Resilience Indicator Of The Greek Regions. Impact Of The Tourist Flows In The Covid-19 Pandemic Era

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Summary
The degree of resilience of the regions is one of the most important indicator for understanding and interpreting the functioning of local economies. The resilience indicator records the response of the thirteen regions of Greece during the Covid-19 pandemic. In particular, the regions that account for around 60 % of the country's total tourism revenue, (in sete, 2013) the Ionian Islands, the South Aegean and Crete, presented the highest values of the resilience index, which translates to a high sensitivity caused by the COVID-19 pandemic. The Region of Crete is the only region, among the other two regions receiving high rates of tourism revenue, which has been able to canalize its available resources to other production channels, with relatively satisfactory resilience indicator during the pandemic.
Key Words: *Resilience, Region (NUTSII), Pandemic (Covid-19), Dependency Path.*

I.   INTRODUCTION

This study aims to calculate the degree of resilience[1] of our country's regional units, through the "Martin" resilience index [2]during the Covid-19 pandemic, with a particular focus on those with high tourist traffic. The concept of resilience is used by the scientific fields of regional economic and economic geography and interprets either the ability of an economy to absorb external influences before changing its structure, or the speed at which an economy can return to a point of prior equilibrium or even a new equilibrium. Barraí Hennebry, pp 24 Resilience through the 'Martin' indicator is an important tool for interpreting economic fluctuations between regions. Through the Regional Resilience index, we will list the regions of the country, which for the period 2019-2021 were under the least/most pressures and recovered quickly/slowly as a result of the Covid-19 pandemic identifying the root cause. The division of the country's regions, like other regions of the countries of the European Union, follows the common classification of territorial units for statistics 'NUTS II' and constitutes the hierarchical system of administrative division for reasons of statistical processing and data homogeneity. Eurostat [3]

II.   THEORETICAL BACKGROUND

According to Pendall, Fistel and Cowell, regional growth in production, population growth, reduction in unemployment and poverty, increased labour force participation, can be seen, at least in part, as equilibrium effects. Pendall, Fistel, Cowell, pp 73. Moving away from the equilibrium point under the influence of

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[1] The concept of resilience is initially identified in ecology as a measure of the persistence of systems and the ability to absorb disturbances, thus maintaining the same relationships between populations. C.S Holling, 1973. Based on this view, a very general approach to the concept of economics is summarised in the ability of a system in economics science to return to equilibrium. Kallioras D, 2018.

[2] Different methodologies for measuring the resilience indicator at regional level have been recorded, summarised in Gross Domestic Product, gross value added and employment level. Chiotas, 2021. In this study we selected for analysis the statistical data of the Gross Domestic Product, i.e. the total production process for a specific period of time "year", as the most representative statistical parameter of the image of an economy. Substantial differences between gross value added and gross domestic product do not exist, while the level of employment may give an incorrect picture in cases of non-registration of seasonally employed staff.

[3] https://ec.europa.eu/eurostat/web/nuts/background

external/internal effects makes resilience one of the most important parameters for understanding the region's economy.

The strength content is divided into three dimensions. The first dimension, it is based on the idea that the regional economy is at a point of equilibrium, disturbed by an exogenous/indigenous parameter, that causes obvious signs of economic downturn. The speed at which the periphery will recover, so that it is at its earliest equilibrium, constitutes the region's resilience. The second dimension of resilience is the ability of the periphery to absorb disturbances so that it remains either at the same or at adjacent equilibrium points. Finally, the third dimension, called evolutionary resilience, combines the ability of the periphery to react/expect when there are signs of recession.

Martin and Sunley consider the ability of a region or local economy to withstand and recover from market shocks, competition and the economic environment by making adaptive and structural changes in order to maintain a prior development path. Martin & Sunley, pp 10

III. METHODOLOGY

In accordance with Regulation 1059/2003 of the European Parliament, as well as subsequent amendments, legal recognition of the territorial typologies of the Member States of the European Union is introduced in order to capture better and analyse statistical data, while the definition of territorial units is based on the existing administrative units of the Member States. The nomenclature, called NUTS, divides a geographical-economic territory into three levels, a large geographical area, region and county. Eurostat [4]

The economic resilience of the regions can be measured using two main metrics, one-dimensional and multidimensional. In this paper we will use a variation of Martin's one-dimensional employment sensitivity index, with the breakdown of gross domestic product per district.

