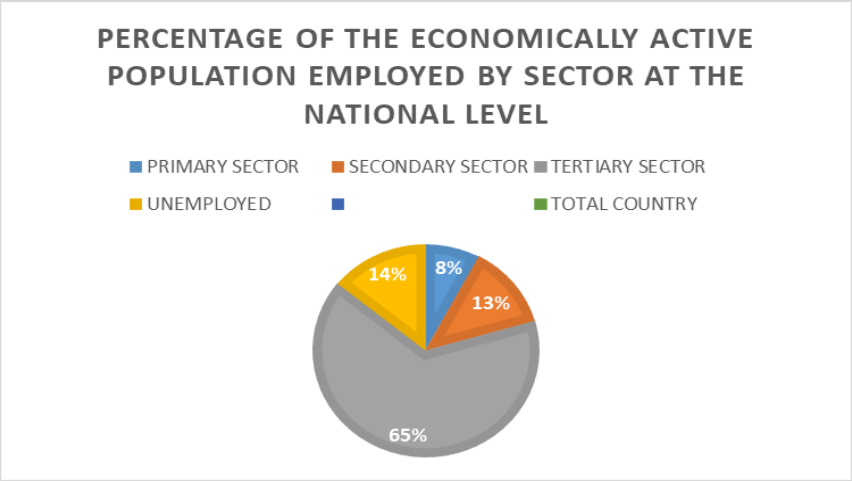

Fig. 3. Percentage of the economically active population employed by sector at the national level. Source of data ELSTAT (2021), own processing

From the above data, it appears that in the Regional Unity of Xanthi, the percentage of the population employed in the primary sector is almost double (13.5%) compared to the national average (7.8%), while the percentage of the economically active population employed in the secondary sector in Xanthi (26%) is approximately 13 percentage points higher than the national average (12.7%). The percentage of those employed in the tertiary sector is approximately the same, but 5 percentage points lower in Xanthi (60.3%) compared to the national total (65.1%). Additionally, the unemployment rate as a percentage of the economically active population in Xanthi is 6 percentage points higher (20.7%) compared to the national rate (14.1%).

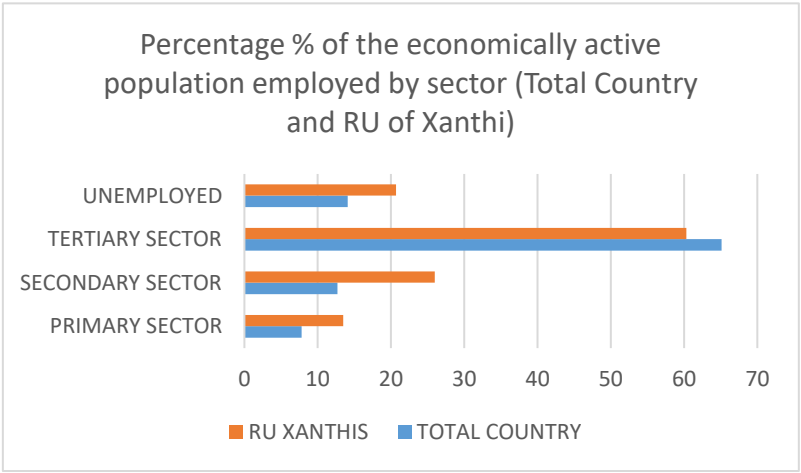

Fig. 4. Comparison of the percentage of the economically active population employed by sector between the national total (NT) and the Regional Unity of Xanthi. Source of data ELSTAT (2021), own processing

In conclusion, based on the data from the latest ELSTAT census (2021), we could argue that the Regional Unity of Xanthi generally follows the development model of the entire country, which is based on the tertiary sector. However, it maintains nearly double the percentage of its economically active population in the primary sector, while also experiencing a significantly higher unemployment rate compared to the national total (NT).

3.1 Socio-professional characteristics in the Regional Unity of Xanthi

Based on the 2021 census, the population of the Regional Unity (RE) of Xanthi is 108,195, showing a decrease of 2.7 percentage points compared to the previous census (2011). At the same time, an increase in the urban population of the Municipality of Xanthi is observed. In the 2001 census, the urban population was 56,383, in the 2011 census it was 65,133, and in the most recent 2021 census, it is 66,875. This reflects an increase of 2.6 percentage points.

