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The impact of economic crisis on regional disparities and the allocation of economic branches in Greek regions

Manolis Christofakis[1, CDFMR], Eleni Gaki[2, CDFMR], Dimitrios Lagos[3, CDFMR]

University of the Aegean, Department of Business Administration, Greece, [1]email: mchri@panteion.gr *(corresponding author),* [2]email: e.gaki@aegean.gr, [3]email: d.lagos@aegean.gr

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Abstract. The objective of this paper is to analyse the changes that occurred in the regional disparities and sectoral specialisation of the Greek regions due to the economic crisis. The research problem is to identify the effect that the crisis had on the developmental perspectives of the regions and on regional policy priorities. In this framework, we explore the regional disparities, along with the allocation and specialisation of economic sectors in two separate time periods: the pre-crisis period (2000–2007) and the crisis period (2008–2014). The variable used is regional employment in the branches of economic activity. The methods used are Coefficient of Variation, Location Quotients and Shift-Share Analysis. According to the results, we classify the spatial units into categories and we propose means of regional policy. The results show that the disparities increased during the first period of the crisis and declined in the next, without, however, reaching the levels of 2000. In the first period the dynamic economic sectors are concentrated mainly in the metropolitan region of Attica and in the island region of South Aegean, while local advantages are shown in several regions except Attica. During the period of crisis, Attica and South Aegean lost their sectoral dynamism, while a few regions resisted. Regarding the local share effects, the more urbanised regions show negative local shares. The rest of the regions exhibit local advantages. Thus, according to these results, a concluding remark is that the more traditional activities seem to be more resilient, unlike the modern activities, which seem more sensitive to the crisis and are located mainly in the large cities and the most urbanised regions of the country. Regarding the proposed regional policy means, infrastructure improvement is indicated for most of the urbanised regions in order to improve their developmental environment. For the other regions, a more balanced sectoral structure must be promoted. Of course, in order to propose more targeted policy measures, it is important that regional development features (according to the classification of the regions and the proposed policy measures) be adapted to smaller areas and to a greater number of narrower economic sectors, rather than simply applying them at the regional level. This is also true of the effect that some other factors such as human capital and innovative capacity have on regional resilience. Future research will focus on this.

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1. Introduction

The spatial impact of economic crisis has been one of the core issues for regional economic analysis in recent years, both in theory and in political practice. Several factors affect the magnitude of external upheaval in regions, such as the sectoral composition of the economy, the level of urbanisation, the skills of the workforce, the innovation rate and the institutional arrangements within regions (Fingleton et al., 2012; Balland et al., 2015; Boschma, 2015; Brakman et al., 2015; Voulgaris et al., 2015).

Especially in the case of the European Union, thirty years after the establishment of the Cohesion Policy, the debate as regards the degree of its impact in dealing with regional disparities remains quite intense. In recent years this debate has acquired new dimensions due to the economic and financial crisis, which has evidently more affected the traditional cohesion countries (Greece, Spain, Portugal, Ireland) and threatens even more the economic, social and territorial cohesion of the Union, as well as its position in the global order (Christofakis and Papadaskalopoulos, 2011).

Greece is the European Union country that was most severely hit by the financial crisis, having been still deep into recession for seven consecutive years and having lost cumulatively almost 25% of its GDP. However, in the early mid-2000s, the Greek economy was one of the fastest growing in the Eurozone, with an annual growth rate of 4.2 %. In recent years Greece has made an immense effort and has taken impressive steps toward achieving fiscal sustainability, with occasionally remarkable results. Within three years of the beginning of the crisis, it implemented a fiscal tightening of some 20% of GDP (around €50 bn, while it committed to measures cumulatively totalling €65 bn by 2015) and reduced its budget deficit by nine percentage points (Monastiriotis, 2014; Giannakis and Bruggeman, 2015a).

Nevertheless, the economic crisis in Greece is not over yet and as such, at spatial level, the resilience concept (including recovery, reorientation and renewal) cannot be fully applied to the regions' evolution. The interaction between short-term resilience and long-term adaptability requires a more thorough analysis. Policy-makers need to understand and overcome the regional impact of recessionary shocks and build on the opportunities that may emerge for the regions. However, recent studies regarding the impact of austerity measures on regional income and inequalities in Greece, argue that the horizontal measures are widening existing disparities – something that may be difficult to redress in the future (Monastiriotis 2011, 2014; Psycharis et al., 2014).