In particular, the mathematical relationship that captures the sensitivity index of the regions consists of the rate of change in economic figures between two time intervals.

$$B_r = (DAEP_{ri}/AEP_{ri})/(DAEP_{ni}/AEP_{ni)} \qquad I^5$$

In summary, the mathematical ratio I reflects the rate of change in the gross domestic product of region 'i' and the rate of change of gross domestic product at national level 'n'. The lower the value of Br, the higher the durability of the region.

IV. SUMMARY HISTORICAL RETROSPECTIVE OF THE PERIOD 2019-2021

According to the World Health Organisation, the coronavirus appears late 2019 in a geographical area of China and is rapidly spreading, characterising the virus-induced disease as a pandemic. WHO, 2023[6]

Since the emergence of the first case in Greece, the first restrictive measures on socio-economic activities have started, while since the beginning of July 2020 tourism activities have started under specific control procedures. Tourist traffic as well as revenues are falling significantly for the country, and gradually from 2021 signs of recovery appears.

CLASSIFICATION OF REGIONS OF GREECE BY NUTS II

Greece is divided by NUTS II into 13 regional units, Eastern Macedonia & Thrace, Western Macedonia, Central Macedonia, Ionian Islands, Attica, Thessaly, Sterea Ellada, North Aegean, South Aegean, Western Greece, Peloponnese, Epirus and Crete. The aim of this study is to find the degree of sensitivity of each regional unit for the periods 2019-2020 and 2020-2021, essentially one year before the outbreak of the coronavirus pandemic up to one year later.

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[4] https://www.europarl.europa.eu/factsheets/el/sheet/99

[5] The mathematical formula proposed by Martin is the quotient of the change of a size at a local level to the change of the same size at the national level. Because it is a numerical fraction, increasing the numerator also increases the fraction, so a higher change of a size in a given region than the change of the same size at national level increases the resilience indicator, thus reducing the region's reaction under the pressure of an economic shock.

[6] https://www.who.int/news/item/27-04-2020-who-timeline---covid-19

Map I, Regions by NUTS II
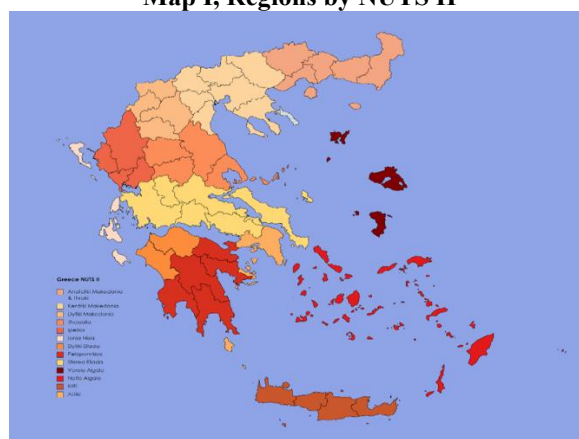
Source: Mapcharts.net, same edit

FINANCIAL DATA 2019-2021

Table I Annual difference in G.D.P (2019-2021)

DIFFERENCES BETWEEN 2019-2021 (GDP) IN GREEK REGION NUTSII	2019-2020	2019-2021	2020-2021
Greece	-10%	-1%	10%
Attiki	-10%	-2%	9%
Nisia Aigaiou, Kriti	-16%	-4%	14%
Voreio Aigaio	-9%	-1%	9%
Notio Aigaio	-20%	-6%	18%
Kriti	-14%	-3%	13%
Voreia Ellada	-9%	0%	10%
Anatoliki Makedonia, Thraki	-7%	2%	10%
Kentriki Makedonia	-10%	0%	10%
Dytiki Makedonia	-13%	-5%	9%
Ipeiros	-9%	0%	10%
Kentriki Ellada	-7%	3%	11%
Thessalia	-7%	0%	8%
Ionia Nisia	-20%	-6%	17%
Dytiki Ellada	-7%	1%	9%
Sterea Ellada	-1%	12%	13%
Peloponnisos	-8%	1%	10%