In contrast, according to the comparison between the 2011 census data and those of the 2021 census, a trend of population decrease is observed in all other municipalities of the Regional Unity of Xanthi. The table below presents the data of the last thirty years, based on the 1991, 2001, 2011, and 2021 censuses, where the population trends are clearly visible.

Table 1. Change in the permanent population by Municipal Unit of the Regional Unity of Xanthi 1991-2001-2011-2021 Source of data ELSTAT (2021), own processing 2025

RU, Municipalities/ Pop	**1991**	**2001**	**2011**	**2021**	**Percentage Change 1991-2001**	**Percentage Change 2001-2011**	**Percentage Change 2011-2021**
RU of XANTHI	**92.218**	**102.959**	**111.222**	**108.195**	**11,6**	**8,0**	**-2,7**
MU Xanthi	46.513	56.383	65.133	66.875	21,2	15,5	2,6
MU Avdiron	17.087	18.262	19.005	17.610	6,9	4,1	-7,3
MU Mikis	16.180	16.084	15.540	14.237	-0,6	-3,4	-8,3
MU Topeirou	12.436	12.223	11.544	9.473	-1,7	-6,6	-17,9

According to the data, there is an uneven distribution of the population, which does not favor the improvement of technical infrastructure or the enhancement of services such as healthcare, education, recreation, etc. In the rural population of the Regional Unity of Xanthi, according to the 2021 census, aging is observed, which leads to a decrease in production. Moreover, the mountainous areas face depopulation, as young people leave them in search of work in urban centers or their outskirts.

Table 2. Population of the Regional Unity (former Prefecture) of Xanthi 1961-2021. Source of data ELSTAT (2021), own processing 2025

YEAR	*XANTHI*	*GREECE*
1961	89.594	8.388.600
1971	82.917	8.768.600
1981	88.777	9.740.417
1991	92.218	10.259.900
2001	102.959	10.964.020
2011	111.222	10.816.286
2021	108.195	10.482.487

The combination of high unemployment, primarily in the urban centers of the region, along with the lack of education and infrastructure, leads entire groups into social exclusion. Vulnerable groups mainly concern minority populations, particularly the Pomaks of the mountainous areas. Therefore, the demographic composition of the Regional Unity (former Prefecture) is of particular interest, with key references to multiculturalism, religious minorities, and repatriation.

In order to achieve sustainability, as defined by the European Commission, the social integration of population groups must precede, and social inequalities should be reduced. Given the significant educational disparities among population groups, in order to achieve sustainable development in the Regional Unity, equal access opportunities to social infrastructure must be ensured, as well as strengthening public education. Inequalities are also spatially recorded, as indicated by data from ELSTAT (2021) regarding occupations at the level of the Regional Unity of Xanthi, in comparison to the national average.

Regarding the occupational characteristics of the population of the Regional Unit of Xanthi, according to the 2021 data (ELSTAT), among the 35,194 employed individuals in the economically active population: a) 2.6% are employed as senior administrative and managerial staff, b) 14.8% are professionals, c) 5.5% are employed as technicians and related occupations, d) 6.1% work as office clerks, e) 22.6% are employed in service provision and as salespeople, f) 11.7% are farmers, stockbreeders, foresters, and fishermen, g) 11.7% are skilled craftsmen and in related occupations, h) 8.5% are machine operators and assemblers, i) 16% are unskilled laborers, manual workers, and small business owners.

