SPATIAL VARIATIONS OF EMPLOYMENT CHANGE IN GREECE OVER THE EARLY-CRISIS PERIOD (2008-2011)

Dimitris KALLIORAS
University of Thessaly, Department of Planning and Regional Development, Pedion Areos, 38334 Volos, tel: 0030 24210 74484
dkallior@uth.gr
(Corresponding author)

Maria TSIAPA
University of Thessaly, Department of Planning and Regional Development
mtsiapa@uth.gr

Spyridon ZAPANTIS
University of Thessaly, Department of Planning and Regional Development
szapantis@uth.gr

Abstract

Towards conceptualizing and understanding the spatial impact of the contemporary economic crisis, the paper scrutinizes the spatial variations of employment change in Greece. To this end, the paper employs a trade-adjusted shift-share analysis; a shift-share formulation accounting for employment changes resulting from changes in exports, imports and domestic demand. Trade-adjusted shift-share analysis is employed against the backdrop of the world economy, on the basis of employment data that refer to NACE Rev. 2 aggregation sectoral levels and to NUTS II spatial level, and covers the early-crisis period (2008-2011). The results obtained highlight the negative national effect component as an outcome of the shocks and the upsets that the Greek economy has suffered. The industry mix component and the competitive shift component are positive only for specific regions and sectors. Particularly, for the industry mix component it comes that all Greek regions specialize in sectors that, at the national level, are export-declining and import-declining and experience labor productivity losses.

Keywords: economic crisis, employment change, Greek regions, trade-adjusted shift-share analysis

JEL classification: C10, F10, L16, R11, R12

1. Introduction

Towards conceptualizing and understanding the spatial impact of the contemporary economic crisis, the paper scrutinizes the spatial variations of employment change in Greece, a country being within a stressful context of economic recession, fiscal consolidation and structural adjustment (Greek Ministry of Finance 2010, 2011 and 2012); an outcome of both exogenous and endogenous factors (Oltheten et al. 2003, Kotios and Pavlidis 2012, Petrakos et al. 2012, inter alia). To this end, the paper employs the trade-adjusted shift-share analysis; a shift-share formulation accounting for employment changes resulting from changes in exports, imports and domestic demand. Trade-adjusted shift-share analysis is employed against the backdrop of the world economy and covers the early-crisis period (2008-2011). Though small in duration, the period of analysis is extremely importance as it captures the shocks and the upsets that the Greek economy has suffered, just after the eruption of the economic crisis.

The analysis is employed on the basis of employment data, derived from the Hellenic Statistical Authority (ELSTAT 2015), that refer to NACE Rev. 2 aggregation sectoral levels and the NUTS II spatial level. Employment has been preferred over GDP as measure of analysis under the rationale that employment data is the most available, at a timely manner, input for evidence-based policy-making at the regional level. Apparently, this allows for a systematic account as regards the spatial impact of economic crisis. National-sectoral-level

data for GDP are derived from ELSTAT (2015) while trade activity (i.e. value of exports and imports flows), necessary for the application of the trade-adjusted shift-share analysis, are derived from UN (2015a, 2015b). Both variables are expressed in real (i.e. inflation-adjusted) terms (i.e. constant, year 2000, prices), with the utilization of deflators obtained from the World Bank. Due to the fact that trade data refer to SITC sectoral level, the necessary sectoral arrangements have been made for the sake of compatibility with the corresponding employment and GDP data.

The paper is organized as follows: The next section describes the trade-adjusted shift-share analysis. The third section sketches the profile of the Greek regions. The fourth section discusses the results derived from the application of the trade-adjusted shift-share analysis. The last section offers the conclusions.

2. The trade-adjusted shift-share analysis

Shift-share analysis is a method of decomposing regional employment growth patterns into expected (share) and differential (shift) components. On the basis of the propositions made by Dunn (1959), Rosenfeld (1959) and Esteban-Marquillas (1972), the standard shift-share analysis treats regional employment changes (i.e. gains or losses) between two points in time as the sum of three components: (a) the national effect, (b) the industry mix, and (c) the competitive shift. The national effect component represents the share of regional job growth attributable to growth of the national economy (i.e. how much regional growth can be attributed to the national growth?). The industry mix component represents the share of regional job growth attributable to differences in industry and total national growth rates (i.e. how much regional growth can be attributed to the region's mix of industries?). The competitive shift component represents the share of regional job growth attributable to differences in regional and national industrial growth rates (i.e. how much regional growth can be attributed to the region's competitiveness?).

Let E be standing for employment, i for sectors, r for regions, for base (initial) year, and t for terminal (final) year. The change in regional employment is given by: $\Delta E^r = \sum_i E^r_{i0} e^r_i$, where $e^r_i = \frac{E^r_{it} - E^r_{i0}}{E^r_{i0}}$. The regional employment change can be, further, decomposed as the sum of the national effect, the industry mix and the competitive shift:

$$\Delta E^r \equiv \underbrace{\sum_i E^r_{i0} e}_{national\_effect} + \underbrace{\sum_i E^r_{i0}\left(e_i - e\right)}_{industry\_mix} + \underbrace{\sum_i E^r_{i0}\left(e^r_i - e_i\right)}_{competitive\_shift},$$

where $e_i = \frac{\sum_r E^r_{it} - E^r_{i0}}{\sum_r E^r_{ir}}$ and $e = \frac{\sum_i \sum_r E^r_{it} - E^r_{i0}}{\sum_i \sum_r E^r_{i0}}$.

Shift-share analysis was first applied by Dunn (1960), for the calculation of employment changes in the USA over the period 1939-1954, even though its origins date back in the 1940s (Jones 1940, Creamer 1943). Later on, it was popularized, mainly, by the contributions made by Fuchs (1962) and Ashby (1964), who measured the corresponding employment changes over the periods 1929-1954 and 1940-1960, respectively. Despite the lack of theoretical substance and the criticism surfaced (see, *inter alia*, Houston 1967, MacKay 1968, Cunningham 1969, Richardson 1978, Theil and Gosh 1980, Bartels et al. 1982), shift-share analysis became, pretty soon, an extremely useful, and easy-to-use, tool for regional economists trying to sketch the economic profiles of regional economies.

Yet, one serious criticism against the (standard) shift-share analysis has to do with the use of the national economy as the norm against the measurement of changes in the regional (i.e. sub-national) economies as international trade - the first type of linkage between economic entities (Cornett 1996), and one of the most expedient (economic) factors in pushing economies into integration (Paas and Tafenau 2008) - becomes increasingly important to both national and, consequently, regional economies. Indeed, the process of (economic) integration eliminates border obstacles in factor movements and further intensifies itself via the reduction of transactions costs (Kallioras et al. 2009). The abolition of border obstacles allows for the

emergence of several spatial forces related to exports and imports competition, thus increasing regional competition (Brülhart et al. 2004). In an attempt to deal with this criticism, Markusen et al. (1991) modified shift-share analysis proposing a trade-adjusted shift-share counterpart – the trade-adjusted shift-share analysis – where the conventional national effect and industry mix components are, further, disaggregated to account for regional employment growth resulting from changes in exports, imports and domestic demand. In addition, since output has been used as the base against which the relative importance of both imports and exports has been measured, the national effect and industry mix components have been, further, extended to account for possible effects on employment due to productivity gains. That is, it represents hypothetical losses in employment in cases where output growth leads to disproportionately smaller employment growth.[1]

Trade-adjusted shift-share analysis is based on the relationship: $Q = D + X - M$, where Q is the value of production (i.e. GDP), D is domestic demand (i.e. apparent consumption), X stands for exports and M stands for imports.