Source: Eurostat, same edit

Table II G.D.P.. of Regions of Greece (2019-2021), EUR million

GDP CURRENT MARKET PRICE IN GREEK REGION	2019	2020	2021
Greece	183351,2	165405,9	181674,6
Attiki	87642,35	78993,18	85768,85
Nisia Aigaiou, Kriti	18108,84	15274,75	17430,24
Voreio Aigaio	2558,48	2330,79	2541,48
Notio Aigaio	6338,53	5066,36	5975,63
Kriti	9211,83	7877,6	8913,12
Voreia Ellada	39896,88	36131,96	39779,77
Anatoliki Makedonia, Thraki	6976,48	6509,48	7137,72
Kentriki Makedonia	24989,91	22555,95	24891,82
Dytiki Makedonia	3896,09	3381,19	3701,59
Ipeiros	4034,4	3685,35	4048,64
Kentriki Ellada	37703,13	35006,01	38695,75
Thessalia	9365,17	8672,05	9337,06
Ionia Nisia	3264,53	2618,66	3056,44
Dytiki Ellada	8114,58	7537,58	8220,02
Sterea Ellada	8615,59	8497,85	9634,6
Peloponnisos	8343,26	7679,87	8447,63

Source: Eurostat, same edit

Table I shows the annual change in gross domestic product for the thirteen regions of Greece. It is also shows cumulatively three geographical areas, which unite two or more regions, such as the Aegean Islands & Crete, Northern Greece and Central Greece.

For the period 2019-2020, there is a decrease in Greece's GDP of -10 %. The region's most under pressure are the Ionian Islands and the South Aegean, reflecting a decrease in regional GDP by -20 %. Followed by the region of Crete with -14 %, Western Macedonia with -13 % and Central Macedonia with -10 %. The region that appears to be least affected is Sterea Ellada , with a percentage of -1 %.[7]

For the period 2019-2021,[8] a recovery in the change in GDP is reflected, albeit with a negative trend for most regions, compared to the period 2019-2020. In particular, the South Aegean and the Ionian Islands show a decrease in GDP of -6 %, Western Macedonia of -5 % and Crete with -3 %, while Greece for the period 2019-2021, decreased by 1 %.

For the period 2020-2021, there is a clear improvement in the GDP for most regions of Greece. In particular, the largest increase is found in the South Aegean islands, with 18 %, followed by the Ionian Islands (17 %) and Crete (13 %). This is a clear recovery of the country's S.A.P compared with the year 2020, which is co-changing with increases in tourism receipts.

In summary, the regions that suffered the highest reduction in GDP for 2020 compared to 2019, are the Ionian Islands, the South Aegean and Crete. I.e. regions that capture high rates of tourism transit and revenue. GDP seems to be growing for 2021, but again the Ionian Islands, the South Aegean and Crete still reflect a negative change compared to 2019. Clearly a better picture can be found for 2021, where the GDP for the regions that had suffered the biggest losses, seems to be recovering.

ANALYSIS OF THE RESILIENCE OF REGIONS OF GREECE 2019-2020

In this section we will use a variation of Martin's one-dimensional sensitivity index, with the breakdown of gross domestic product per regional department of Greece, as categorised by NUTS II. The objective is to capture those regions that showed the least resilience during the outbreak of the coronavirus pandemic.