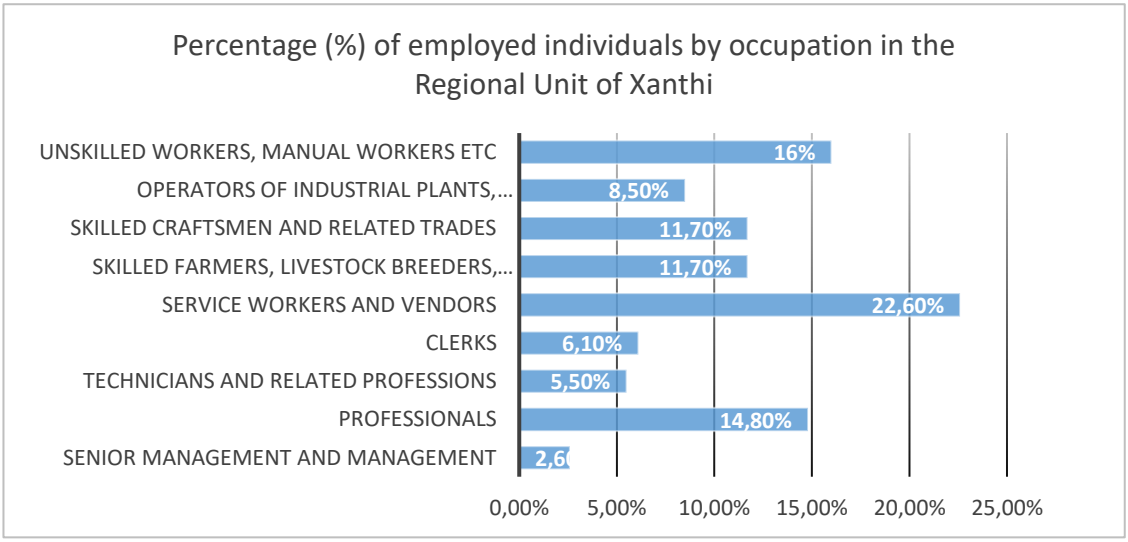

Fig. 5. Percentage (%) of Employed Individuals by Occupation (Single-Digit) in the Regional Unit of Xanthi. Source of data ELSTAT (2021), own processing 2025

Similarly, at the national level, the percentage of employed individuals in the economically active population is distributed as follows: a) 3.8% are employed as senior administrative and managerial staff, b) 18.6% are professionals, c) 9.2% are employed as technicians and in related occupations, d) 10.1% work as office clerks, e) 23.9% are employed in service provision and as salespeople, f) 7.6% are farmers, stockbreeders, foresters, and fishermen, g) 8.7% are skilled craftsmen and in related occupations, h) 6.8% are machine operators and assemblers, i) 11% are unskilled laborers, manual workers, and small business owners.

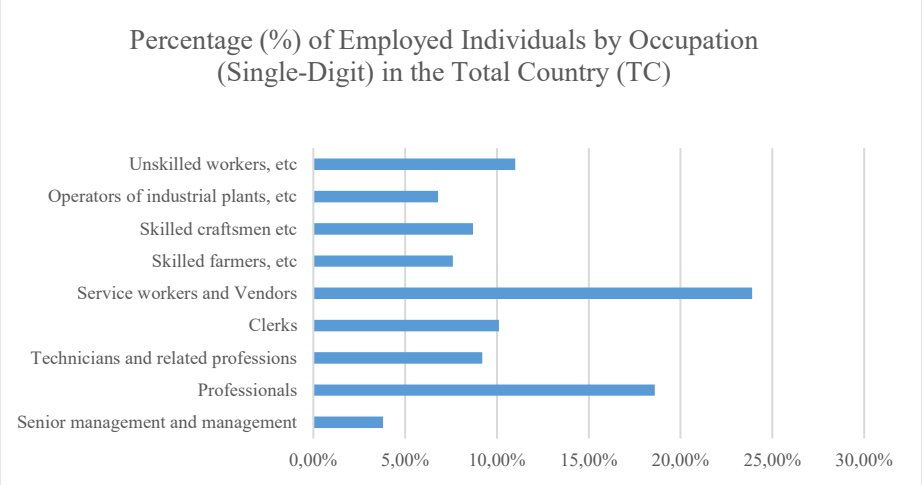

Fig. 6. Percentage (%) of Employed Individuals by Occupation (Single-Digit) in the Total Country (TC). Source of data ELSTAT (2021), own processing 2025

By comparing the data regarding the professions practiced, at the level of the Regional Unit of Xanthi and the Total Country, and observing the following chart (Chart 5), we find that the economically active population of the Regional Unit of Xanthi is employed to a greater extent than that of the rest of the country in professions that do not require a high level of education for their practice.