The national effect component of the trade-adjusted shift-share analysis is given by: $\sum_i E_{i0}^r e = \sum_i E_{i0}^r (e + q - q) = \sum_i E_{i0}^r q + \sum_i E_{i0}^r (e - q)$. In this relationship, $q = \frac{Q_t - Q_0}{Q_0}$ is the national-level growth of output. The term $\sum_i E_{i0}^r q$ can be, further, decomposed as: $\sum_i E_{i0}^r q = \sum_i E_{i0}^r \left(d \frac{D_0}{Q_0} + x \frac{X_0}{Q_0} - m \frac{M_0}{Q_0} \right)$, where $d = \frac{D_t - D_0}{D_0}$ represents growth in domestic demand, $x = \frac{X_t - X_0}{X_0}$ growth in exports, and $m = \frac{M_t - M_0}{M_0}$ growth in imports. The national effect component of the trade-adjusted shift-share analysis is fully decomposed as:

$$\sum_i E_{i0}^r e = \underbrace{E_0^r \left(d \frac{D_0}{Q_0} \right)}_{\text{domestic\_demand\_national\_effect}} + \underbrace{E_0^r \left(x \frac{X_0}{Q_0} \right)}_{\text{exports\_national\_effect}} - \underbrace{E_0^r \left(m \frac{M_0}{Q_0} \right)}_{\text{imports\_national\_effect}} + \underbrace{E_0^r (e - q)}_{\text{labor\_productivity\_national effect}}.$$

It can be confirmed that: $q = d \frac{D_0}{Q_0} + x \frac{X_0}{Q_0} - m \frac{M_0}{Q_0}$.

The industry mix component of the trade-adjusted shift-share analysis is obtained by the relationship: $\sum_i E_{i0}^r (e_i - e) = \sum_i E_{i0}^r (q_i - q) + \sum_i E_{i0}^r ((e_i - e) - (q_i - q))$. The term $\sum_i E_{i0}^r (q_i - q)$ can be, further, decomposed, yielding:

$\sum_i E_{i0}^r (q_i - q) = \sum_i E_{i0}^r \left[\left(d_i \frac{D_{i0}}{Q_{i0}} + x_i \frac{X_{i0}}{Q_{i0}} - \frac{M_{i0}}{Q_{i0}} \right) - \left(d \frac{D_0}{Q_0} + x \frac{X_0}{Q_0} - \frac{M_0}{Q_0} \right) \right]$. The latter becomes:

$$\sum_i E_{i0}^r (q_i - q) = \underbrace{\sum_i E_{i0}^r \left(d_i \frac{D_{i0}}{Q_{i0}} - d \frac{D_0}{Q_0} \right)}_{\text{domestic\_demand\_industry\_mix}} + \underbrace{\sum_i E_{i0}^r \left(x_i \frac{X_{i0}}{Q_{i0}} - x \frac{X_0}{Q_0} \right)}_{\text{exports\_industry\_mix}} - \underbrace{\sum_i E_{i0}^r \left(m_i \frac{M_{i0}}{Q_{i0}} - m \frac{M_0}{Q_0} \right)}_{\text{imports\_industry\_mix}}.$$

Thus, the industry mix component of the trade-adjusted shift-share analysis can be, fully, decomposed as:

[1] At this point, it should be noted that in Markusen et al. (1991) there have been some typographical errors that prevent the reader to fully comprehend the proposed methodology. These errors have offered the opportunity for a fertile discussion of this methodological proposition in the literature (Dinc and Haynes 1998a and1998b). Noponen et al. (1998) account for these errors and respond to the comments raised. Thenceforth, there have been many empirical studies in the literature deploying the trade-adjusted shift-share analysis (Fotopoulos et al. 2010, Kowaleski 2011, Chiang 2012, *inter alia*).

$$\sum_i E_{i0}^r (e_i - e) = \underbrace{\sum_i E_{i0}^r \left(d_i \frac{D_{i0}}{Q_{i0}} - d \frac{D_0}{Q_0} \right)}_{\text{domestic\_demand\_industry\_mix}} + \underbrace{\sum_i E_{i0}^r \left(x_i \frac{X_{i0}}{Q_{i0}} - x \frac{X_0}{Q_0} \right)}_{\text{exports\_industry\_mix}} - \underbrace{\sum_i E_{i0}^r \left(m_i \frac{M_{i0}}{Q_{i0}} - m \frac{M_0}{Q_0} \right)}_{\text{imports\_industry\_mix}} +$$
$$+ \underbrace{\sum_i E_{i0}^r \left((e_i - e) - (q_i - q) \right)}_{\text{labor\_productivity\_industry\_mix}}$$

The competitive shift component of the trade-adjusted shift-share analysis remains the same as in the standard version of the method.

As far as the interpretation of the components of the trade-adjusted shift-share analysis is concerned, it should be noted that the national effect component has four sub-components: (a) the domestic demand national effect, (b) the exports national effect, (c) the imports national effect, and (d) the labor productivity national effect. These sub-components would represent, respectively, the effect on employment through a residual effect of national demand shifts, the hypothetical effect if employment were to expand proportionately to national exports, the effect on employment through national imports substituting for domestic production, and a correction factor as productivity gains (losses) may lead to employment losses (gains) if output growth leads to disproportionately smaller (greater) job growth. The industry mix component of the trade-adjusted shift-share analysis, also, has four sub-components: (a) the domestic demand industry mix, (b) the exports industry mix, (c) the imports industry mix, and (d) the labor productivity industry mix. These sub-components would represent, respectively, the residual effect of domestic demand on local industries, the hypothetical employment effect as if a region's industries expanded proportionally to national export sales in those industries, the hypothetical employment effect through import substitution for region's industries, and a correction factor as productivity gains (losses) may lead to employment losses (gains) if the national-level productivity growth of the region's industrial structure has outperformed (lagged-behind) the corresponding productivity growth of the nation's industrial structure. Evidently, the employment effects attributed to domestic demand, exports and imports shifts are all hypothetical. The basic assumption is that output-based measures are translated into jobs as if employment-to-output ratios had remained constant. The labor productivity components come into play to account (as correction factors) for possible shifts of employment-output ratios.

Within the framework of internationalization / economic integration, (especially) the decomposition of the industry mix component of the trade-adjusted shift-share analysis, and the consequent interpretation of the results, is of great importance. This is so as international trade has a direct impact on the level and the nature of regional sectoral specialization, changing, significantly, the mix of opportunities and threats of the external environment (comparing to the corresponding mix of a closed economy) and accentuating the importance of the indigenous strengths and weaknesses.

The domestic demand industry mix sub-component is positive when: $\frac{D_{it} - D_{io}}{Q_{i0}} - \frac{D_t - D_0}{Q_0} > 0$. This means that: (a) a sector faces domestic demand expansion, at the national level, whereas total economy faces domestic demand decline, or (b) a sector faces domestic demand expansion, at the national level, at a higher rate than total economy, or (c) a sector faces domestic demand decline, at the national level but at a lower rate than total economy. In contrast, the domestic demand industry mix sub-component is negative when: $\frac{D_{it} - D_{io}}{Q_{i0}} - \frac{D_t - D_0}{Q_0} < 0$. This means that: (a) a sector faces domestic demand decline, at the national level, whereas total economy faces domestic demand expansion, or (b) a sector faces domestic demand expansion, at the national level, but at a lower rate than total economy, or (c) a sector faces domestic demand decline, at the national level, at a higher rate than total economy.

The exports industry mix sub-component is positive when: $\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}>0$. This means that: (a) a sector is export-expanding, at the national level, whereas total economy is export-declining, or (b) a sector is export-expanding, at the national level, at a higher rate than total economy, or (c) a sector is export-declining, at the national level, but at a lower rate than total economy. In contrast, the exports industry mix sub-component is negative when: $\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}<0$. This means that: (a) a sector is export-declining, at the national level, whereas total economy is export-expanding, or (b) a sector is export-expanding, at the national level, but at a lower rate than total economy, or (c) a sector is export-declining, at the national level, at a higher rate than total economy.