Table III
Regional Resilience Index breakdown 2019-2020

REGIONAL RESILIENCE	2019-2020
Sterea Ellada	0,1409
Anatoliki Makedonia, Thraki	0,6901
Dytiki Ellada	0,7331
Kentriki Ellada	0,7375
Thessalia	0,7630
Peloponnisos	0,8197
Ipeiros	0,8919
Voreio Aigaio	0,9175
Voreia Ellada	0,9728
Kentriki Makedonia	1,0041
Attiki	1,0174
Dytiki Makedonia	1,3625
Kriti	1,4932
Nisia Aigaiou, Kriti	1,6134
Ionia Nisia	2,0396
Notio Aigaio	2,0691

Source: Same edit

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[7] Sterea Ellada is the only region in the country which for the period 2019-2020 has suffered the least losses and, as we will note, in the next section recorded the lowest resilience index. According to the data of the Association of Tourism Enterprises, only 9 % of the region's total employment is allocated to tourism, while the remaining 91 % is allocated to other productive sectors. So this distribution is attributed to the low sensitivity of the region and also from the view that the remaining production channels were activated, perhaps to a higher degree and were not affected by the tourist disruption.

[8] This period reflects the change in the GDP of the regions of Greece, at two points in time, before the outbreak of the pandemic (end of 2019) and one year after the outbreak of the disorder (2021).

Table III shows the regional resilience of the thirteen regions of Greece including also three geographical districts grouping two or more regions in ascending order. The methodology, as presented in a previous section, is based on the rate of change in the GDP of a given region towards the rate of change in GDP in the whole country, between two years. When the values are higher than the unit, the region concerned is considered to be of low resistance to the presence of a disturbance, whereas regions with a low value, less than one, face a high degree of resistance and therefore high resilience.

The analysis will be carried out on the basis of[9]the Martin sensitivity index, for the thirteen regions of Greece and for the period 2019-2020, starting from the regions with the highest resilience index and thus low resistance to the presence of disturbances. Thus, Crete (1.49), the Ionian Islands (2.03) and the South Aegean (2.07) appear among the highest values of the sensitivity index and thus the least resistance at the beginning of the pandemic. In particular, the South Aegean ranks last in resilience, while at the same time, it is the region that received a 75 % reduction in its tourism revenues, (2019: 5 174.80 million euros -2020: 1 256.60 million euros) Follow the Ionian Islands, with the second worst position in terms of resilience and with a 77 % reduction in tourism revenue, (2019:1911,20 million euros- 2020: 446,10 million euros), while Crete, ranking the third worst resilience position, experienced a drop in tourism revenue of 77 % (2019: 3600,90 million euros – 2020: 861.40 million euros) in sete:2023

It is noted that the three above mentioned regions, according to the data of the Association of Tourist Enterprises, account for 60 % of the revenue from the inbound tourism of Greece. It also appears to be maintained for the year 2020 stable or slightly decreasing the allocation of tourism revenue for these regions, over the total.[10] The Attica region shows a significant specificity, while there is a decrease in its revenue of 70 % (2019-2020), however, for the year 2020, there is a 5.2 % increase in tourism revenue over the total. It appears that Attica during the containment measures of the pandemic, as the capital, accumulated a larger share of total tourism revenues.[11]

The regions with a sensitivity index below the unit consist of Sterea Ellada (0,1409), Eastern Macedonia & Thrace (0,6901), Western Greece (0,7331), Thessaly (0,7630), Peloponnese (0,8197), Epirus (0,8919), North Aegean (0,9175) and Central Macedonia (1,0041). These regions receive a range of tourism revenues out of the total (0.5-2.7 %). In fact, Sterea Ellada , with a tourism revenue rate of around 1 % (2019), seems not to be affected at all by the pandemic, as it has the lowest resilience index.

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[9] It has already been noted that Martin's mathematical formula was originally used to analyse the magnitude of unemployment, but later, according to the literature, other economic figures were used, such as G.D.P , income, etc.

[10]Although tourist flows for the year 2020 showed a significant decline for all of Greece, it appears that proportionally the so-called tourist regions, generally maintained the ratio of tourist flows to total tourist flows. Therefore, popular tourist areas have maintained their traffic, albeit with a significant decline compared to the year 2019.