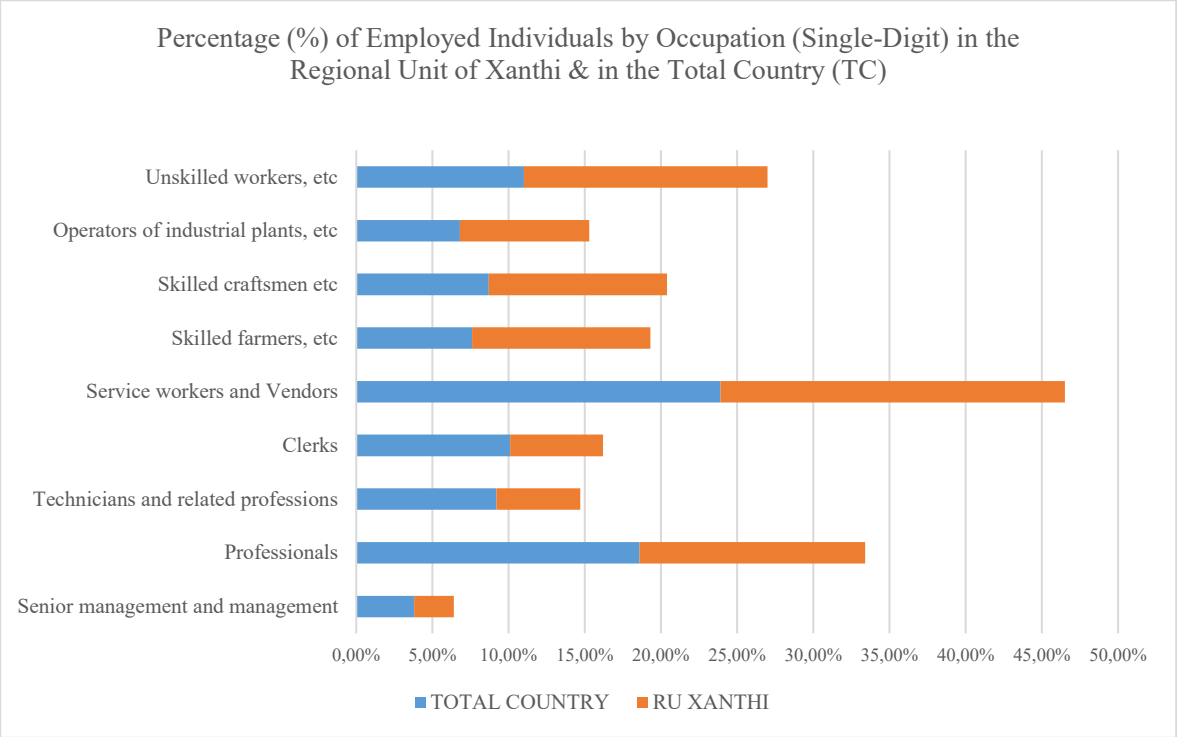

Fig.7. Percentage (%) of Employed Individuals by Occupation (Single-Digit) in the Regional Unit of Xanthi & in the Total Country (TC). Source of data ELSTAT (2021), own processing 2025

3.2 Incomes and Education Level in the Regional Unit of Xanthi

According to the ELSTAT data for the Regional Unit of Xanthi, in 2011, the total annual Gross Domestic Product (GDP) amounted to 1.320 billion euros, and the GDP per capita was 11,713 euros. In 2022, the total annual GDP decreased to 1.219 billion euros, and the GDP per capita also decreased to 11,095 euros, which is lower than that of the previous decade. As already mentioned, the employment percentages by sector at the level of the regional unit are: a) in the primary sector 13.5%, b) in the secondary sector 26%, and c) in the tertiary sector 60.3%.

Regarding the well-being indicators of the Regional Unit based on GDP per capita, the Regional Unit of Xanthi ranks low compared to the five Regional Units of the Eastern Macedonia and Thrace Region, occupying the last position with 11,095 euros, while the regional average is 13,005 euros, and the national average reaches 19,647 euros.