The imports industry mix sub-component is positive when: $\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}>0$. This means that: (a) a sector is import-expanding, at the national level, whereas total economy is import-declining, or (b) a sector is import-expanding, at the national level, at a higher rate than total economy, or (c) a sector is import-declining, at the national level, but at a lower rate than total economy. In contrast, the imports industry mix sub-component is negative when: $\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}<0$. This means that: (a) a sector is import-declining, at the national level, whereas total economy is import-expanding, or (b) a sector is import-expanding, at the national level, but at a lower rate than total economy, or (c) a sector is import-declining, at the national level, at a higher rate than total economy.

The labor productivity industry mix sub-component is positive when: $(q_i-e_i)-(q-e)\succ 0$. This means that: (a) a sector experiences productivity increase, at the national level, whereas total economy experiences productivity decrease, or (b) a sector experiences productivity increase, at the national level, at a higher rate than total economy, or (c) a sector experiences productivity decline, at the national level, but at a lower rate than total economy. In contrast, the labor productivity industry mix sub-component is negative when: $(q_i-e_i)-(q-e)\prec 0$. This means that: (a) a sector experiences productivity decrease, at the national level, whereas total economy experiences productivity increase, or (b) a sector experiences productivity increase, at the national level, but at a lower rate than total economy, or (c) a sector experiences productivity decline, at the national level, at a higher rate than total economy.

3. The profile of the Greek regions

Greece is divided into 13 NUTS II regions, namely: Anatoliki Makedonia & Thraki, Kentriki Makedonia, Dytiki Makedonia, Thessalia, Ipeiros, Ionia Nisia, Dytiki Ellada, Sterea Ellada, Peloponnisos, Attiki, Voreio Aigaio, Notio Aigaio, and Kriti. Attiki is the capital region of Greece, where the capital city of Athens is situated. Kentriki Makedonia hosts the city of Thessaloniki, the second Greek metropolitan area. Ionia Nisia, Voreio Aigaio, Notio Aigaio, and Kriti are entirely insular regions. The rest of the Greek regions are mainly continental. Dytiki Makedonia is the only Greek region which has no access to the sea. Figure 1 depicts the nomenclature of Greek regions and Table 1 presents some stylized facts. Notable is the fact that jointly the regions of Attiki and Kentriki Makedonia concentrate more than the 50% of Greece's population and produce more than the 50% of Greece's GDP.

Figure 1: The nomenclature of the Greek regions

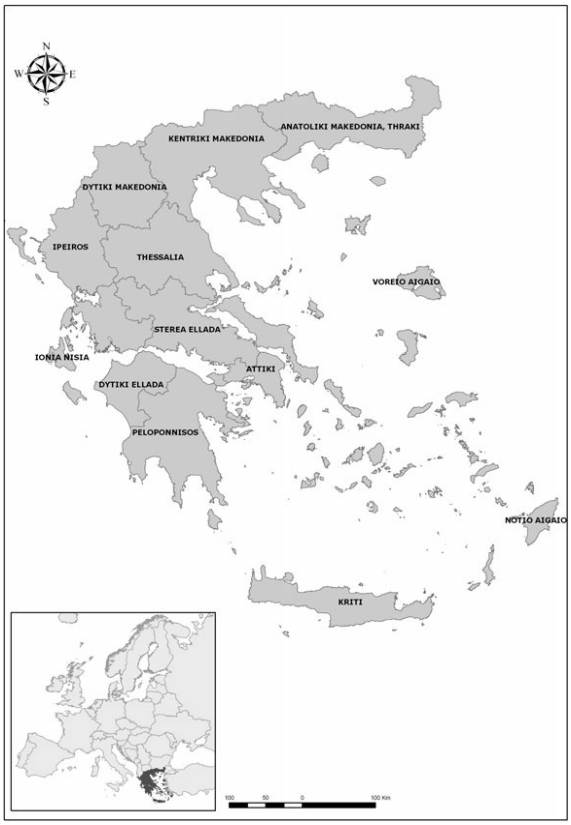

Table 1: Stylized facts for the Greek regions, year 2011

REGION NAME	AREA		POPULATION		GDP	
	(km^2)	(% country)	(inhabitants)	(% country)	(€)	(% country)
Anatoliki Makedonia & Thraki	14,157	10.7	608,182	5.6	307,879	5.0
Kentriki Makedonia	19,146	14.5	1,881,869	17.4	1,011,962	16.3
Dytiki Makedonia	9,451	7.2	283,689	2.6	145,668	2.4
Thessalia	14,036	10.6	732,762	6.8	395,931	6.4
Ipeiros	9,203	7.0	336,856	3.1	188,030	3.0
Ionia Nisia	2,306	1.7	207,855	1.9	128,659	2.1
Dytiki Ellada	11,350	8.6	679,796	6.3	395,858	6.4
Sterea Ellada	15,549	11.8	547,390	5.1	297,289	4.8
Peloponnisos	15,489	11.7	577,903	5.3	339,639	5.5
Attiki	3,808	2.9	3,827,624	35.4	2,355,002	38.0
Voreio Aigaio	3,835	2.9	199,231	1.8	101,125	1.6
Notio Aigaio	5,285	4.0	308,975	2.9	170,099	2.7
Kriti	8,335	6.3	623,065	5.8	354,678	5.7
GREECE	**131,950**	**100.0**	**10,815,197**	**100.0**	**6,191,819**	**100.0**

Source: ELSTAT (2015) / Authors' Elaboration

Tables 2 and 3 present the sectoral employment allocation of Greek regions. 9 NACE-2 sectors considered, namely: agricultural products, manufacturing products, construction,

transport & travel, informatics & information services, financial & insurance services, cultural & recreational services, government services, and other business services.

The overwhelming majority of sectors is highly concentrated in the capital region of Attiki with shares ranging (year 2011) from 33% (construction) to 68% (informatics & information services). The only exception to that is the sector of agricultural products that is mainly concentrated in the other metropolitan region of Kentriki Makedonia. This fact verifies the prevailing role of the metropolitan region of Attiki that generates imbalances in the production pattern of Greece not only by producing over the half of GDP but also by presenting high concentration levels in nearly all the production sectors. Slight trends of partial de-concentration seem to have taken place during the early-crisis period as the concentration shares in most of the sectors in Attiki have decreased (exceptions are found to the sectors of agricultural products, construction and government services).

Under a different perspective, noteworthy is the fact that nearly all Greek regions specialize primarily in the sector of transport & travel (except Peloponnisos that specialize in agricultural products) and secondarily in government services. Greece's production base historically - due to poor industrial performance and deindustrialization trends - was restructured, mainly, towards local-scale services (i.e. government services) as well as in tourism activities (Panteladis and Tsiapa 2012). Noteworthy is, also, the fact that no Greek region specialize in the sectors of construction, informatics & information services, financial & insurance services, cultural & recreational services, and other business services underlying their low-tech services specialization ability.

Table 2: Sectoral employment allocation (% country) in the Greek regions, years 2008 and 2011