[11]The Attica region recorded an increase for the year 2020 in its tourism traffic, showing satisfactory resilience, recommending the region which "contained" tourism flows. Regarding the increased tourist traffic of Attica, compared to 2019, despite the fact that all tourist regions accepted reductions, perhaps due to the thought that the restrictive measures in transport as a cause of the Covid-19 pandemic or some measures taken to protect tourism workers, as compensation for the non-operation of hotel units, acted as a deterrent to the movement of tourist flows outside the centre.

ANALYSIS OF THE RESILIENCE OF REGIONS OF GREECE 2020-2021

Table IV
Regional Resilience Index breakdown 2020-2021

REGIONAL RESILIENCE	2020-2021
Thessalia	0,7797
Attiki	0,8721
Voreio Aigaio	0,9190
Dytiki Ellada	0,9205
Dytiki Makedonia	0,9634
Anatoliki Makedonia, Thraki	0,9812
Ipeiros	1,0022
Peloponnisos	1,0164
Voreia Ellada	1,0265
Kentriki Makedonia	1,0529
Kentriki Ellada	1,0716
Kriti	1,3365
Sterea Ellada	1,3600
Nisia Aigaiou, Kriti	1,4347
Ionia Nisia	1,6997
Notio Aigaio	1,8247

Source: Same edit

Table IV shows the distribution of the regional resilience indicator for the years 2020-2021[12]. Already for the year 2020 there are losses in the tourist transit of the country as well as in the corresponding tourist revenues. For 2021, although restrictive measures are still identified, but are detected in lesser intensity, in order to protect against the pandemic. Tourism transit in relation to the year 2020 seems to be recovering with revenues, almost all regions doubling, but without reaching revenue at level of 2019.

We will start the analysis of the resilience indicator from the regions with the highest resilience index and thus low resistance to the presence of disturbances. The South Aegean has the highest index 1.8, much higher than the unit, which ranks it as the region with the lowest degree of resilience for the period 2020-2021. Tourism receipts of 1256,26 million euros (2020) increased to 3121,30 million euros (2021), showing a 30.2 % increase in revenue in the country as a whole. The Ionian Islands have the second worst indicator of 1.69, with tourist revenues of 1297.30 million euros (2021) against 446,10 (2020) million euros, accounting for 12.60 % of the country as a whole. The third worst is Crete, with a resilience index of 1.34 and with tourist receipts increasing from 861,40 (2020) to 2395 (2021), i.e. 23.20 % for the region of total tourist receipts. Surprisingly, the value of the resilience index for the region of Sterea Ellada, which from 0.1 (2019-2020) passed to 1.3 (2020-2021), even with a doubling of tourist revenues but with only 1.1 % of the country's total tourist revenues.[13] Five regions of the country, in particular Thessaly, Western Macedonia, Attica, the North Aegean and Eastern Macedonia & Thrace, seem to be able to exploit, for the period 2020-2021, both the growth of tourist traffic as well as the allocation of available resources to other possible productive channels. To the same extent are the regions that marginally reflect tolerable resilience around the unit, namely Epirus, the Peloponnese and Western Greece.

V. Conclusions of resilience results (2019-2020) & (2020-2021)

For the period 2019-2020, the regional resilience indicator is above 1.49 for three regions. In particular, the South Aegean region, the Ionian Islands and Crete, which have high resilience index values ranging from 1.49 to 2.69. This is a very important finding, given the record, that a percentage of around 60 % (2019), according to the Association of Greek Tourism Enterprises, of the total receipts from incoming tourism in Greece, are concentrated in these three geographical areas.

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[12] The period 2020-2021was selected   In order to determine the degree of recovery of the regions.
[13] The Region of Sterea Ellada is the only region in Greece, which, in the period of the Covid-19 pandemic, shows a low resilience indicator

For the period 2020-2021, the regions of Greece that accepted almost 60 % of total tourist receipts for the year 2021 again showed the highest sensitivity ratio.[14] Thus, the South Aegean has the highest resilience index despite the fact[15] that tourism revenues appear to be up twice as much as in 2020. Although the Ionian islands have less dynamics in tourist revenues than in the South Aegean, they seem to record a slightly better resilience index. Crete seems to improve by one point the value of the resilience index and to be in a better position than the two other regions mentioned above. In particular, six regions are well resilient below the unit, suggesting that there is gradually a rapid recovery from the shock of previous years (2019-2020), while four regions are resilient around the unit.

EPILOGUE

A first reason for the weak reaction of the regions receiving the highest tourist traffic is the view that either they failed to canalize their available resources to other channels in order to cope with the disruption of the pandemic, or there were no other channels available other than the one significantly affected by the disruption, which constituted the only productive exploitation, in this case tourism. This view can be seen even from the slight recovery and improvement of the resilience indicator for the period 2020-2021, in these regions.

Thus, the regions of the Ionian islands of the South Aegean and Crete, with high tourist dynamics, seem to be facing a reduced reaction to the presence of the disruption of the decline in tourism revenues. In particular, the region of the Ionian islands seems to have, perhaps the worst despite the penultimate position of Table III, given that with 10.80 %, in sete (2023) of the total tourist revenues of the country, it recorded a sensitivity index of 2.03, while the South Aegean, with 29.31 %, in sete (2023) of total revenues, recorded a sensitivity index of 2.06. Finally, Crete, with 20.4 % of tourism revenues, shows a resilience index of 1,4932. The picture of the resilience indicator, although clearly improved for the period 2020-2021, for these tourist regions, is not compatible with an immediate recovery, despite the doubling of tourism revenues compared to 2020.

NOTES

At regional level and given that tourism transit and tourism revenues decreased significantly for 2020 compared to 2019, because of the pandemic, it appears that among those regions with high tourist revenues, only the region of Crete managed to canalize to other productive channels of its available resources, a feature that is not found to a large extent in the South Aegean region and to an even higher extent in the region of the Ionian islands.

This finding leads to the assumption of the identification of regions which, not only have low coping dynamics and therefore high sensitivity in the event that tourist revenues are significantly reduced but also a significant inability to find available productive channels to escape from the presence of a tourist disruption. This finding directs us to the view of economic "monoculture" or better use of a specific production[16]process path, which may function satisfactorily to some extent but deprives available resources, for example the employment of human capital from another productive activity. And we will not only focus on human capital, which specialises in a particular production process, but also on other available resources that remain inactive, thus creating conditions of dependence on a particular productive sector, tourism.

STUDY LIMITATIONS – FURTHER ANALYSIS

The Martin Resilience Index is an important tool for understanding local economies at regional level by changing a local economic indicator to change the same economic indicator at country level. This study measured the resilience index and found that two out of at least three regions with the highest tourist traffic were under the most pressure due to the disruption caused by the pandemic. Further analysis, especially for regions with less

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[14] As has been noted in the previous paragraph, the higher the indicator of resistance, the less the resistance to potential disruption.

[15] This is essentially a slow return to an earlier equilibrium point.

[16] We used the term "use of a specific production process path, not from the point of view that this production channel is the only one, besides only 25 % of employment in the region of the Ionian Islands, for example, is attributed to tourism for the years 2019-2021 and the remaining 75 % to other production channels". Given the image of high sensitivity presented by the region of the Ionian Islands and the parallel existence of other production channels (75 % employment in other production sectors), we conclude that either the other productive sectors cannot compensate for a regional tourist disruption, or are partially activated and closely linked to the tourism sector. This view is supported by Martin and Sunley's theory of the dependent route, which argues that the trend for regional development is based on the development of local activities. In the case that this activity path becomes very sensitive to disturbances, we now refer to the presence of conditions of blockage, inactivity and thus productive dependence. Martin & Sunley, 2015

tourist traffic, would need other indicators, at prefecture level (NUTS III), such as the location indicator, which identifies sectoral specialisation or even the use of complex resilience indicators that take into account most economic and social considerations.

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