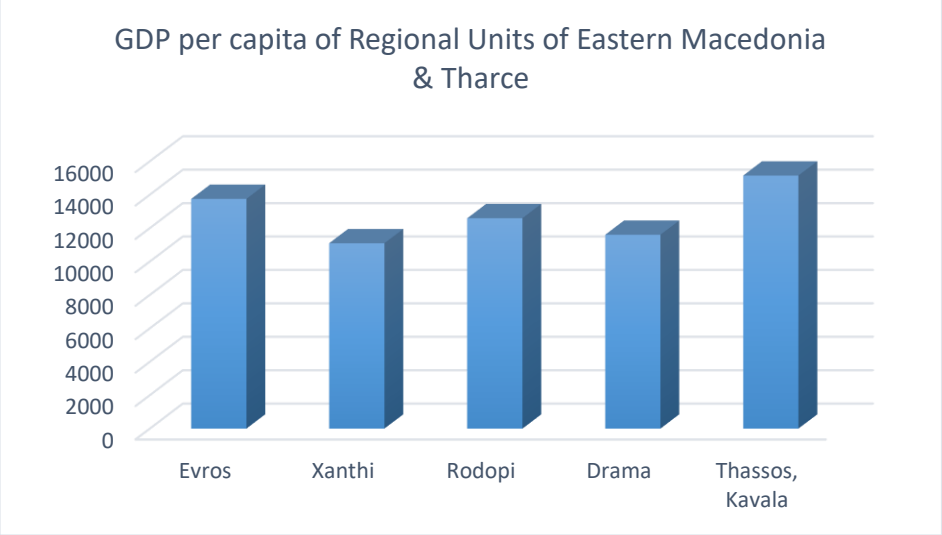

Fig. 8. Ranking of the Regional Unit of Xanthi based on GDP per capita in the Eastern Macedonia – Thrace Region. Source of data ELSTAT (2021), own processing 2025

The contribution of the Regional Unit to the total figures of the country reaches, according to the 2022 data, 0.58% of the GDP.

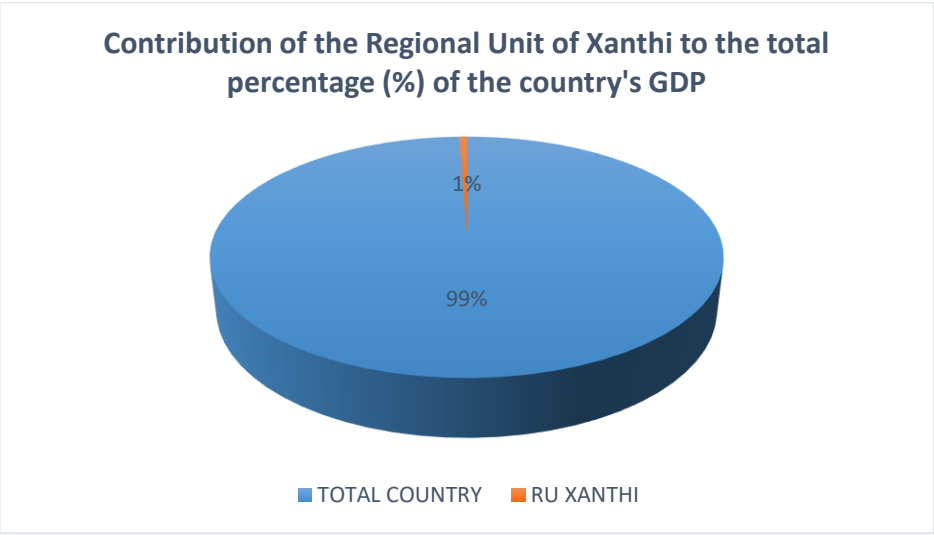

Fig. 9. Contribution of the Regional Unit of Xanthi to the total percentage (%) of the country's GDP. Source of data ELSTAT (2021), own processing 2025

In terms of education, the Regional Unit of Xanthi shows a significant lag. This deficit, as revealed by the analysis of the 2021 census data from ELSTAT, combined with

other factors such as the existence of a minority population, spatial inequalities, etc., exacerbates social inequalities in the study area.

More specifically, according to the 2021 census, in the Regional Unit of Xanthi, 14.4% of the total population has received higher or tertiary education, whereas the national average for this percentage is 21%. 3.8% has post-secondary education, compared to 6% for the whole country. The percentage of high school graduates is 22.8% at the level of the Regional Unit and 27.1% at the national level. Furthermore, 11.4% of the population in the Regional Unit of Xanthi has completed their education at the junior high school level, compared to 13% for the entire country. Particularly high is the percentage of the population in Xanthi who have completed only primary education, 29.3%, compared to the national percentage, which is 18.6%. Finally, it is noted that 12.7% of the population has not completed primary education or is illiterate, while the corresponding percentage for the whole country is 9.3%.