REGION NAME	agri/al products		manuf/ng products		const/on		trans/rt & travel		info/ics & info/ion services		fin/al & ins/nce services		cult/al & recr/al services		gov/ment services		other buss/ss services	
	(% country)		(% country)		(% country)		(% country)		(% country)		(% country)		(% country)		(% country)		(% country)	
	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011
Anatoliki Makedonia & Thraki	11.0	10.9	5.0	4.5	4.7	3.4	4.0	4.1	1.7	2.1	3.0	3.0	3.0	2.7	5.6	5.6	3.7	3.2
Kentriki Makedonia	17.6	16.7	20.0	19.2	16.2	12.6	16.5	16.8	13.0	14.4	11.5	13.4	15.6	15.1	15.8	16.0	17.1	16.0
Dytiki Makedonia	3.6	3.2	3.6	4.4	3.0	2.4	1.8	2.0	0.3	0.5	1.2	1.2	1.6	1.6	2.4	2.3	0.8	1.3
Thessalia	11.7	13.1	6.4	5.9	6.6	5.6	5.5	5.7	0.6	0.9	3.8	3.9	4.9	4.7	7.2	6.3	4.0	4.4
Ipeiros	4.9	4.7	2.3	2.8	3.9	4.3	2.5	2.8	0.9	0.6	1.7	1.6	2.2	1.8	3.5	3.3	1.8	2.2
Ionia Nisia	3.0	3.1	0.8	0.9	2.4	2.8	2.9	2.6	0.1	0.2	0.9	1.4	1.8	1.9	1.4	1.5	1.7	1.7
Dytiki Ellada	10.9	11.1	4.2	4.7	7.2	7.9	5.8	6.0	3.0	3.3	3.7	3.9	4.1	5.8	6.4	6.3	4.5	4.6
Sterea Ellada	8.1	7.6	6.7	7.7	5.7	6.3	4.3	4.1	2.5	2.2	2.9	2.4	3.2	3.4	3.9	3.9	2.7	3.2
Peloponnisos	14.9	13.4	3.9	4.4	5.6	7.3	4.6	4.5	3.0	2.6	2.7	3.1	4.0	5.4	5.0	4.1	2.9	3.2
Attiki	3.0	3.2	40.4	38.8	33.4	33.6	39.9	39.8	69.8	67.9	61.9	60.6	53.2	50.6	39.4	41.3	52.6	51.9
Voreio Aigaio	1.8	1.8	1.0	1.1	1.5	1.8	1.6	1.7	1.1	1.2	1.1	1.0	0.8	0.9	2.2	2.3	0.9	1.0
Notio Aigaio	1.5	1.8	1.7	2.0	3.3	5.3	4.1	3.6	1.2	1.3	1.4	1.2	1.9	1.8	2.3	2.3	2.0	2.5
Kriti	8.0	9.5	3.9	3.6	6.6	6.7	6.4	6.3	2.7	2.7	4.1	3.2	3.7	4.4	4.9	4.9	5.4	4.8
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: ELSTAT (2015) / Authors' Elaboration

Table 3: Sectoral employment allocation (% region) in the Greek regions, years 2008 and 2011

REGION NAME	agri/al products		manuf/ng products		const/on		trans/rt & travel		info/ics & info/ion services		fin/al & ins/nce services		cult/al & recr/al services		gov/ment services		other buss/ss services		**total**	
	(% region)		(% region)		(% region)		(% region)		(% region)		(% region)		(% region)		(% region)		(% region)		(% region)	
	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011
Anatoliki Makedonia & Thraki	23.6	25.6	11.8	10.0	7.3	3.8	24.7	26.2	0.6	0.8	1.5	1.6	3.7	3.7	21.8	23.8	5.0	4.6	**100.0**	**100.0**
Kentriki Makedonia	11.5	11.9	14.4	12.9	7.7	4.3	31.2	33.0	1.4	1.6	1.7	2.1	6.0	6.3	19.0	20.8	7.1	7.1	**100.0**	**100.0**
Dytiki Makedonia	17.1	15.8	18.9	20.5	10.3	5.7	24.4	26.9	0.3	0.4	1.2	1.3	4.4	4.6	21.2	20.8	2.4	4.0	**100.0**	**100.0**
Thessalia	19.7	23.8	11.9	10.1	8.1	4.9	27.1	28.4	0.2	0.2	1.4	1.6	4.9	5.1	22.3	20.9	4.4	5.0	**100.0**	**100.0**
Ipeiros	18.0	17.9	9.5	10.1	10.5	8.0	26.9	30.0	0.5	0.4	1.4	1.4	4.9	4.0	23.9	23.1	4.3	5.1	**100.0**	**100.0**
Ionia Nisia	15.6	17.2	4.9	4.8	9.3	7.5	44.6	40.7	0.1	0.2	1.0	1.7	5.6	6.3	13.3	15.7	5.6	5.9	**100.0**	**100.0**
Dytiki Ellada	19.4	20.2	8.2	8.1	9.4	6.9	30.1	29.9	0.9	0.9	1.5	1.6	4.4	6.3	21.1	20.9	5.1	5.2	**100.0**	**100.0**
Sterea Ellada	18.4	18.5	16.8	17.7	9.5	7.3	28.4	27.5	0.9	0.8	1.5	1.3	4.2	4.9	16.2	17.2	4.0	4.7	**100.0**	**100.0**
Peloponnisos	29.2	28.5	8.4	8.7	8.0	7.5	25.9	26.1	1.0	0.9	1.2	1.4	4.6	6.8	18.1	15.8	3.6	4.2	**100.0**	**100.0**
Attiki	0.9	1.0	12.7	11.2	6.9	5.0	33.0	33.5	3.3	3.2	4.0	4.1	9.0	9.2	20.7	23.1	9.6	9.8	**100.0**	**100.0**
Voreio Aigaio	13.0	12.5	7.7	7.4	7.7	6.1	33.1	32.8	1.3	1.3	1.8	1.6	3.4	3.6	27.9	30.4	4.1	4.2	**100.0**	**100.0**
Notio Aigaio	6.1	7.6	7.7	8.1	9.7	10.8	47.6	42.1	0.8	0.9	1.2	1.2	4.5	4.6	17.3	18.2	5.1	6.5	**100.0**	**100.0**
Kriti	15.4	19.4	8.3	6.9	9.3	6.6	36.1	35.4	0.9	0.8	1.8	1.4	4.2	5.2	17.3	18.2	6.7	6.0	**100.0**	**100.0**

Source: ELSTAT (2015) / Authors' Elaboration

4. Application of the trade-adjusted shift-share analysis for the Greek regions

During the early-crisis period (2008-2011), Greek employment declined at about 13.52%, Greek GDP declined at about 14.29%, Greek exports declined at about 14.13%, and Greek imports declined at about 36.23%. Needless to say, all Greek regions exhibited a decline in terms of employment. Yet, there are some notable exceptions (i.e. slight increases) at the sectoral level, namely: agricultural products (Thessalia, Notio Aigaio, and Kriti), informatics & information services (Anatoliki Makedonia & Thraki, Dytiki Makedonia, Thessalia, and Ionia Nisia), financial & insurance services (Kentriki Makedonia, Ionia Nisia, and Peloponnissos), cultural & recreational services (Dytiki Ellada, Peloponnissos, and Kriti), government services (Ionia Nisia), and other business services (Dytiki Makedonia, Ipiros, Sterea Ellada, and Notio Aigaio).

Table 4 presents the economy-wide results of the trade-adjusted shift-share analysis[2] for the Greek regions with respect to the world. The national effect component is negative for all Greek regions, an outcome of the major shocks and upsets that the Greek economy has experienced (in such a short period). The same holds at the sectoral level, also. The industry mix component is positive for the regions of Anatoliki Makedonia & Thraki, Thessalia, Ionia Nisia, Dytiki Ellada, Peloponnisos, and Voreio Aigaio. The aforementioned regions specialize in sectors that favor employment growth. Noteworthy is that, at the sectoral level, the industry mix component is positive for all Greek regions in the sectors of agricultural products, transport & travel, financial & insurance services, cultural & recreational services, government services, and other business services. In contrast, the industry mix component is negative for all Greek regions in the other sectors considered. The competitive shift

[2] Due to lack of space the trade-adjusted shift-share analysis' results for each particular sector are not provided. Yet, they are available upon request.