In this framework, the objective of this paper is to analyse the changes in the spatial allocation (at regional level) of the economic branches during the economic crisis and to compare these changes against the respective spatial pattern of the pre-crisis period, so that the appropriate regional development means can be adopted. Towards this goal, specific techniques have been applied. More specifically, the methodological framework of our analysis initially includes the use of Coefficient of Variation for the estimation of regional disparities, and Location Quotient for the exploration of sectoral specialisation of the regions. Moreover, we use Shift-Share analysis, which is a structural method used in urban and regional economics to attempt to identify the

causes of regional economic changes. It helps determine branches where a local or regional economy has advantages over the national economy (Dunn, 1960; Richardson, 1978). This method, as compared to other methods (i.e. input-output analysis, regional multipliers), helps us classify regions more comprehensively according to their performance, and then to identify the appropriate type of regional policy means (Boudeville, 1966; Stilwell, 1970).

The structure of the paper is as follows. In the next section the literature review is presented, and the analytical methodology of the research follows. Then, the applications and results of the methods are presented, and according to those the means of regional policy are proposed. Finally, the paper ends with conclusions and suggestions for further research. A draft of this research was presented at the joint Congress of the 54th colloquium of the Association de Science Régionale de Langue Française (ASRDLF), and the 15th conference of the Greek Section of the European Regional Science Association (ERSA-GR), held in Athens on 5–7 July 2017 (Christofakis et al., 2017).

2. Literature Review

The sectoral composition and production structure of regional economies has attracted the interest of several researchers as one of the key factors affecting the resilience of Greek regions to the economic crisis (Hadjimichalis and Hudson, 2014; Psycharis et al., 2014; Gialis and Tsampra, 2015; Giannakis and Bruggeman, 2015a,b; Gkouzos et al., 2015; Voulgaris et al., 2015; Petrakos and Psycharis, 2016).

Differences in the sectoral composition of regional economies contribute to spatial variation in severity of crisis impacts (Voulgaris et al., 2015).

Gialis and Tsampra (2015), exploring the effects of the crisis in the regional labour markets of Greece in relation to labour flexibilisation (defined by regional industrial specialisation and restructuring), conclude that regions specialising in sectors less affected by the crisis experienced lower total and permanent employment contraction and even greater temporary employment. For example, the North Aegean, a lagging touristic region characterised by dependence on the public sector, had the lowest employment reduction across all regions in the early years of the crisis, 2009–2011. In contrast, the resilient regions of Crete and South Aegean – which are dependent on agriculture (Crete) and construction as well as tourism (South Aegean) – suffered total employment losses that were greater than North Aegean in the same period.

According to Petrakos and Psycharis (2016), greater openness of the economy is expected to have a positive effect on regional performance, which, however, is stronger in the country's regions specialising in tradable activities. In general, regions with a higher level of development, greater public investment policy support, a stronger tradable sector, a more sheltered initial environment and a "response function" that increased the openness of the economy and at the same time improved and restructured the tradable sector of the production base, would experience a less severe impact of the crisis than otherwise. Christopherson et al. (2010) point out that the factors that appear to have been helpful at the regional level in the past would include: a strong regional system of innovation; strength in factors that create a "learning region"; a modern productive infrastructure (transport, broadband provision, etc.); a skilled, innovative and entrepreneurial workforce; a supportive financial system providing patient capital; and a diversified economic base that is not over-reliant on a single industry.

Gkouzos et al. (2015), focusing their analysis on the sectoral specialisation and the existence of local productive advantages at the prefectural level in Greece, used a Shift-Share analysis to conclude that local productive advantages existed in the pre-crisis period in prefectures specialising in agriculture, education and health, and transport, but also in the tourism sector, and mainly in prefectures around the two metropolitan centres of the eastern development axis in continental Greece, as well as on tourism islands. In the next period of the crisis, local advantages were limited to only peripheral prefectures with rural development potential and a high participation rate in the agricultural sector.

Several researchers highlight the resilience of agriculture and the agro-food industry to the current economic crisis (Mattas and Tsakiridou, 2010; Giannakis and Bruggeman, 2017; Holl, 2018). The adaptation of Greek agriculture to such versatile

changes and its transformation to a modern sector capable of promoting rural growth requires the acceleration of structural adjustments and the improvement of productivity. Moreover, the resilience of the island regions compared to continental regions was mainly attributed to the tourism sector, which can be evolved into a key and stable pillar for the recovery of the Greek economy. The promotion of alternative forms of tourism, including rural tourism, ecotourism and health/wellness, could be an option for minimising seasonality problems and stimulating all year-round economic activities (Giannakis and Bruggeman, 2015b).

On this subject, several studies indicate that regions with a more diverse economy have reduced vulnerability to employment fluctuations and economic contraction, as compared to regions dependent on a narrow range of branches of economic activity (Dissart, 2003; Christopherson et al., 2010).

Along with the production structure, some other studies include level of urbanisation among the factors affecting the response of regional economies to economic crisis. The reaction of urban areas and metropolitan regions to economic crisis acquires a prominent role (Brakman et al., 2015). Urban economies are more vulnerable to economic crisis (Hadjimichalis and Hudson, 2014). However, the differentiated productive structure (Di Caro, 2017), the adaptive innovative environment and the highly skilled human capital in these areas could help them to adapt and recover more immediately than the other areas (Balland et al., 2015).

In this framework, this research adds to the existing literature on the policy implications regarding the response of regional economies to economic crisis. Although the sectoral composition and the production structure at spatial level have been fully researched, the analysis of the causes of regional economic changes and, according to that, the appropriate type of regional policy means is now more timely than ever, because the crisis effects are more visible.

3. Methodology of the Research

As mentioned above, the methods used in our research are Coefficient of Variation, Location Quotient and Shift-Share Analysis.

An initial assessment of recent developments of inter-regional disparities within the country can occur using one of the key dispersion indicators, which is the Coefficient of Variation (Christofakis and Papadaskalopoulos, 2011), regarding the distribution of employment among the regions.

The Coefficient of Variation (CV) is calculated as follows (Vanhove and Klaassen, 1980):

$$CV = \frac{\sigma}{\overline{A}} 100$$

where: σ is the standard deviation), and

$$\sigma = \sqrt{\sum_{r=1}^{N} \frac{(A_R - \overline{A})^2}{N}}$$

where:

A_r = the variable in the region – here, regional employment,

$\overline{A}$ = the average regional employment of the country, and

N = the number of regions of the country.

In our research we calculate the CV for the years 2000 (the first year of the whole time period of our analysis), 2008 (the first year of the crisis period) and 2016 (the last year of the crisis period, for which we have the most recent statistical data regarding the regional distribution of the total employment of the country).

Location Quotient is used to see the sectoral specialisation of the spatial units. The sectoral specialisation of regions and their export orientation have been, for many decades now, a field of systematic exploration and use of special measuring methods (Florence, 1953; North, 55; Tiebout, 1956a,b; Isard, 1956, 1960; Mayer and Pleeter, 1975; Isserman, 1977; Chiang, 2009; Christofakis and Gkouzos, 2013). Thus, a group of special indices has been formed, with the most important being the Location Quotient (LQ). It estimates an economic activity's share in a spatial unit compared with the

activity's corresponding share in the national economy, in terms of a variable, such as employment or production (Norcliffe, 1982). If the first is higher, the spatial unit is specialised in the specific economic activity.

The Location Quotient (LQ) is given by the following formula:

$$LQ_{ir} = \frac{\frac{A_{ir}}{A_r}}{\frac{A_{in}}{A_n}}$$

where:
A: the variable,
i: the branch of economic activity,
r: the spatial unit (region, prefecture etc), and
n: the country

Having 1 as a reference value, when $LQ_{ir} \succ 1$, then the examined spatial unit r shows a specialisation in the specific branch i.

Shift-Share analysis is a structural method used in urban and regional economics to attempt to identify the causes of regional economic changes. It helps determine branches where a local or regional economy has advantages over the national economy. More specifically, Shift-Share analysis takes the change over time of an economic variable, such as employment or product, within branches of a regional economy, and divides that change into various components. The traditional form of the method (Dunn, 1960), which is used in this paper, is a comparative static model that splits regional changes into three components (Richardson, 1978; Papadaskalopoulos, 2000; Giannakis and Bruggeman, 2015a): a) National growth effect or national share, b) Industry mix effect or proportional shift, and c) Local share effect or differential shift. Other models have evolved that expand the decomposition into additional components, while some other have acquired a more dynamic and stochastic dimension (Arcelus, 1984; Barff and Knight III, 1988; Fotopoulos et al., 2010). However, they all identify the three main components that influence the variable changes (Esteban-Marquillas, 1972; Fothergill and Gudgin, 1979).

In this framework, according to the traditional model, each regional change (M_r) is broken down into three components, which are:

$$M_r = NS_r + PS_r + DS_r$$

1. *The National Growth Effect* or *National Share* (NS_r) is the portion of the change attributed to the total growth of the national economy. It equals the theoretical change in the regional variable had it increased by the same percentage as the national economy.
2. *Industry Mix Effect* or *Proportional Shift* (PS_r) is the portion of the change attributed to the performance of the specific economic branch. It equals the theoretical change in the regional variable had it increased by the same percentage as the branch nationwide, minus the national growth effect. Positive PS_r means that in the examined region the dynamic branches of the national economy are located.
3. *Local Share Effect* or *Differential Shift* (DS_r) is the portion of the change attributed to regional influences. It equals the actual change in the regional variable, minus the previous two effects. Positive DS_r means local advantages for the examined region.

The three components are given by the following formula (Papadaskalopoulos, 2000):
where:

$$NS_r = A_{ro}\left(\frac{A_{nt}}{A_{no}}\right) - A_{ro}$$

$$PS_r = \sum\left[\left(\frac{A_{int}}{A_{ino}} - \frac{A_{nt}}{A_{no}}\right)A_{iro}\right]$$

$$DS_r = \sum\left[A_{irt} - A_{iro}\left(\frac{A_{int}}{A_{ino}}\right)\right]$$

A: the variable,
i: the branch of economic activity,
r: the spatial unit (region or prefecture),
n: the country,
t: the last year of the period of analysis, and
o: the first year of the period of analysis.

In this framework, through the implementation of the above methods we explore the spatial allocation of economic branches among the 13 NUTS II regions (Fig. 1) in two separate time periods – the pre-crisis period (2000–2007) and the crisis period (2008–2014).

The variable used is the employment in 10 branches of economic activity, according to the classification of Hellenic Statistical Authority. These branches are the following:

1. Agriculture, forestry and fishing,
2. Mining and quarrying, manufacturing, electricity, gas, steam, air conditioning and water supply, sewerage, waste management and remediation activities,
3. Construction,
4. Wholesale and retail trade, repair of motor vehicles and motorcycles, transportation and storage, accommodation and food service activities,
5. Information and communication,
6. Financial and insurance activities,
7. Real estate activities,
8. Professional, scientific and technical activities, administrative and support service activities,
9. Public administration and defence, compulsory social security, education, human health and social work activities,
10. Arts, entertainment, recreation, other service activities, activities of households as employers, undifferentiated goods and services producing activities of households for own use, activities of extraterritorial organisations and bodies.

Moreover, to identify the appropriate type of regional policy needed and set priority among regions, Boudeville's method (1966) is utilised. His method involves a classification of regions according to their performance in terms of Proportional Shift (PS) and Differential Shift (DS) of the Shift-Share analysis. To this end, he suggested an eightfold classification of regional types to be made as presented in Table 1 (Papadaskalopoulos, 2000).

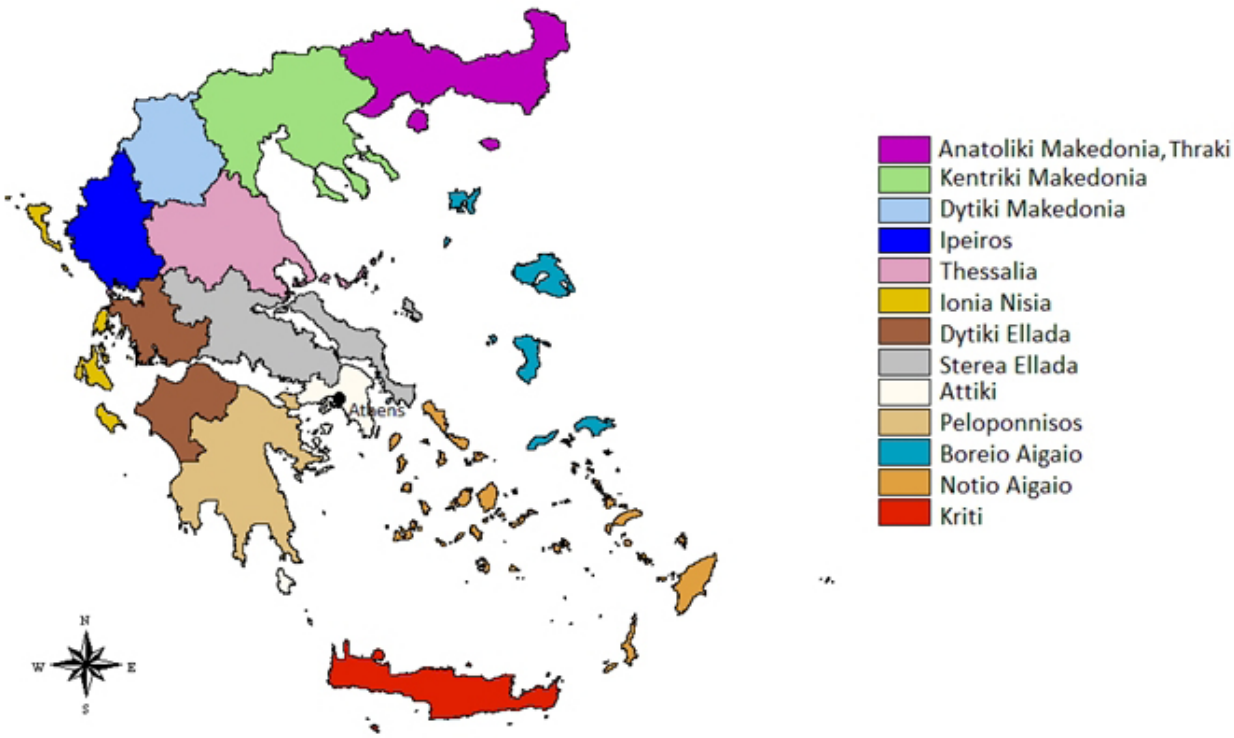

Fig. 1. The Greek NUTS II Regions

Table 1. Boudeville's regional classification

Regional classification type	Relative change-relation between PS and DS			
1	PS > 0,	DS> 0	and	|PS|>|DS|
2	PS > 0,	DS > 0	and	|PS|<|DS|
3	PS > 0,	DS < 0	and	|PS|>|DS|
4	PS < 0,	DS > 0	and	|PS|<|DS|
5	PS < 0,	DS > 0	and	|PS|>|DS|
6	PS > 0,	DS < 0	and	|PS|<|DS|
7	PS < 0,	DS < 0	and	|PS|>|DS|
8	PS < 0,	DS < 0	and	|PS|<|DS|

The use of Boudeville's classification provides useful guidelines regarding future regional economic policies. According to this classification, Stilwell (1970) suggests that the deficiencies attributed to differential growth can be corrected either through an overall improvement in infrastructure of certain regions or through injection of growth sectors in other regions (Andrikopoulos, 1978). More specifically, he points out that in regions where the low rate of growth is due to local disadvantages (negative DS_r), the strengthening of infrastructure is needed, while in regions where the low rate of growth is due to the sectoral structure (negative PS_r), sectoral restructuring is needed.

The basic policy means according the regional classification types of Boudeville are presented in the following table.

Furthermore, based on the above classification, Stilwell (1970) accepts the existence of only six types of regions by unifying types 1 and 2, and doing the same for types 7 and 8 (Papadaskalopoulos, 2000). The above classification can be further simplified (in terms of policy means) by unifying types 4 and 5, as well as 3 and 6. This methodological framework is what we follow in the present article.

4. Applications and results

The disparities among the Greek regions were calculated by the Coefficient of Variation using the regional distribution of the total employment, for the years 2000, 2008 and 20016, according to the proposed methodology. The results are presented in Table 3.

Table 2. Regional Policy Means according the regional type

Relative change-relation between PS and DS				Regional classification type	Regional Policy Means
PS > 0,	DS> 0	and	|PS|>|DS|	1	
PS > 0,	DS > 0	and	|PS|<|DS|	2	
PS > 0,	DS < 0	and	|PS|>|DS|	3	infrastructure strengthening
PS < 0,	DS > 0	and	|PS|<|DS|	4	sectoral restructuring
PS < 0,	DS > 0	and	|PS|>|DS|	5	sectoral restructuring
PS > 0,	DS < 0	and	|PS|<|DS|	6	infrastructure strengthening
PS < 0,	DS < 0	and	|PS|>|DS|	7	sectoral restructuring and infrastructure strengthening
PS < 0,	DS < 0	and	|PS|<|DS|	8	infrastructure strengthening and sectoral restructuring

Table 3. Interregional disparities in Greece according to CV index for the years 2000, 2008 and 2016

Years	Disparities in employment
	CV
2000	114.86
2008	125.41
2016	120.04

From the CV values, it emerges that during the total period 2000–2016, the regional disparities increased. However, if we divide this period into two sub-periods 2000–2008 and 2008–2016, we see regional disparities increase during the first period (development period), while in the next period (of the crisis) there is a decline of inequalities, although the level of the year 2000 is not reached. This fact means that the regional distribution of employment during the development period was more imbalanced than the corresponding distribution during the crisis.

The sectoral specialisation of the Greek regions was calculated by the Location Quotients (LQ) for the years 2008 and 2014, namely for the beginning and the end of the crisis period, in order to see the possible changes in the specialisation of the regions that occurred during the crisis. The results are presented in the following table.

Most of the regions are specialised in agriculture, forestry and fishing (except the region of Attiki, which includes the capital, Athens, and the island region of Notio Aigaio, which is characterised by high tourism activity). The higher values of LQ are observed, in both years, in the primary sector in the regions Anatoliki Makedonia, Thraki and Peloponnisos, while Attiki (the metropolitan region of the country) is specialised in most tertiary sector activities.

Moreover, as we can see from the above table, most of the Greek regions do not seem to have significant changes in their specialisation during the period of the economic crisis. In some regions, the low specialisation that existed in 2008 does not exist in 2014 (such as Voreio Aigaio in agriculture, forestry and fishing, Dytiki Ellada and Sterea Ellada in construction, Dytiki Makedonia and Thessalia in public administration and related services). Conversely, some regions gained a very low specialisation in the year 2014 (such as Thessalia and Peloponnisos in construction, Voreio Aigaio in trade, repair of motor vehicles and motorcycles, transportation and storage, etc., Attiki in public administration and related services).

To see how the possible changes in the spatial allocation pattern of the economic activity resulted from the economic crisis, Shift-Share analysis is used. According to the application's results, the following table shows the comparative presentation of the three components (National Share, Proportional Shift, and Differential Shift) for the two examined periods (2000–2007 and 2008–2014).

As we see, there is a general increase in employment in the first period (2000–2007) in all regions, and a corresponding fall during the crisis period of 2008–2014.

During the first period only two regions, Attiki and Notio Aigaio, achieve positive Proportional Shift. This fact means that the dynamic economic branches of the national economy (such as: high-quality specialised services, e.g. IT, communication, financial activities; and tourism-related activities, e.g. recreation and accommodation) are concentrated in these two regions (which are also the most prosperous regions in the country), while local advantages (according to the Differential Shift component) are shown in several regions except Attiki. These are the two island regions of Notio and Voreio Aigaio and some continental regions (Anatoliki Makedonia, Thraki, Kentriki Makedonia, Thesalia, Dytiki Ellada, Sterea Ellada and Peloponnisos). During the period of crisis, 2008–2014, where there is a general decline in employment (in all regions), Attiki and Notio Aigaio lost their sectoral dynamism, while a few regions resisted. However, regarding the local share effects (Differential Shift) we observe that the more urbanised regions, i.e. those with the largest urban concentrations of the country (Attiki, Kentriki Makedonia, Thessalia and Dytiki Ellada) show negative local shares. In contrast, the rest of the regions show positive local shares (mainly in peripheral regions with rural development potential, and in some more diverse regional economies).

From these results we can observe that the more traditional activities seem to be more resilient, unlike the modern activities, which seem more sensitive to the crisis and are located mainly in the large

Table 4. Specialisation (LQ>1) in the branches of economic activity by region for the years 2008 and 2014

Branches[1]	**1**		**2**		**3**		**4**		**5**		**6**		**7**		**8**		**9**		**10**	
Years	**2008**	**2014**	**2008**	**2014**	**2008**	**2014**	**2008**	**2014**	**2008**	**2014**	**2008**	**2014**	**2008**	**2014**	**2008**	**2014**	**2008**	**2014**	**2008**	**2014**
Attiki									1.8	1.8	1.6	1,6	1.5	1.5	1.4	1.4		1.1	1.4	1.3
Voreio Aigaio	1.2				1.1	1.2		1.1									1.4	1.2		
Notio Aigaio					1.2	1.5	1.6	1.4												
Kriti	1.5	1.4			1.1	1.3	1.1	1.2												
Anatoliki Makedonia, Thraki	2.2	2.3															1.1	1.1		
Kentriki Makedonia	1.1	1.1	1.2	1.1																
Dytiki Makedonia	1.6	1.4	1.6	1.8	1.2	1.4											1.1			
Ipeiros	1.7	1.6			1.3	1.4											1.2	1.1		
Thessalia	1.8	2.0				1.1											1.1			
Ionia Nisia	1.4	1.2			1.2	1.5	1.4	1.3												
Dytiki Ellada	1.8	1.8			1.1															
Sterea Ellada	1.7	1.7	1.5	1.8	1.1															
Peloponnisos	2.9	2.4				1.2														

Branches of economic activity:
1. Agriculture, forestry and fishing
2. Mining and quarrying, manufacturing, electricity, gas, steam, air conditioning and water supply, sewerage, waste management and remediation activities
3. Construction
4. Wholesale and retail trade, repair of motor vehicles and motorcycles, transportation and storage, accommodation and food service activities
5. Information and communication
6. Financial and insurance activities
7. Real estate activities
8. Professional, scientific and technical activities, administrative and support service activities
9. Public administration and defence, compulsory social security, education, human health and social work activities
10. Arts, entertainment, recreation, other activities, activities of households as employers, undifferentiated goods and services producing activities of households for own use, activities of extraterritorial organizations and bodies

Table 5. Comparative Shift-Share Analysis results (positive and negative symbols), 2000–2007 and 2008–2014

Components	National Share		Proportional Shift		Differential Shift	
	2000–2007	2008–2014	2000–2007	2008–2014	2000–2007	2008–2014
Attiki	+	-	+	-	-	-
Voreio Aigaio	+	-	-	+	+	+
Notio Aigaio	+	-	+	-	+	+
Kriti	+	-	-	+	-	+
Anatoliki Makedonia, Thraki	+	-	-	+	+	+
Kentriki Makedonia	+	-	-	-	+	-
Dytiki Makedonia	+	-	-	-	-	+
Ipeiros	+	-	-	-	-	+
Thessalia	+	-	-	+	+	-
Ionia Nisia	+	-	-	+	-	+
Dytiki Ellada	+	-	-	+	+	-
Sterea Ellada	+	-	-	-	+	+
Peloponnisos	+	-	-	+	+	+

Table 6. Regional classification types of Greek regions for the periods 2000–2007 and 2008–2014, according to Shift-Share results

Regions	Regional types	
	2000–2007	2008–2014
Attiki	3	8
Voreio Aigaio	4	2
Notio Aigaio	2	4
Kriti	7	2
Anatoliki Makedonia, Thraki	5	2
Kentriki Makedonia	5	8
Dytiki Makedonia	8	4
Ipeiros	8	4
Thessalia	4	3
Ionia Nisia	7	2
Dytiki Ellada	5	6
Sterea Ellada	5	4
Peloponnisos	5	2

Table 7. Regional classification of Greece regions and Policy Means, 2000–2007

Relative change-relation between PS and DS				Regional type	Regions	Regional Policy Means
PS > 0,	DS> 0	and	|PS|>|DS| or |PS|<|DS|	1 or 2	Notio Aigaio	infrastructure strengthening
PS > 0,	DS < 0	and	|PS|>|DS| or |PS|<|DS|	3 or 6	Attiki	
PS < 0,	DS > 0	and	|PS|<|DS| or |PS|>|DS|	4 or 5	Voreio Aigaio, Anatoliki Makedonia, Thraki, Kentriki Makedonia, Thessalia, Dytiki Ellada, Sterea Ellada, Peloponnisos	sectoral restructuring
PS < 0,	DS < 0	and	|PS|>|DS| or |PS|<|DS|	7 or 8	Kriti, Dytiki Makedonia, Ipeiros, Ionia Nisia	sectoral restructuring and infrastructure strengthening

Table 8. Regional classification of Greece regions and Policy Means, 2008–2014

Relative change-relation between PS and DS				Regional type	Regions	Regional Policy means
PS > 0,	DS> 0	and	|PS|>|DS| or |PS|<|DS|	1 or 2	Voreio Aigaio, Kriti, Anatoliki Makedonia, Thraki, Ionia Nisia, Peloponnisos	
PS > 0,	DS < 0	and	|PS|>|DS| or |PS|<|DS|	3 or 6	Thessalia, Dytiki Ellada	infrastructure strengthening
PS < 0,	DS > 0	and	|PS|<|DS| or |PS|>|DS|	4 or 5	Notio Aigaio, Dytiki Makedonia, Ipeiros, Sterea Ellada	sectoral restructuring
PS < 0,	DS < 0	and	|PS|>|DS| or |PS|<|DS|	7 or 8	Attiki, Kentriki Makedonia	sectoral restructuring and infrastructure strengthening

Table 9. Main Regional Policy Means for the Greek regions, in 2000–2007 and 2008–14

	2000–2007		2008–2014	
	sectoral restructuring	infrastructure strengthening	sectoral restructuring	infrastructure strengthening
Attiki		✓	✓	✓
Voreio Aigaio	✓			
Notio Aigaio			✓	
Kriti	✓	✓		
Anatoliki Makedonia, Thraki	✓			
Kentriki Makedonia	✓		✓	✓
Dytiki Makedonia	✓	✓	✓	
Ipeiros	✓	✓	✓	
Thessalia	✓			✓
Ionia Nisia	✓	✓		
Dytiki Ellada	✓			✓
Sterea Ellada	✓		✓	
Peloponnisos	✓			

cities and, thus, in the most urbanised regions of the country.

5. Regional Classification and Policy Means

According to the above results and the proposed methodology, we move on to the classification of the regions into categories for each of the two research periods. This will help us to propose the appropriate regional policy means that fit each type of region.

The regional classification of the examined periods is presented in the following table.

The basic regional policy means, according the above regional classification types of Boudeville, are presented in tables 7 and 8 for each of the two distinct periods.

To have a more comprehensive picture of the proposed policy means for each region in the two examined periods, the following comparative table is presented.

As we can see, during the development period (pre-crisis) sectoral restructuring is needed in most of the regions, except Attiki and Notio Aigaio, while during the period of crisis sectoral restructuring is needed in some regions (including the two above), while in some others infrastructure improvement is required – mainly in the two metropolitan regions of the country, i.e. Attiki and Kentriki Makedonia, as well as in some other regions with large urban concentrations (Thessalia and Dytiki Ellada).

Regarding the proposed regional policy means, infrastructure improvement is indicated for the most urbanised regions, in order to improve their developmental environment. So, we agree with some researchers who point out that urban economies are more vulnerable to economic crisis (Hadjimichalis and Hudson, 2014). However, a positive developmental environment, such as a differentiated productive structure (Di Caro, 2017), an adaptive innovative environment and highly skilled human capital could help these areas to adapt and recover more immediately than other areas (Balland et al., 2015). For the other regions, a more balanced sectoral structure must be promoted. More specifically, in rurally oriented regions the traditional activities of the primary sector need to become more competitive in order for local advantages to be reinforced. To this end, the linkages of the sector with other economic activities (i.e. rural tourism, local manufacturing activities) must be promoted as well. Finally, regarding the island regions, diversification of tourism activity through the development of alternative forms of tourism, as well as its interconnection with other local economic activities must be a policy priority, as many other researchers have suggested (Dissart, 2003; Christopherson et al., 2010; Giannakis and Bruggeman, 2015b, 2017).

6. Conclusions and issues for further research

A first finding that emerges from the above analysis is that the crisis has not left the regional inequalities unaffected. More specifically, it has emerged that during the total period 2000–2016, the regional disparities increased. However, if we divide this period into two sub-periods 2000–2008 and 2008–2016, we see that the regional disparities increased during the first period while in the next period of crisis they declined, but without reaching the levels they were at in 2000. This fact means that the regional distribution of employment during the development period was more imbalanced than the corresponding distribution during the crisis. In other words, we can say that the crisis hit the regions in a more balanced way.

Most of the Greek regions continue to be specialised in agriculture, forestry and fishing (except the region of Attiki in which the capital Athens is located, and the island region of Notio Aigaio, which is characterised by high tourism activity), without any significant changes in their specialisation during the period of the economic crisis, 2008–2014, despite the general decline in employment in all regions.

In the first period, 2000–2007, the dynamic branches of economic activity are concentrated mainly in the metropolitan region of Attiki (because of the existence of high-quality specialised services) and in the island region of Notio Aigaio (obviously, because of the existence of the tourism sector),

while local advantages are shown in several regions in addition to Attiki. During the next period, that of crisis, where there is a general decline in employment (in all regions), Attiki and Notio Aigaio lost their sectoral dynamism, while a few regions resisted. However, regarding the local share effects we observe that the more urbanised regions (Attiki, Kentriki Makedonia, Thessalia and Dytiki Ellada) show negative local shares. In contrast, the other regions show positive local shares. More specifically, local advantages seem to shift to peripheral regions with rural development potential and a high participation rate in the agricultural sector, as well as in the more diverse regional economies. According to these results, a concluding remark of the analysis is that the more traditional activities seem to be more resilient, unlike the modern activities, which seem more sensitive to crisis and are located mainly in the large cities and, thus, in the most urbanised regions of the country.

In this framework, regarding the proposed regional policy means, during the development period (pre-crisis) sectoral restructuring is needed in most of the regions, except Attiki and Notio Aigaio, while during the period of crisis sectoral restructuring is needed in some regions (including the two above), while, in some others, infrastructure improvement is indicated, and mainly in the two metropolitan regions of the country, i.e. Attiki and Kentriki Makedonia, as well as in some other regions with large urban concentrations. In rurally oriented regions the traditional activities of the primary sector need to become more competitive in order for local advantages to be strengthened. Moreover, the linkages of the sector with other economic activities (i.e. rural tourism, local manufacturing activities) must be promoted. In island regions the differentiation of tourism as well as its interconnection with other local economic branches is needed.

Of course, it must be noted that it is important that the features of regional development according to the classification of the regions and, moreover, the proposed policy measures, are more important to perform similar studies at a higher resolution, classifying smaller geographical areas and a greater number of narrower economic sectors, in order to propose more targeted and practicable policy measures. Future research will be focused on this area. In addition other factors affecting regional resilience must be examined, such as human capital and regions' innovation capacity.

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Ministry of Science and Higher Education
Republic of Poland

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