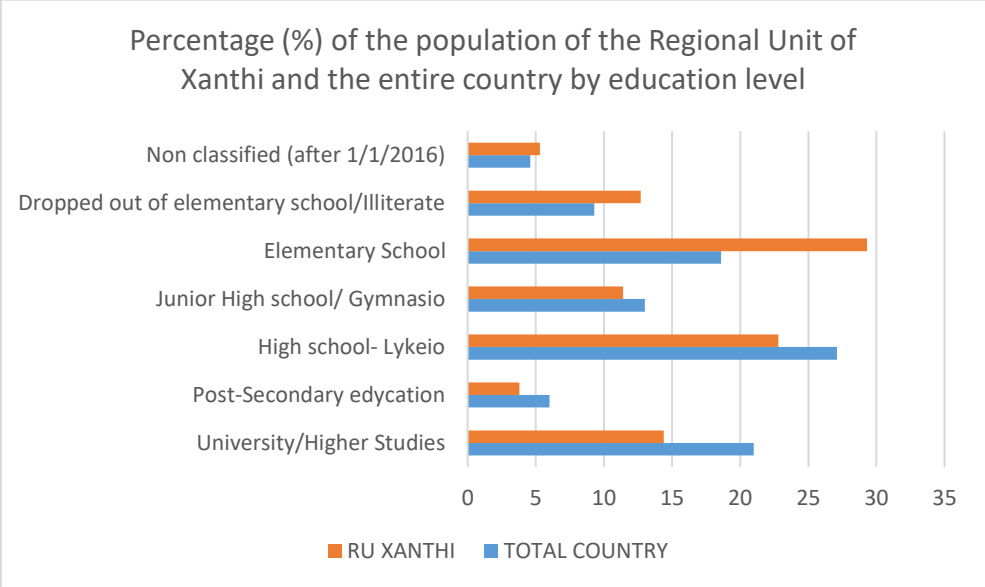

Fig. 10. Percentage (%) of the population of the Regional Unit of Xanthi and the entire country by education level Source of data ELSTAT (2021), own processing 2025

The main causes of school abandonment, considering the data, are believed to be unemployment, low incomes, and the level of economic activities in a region. Additionally, factors such as the culture of the minority population living in the Regional Unit of Xanthi, as well as the educational policies followed, are also seen as obstacles to school attendance.

4 Discussion

The findings of this study align with previous research on social inequalities and their spatial expression. Several scholars have emphasized the role of space in shaping social relations and inequalities. For instance, Preteceille (2006) argues that spatial differentiation is a characteristic that defines social inequalities, and this study confirms that social inequalities in the Regional Unit of Xanthi have a clear spatial expression.

The comparison of data from the Regional Unit of Xanthi with the national total reveals significant disparities in employment, education, and income levels. These findings are consistent with the work of Artelaris (2023), who highlights regional inequalities in Greece and their impact on social and economic development. The high unemployment rates and low incomes in Xanthi, compared to the national average, further support the argument that social inequalities are exacerbated by spatial factors.

Moreover, the lack of infrastructure in the mountainous areas of Xanthi is a critical issue that has been discussed in the literature. Gospodini (2007) emphasizes the importance of infrastructure for regional development and competitiveness. The findings of this study indicate that the lack of infrastructure in Xanthi creates significant developmental gaps and limits opportunities for economic and social progress.

Educational inequalities are another key aspect of this study. The data shows that children from poor and disadvantaged groups are less likely to continue to high school or higher education. This finding is in line with the work of Lymperopoulou and Finney (2017), who discuss the socio-spatial factors associated with ethnic inequalities in education. The educational disparities in Xanthi contribute to the perpetuation of social inequalities and hinder the region's development.

In summary, the findings of this study are consistent with the existing literature on social inequalities and their spatial expression. The Regional Unit of Xanthi faces significant challenges in terms of employment, education, and infrastructure, which contribute to the persistence of social inequalities. Addressing these issues is crucial for achieving sustainable development in the region.

5 Conclusions

Based on the research and examining the economic, social, and spatial characteristics of the study area, there appears to be a direct correlation between social inequalities, spatial inequalities, education, and indicators of economic and cultural development. Taking into account the geographical location, terrain, and geopolitical significance of the area, as well as the data recorded by ELSTAT (2021), the social, territorial, and economic inequalities in the Regional Unit of Xanthi, in comparison with the rest of the country, have been analyzed and studied in this research.

Regarding the education level of the residents of the Regional Unit of Xanthi compared to the entire country, it is concluded that children from poor and disadvantaged groups and regions benefit less from the educational systems and ultimately have fewer chances of continuing to high school or higher education, and may drop out of school before completing compulsory education.

Additionally, there is a development deficit, as the economy of the mountainous areas of Xanthi County is based on the primary production sector. The lack of infrastructure, along with the mountainous terrain of the area, contributes to the inability to industrialize agriculture. The income of the residents of the Regional Unit of Xanthi is low compared to the national average. Typically, territorial exclusion has specific geographic features, which in the case of the Regional Unit of Xanthi are mixed. Such characteristics include the regional position of an area, the concentration of marginalized groups in an area, or the conflicts faced by an area as a result of economic structural reform.

Moreover, the lack of infrastructure, which is particularly evident in the study area, creates significant development gaps, while those living in the mountainous settlements do not have equal learning opportunities and access to services.

Regarding access to employment, the region has a very high unemployment rate compared to the national average. As for income, there is an unequal distribution compared to the national level, with residents of the Regional Unit of Xanthi earning the lowest income compared to the other regional units of the Eastern Macedonia and Thrace Region.

The low level of education mentioned above leads the residents of the area to be employed in professional sectors with little to no prospects for economic and social advancement.

The difference in employment sectors compared to the national level, as well as in education levels and income, leads to the conclusion that the spatial social differentiation of the Regional Unit of Xanthi reflects social and spatial inequalities.

For a region to develop sustainably, as mentioned in the introduction of this paper, social and territorial cohesion is required. Areas that are excluded from both economic life and access to the labor market, education, and health services are an obstacle to development as a whole and hinder the achievement of sustainable goals. Given that space is not neutral but shapes and is shaped by policies, this research demonstrates that the social problems that appear in this particular study area are also spatial.

Aiming for the sustainable development of the Regional Unit of Xanthi, the elimination of social and spatial inequalities and the achievement of social and territorial cohesion can be realized through the use of institutional and developmental tools for improvement of infrastructure, educational programs, initiative to support agricultural development and empower younger generations in farming, strengthening the secondary sector, particularly the processing of agricultural products by adding value.

Drawing from international examples, several solutions can be proposed to address the social and spatial inequalities in the Regional Unit of Xanthi. For instance, the microcredit model implemented in Ireland has successfully empowered rural populations through microfinance, enabling small-scale entrepreneurs to start and grow their businesses (European Microfinance Network, 2021). This model could be adapted to support local entrepreneurs in Xanthi, particularly in the agricultural sector.

Additionally, the Finnish education system, known for its emphasis on equality and high-quality education for all, could serve as a model for improving educational out-

comes in Xanthi (Finnish National Agency for Education, 2021). Implementing policies that ensure equal access to education and resources, regardless of socioeconomic background, can help reduce educational inequalities.

Furthermore, the development of infrastructure in remote areas, as seen in countries like Norway, can enhance connectivity and access to services, fostering economic growth and social inclusion (Norwegian Ministry of Local Government and Modernisation, 2021). By investing in infrastructure projects that improve transportation, healthcare, and education in the mountainous areas of Xanthi, the region can overcome some of the barriers to development.

These initiatives could improve the education level, boost local economies, create jobs, and eliminate the inequalities.

The findings of this study are closely related to several Sustainable Development Goals (SDGs) of the 2030 Agenda: a) "No Poverty": Addressing income inequalities and improving access to economic opportunities, b) "Quality Education": Ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all, c) "Decent Work and Economic Growth": Promoting sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all, d) "Industry, Innovation, and Infrastructure": Building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation, e) "Reduced Inequalities": Reducing inequality within and among countries, f) "Sustainable Cities and Communities": Making cities and human settlements inclusive, safe, resilient, and sustainable.

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