component is positive for the regions of Dytiki Makedonia, Ipeiros, Ionia Nisia, Dytiki Ellada, Sterea Ellada, Voreio Aigaio, Notio Aigaio, and Kriti. The aforementioned regions exhibit conditions that favor employment growth. At the sectoral level, the competitive shift component is positive for the regions of Thessalia, Ionia Nisia, Dytiki Ellada, Attiki, Notio Aigaio, and Kriti in the sector of agricultural products; for the regions of Dytiki Makedonia, Ipeiros, Ionia Nisia, Dytiki Ellada, Sterea Ellada, Peloponnisos, Voreio Aigaio, and Notio Aigaio in the sector of manufacturing products; for the regions of Ipeiros, Ionia Nisia, Dytiki Ellada, Sterea Ellada, Peloponnisos, Attiki, Voreio Aigaio, Notio Aigaio, and Kriti in the sector of construction; for the regions of Anatoliki Makedonia & Thraki, Kentriki Makedonia, Dytiki Makedonia, Thessalia, Ipeiros, Dytiki Ellada, and Voreio Aigaio in the sector of transport & travel; for the regions of Anatoliki Makedonia & Thraki, Kentriki Makedonia, Dytiki Makedonia, Thessalia, Ionia Nisia, Dytiki Ellada, Voreio Aigaio, and Notio Aigaio in the sector of informatics & information services; for the regions of Kentriki Makedonia, Dytiki Makedonia, Thessalia, Ionia Nisia, Dytiki Ellada, and Peloponnisos in the sector of financial & insurance services; for the regions of Dytiki Makedonia, Ionia Nisia, Dytiki Ellada, Sterea Ellada, Peloponnisos, Voreio Aigaio, and Kriti in the sector of cultural & recreational services; for the regions of Kentriki Makedonia, Ionia Nisia, Attiki, Voreio Aigaio, Notio Aigaio, and Kriti in the sector of government services; and for the regions of Dytiki Makedonia, Thessalia, Ipeiros, Ionia Nisia, Dytiki Ellada, Sterea Ellada, Peloponnisos, Voreio Aigaio, and Notio Aigaio in the sector of other business services.

Table 4: Results of the trade-adjusted shift-share analysis for the Greek regions with respect to the world, economy-wide, period 2008-2011

REGION NAME	**JOB CHANGE**	NATIONAL EFFECT				**NATIONAL EFFECT**	INDUSTRY MIX				**INDUSTRY MIX**	**COMPETITIVE SHIFT**
		DOMESTIC DEMAND	EXPORTS	(-) IMPORTS	(-) LABOR PROD/TY		DOMESTIC DEMAND	EXPORTS	(-) IMPORTS	(-) LABOR PROD/TY		
Anatoliki Makedonia & Thraki	**-57,145**	-132,623	-27,991	108,440	2,825	**-49,349**	-31,688	-234	27,902	6,619	**2,599**	**-10,395**
Kentriki Makedonia	**-182,750**	-434,072	-91,612	354,921	9,247	**-161,516**	-106,952	-19,890	100,105	24,553	**-2,184**	**-19,050**
Dytiki Makedonia	**-17,946**	-59,445	-12,546	48,606	1,266	**-22,119**	-36,132	3,603	28,687	2,160	**-1,681**	**5,855**
Thessalia	**-64,596**	-167,322	-35,314	136,811	3,565	**-62,260**	-33,518	-3,135	29,205	9,224	**1,776**	**-4,112**
Ipeiros	**-22,417**	-76,461	-16,137	62,519	1,629	**-28,451**	-7,290	-1,698	2,540	6,260	**-189**	**6,223**
Ionia Nisia	**-19,112**	-53,690	-11,331	43,899	1,144	**-19,978**	14,245	-12,749	-8,454	7,185	**226**	**639**
Dytiki Ellada	**-41,623**	-158,949	-33,547	129,965	3,386	**-59,144**	-1,818	-10,902	-388	14,233	**1,124**	**16,397**
Sterea Ellada	**-45,605**	-124,583	-26,294	101,866	2,654	**-46,357**	-61,104	71	51,848	6,505	**-2,681**	**3,433**
Peloponnisos	**-59,080**	-144,865	-30,574	118,450	3,086	**-53,904**	-15,570	-5,082	15,504	8,855	**3,707**	**-8,883**
Attiki	**-375,111**	-991,926	-209,349	811,052	21,132	**-369,091**	-15,822	-67,652	33,450	47,911	**-2,112**	**-3,907**
Voreio Aigaio	**-9,304**	-40,122	-8,468	32,806	855	**-14,929**	5,251	-3,944	-3,900	3,324	**732**	**4,893**
Notio Aigaio	**-24,669**	-70,765	-14,935	57,861	1,508	**-26,331**	14,927	-17,064	-8,540	9,585	**-1,093**	**2,755**
Kriti	**-48,591**	-146,519	-30,923	119,802	3,121	**-54,519**	5,547	-19,127	-2,771	16,127	**-225**	**6,153**

Source: ELSTAT (2015) / UN (2015a, 2015b) / World Bank (2015) / Authors' Elaboration

Table 5 presents the decomposition of the exports industry mix sub-component of the economy-wide trade-adjusted shift-share analysis. The exports industry mix sub-component is positive only in the regions of Dytiki Makedonia and Sterea Ellada. Both regions specialize in sectors that are export-declining, at the national level, but at a lower rate than the total economy. The exports industry mix sub-component is negative in the rest of the Greek regions. These regions specialize in sectors that are export-declining, at the national level, at a higher rate than the total economy. In any case, all sectors are export-declining, at the national level. Therefore, it is wrong to infer that for the regions of Dytiki Makedonia and Sterea Ellada the positive exports industry-mix sub-component suggests specialization in export-expanding sectors.

Table 5: Decomposition of the exports industry mix sub-components of the trade-adjusted shift-share analysis for the Greek regions with respect to the world, economy-wide, period 2008-2011

REGION NAME	(1) $\sum_i E_{i0}^r(\frac{X_{it}-X_{i0}}{Q_{i0}})$	(2) $\sum_i E_{i0}^r(\frac{X_t-X_0}{Q_0})$	(1)-(2)
Anatoliki Makedonia & Thraki	-28,225	-27,991	-234
Kentriki Makedonia	-111,503	-91,612	-19,890
Dytiki Makedonia	-8,943	-12,546	3,603
Thessalia	-38,449	-35,314	-3,135
Ipeiros	-17,835	-16,137	-1,698
Ionia Nisia	-24,081	-11,331	-12,749
Dytiki Ellada	-44,449	-33,547	-10,902
Sterea Ellada	-26,223	-26,294	71
Peloponnisos	-35,656	-30,574	-5,082
Attiki	-277,001	-209,349	-67,652
Voreio Aigaio	-12,411	-8,468	-3,944
Notio Aigaio	-32,000	-14,935	-17,064
Kriti	-50,051	-30,923	-19,127

Source: ELSTAT (2015) / UN (2015a, 2015b) / World Bank (2015) / Authors' Elaboration

Table 6 presents the decomposition of the imports industry mix sub-component of the economy-wide trade-adjusted shift-share analysis. The imports industry mix sub-component (opposite values) is negative only in the regions of Ionia Nisia, Dytiki Ellada, Voreio Aigaio, Notio Aigaio, and Kriti. These regions specialize in sectors that are import-declining, at the national level, but at a lower rate than the total economy. The imports industry mix sub-component (opposite values) is positive in the rest of the Greek regions. These regions specialize in sectors that are import-declining, at the national-level, at a higher rate than the total economy. In any case, all sectors are import-declining, at the national level. Therefore, it is wrong to infer that for the regions of Ionia Nisia, Dytiki Ellada, Voreio Aigaio, Notio Aigaio, and Kriti the negative imports industry mix sub-component (opposite values) suggests specialization in import-expanding sectors.

Table 6: Decomposition of the imports industry mix sub-components of the trade-adjusted shift-share analysis for the Greek regions with respect to the world, economy-wide, period 2008-2011

REGION NAME	(1) $\sum_i E_{i0}^r(\frac{M_{it}-M_{i0}}{Q_{i0}})$	(2) $\sum_i E_{i0}^r(\frac{M_i-M_0}{Q_0})$	-[(1)-(2)]
Anatoliki Makedonia & Thraki	-136,342	-108,440	27,902
Kentriki Makedonia	-455,026	-354,921	100,105
Dytiki Makedonia	-77,293	-48,606	28,687
Thessalia	-166,016	-136,811	29,205
Ipeiros	-65,058	-62,519	2,540
Ionia Nisia	-35,445	-43,899	-8,454
Dytiki Ellada	-129,577	-129,965	-388
Sterea Ellada	-153,714	-101,866	51,848
Peloponnisos	-133,954	-118,450	15,504
Attiki	-844,502	-811,052	33,450
Voreio Aigaio	-28,906	-32,806	-3,900
Notio Aigaio	-49,321	-57,861	-8,540
Kriti	-117,031	-119,802	-2,771

Source: ELSTAT (2015) / UN (2015a, 2015b) / World Bank (2015) / Authors' Elaboration

Table 7 presents the decomposition of the labor productivity industry mix sub-component of the economy-wide trade-adjusted shift-share analysis. Assuming constant employment-to-output ratios over the period considered, shifts in exports, imports and domestic demand translate to employment changes. The labor productivity industry mix sub-component (opposite values) is positive in all Greek regions. This means that all Greek regions specialize in sectors that experience labor productivity losses, at the national level, at rates higher than the total economy. It is thus wrong to infer that all Greek regions specialize in sectors that experience labor productivity gains, at the national level, at rates lower than the total economy.

Table 7: Decomposition of the labor productivity industry mix sub-components of the trade-adjusted shift-share analysis for the Greek regions with respect to the world, economy-wide, period 2008-2011

REGION NAME	-(1) $\sum_i E_{i0}^r(e_i - q_i)$	-(2) $\sum_i E_{i0}^r(e - q)$	-(1)-[-(2)]
Anatoliki Makedonia & Thraki	9,444	2,825	6,619
Kentriki Makedonia	33,801	9,247	24,553
Dytiki Makedonia	3,427	1,266	2,160
Thessalia	12,789	3,565	9,224
Ipeiros	7,888	1,629	6,260
Ionia Nisia	8,328	1,144	7,185
Dytiki Ellada	17,619	3,386	14,233
Sterea Ellada	9,159	2,654	6,505
Peloponnisos	11,941	3,086	8,855
Attiki	69,043	21,132	47,911
Voreio Aigaio	4,179	855	3,324
Notio Aigaio	11,093	1,508	9,585
Kriti	19,248	3,121	16,127

Source: ELSTAT (2015) / UN (2015a, 2015b) / World Bank (2015) / Authors' Elaboration

Overall, it comes that all Greek regions specialize in sectors that, at the national level, are export-declining and import-declining and experience labor productivity losses. The vast majority of the Greek regions specialize in sectors that, at the national level, are export-declining at a higher rate than the total economy, import-declining at a higher rate than the total economy, and experience labor productivity losses at rates higher than the total economy. Apparently, in the regions of Anatoliki Makedonia & Thraki, Thessalia, Ionia Nisia, Dytiki Ellada, Peloponnisos, and Voreio Aigaio the positive impact of imports decline and labor productivity losses manages to counterbalance, in relative terms, the negative impact of exports decline (as the positive values of the industry mix component of the trade-adjusted shift-share analysis indicates).

Towards the categorization of the Greek regions, on the basis of the trade-adjusted shift-share analysis' results, the paper follows the regional classification proposed from Kallioras (2014). Table 8 suggests a sixteen-fold classification that can provide some useful guidelines related to regional-differentiating policies designed to enhance regional development. Regions are attributed to types on the basis of actual values of the exports and imports industry mix sub-components, and the decomposition of the exports and imports industry mix sub-components. On the basis of the trade-adjusted shift-share analysis' classification, regional policies proposed may be expansionary, structural, stabilization or preventive. Expansionary policies encourage the preservation and / or the expansion of competitive advantages, structural policies face development deprivation and contribute to sustainability and the viability of growth, stabilization policies are targeted policies that neutralize or offset certain negative trends in the growth environment, and preventive policies are selective policies that prevent and mitigate negative effects on growth. Each type of policy may be

combined with policies designed at the regional level (i.e. place-based policies) , tailored to regional characteristics and specificities (as reflected in the competitive shift-component).

Table 8: Trade-adjusted shift-share analysis' regional classification, regional characteristics and policies proposed.

REGIONAL TYPE	CRITERIA	REGIONAL CHARACTERISTICS	POLICIES PROPOSED
1	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}>0$; $\frac{X_{it}-X_{io}}{Q_{i0}}>0$	POSITIVE EXPORTS INDUSTRY MIX, EXPORT-EXPANDING SECTOR	EXPANSIONARY POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}>0$; $\frac{M_{it}-M_{io}}{Q_{i0}}>0$	POSITIVE IMPORTS INDUSTRY MIX, IMPORT-EXPANDING SECTOR	PREVENTIVE POLICIES
2	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}>0$; $\frac{X_{it}-X_{io}}{Q_{i0}}<0$	POSITIVE EXPORTS INDUSTRY MIX, EXPORT-DECLINING SECTOR	STABILIZING POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}>0$; $\frac{M_{it}-M_{io}}{Q_{i0}}<0$	POSITIVE IMPORTS INDUSTRY MIX, IMPORT-DECLINING SECTOR	STRUCTURAL POLICIES
3	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}>0$; $\frac{X_{it}-X_{io}}{Q_{i0}}>0$	POSITIVE EXPORTS INDUSTRY MIX, EXPORT-EXPANDING SECTOR	EXPANSIONARY POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}>0$; $\frac{M_{it}-M_{io}}{Q_{i0}}<0$	POSITIVE IMPORTS INDUSTRY MIX, IMPORT-DECLINING SECTOR	STRUCTURAL POLICIES
4	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}>0$; $\frac{X_{it}-X_{io}}{Q_{i0}}<0$	POSITIVE EXPORTS INDUSTRY MIX, EXPORT-DECLINING SECTOR	STABILIZING POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}>0$; $\frac{M_{it}-M_{io}}{Q_{i0}}>0$	POSITIVE IMPORTS INDUSTRY MIX, IMPORT-EXPANDING SECTOR	PREVENTIVE POLICIES
5	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}<0$; $\frac{X_{it}-X_{io}}{Q_{i0}}>0$	NEGATIVE EXPORTS INDUSTRY MIX, EXPORT-EXPANDING SECTOR	STRUCTURAL POLICIES

REGIONAL TYPE	CRITERIA	REGIONAL CHARACTERISTICS	POLICIES PROPOSED
	$\frac{M_{it}-M_{io}}{Q_{i0}} - \frac{M_t-M_0}{Q_0} < 0$; $\frac{M_{it}-M_{io}}{Q_{i0}} > 0$	NEGATIVE IMPORTS INDUSTRY MIX, IMPORT-EXPANDING SECTOR	STABILIZING POLICIES
6	$\frac{X_{it}-X_{io}}{Q_{i0}} - \frac{X_t-X_0}{Q_0} < 0$; $\frac{X_{it}-X_{io}}{Q_{i0}} < 0$	NEGATIVE EXPORTS INDUSTRY MIX, EXPORT-DECLINING SECTOR	PREVENTIVE POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}} - \frac{M_t-M_0}{Q_0} < 0$; $\frac{M_{it}-M_{io}}{Q_{i0}} < 0$	NEGATIVE IMPORTS INDUSTRY MIX, IMPORT-DECLINING SECTOR	EXPANSIONARY POLICIES
7	$\frac{X_{it}-X_{io}}{Q_{i0}} - \frac{X_t-X_0}{Q_0} < 0$; $\frac{X_{it}-X_{io}}{Q_{i0}} > 0$	NEGATIVE EXPORTS INDUSTRY MIX, EXPORT-EXPANDING SECTOR	STRUCTURAL POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}} - \frac{M_t-M_0}{Q_0} < 0$; $\frac{M_{it}-M_{io}}{Q_{i0}} < 0$	NEGATIVE IMPORTS INDUSTRY MIX, IMPORT-DECLINING SECTOR	EXPANSIONARY POLICIES
8	$\frac{X_{it}-X_{io}}{Q_{i0}} - \frac{X_t-X_0}{Q_0} < 0$; $\frac{X_{it}-X_{io}}{Q_{i0}} < 0$	NEGATIVE EXPORTS INDUSTRY MIX, EXPORT-DECLINING SECTOR	PREVENTIVE POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}} - \frac{M_t-M_0}{Q_0} < 0$; $\frac{M_{it}-M_{io}}{Q_{i0}} > 0$	NEGATIVE IMPORTS INDUSTRY MIX, IMPORT-EXPANDING SECTOR	STABILIZING POLICIES
9	$\frac{X_{it}-X_{io}}{Q_{i0}} - \frac{X_t-X_0}{Q_0} > 0$; $\frac{X_{it}-X_{io}}{Q_{i0}} > 0$	POSITIVE EXPORTS INDUSTRY MIX, EXPORT-EXPANDING SECTOR	EXPANSIONARY POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}} - \frac{M_t-M_0}{Q_0} < 0$; $\frac{M_{it}-M_{io}}{Q_{i0}} > 0$	NEGATIVE IMPORTS INDUSTRY MIX, IMPORT-EXPANDING SECTOR	STABILIZING POLICIES
10	$\frac{X_{it}-X_{io}}{Q_{i0}} - \frac{X_t-X_0}{Q_0} > 0$;	POSITIVE EXPORTS INDUSTRY MIX, EXPORT-DECLINING	STABILIZING POLICIES

REGIONAL TYPE	CRITERIA	REGIONAL CHARACTERISTICS	POLICIES PROPOSED
	$\frac{X_{it}-X_{io}}{Q_{i0}}<0$	SECTOR	
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}<0$; $\frac{M_{it}-M_{io}}{Q_{i0}}<0$	NEGATIVE IMPORTS INDUSTRY MIX, IMPORT-DECLINING SECTOR	EXPANSIONARY POLICIES
11	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}>0$; $\frac{X_{it}-X_{io}}{Q_{i0}}>0$	POSITIVE EXPORTS INDUSTRY MIX, EXPORT-EXPANDING SECTOR	EXPANSIONARY POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}<0$; $\frac{M_{it}-M_{io}}{Q_{i0}}<0$	NEGATIVE IMPORTS INDUSTRY MIX, IMPORT-DECLINING SECTOR	EXPANSIONARY POLICIES
12	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}>0$; $\frac{X_{it}-X_{io}}{Q_{i0}}<0$	POSITIVE EXPORTS INDUSTRY MIX, EXPORT-DECLINING SECTOR	STABILIZING POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}<0$; $\frac{M_{it}-M_{io}}{Q_{i0}}>0$	NEGATIVE IMPORTS INDUSTRY MIX, IMPORT-EXPANDING SECTOR	STABILIZING POLICIES
13	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}<0$; $\frac{X_{it}-X_{io}}{Q_{i0}}>0$	NEGATIVE EXPORTS INDUSTRY MIX, EXPORT-EXPANDING SECTOR	STRUCTURAL POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}>0$; $\frac{M_{it}-M_{io}}{Q_{i0}}>0$	POSITIVE IMPORTS INDUSTRY MIX, IMPORT-EXPANDING SECTOR	PREVENTIVE POLICIES
14	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}<0$; $\frac{X_{it}-X_{io}}{Q_{i0}}<0$	NEGATIVE EXPORTS INDUSTRY MIX, EXPORT-DECLINING SECTOR	PREVENTIVE POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}>0$; $\frac{M_{it}-M_{io}}{Q_{i0}}<0$	POSITIVE IMPORTS INDUSTRY MIX, IMPORT-DECLINING SECTOR	STRUCTURAL POLICIES
15	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}<0$;	NEGATIVE EXPORTS INDUSTRY MIX, EXPORT-EXPANDING SECTOR	STRUCTURAL POLICIES

REGIONAL TYPE	CRITERIA	REGIONAL CHARACTERISTICS	POLICIES PROPOSED
	$\frac{X_{it}-X_{io}}{Q_{i0}}>0$		
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}>0;\ \frac{M_{it}-M_{io}}{Q_{i0}}<0$	POSITIVE IMPORTS INDUSTRY MIX, IMPORT-DECLINING SECTOR	STRUCTURAL POLICIES
16	$\frac{X_{it}-X_{io}}{Q_{i0}}-\frac{X_t-X_0}{Q_0}<0;\ \frac{X_{it}-X_{io}}{Q_{i0}}<0$	NEGATIVE EXPORTS INDUSTRY MIX, EXPORT-DECLINING SECTOR	PREVENTIVE POLICIES
	$\frac{M_{it}-M_{io}}{Q_{i0}}-\frac{M_t-M_0}{Q_0}>0;\ \frac{M_{it}-M_{io}}{Q_{i0}}>0$	POSITIVE IMPORTS INDUSTRY MIX, IMPORT-EXPANDING SECTOR	PREVENTIVE POLICIES

Source: Kallioras (2014)

Table 9 presents the classification of the Greek regions, on the basis of the trade-adjusted shift-share analysis' results, and according the trade-adjusted shift-share analysis' classification followed. It turns out that the regions of Anatoliki Makedonia & Thraki, Kentriki Makedonia, Thessalia, Ipeiros, Peloponnisos, and Attiki belong to regional type 6, having negative exports and imports industry-mix sub-components and specialization in export-declining and import-declining sectors; the regions of Dytiki Makedonia and Sterea Ellada belong to regional type 10, having positive exports and negative imports industry-mix sub-components and specialization in export-declining and import-declining sectors; and the regions of Ionia Nisia, Dytiki Ellada, Voreio Aigaio, Notio Aigaio, and Kriti belong to regional type 14, having negative exports and positive imports industry-mix sub-components and specialization in export-declining and import-declining sectors. Therefore, stabilizing policies are suggested for the regions of Dytiki Makedonia and Sterea Ellada and preventive policies are suggested for the rest of the Greek regions with respect to exports, and structural policies are suggested for the regions of Ionia Nisia, Dytiki Ellada, Voreio Aigaio, Notio Aigaio, and Kriti and expansionary policies are suggested for the rest of the Greek regions with respect to imports.

Table 9: Classification of the Greek regions according to the economy-wide trade-adjusted shift-share analysis results with respect to the world, period 2008-2011

REGION NAME	BELONGS TO REGIONAL TYPE …	SUGGESTED POLICIES FOR EXPORTING SECTORS	SUGGESTED POLICIES FOR IMPORTING SECTORS
Anatoliki Makedonia & Thraki	6	PREVENTIVE	EXPANSIONARY
Kentriki Makedonia	6	PREVENTIVE	EXPANSIONARY
Dytiki Makedonia	10	STABILIZING	EXPANSIONARY
Thessalia	6	PREVENTIVE	EXPANSIONARY
Ipeiros	6	PREVENTIVE	EXPANSIONARY
Ionia Nisia	14	PREVENTIVE	STRUCTURAL
Dytiki Ellada	14	PREVENTIVE	STRUCTURAL
Sterea Ellada	10	STABILIZING	EXPANSIONARY
Peloponnisos	6	PREVENTIVE	EXPANSIONARY

REGION NAME	BELONGS TO REGIONAL TYPE …	SUGGESTED POLICIES FOR EXPORTING SECTORS	SUGGESTED POLICIES FOR IMPORTING SECTORS
Attiki	6	PREVENTIVE	EXPANSIONARY
Voreio Aigaio	14	PREVENTIVE	STRUCTURAL
Notio Aigaio	14	PREVENTIVE	STRUCTURAL
Kriti	14	PREVENTIVE	STRUCTURAL

Sources: Kallioras (2014) / ELSTAT (2015) / UN (2015a, 2015b) / World Bank (2015) / Authors' Elaboration

5. Conclusions

The paper scrutinizes the spatial variations of employment change in Greece towards conceptualizing and understanding the spatial impact of the contemporary economic crisis over the early-crisis period (2008-2011). To this end, the paper employs the trade-adjusted shift-share analysis; a shift-share formulation accounting for employment changes resulting from changes in exports, imports and domestic demand. The results of the trade-adjusted shift-share analysis obtained, against the backdrop of the world economy, demonstrate the negative national effect component as an outcome of the shocks and the upsets that the Greek economy has suffered. This negative effect is partially counterbalanced, in some specific regions and sectors, by the positive industry mix component and competitive shift component. Particularly, noteworthy is that the industry mix component is positive for all Greek regions in the sectors of agricultural products, transport & travel, financial & insurance services, cultural & recreational services, government services, and other business services. In contrast, the industry mix component is negative for all Greek regions in the other sectors considered. In any case, it comes that all Greek regions specialize in sectors that, at the national level, are export-declining and import-declining and experience labor productivity losses. According to the classification of the Greek regions, on the basis of the trade-adjusted shift-share analysis' results, stabilizing policies are suggested for the regions of Dytiki Makedonia and Sterea Ellada and preventive policies are suggested for the rest of the Greek regions with respect to exports, and structural policies are suggested for the regions of Ionia Nisia, Dytiki Ellada, Voreio Aigaio, Notio Aigaio, and Kriti and expansionary policies are suggested for the rest of the Greek regions with respect to imports. Each type of policy may be combined with place-based policies, tailored to regional characteristics and specificities.

References

Ashby L. D. (1964), The Geographical Redistribution of Employment: An Examination of the Elements of Change, Survey of Current Business, 44(10): 13-20.

Barca F., McCann P. and Rodriguez-Pose A. (2012), The Case for Regional Development Intervention: Place-Based versus Place-Neutral Approaches, Journal of Regional Science, 52(1): 134-152.

Bartels C. P., Nicol W. R. and van Duijn J. J. (1982), Estimating the Impact of Regional Policy: A Review of Applied Research Methods, Regional Science and Urban Economics, 12(1): 3-41.

Brülhart M., Crozet M. and Koenig P. (2004), Enlargement and the EU Periphery: The Impact of Changing Market Potential, HWWA Discussion Paper, 270.

Chiang S.-H. (2012), The Sources of Metropolitan Unemployment Fluctuations in the Greater Taipei Metropolitan Area, Papers in Regional Science, 91(4): 775-793.

Cornett A. P. (1996), The Internationalization of Economies: From Regional to Global Orientation, Copenhagen: DJØF-Publishers (in Danish).

Creamer D. (1943), Shifts of Manufacturing Industries, in USA National Resources Planning Board, Industrial Location and National Resources, Washington D.C.: US Government Printing Office.

Cunningham N. J. (1969), A Note on the Proper Distribution of Industry, Oxford Economic Papers, 21(1): 122-127.

Dinc M. and Haynes K. E. (1998a), International Trade and Shift-Share Analysis: A Specification Note, Economic Development Quarterly, 12: 337-343.

Dinc M. and Haynes K. E. (1998b), International Trade and Shift-Share Analysis: A Specification Note, Rejoinder, Economic Development Quarterly, 12: 351-354.

Dunn E. S. Jr. (1959), A Statistical and Analytical Technique for Regional Analysis: Description and Projection, Economie Appliquee, 4: 521–530 (in French).

Dunn E. S. Jr. (1960), A Statistical and Analytical Technique for Regional Analysis, Papers and Proceedings of the Regional Science Association, 6: 98-112.

ELSTAT (2015), Statistical Themes, http://www.statistics.gr/portal/page/portal/ESYE.

Esteban-Marquillas J. M. (1972), A Reinterpretation of Shift-Share Analysis, Regional and Urban Economics, 2(3): 249–261.

Fotopoulos G., Kallioras D. and Petrakos G. (2010), Spatial Variations in Greek Manufacturing Employment Growth: The Effects of Specialization and International Trade, Papers in Regional Science, 89(1): 109-133.

Fuchs V. R. (1962), Statistical Explanations of the Relative Shift of Manufacturing among Regions of the United States, Papers of the Regional Science Association, 8, 1-5.

Greek Ministry of Finance (2010), Memorandum of Economic and Financial Policies, available at: http://www.minfin.gr/content-api/f/binaryChannel/minfin/datastore/d1/d9/7c/d1d97cb60bad8706a2cabbf83e5ae9fb7f3ab369/application/pdf/MOU+_+MEFP+13+march+2012%5B1%5D.pdf.

Greek Ministry of Finance (2011), Medium-Term Fiscal Strategy, 2012-2015, available at: http://www.minfin.gr/content-api/f/binaryChannel/minfin/datastore/8d/78/0e/8d780e3337a1e1cb20d1a1707686d7399be4913a/application/pdf/MTFS.pdf.

Greek Ministry of Finance (2012), Medium-Term Fiscal Strategy, 2013-2016, available at: http://www.minfin.gr/content-api/f/binaryChannel/minfin/datastore/a7/91/b0/a791b0bf4bc73a9679bac65792933157d4cf7b27/application/pdf/%CE%9C%CE%95%CE%A3%CE%9F%CE%A0%CE%A1%CE%9F%CE%98%CE%95%CE%A3%CE%9C%CE%9F_2013.pdf.

Houston D. B. (1967), The Shift and Share Analysis of Regional Growth: A Critique, Southern Economic Journal, 33(4): 577-581.

Jones J. H. (1940), The Report of the Royal Commission on the Distribution of the Industrial Population, Journal of the Royal Statistical Society, 103(3): 323-343.

Kallioras D. (2014), Proposing a Classification of Regions on the Basis of the Trade-Adjusted Shift-Share Analysis' Results, Empirical Economics Letters, 13(12): 1285-1294.

Kallioras D., Topaloglou L. and Venieris S. (2009), Tracing the Determinants of Economic Cross-Border Interaction in the European Union, Spatium International Review, 21: 1-10.

Kotios A. and Pavlidis G. (2012) (eds.), International Economic Crises: Systemic or Political Crisis? Athens: Rosili (in Greek).

Kowaleski J. (2011), Specialization and Employment Development in Germany: An Analysis at the Regional Level, Papers in Regional Science, 90(4): 789-811.

MacKay D. I. (1968), Industrial Structure and Regional Growth: A Methodological Problem, Scottish Political Journal, 15: 129-142.

Markusen A. R., Noponen H. and Driessen K. (1991), International Trade, Productivity, and US Regional Job Growth: A Shift-Share Interpretation, International Regional Science Review, 14: 15-39.

Noponen H., Markusen A. R. and Driessen K. (1998), International Trade and Shift-Share Analysis: A Response to Dinc and Haynes, Economic Development Quarterly, 12: 344-350.

Oltheten E., Pinteris G. and Sougiannis T. (2003), Greece in the European Union: Policy Lessons from Two Decades of Membership, Quarterly Review of Economics and Finance, 43: 774-806.

Paas T. and Tafenau E. (2008), Regional Integration and International Trade Clusters of the enlarged European Union, in Jones B. R. (ed.): Europe at the Crossroads, New York: Nova Publishers, 67-89.

Panteladis I. and Tsiapa M. (2012), Asymmetries and Inequalities in the Greek Space, The Greek Review of Social Research, 137-138: 51-84 (in Greek).

Petrakos G., Fotopoulos G., Kallioras D. (2012), Peripherality and Integration: Industrial Growth and Decline in the Greek Regions, Environment and Planning C: Government and Policy, 30(2): 347-361.

Richardson H. H. (1978), The State of Regional Economics: A Survey Article, International Regional Science Review, 3(1): 1-48.

Rosenfeld F. (1959), A Comment to expose E. S. Dunn on "Statistical and Analytical Technique for Regional Analysis": Presentation of Mathematical Method, Economie Appliquee, 4: 531-534 (in French).

Theil H. and Gosh R. (1980), A Comparison of Shift-Share and the RAS Adjustment, Regional Science and Urban Economics, 10: 175-180.

UN (2015a), COMTRADE, Available: http://comtrade.un.org.

UN (2015b), UN Service Trade, Available: http://unstats.un.org/unsd/servicetrade.

World Bank (2015), World Development Indicators, Available: http://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG.