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Title: Geographies of unemployment and regional inequalities in Greece in the context of current crisis

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Contents

Summary

Current situation in the globalized economy is extremely stigmatized by economic crisis which stuck it in 2008 and affected the whole socio-economic life. One of the national economies with the most important impact was the Greek one which since 2008 has met the worst period and conditions of its recent history. Crisis affected all the sectors in Greek economy but not in the same way across space: regions were affected in different rate, with different speed and from different factors. One of the sectors with the most negative impact was this of employment; unemployment in Greece increased more than 200% in 4 years. This research studies the impact of crisis on Greek Regional Development and focuses on Greek Regional Unemployment evolution.

KEYWORDS: crisis, region, Greece, unemployment, development.

Thanksgiving

This study took place in a very important but also extremely difficult period not only for Greece and European Union but for the whole global economy. Crisis of 2008, the most important that early societies have ever experienced, has influenced all the sectors of our socio-economic, ranging from economy and finance to psychological problems, life in an extremely negative way.

The whole academic community, in almost all the fields, has engaged with a very interesting debate about the crisis: the reasons of its emergence, the way that it took place and spread everywhere, the way that official policy reacted and reacts and possible ways of confronting the more and more negative consequences that it has. This study makes efforts to participate in this debate by mostly analyzing the situation in the Greek regions and the evolution of regional unemployment.

Greece is one of the national economies which were hit mostly and most negatively by crisis. As a result, it is in the centerpiece of the interest of the policy and scientific debate. Probably the only certain conclusion from the situation until now is that the scientific debate is not taken into account by policy makers and politicians who have chosen to implement policies which hit are quite unfair: they oblige the majority of the society to pay for the consequences and the results of the crisis. However, they (the societal majority) did not create this crisis. This emerged as a result of the way that production took place in the last 30 years.

The major topic of this study was chosen because there is great interest to the impacts of economic crisis (at regional level), to examine the types and forms of regional inequality both before and during crisis, to the relationship between socio-economic phenomena and space. This study may be of interest of policy-makers since it could be a reference for them while preparing or evaluating their own programs. Also, there could be a possible contribution to the regions themselves, their citizens and their institutions for a better understanding of the current situation.

For the conduction of this study I would like to thank Mr. Petrakos and Mr. Robolis for their contribution, not only to this Thesis, but generally to the way of my thinking. In addition, without the help of Dr. Kallioras, Professor of the University of Thessaly, this study would have never been conducted. I would, also, like to thank the staff of the lab of SEED (South & East European Development Center) of the University of

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To Terry

1. Introduction

This study examines the impact of global economic crisis on regional inequalities in Greece and especially on regional unemployment by focusing on the geographical cross sectional dynamic of crisis shock on unemployment. This project seeks to investigate the structure of the geography of unemployment, before and during crisis in the Greek regions and the comparison of them.

Regional development in Greece has been characterized by a high level of inequalities among regions and by high concentration of economic activity in the regions with the big urban centers and especially Attiki and Thessaloniki (Petrakos & Saratsis, 2000; Petrakos, 2004; Petrakos & Artelaris, 2008). Moreover, Greece is a peripheral economy of the European Union (EU) with weak productive base (potentially it seems that it has a strong one) and until 2007 it had not common borders with any other Member States (MS) of the EU (Petrakos and Christodoulakis, 2000).

Current global crisis, which had a huge impact on the whole socio-economic life, affected regions all over EU. Little is known about the uneven regional impacts of the crisis as yet and in particular whether it reinforces uneven development and the way that firms in global production networks are reorganizing their operations. Regional development in the EU, which largely changed in 1992 after the establishment of common market and in 1999 after the establishment of common currency, is currently introduced in a new era due to crisis.

Regional development has been affected by current global crisis since the collapse of financial sector resulted in "uneven economic shocks and recession" (Tomaney et al., 2010). Furthermore, the impact of current crisis is deeper and longer in regions with major structural problems before crisis. Especially, the regions and the states of the "European South" (or "Periphery of the EU") such as Greece, Spain, Portugal and Ireland were mostly affected by current crisis (Hadjimichalis, 2011).

Greece is considered as the MS of the EU that has been mostly affected by crisis; many things have already changed in Greek society. For this reason it is quite interesting to study the change of regional inequalities due to crisis' effects: whether they increased or decreased, which regions have suffered the most, and which the types and forms of regional inequality both before and during crisis are. This research makes efforts to shed light on these trends.

Probably the employment experienced the most negative and biggest impact of crisis (Marelli et al., 2011). Employment and unemployment characteristics affect regional development in many ways (Pike et al., 2006); for this reason they are in the centerpiece of the scientific and policy debate over regional development (Morgan & Mourougane, 2005; Boeri & van Ours, 2008). There is big evidence that employment growth contributes to regional development in a positive way (Solow, 1956; Weeden, 1974; Baldwin and Brown 2004) especially in peripheral economies like Greece (Petrakos, 1997).

Many changes in the past period, like this that Greece joined the EU and its implications (opening of borders, free movement of firms and labor force), the access in Eurozone, have affected regional development and regional labor market in Greece (Petrakos & Psycharis, 2004). There is much literature which refers to regional labor market and its patterns in Greece but its majority deals with sectoral analysis of regional employment growth related to specific factors like this of European integration and its impact on manufacturing employment change (Melachroinos, 2002) or manufacturing regional employment growth and effects of specialization and international trade (Fotopoulos et. al, 2010).

Crisis had a major impact on employment in Greece, in a different way and rate in each region: thousands of dismissals (combined with wage redundancies) and unemployment, which from 8.3% in 2007 rocketed up to 21% in the end of 2011. This project aims at investigating these effects: in which regions the unemployment mostly rose, whether the specialized regions have suffered more (and in which sectors) than the non-specialized ones, which are the determinant factors of unemployment rate change, whether crisis has introduced a new geography of unemployment at national level. Also, this study aims at evaluating the way that policy made efforts to respond in order to confront these impacts.

In general, this project investigates the initial impacts of current crisis on regional development in Greece. The comparison of the current situation of regional inequalities (2012) with the previous one (before crisis beginning, i.e. 2008) focusing on regional unemployment, enables an approach to the trend: convergence, divergence or other. This study aims at highlighting some specific crisis' regional effects by emphasizing on unemployment.

This study, which examines this pattern in the 51 NUTS III and 13 NUTS II regions of Greece, uses a combination of existing secondary data with the collection of original primary data applying qualitative and quantitative analysis. Fieldwork data is obtained in the means of in-depth interviews with the general director of the Ministry of Development and with the Scientific Director of the Institute of Labor of the National Labor Union.

This project is innovative in two ways: it examines crisis' implications and the impact of current policy on regional development in Greece, in general, and it investigates the impact of crisis specifically on regional unemployment in Greece. This project is important for policy-makers and regional institutions since it could be a reference for them while preparing or evaluating their own programs. It could also contribute to the regions themselves, their citizens and their institutions for a better understanding of the current situation.

In the following chapter the regional development in the Greek context is described before going through the main structural characteristics of global crisis and the way that it was adjusted to Greece. The fourth chapter focuses on the impact of crisis on regional inequalities in Greece in order to introduce us to the next chapter which investigates the impact of crisis on regional unemployment. In the pre-final chapter the policies which were implemented to confront crisis and its impact are discussed. In the final chapter, the conclusions are drawn, the discussion over the topic is overviewed and topics for future research are proposed.

2. Regional Development in the Greek context

The big majority of scientists admit that the economic, social and cultural characteristics largely differentiate across space, creating the regional characteristics (Brakman and Marrewijk, 2008). Location of activities, people and settlements is one of the most important issues within the debates of scientific and policy community. This decision about the location of the activities and the location itself influence in a different way the space.

In the economic theory there are two conflicting approaches on the relationship between growth and inequalities. Solow (1956) and the scholars supporting neoclassical paradigm (convergence school) claim that there is a negative relationship since the inequalities decline in periods of economic growth due to regional capital and labor mobility and regional trade. On other hand, Myrdal (1957) and the proponents of cumulative approach (divergence school) state that growth is cumulative process since it "requires a minimum crucial threshold of resources and activities to take place" (Petrakos et al., 2005).

However, unevenness over space is inherent to current economic system and fundamental in its function (Hudson, 2005; Harvey, 2010), which is a market driven economy, due to the specific geography of capital accumulation (Holland, 1976: 13; Harvey, 2001: 266). So, policy may determine the trend by increasing or reducing the inequalities but not get rid of them (Cardoso, 1993).

The scientific and policy debate over geography and economy has focused on regional development in the last decades. The market integrations, like the EU, which emerged in this period, had an important role in this. Neo-classical regional growth, stage theory of development, cumulative causation, agglomeration economies, export base model, endogenous growth and New Economic Geography are some of the theories for regional development (Pike et al., 2006).

The theory of New Economic Geography was expressed from Krugman (1991) in a period that the neoclassical paradigm was in the centerpiece of the analysis and policy. This theory made efforts to relax the restrictive assumptions of neoclassical framework, which assumes the existence of perfect competitive markets, factor substitutability and mobility, and profit maximization (Yap, 2004). New Economic Geography emerged in an era which is dominated by the perspective of, widely

known as, 'New Regionalism' (Storper, 1997). This era starts from the assertion that changes in the market and economic system have largely influenced and created new conditions and challenges for regional development.

Geography and regional development have been largely affected by the last changes in the global economy which are summarized by globalization and market integrations. This period is characterized by the transition from local-placed economic systems to a globalised economy, with integrated smaller economic systems (like the EU), which has new and different characteristics from previous, and by the financial and labor mobility, free trade, foreign direct investment, capital flows, migration and spread of technology and innovation (Hall, 1993; Gordon, 1999).

What is the result of these processes? It is a fact that since 1990 there has been a decline in inequalities among states, largely due to the huge growth of newly industrializing (mainly South-eastern) Asian economies (Rodriguez-Pose & Crescenzi, 2008), while the conditions have worsened in other parts of world (Castells, 1993). On contrary, inequalities among regions have increased (Esteban, 1997; Puga, 1999) especially in the open-integrated economic systems. In this way, inequalities among states fall down while among regions grow, as a result of globalization process (Cox, 2008).

The EU has two main characteristics: market integration and the (geographical, economic and social) division between Core and Periphery MS (or South and North) which is inherent to the architecture of the EU (Petrakos & Psycharis, 2004; Petrakos, 2012; Robolis, 2012). Following "Krugman's shadow effect", the process of opening of borders and liberalization of trade implies in some certain winners and many certain losers: the strong, rich and leading regions benefit from the process of competition while the weaker and poorer regions lose. Through integration process the firms (capital) and workers (labor force) tend to accumulate over space due to the labor force migration with increasing returns and trade costs (Krugman, 1991).

The EU is a case like this, since the Treaty of Maastricht sets as the basic principle of the EU the "free movement of goods, persons, services and capital" (Commission, 1992). In this process, which takes places for more than 20 years, there are the leading European regions (mainly in the MS of the Core of the EU) which benefit and there are much more regions which lose (mainly in the MS of the Periphery of the EU). In

this certain situation, the Common Currency Area (Eurozone) was established in 1999 expanding the integration process. Eurozone accelerated the geographical concentration of the economic activity in the Core regions, increasing in such a way the regional disparities.

The increasing concentration of economic activity in these certain areas is caused by many factors which have been addressed in a theoretical level from many previous studies: location decision of capital investment, differentiations of productive structure, initial conditions, level of technological development, human capital, proximity and accessibility to the European markets (Amin et al., 1992; Camagni, 1992; Rodriguez-Pose & Fratesi, 2004). The Cohesion policy is planned, decided and implemented in order to diminish the divergence trends which emerge as an implication of integration process. This policy has had ambiguous results on the convergence and divergence trends.

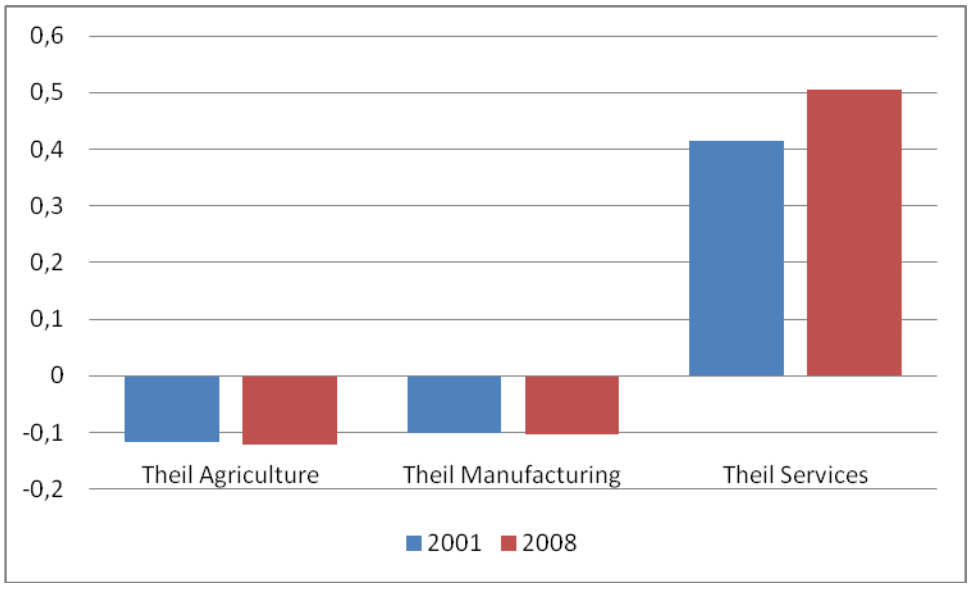
There is evidence that the EU Member States (MS), which from 15 became 25 (in 2004) and 27 (in 2007), converge through time at least until the crisis of 2008 (Heidenreich & Wunder, 2008). On contrary, within the EU, the regional divergence dynamics dominate according to many scholars who studied the regional inequalities in the EU based on different indexes and different databases, in different periods and with different methodologies (Cardoso, 1993; Heidenreich, 2003; Heidenreich & Wunder, 2008; Petrakos & Artelaris, 2009; Beckfield, 2009; Petrakos et al., 2011).

Regional inequalities declined until the middle of 1990s. After this period they rose again by reaching in 2007 the levels of 1987 (Commission, 2007). So, also within the EU, there is evidence for slow convergence among states (international level) and divergence among regions (interregional level) within the states (McCann, 2008). Comparing the EU and the USA, it should be noted that the level of regional income disparities in the EU is much higher than in the USA (Petrakos & Psycharis, 2004) while manufacturing is less concentrated in the EU than in the USA (Puga, 1999).

In this EU context, Greece is an interesting case regarding regional development, which is largely influenced by Greece's access in the EU in 1981 and in Eurozone in 2001. This happens since Greece is a peripheral economy of the EU in an excluded geographical position far away from the central core European markets.

Greece, is a state with a potentially strong productive base and with some very important comparative advantages (tourism, shipping, fertile ground, minerals). In some of the previous different periods Greek state has taken advantage of this productive base and of these advantages, and in others not. In the periods that Greece did not take advantage of these, it was obliged to borrow huge loans from the international markets and from independent states. However, in the last period the situation has largely worsened: without taking advantage decade of its productive base (for reasons which are explained below) Greece had high trade deficit. In addition, mega events, like Olympic Games, and other conditions gave the opportunity to Greek State to borrow in order to finance large enterprises (like Siemens). On the other hand Greece was obliged to borrow in order to repay its older debt and interests. In addition, there was and there is still high tax evasion of the upper class. In such a way, the revenues of the state were not increasing resulting in the high increase of deficit.

Graph 1: Theil index of employment for each sector in Greece 2001 and 2008



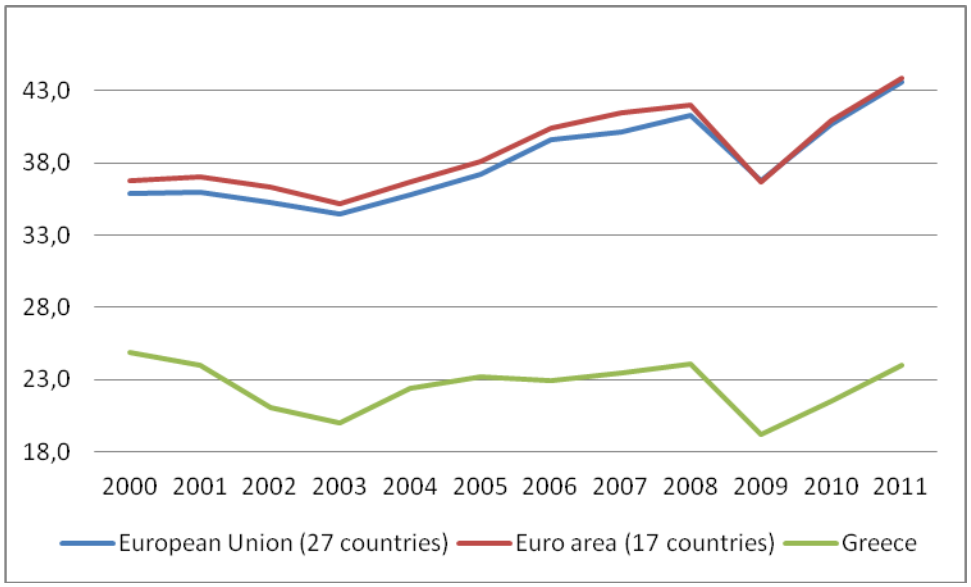
Source: ELSTAT (2012), own elaboration

Greece is certainly a different case than the majority of the EU MS since: Greece is extremely specialized in tertiary sector (Graph 1) and has a comparative advantage on agriculture. According to data from ELSTAT (2012), 66% of firms' output is allocated in tertiary sector, 32% in secondary and only 2% in agriculture. On contrary, the majority of the EU MS are economically diversified (characteristic examples are the Netherlands and Sweden).

It is a very particular type of economy based on small family enterprises (micro enterprises with important family networks): The 98.1% of total number of enterprises hired up to 9 employees and the 96% up to 4 in 2002. In addition, its average firm size in 2001 was 41 employees while in 2005 42 (ELSTAT, 2012). This means that the most of the firms are small and have developed family networks which allow them to survive.

Until 2008, its export base was very low (however it started to increase afterwards) and around 15% lower than the EU and Eurozone average (Graph 2). Imports were quite high (Graph 3) and higher than EU and Eurozone average in the beginning of previous decade. However, up to 2003 it largely declined and afterwards it had wild fluctuations to end in 2011 in a 10% lower than EU and Eurozone average.

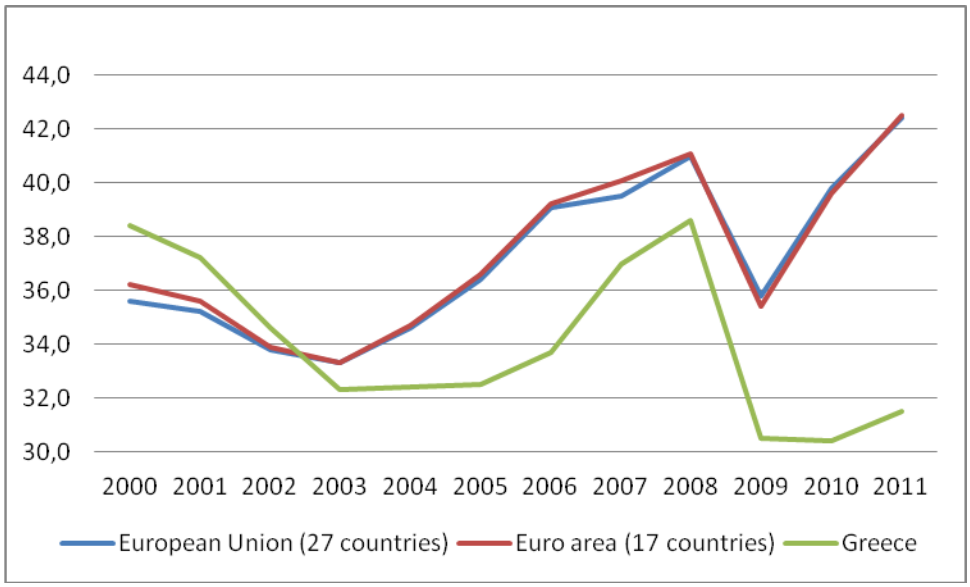
Graph 2: Exports (% of GDP) in Greece and in the EU



Source: Eurostat (2012), own elaboration

Outward Foreign Direct Investment (FDI) is low (10-12% of GDP in 2007-2010), since except the border MS like Bulgaria, Romania and Cyprus especially during crisis, there has not been a high activity on investments. On contrary, inward FDI was higher until 2007 (17.1% of GDP) but after crisis it largely declined (Table 1)

Graph 3: Imports (% of GDP) in Greece and in the EU



Source: Eurostat (2012), own elaboration

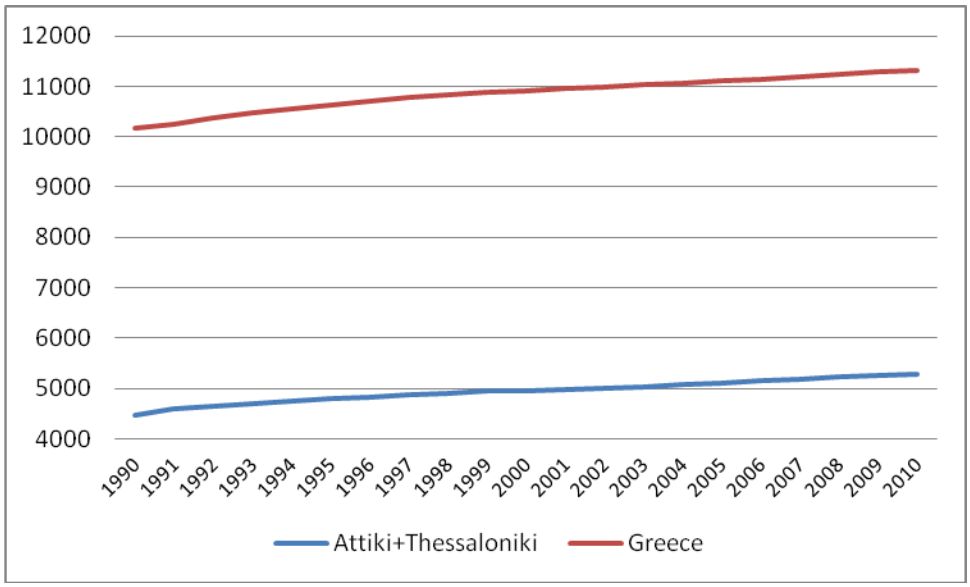
Table 1: Inward and outward FDI of Greece 2007-2010

	2007	2008	2009	2010
Inward FDI (as % of total GDP)	17.1	11.4	12.6	10.4
Outward FDI (as % of total GDP)	10.2	11.2	11.9	11.7
Inward FDI	53221	38121	42101	33558
Outward FDI	31650	37235	39457	37875

Source: OECD (2012)

Another important characteristic of Greek economy is the extreme geographical concentration of population and economic activity: the huge majority of population and economic activity is largely concentrated in the two metropolitan regions of Attiki and Thessaloniki, following the theory of growth poles (Perroux, 1955). They concentrate almost the 50% of both population economic activity (Graph 4 and 5). In this way Attiki is the connection to the global and this is why it was hit mostly by crisis (as it is shown below).

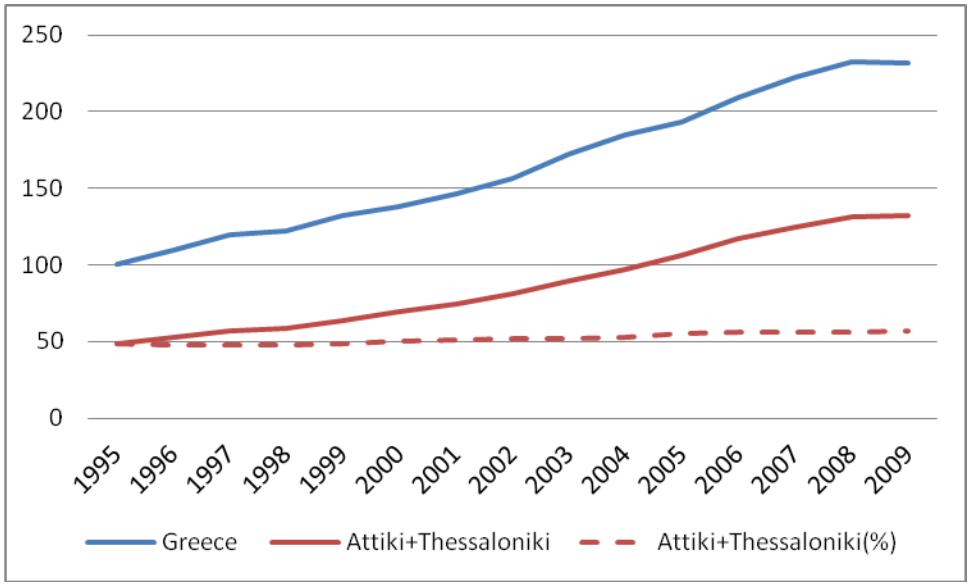
Graph 4: Population of Greece and of Attiki+Thessaloniki 1990-2010



Source: Eurostat (2012), own elaboration

Greek economy, which is labor-intensive, has abundance of labor, low production cost and is dominated by small-sized family enterprises (Oltheten et al., 2003). Greece was also the MS with the 21st highest GINI coefficient in the EU27 in 2010 (ELSTAT, 2012) and the 19th highest GINI coefficient among OECD countries in the same year (OECD, 2012).

Graph 5: GDP of Greece and of Attiki+Thessaloniki 1995-2009



Source: Eurostat (2012), own elaboration

So, Greece is not an average European economy but it has some very special characteristics (as quoted above) and a structural problem with two axes: firstly, the extreme concentration of economic activity and population in the two mega-poles, for the standards of Greek economy (Attiki and Thessaloniki), i.e. center-periphery division and secondly, no production structure.

There are 3 important moments in the recent history that largely influenced Greek economy and the way that Greek State could take advantage of its productive base.

The first important moments for Greece were the access in the European Community (1981) and the establishment of the Treaty of Maastricht (1992) which changed the whole situation in Greece. The free movement of persons, capital and goods, i.e. the market integration, had as a result the disintegration of productive structure of the Greek economy (Robolis, 2012): agriculture (1960-1981 growth: 2.7%, 1982-today growth: -2%) and manufacturing (20% of national GDP in 1970, 10% of national GDP in 2010) had largely shrunk in the first years after Greece's access in the EU (ELSTAT, 2012; Robolis, 2012). Greek economy could compete successfully the economies of the other MS (Petrakos et al., 2012).

Also, it could be said that a process of de-industrialization and violent tertiarization of Greek economy took place in the years after it joined the EU (Louri & Pepealasis-Minoglou, 2001). This took place in a background that the globalized economy becomes gradually largely specialized in financial sector. In addition, a gradual destruction of whole productive structures in Greece (and also generally to the Periphery of EU) took place by mergers of Small and Medium Enterprises (the basis of the national economy of Greece) or the acquisition by larger firms, by firms' closures and by relocation of economic activity to Eastern Europe (Hadjimichalis, 2011). However, the basis of Greek economy is still the microenterprises and the family networks that they have developed.

Between 1981 and 2005, the big majority of the Greek regions exhibited negative growth rates in terms of industrial Gross Value Added (GVA) per capita (Petrakos et al., 2012). In this way of thinking, Petrakos and Psycharis (2004) suggested that EU integration process had a negative impact on the development perspectives of Greece.

The second important moment for Greek economy was in 2001 that Greece joined Eurozone. This common currency union has significant structural problems of institutional design and inability to cover failures. Eurozone has the inherent characteristic to create trade surpluses for the Core economies and trade deficits for the Peripheral ones (Lapavitsas, 2010; Robolis, 2012). Trade inequality is a factor and condition for uneven geographical development; it "frames –and is framed by- the production of commodities and the geographical circulation of surplus value embodied in these commodities" (Hadjimichalis, 2011). These surpluses transform in trade exports, exports of capital in Foreign Direct Investment (FDI) or in bank lending to the peripheral MS. It is characteristic that the exports of Germany to Southern Europe exploded from 2000 (one year after the establishment of Euro) to 2010 while its domestic demand had only an annual 0.2% increase (Hadjimichalis, 2011).

This situation is worsened taking into account the extremely high exchange rates that peripheral MS accessed Eurozone. In addition, after Greece joined Eurozone it was not able to implement its own national fiscal policy (Petrakos, 2012). Integrating peripheral with Core economies without taking into account the different labor markets, the unequal regional production systems and the unequal accessibility to the international markets was not a so good and efficient decision (Medelfart et al., 2003).

The last important moment in recent Greek Economy history was in 2004, when the Olympic Games were organized by the Greek government. This mega-event was stigmatized as the basis for the beginning of a new period of economic growth. However, it had never had the results and benefits that were expected on Greek economy. On contrary, the deficit rose the year that all the financial obligations of Greek economy took place due to the Olympic projects: in 2004, the rate of deficit, according to Eurostat (2012), was the highest in the EU (-7.5%). This happened because all the big projects were financed by money that the Greek Government borrowed. In addition, the projects were not ready on time and the payments were not immediate (Petrakos, 2012). As a result, the Olympic Games cost very much (much more than it was expected) for the Greek State.

In this perspective, Greece experienced in 1981, 1991 and 2000 the third lowest level of NUTS II regional inequalities among 13 MS of the EU measuring them by using the Weighted Coefficient of Variation (WCV) of GDP (Petrakos & Psycharis, 2004).

However, there is a stable regional divergence trend in the 9 of the 13 MS, including Greece. Studying the phenomenon in NUTS III regions, Greece shows the third lowest level of regional inequalities (using the same indicator) in 1990 and the fourth lowest in 2000 among 14 MS of the EU. 11 from the 14 MS experience an increase of regional inequalities from 1981 to 2000. So, a regional divergence trend is indicated in Greece, but also in the majority of the MS of the EU.

Regional inequalities in Greece are examined below by focusing on 4 specific issues: the level of regional inequalities, their evolution i.e. regional divergence or convergence, the speed that the regions grow and finally whether they show a cyclical behavior i.e. whether they increase in growth period and they diminish in case of recession.

A very important issue on the study of regional inequalities in Greece is this of the index that is used. GDP per capita many times is not the most reliable indicator for measuring regional inequalities, since the specific geographical distribution of production does not mean that the incomes that are produced are distributed in the same way. Production in one region does not result necessarily in creation of incomes for the residents of the same region. For this reason, many composite indexes have been structured. In the case of Greece Petrakos & Psycharis (2004) created the Composite Indicator of Development and Prosperity.

Furthermore, in the last 20 years a big part of the manufacturing enterprises of Attiki region (with the capital city of Greece, Athens) has relocated to neighboring regions (satellite cities-regions). This phenomenon took place mainly with the NUTS III region of Viotia. Until recently, this problem was not corrected and Viotia was the richest Greek region, higher than EU average (Petrakos & Psycharis, 2004). So, in order to have results which are closer to the reality we need to correct this problem.

There have already been many studies over regional inequalities in Greece. There are different results using different indicators and different methodology in different periods and in different spatial level. However, the main conclusion of all these studies is that regional inequalities are persistent in Greece, especially after Greece joined the EU, the regional divergence trend is the dominant and that the big majority of the economic activity is concentrated in the two regions with the big agglomerations, Athena and Thessaloniki (Petrakos & Psycharis, 2004).

So, there is much evidence for high regional inequalities and regional divergence among the Greek regions. Siriopoulos et al. (1997) in the 51 NUTS III Greek regions in 1981-1991 (the first decade after Greece's access in the EU) found that divergence trend is dominant. Moreover, Siriopoulos and Asteriou (1998) examined the regional trends in a period of 25 years (1971-1996) focusing on the 13 NUTS II Greek regions. Divergence trends are dominant in the sub-periods, 1971-1981 (before access in the EU) and 1981-1996 (after access in the EU), and in the whole period.

Petrakos and Artelaris (2008) found that, using the Composite Index of Development and Prosperity, the level of NUTS III regional inequalities in Greece is much higher than measuring them in terms of GDP per capita in 1981-2004. In addition, they found that the regional divergence trend is the dominant one. The same authors (2009) found that regional divergence is the dominant trend in Greece after they ran a Weighted Least Squares model focusing on NUTS III regions in the period between 1990 and 2000. Finally, in the most recent study Christofakis and Papadaskalopoulos (2011) found that regional disparities in Greece, focusing on NUTS II level, rose in 2000-2008, in a study which also examines the impact of the National Strategic Reference Framework and Operational Programs of the Current Programming Period 2007-2013.

Table 2: Overview of the studies of regional inequalities in Greece

Study	**Result**	**Period of reference**
Petrakos et al., 1999	Cyclical Behaviour	1950-1995
Petrakos & Saratsis, 2000	Cyclical Behaviour	1971-1991
Tsionas, 2002	Convergence (β, σ)	1971-1993
Michelis et al., 2004	Convergence (β, σ)	1981-1991
Benos & Karagiannis, 2008	Convergence (β)	1971-2003
Siriopoulos et al., 1997	Divergence	1981-1991
Siriopoulos & Asteriou, 1998	Divergence	1971-1996
Petrakos & Artelaris, 2008	Divergence	1981-2004
Petrakos & Artelaris, 2009	Divergence	1990-2000
Christofakis & Papadaskalopoulos, 2011	Divergence	2000-2008

Source: Own elaboration

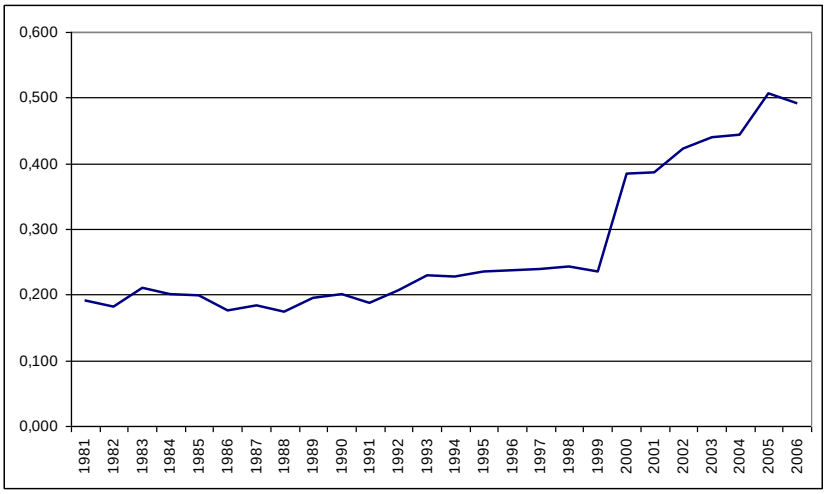
Tsionas (2002) found regional convergence in NUTS III level in 1971-1993 (β-convergence and σ-convergence models) but the Markov chain analysis that he introduced indicated that the Greek regions are "highly polarized and duality prevails". Michelis et al. (2004) found also that the hypotheses of β-convergence and σ-convergence are not rejected in NUTS III Greek regions in the decade that Greece joined the EU (1981-1991). However, the convergence speed that was found in this research is much lower than the crucial threshold of 2% that Sala-i-Martin suggested (1996). Finally, Benos and Karagiannis (2008) found β-convergence among the NUTS III Greek regions in 1971-2003. On contrary, the hypotheses for σ-convergence in NUTS III regions and β-convergence and σ-convergence in NUTS II regions were rejected. This indicates that Greek NUTS II regions are largely heterogeneous and are not single regional economies.

Finally, evidence for a cyclical behaviour of regional inequalities (divergence in economic growth and convergence in economic recession) has been found for the NUTS III Greek regions over 1950-1995 (Petrakos et al., 1999) and 1971-1991 (Petrakos & Saratsis, 2000). These studies have found that in the period of economic recession in Greece (1970s and 1980s) regional inequalities declined. In table 2 there is an overview of these studies and their results.

So, the "Regional Problem" shows persistence in its level and in its duration over time (Petrakos & Psycharis, 2004). At this point, a more careful examination of regional development in Greece in the last decades would be useful in order to understand in a better way the trends, the problems and the causes of the Greek "Regional Problem". Below, data regarding regional development in Greece are presented in order to examine the issues stated above.

Attiki and Thessaloniki (the two big urban centers) exhibit the highest economic activity and the regions specialized in tourism show the biggest economic dynamism (Petrakos & Psycharis, 2004). According to them, the primary and tertiary sectors are more evenly distributed over space than secondary one which is concentrated in the metropolitan regions and their satellite regions.

Graph 6: WCV GDP per capita of Greek NUTS III regions 1981-2006



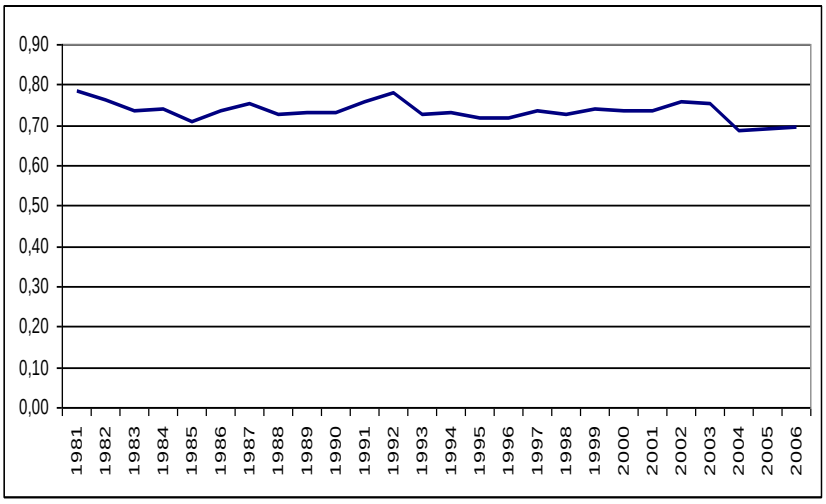
Source: Petrakos & Psycharis (2004), Petrakos (2009)

As it is shown in Graph 6, the divergence trend among Greek NUTS III regions was dominant in 1981-2006. The WCV of GDP per capita started from 0.2 in 1981 and gradually increased until 2000 when it rocketed up to 0.4 and continued to rise until 2006 up to 0.5. These are the years after Greece's access in Eurozone, a decision which did not have a positive impact on regional development.

Since GDP is not always the best indicator for measuring regional development (for reasons explained above), Petrakos and Psycharis created a composite index, the Composite Index of Development and Prosperity (CIDP), which takes into account 21 simple indexes such as GDP per capita, income per capita, household consumption of electricity, savings per capita and population density.

Looking over graph 7 which presents the WCV of CIDP it could be noted that from 1981 to 2006 there is a stable evolution of inequalities among NUTS III Greek regions (with very small convergence), which is not in line with the evolution of regional inequalities in terms of GDP per capita. However, the level of regional inequalities, measuring them with CIDP (minimum is 0.7), is much higher than the level of regional inequalities, using GDP per capita index (maximum is 0.5). Attiki, Thessaloniki and Dodekanisos have the highest level of CIDP in 2000 while there is a change in the last 3 regions: Thesprotia, Ileia and Evritania (instead of Arta).

Graph 7: WCV CIDP of Greece 1981-2006



Source: Petrakos & Psycharis (2004), Petrakos (2009)

Taking into account the problem of measuring regional inequalities in Greece which is caused by the relocation of economic activity from the metropolitan regions to satellite regions, Petrakos and Psycharis (2003) made efforts to correct this situation. After the correction, there is not any NUTS III region which is above the average of both EU15 and EU25 in 2000.

The regions with the highest level of GDP (in PPP) are Dodekanisos (insular region), Attiki and Thessaloniki (the two metropolitan regions) and the regions with the lowest levels of GDP (PPP) are Ileia, Thesprotia and Arta in Western Greece. The 39% of national GDP was produced in Attiki and the 11% in Thessaloniki, indicating the polarization and high concentration of economic activity.

So, regional inequalities evolution in Greece after 1980 and before the crisis of 2008 is not the favorable one. When regional inequalities are measured with GDP per capita they are in a low level but they gradually increase while using CIDP they are in a much higher level and there is a very small convergence since the NUTS III regions of the low level move to upper positions.

Before examining the world economic crisis of 2008 and its adjustment to Greece, it would be useful to study which are the main reasons for this evolution of the Greek Regional Problem. Petrakos and Psycharis (2004) categorized these factors in 4 groups. The first is the historical reasons which include the gradual formation of the

Greek State, the sudden relocation of 250,000 immigrants from Minor Asia (after the disaster) which made the population of Athens to increase 55% and the civil war and post-civil war years from 1949 to 1989.

Secondly, the most important of the geo-morphological factors which influence the evolution of regional disparities in Greece are that the 64% of Greek territory is mountainous or semi-mountainous and that there are more than 220 inhabited islands. Thirdly, there are the economies of scale which are created in the two metropolitan centers (Athens and Thessaloniki), the impact of economic cycles and the integration through the EU.

Finally, the political and policy factors are also important since the highly concentrated administrative system, the fragmentation of local authorities and institutions and the absence of regional policy combined with the poor use of the European Structural Funds have influenced negatively the evolution of the Greek Regional Problem.

3. The global crisis adjusted to Greece

This is the situation in Europe and especially in Greece from the establishment of the EU until 2008 which is the year that many things changed in the worldwide economy and society. This is the year that the "housing bubble crisis", which emerged in the real estate market of USA in 2006, spread all over the world and struck mainly the EU.

At this point, and before describing the main characteristics of this crisis, it would be useful to focus on the way that the crisis was transmitted from the USA to all over the world. So, the transmission of crisis from USA to the rest of the world took place due to the highly interconnected globalized economy and its most important characteristics: the international trade and the Global Commodity Chains (Sassen, 2008).

Global Commodity Chains are "sets or inter-organizational networks clustered around one commodity or product, linking households, enterprises and states to one another within the world economy" (Gereffi and Korzeniewicz, 1994). Territoriality is one of the dimensions of Global Commodity Chains which indicate the spatial dispersion and distribution of production by different firms. Recently, Global Commodity Chains seem to "have diversified and each chain aggregates more and more specialized steps" (Sassen, 2010). In such a way and through the Global Commodity Chains and the high interconnection of national economies in the background of globalized economy, crisis which started in the USA finally struck the most of the other national economies, and especially the most developed and most interconnected (through globalization process) ones.

So, this crisis, which originates from USA in 2006 and especially from its real estate sector, is probably the most important in the history of capitalism (Subramanian & Williamson, 2009). In the way described above it affected and still affects almost all the developed national economies in a different rate: crisis has the biggest impact on the most market integrated, interconnected through globalization and specialized in financial sector, national economies.

Current crisis is a strong, long and deep crisis, since even today, almost five years after its beginning; many national economies (especially in Eurozone) are still in recession. This crisis, originated from housing sector in USA (Dadkah, 2009: 241-

243), well known as housing bubble which was caused by the falling real mortgage rates, income growth and the treatment of housing as a speculative asset (Martin, 2011), affected initially the financial and credit system. There has been a long period of very low interest rates which resulted in growth by over-sales of subprime mortgages to the low income household in USA. These loans were created by securitization through generating bonds based on the expected mortgage payments, which could not be finally paid off (Radice, 2011). In such a way the banks and the insurance corporations confronted great financial disaster and losses.

So, crisis occurred by the voracious and unplanned way of over-accumulation and over-production, by selling more and more houses and mortgages and by the excessive desire and necessity, in the same time, for increasing the profit rate (Harvey, 2010: 44). The real crisis came of banks' and mortgage companies' lending "fake" loans to borrowers who did not have the financial means to undertake the costs of the loan, which in turn had been bundled in securities and sold around the world (bubble phenomenon). As a result the supply exceeded very much the demand at a level that caused a massive drop in orders and a significant reduction in current production (Shaikh, 2011).

Thus, the procedure of "speculative mortgage lending by US financial institutions and the trading of resultant derivative securities by international banks" (Lapavitsas et al., 2010) are the most important causes of the very big bubble in the period before 2007 leading finally to the crisis of 2008. There is one more issue which contributed in the emergence of this crisis: the geographical and economic reorganization of international division of labor (Hadjimichalis, 2010). This situation had as a result the dramatic steep drop in growth, employment, earnings, and investment.

Key data reflect clearly the new situation: (i) in 2008, the total annual world growth declined from 4% in 2007 to 1.4% while in 2009 it was negative (-2.3%) before increasing to 4% in 2010. (ii) In OECD countries the situation is worse (since crisis impact was bigger in developed world): 2.6% in 2007, 0.1% in 2008 and -4% in 2009, before the small recovery of 3.1% in 2010 (World Bank, 2012). World trade fell dramatically -19% in 2009 before increasing 10% in 2010.

(iii) Consequently, world unemployment increased from 8.7% in 2009, 8.8% in 2010 and 9% in 2011. In the same way in OECD countries, the total unemployment

increased, too: 5.8% in 2007, 6.1% in 2008, 8.3 % in 2009 and 8.5% in 2010 (CIA, 2012). Youth unemployment also increased from 11.6% in 2007 to 11.8% in 2008 and 12.7% in 2009 and the same percentage in 2010 (ILO, 2012). The most important alarm is coming from the fact that while in pre-crisis period (1997-2007) the annual average increase of world youth unemployment was less than 100,000 persons, between 2008 and 2009 the increase was 4.6 million persons (ILO, 2011). In OECD countries youth unemployment increased much more: 12% in 2007, 12.7% in 2008, 16.7% in 2009 and 16.7% in 2010 in OECD countries (OECD, 2012).

The region which probably had the biggest and most important impact from crisis is Eurozone. And this did not happen accidentally: the structure and the architecture of Eurozone (and EU) are not in the right direction (Lapavitsas, 2010; Hadjimichalis, 2011; Petrakos, 2012). According to Petrakos (2012) European integration is unequal and uneven since it was based very much on single market (no obstacles at all), on the single currency but not on the fiscal unification, which premised political integration.

Furthering this opinion, Hadjimichalis (2011) claimed that Eurozone moved towards a monetary union since a common tax system has not been established and since there is this false assumption that "regional imbalances would be self-corrected by markets". On contrary, there is tax competition (instead of tax cooperation) and unequal trade process.

In this way the crisis in the EU hit the banks, the real estate and the private and public debt (Hadjimichalis, 2011). There are MS which are mostly hit in one of these sectors than the other ones (Greece in public debt, Spain in real estate, the Netherlands in private debt, Ireland in banks) but the most of them, even the MS which have not been hit so much by the crisis (like Germany, Austria, Finland), had a very negative impact on the banks.

Another characteristic of the crisis in Eurozone is that the negative impact seem to be transmitted from the weak MS of the Periphery which were hit firstly (Greece, Ireland, Portugal, Spain) to the Core ones for two reasons: firstly due to the Eurozone and EU's special characteristics (open borders, dependence on exports and imports, within the Union, of many national economies and problematic structure of the Eurozone) and due to the austerity, hyper-neoliberal and shock-doctrine policies of internal evaluation which are implemented by the national governments following the

directives of the Commission, the European Central Bank (ECB) and the International Monetary Fund (IMF). However, Greece was not the first MS of the EU that was hit by crisis; its initial impact was notable Spain's (mainly tourist) real estate sector, in the MS of Eastern EU and in the banking sector of Ireland (Hadjimichalis, 2011).

Until now, the model of unequal development in the EU is dominant and this was a very important factor that crisis struck the EU in this way (Robolis, 2012). According to the same scholar, the EU is an, economically and, internally, unequal structure: the wealth produced in the Southern or Periphery MS is transferred to the Northern or Core MS resulting in a deficit in the first ones and in a surplus in the second ones (Lapavitsas, 2010). It should be realized, that the economic activity (the enterprises) of the Periphery of the EU cannot compete the firms of the Core of the EU (Robolis, 2012). So, this division between South and North (or Periphery and Core) is the most important structural problem of the EU.

There are some other important characteristics of the Eurozone which indicate the real division between the Core and the Periphery and which contributed to this deep emergence of crisis within the Monetary Union. Firstly, there is the structural and inherent process of the Eurozone that the Core generates surpluses while the Periphery creates deficits (Lapavitsas, 2010) in the way that it was described above.

Secondly, the growth mainly in the Periphery MS is an outcome of the increase of consumption which is financed by big loans (mainly private by rising household debt) or as an outcome of the "investment bubble" through the speculation of the real estate sector. Thirdly, there is much pressure applied to the workers (in terms of salaries' cut and working conditions) of the Periphery MS. Finally, the "welfare state" (at least before crisis) is better in the Core than in the Periphery of the Eurozone (Lapavitsas et al., 2010). In this perspective the Periphery MS have exhibited different economic behaviors: Portugal and Greece had high levels of consumption while Spain and Ireland sustained booms of investment by focusing on real estate speculation.

GDP growth in the Eurozone was 3% in 2007 (3.1% for the EU), 0.4% in 2008 (0.5% for the EU), -4.3% (for both the Eurozone and the EU) in 2009 in the big recession, 1.9% in 2010 (2% in the EU) and 1.5% (for both the Eurozone and the EU) in 2011 (Eurostat, 2012). The unemployment rate in the Eurozone rose from 7.6% in 2008 to 9.6% in 2009, to 10.1% in 2010 and to the highest level in the Eurozone's history

(11.1%) in May 2012 while in the EU it increased from 7.1% in 2008 to 9% in 2009, to 9.6% in 2010 and finally to 10.3% in May 2012 (Eurostat, 2012). This difference, which is important, enhances the argument that the Eurozone has until now the biggest impact of crisis. The unemployment in Greece from 8.3% in 2007 rocketed up to 21.9% in April of 2012, in Spain from 8.3% in 2007 rocketed up to 24.3% in April of 2012 and in Portugal from 8.1% in 2007 rocketed up to 15.2% in April of 2012.

These characteristics of Eurozone combined with the trade and financial deficits of the majority of the (mainly Periphery) MS of the Eurozone have resulted in an increase (gradually until 2008) of the public debt of national economies; governments borrowed loans from international markets with interest rates up to 3% in order to finance large enterprises and to repay their older debt and interests. In addition, the tax systems are not in the right direction. However, after 2008 crisis these interest rates have largely increased especially for the national economies of the Periphery.

In the previous reasons for borrowing it was added another one during crisis which is extremely expensive: the national states decided to rescue the banks which were largely hit from crisis (Lapavitsas, 2010). In this way the fiscal deficits increased and the national debts extended. So, MS like Greece, Ireland and Portugal (and recently Spain and Cyprus, too) were obliged to borrow with interest rates around 6% and 7% in the international markets. These interest rates are almost prohibitive for the national economies since borrowing in such high levels results in a non-sustainable national debt.

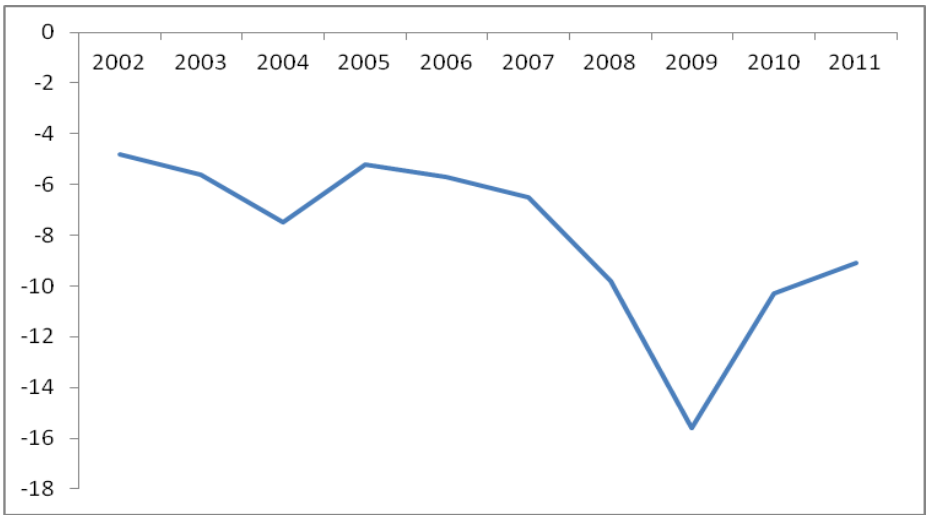
The policy that Eurozone decided to implement was common for the MS which were in this situation: a joint stability program of the IMF, the EU and the ECB established firstly for Greece in 2010, implemented after to Ireland, Portugal and more recently to Spain and Cyprus. In the meanwhile, Eurozone decided to establish two more funds: European Financial Stability Mechanism (EFSM) for temporary use until the European Stability Mechanism (ESM) starts to function in a permanent way.

The first one is a temporary bail-out mechanism which helps the MS which are in economic trouble. It is financed by the money of the tax-payers of the Eurozone. Its duration is probably until 2013 (at least as it was initially decided). ESM is the permanent version of EFSF and has the similar characteristics with it. These funds were established in order mainly to recapitalize the banking sector; after the European

Conference of June 2012 (European Council, 2012) they will also be able to buy bonds of the MS which cannot borrow from the international markets.

In this crisis' background one of the first MS of the EU which experienced the most negative impact was Greece. This, according to Lapavitsas (2010), happened for four reasons: the high deficit, the state's situation (corruption), the fiddling of the figures and the small size of the state which made its speculation from international markets easier than other states. All these situations, combined with the extremely high rate of borrowing in order to finance big enterprises, big projects which were finally useless for Greece (Olympic Games), to refinance the old debt and the interests, to rescue the banks (the subsidies to them were around 45 billion euro until the beginning of 2010) and combined with the huge tax evasion of the upper class resulted in the very bad economic, and consequently social, situation after 2010.

Graph 8: Greek fiscal deficit (% of National GDP)



Source: Eurostat (2012)

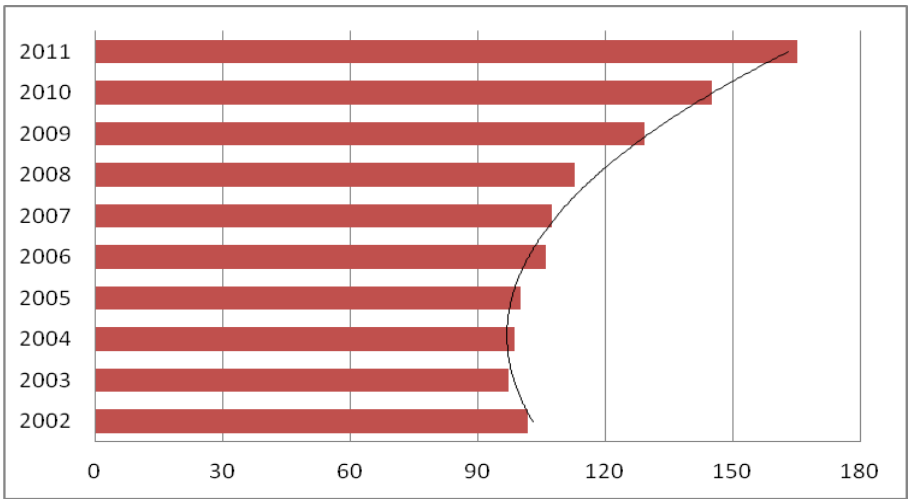
The architecture of the EU and its inherent division Core-Periphery, the function of the state, the role of the political parties and the lack of a proper productive system were the determinant factors that crisis struck Greece in such a way (Petrakos, 2012). The shrinkage of the productive structure of Greek economy, due to the EU integration, resulted in specialization in services and construction and in weakening sectors like agriculture and manufacturing. It is not possible for such an economy of 11 million people to create surpluses in this way. The estimated necessary annual GDP for a satisfying level of living standards for 11 million people is 500 billion euro

while Greece was producing 250, focused on services and construction sectors (Robolis, 2012).

After Greece joined the Eurozone in 2001 it had steadily a very high deficit: in 2000-2003 it was one of the highest in the EU. In 2004, the year of the Olympics (which resulted in 5 billion deficit), Greek deficit was 7.5% of National GDP (Eurostat, 2012). Also, in 2008 and 2009 Greek deficit was the highest in the EU, a situation which affected and was affected by the crisis. In 2009, specifically, the deficit was 15.6% of National GDP (graph 8).

In the same time, in 2009, the public debt was at extremely high level (129% of GDP or almost 300 billion euro), characterized as unsustainable of the economic institutions and the interest rate of borrowing was around 6% and 7%, which is a prohibited level. In 2010, national debt rocketed up to 145% and in 2011 in 165% and 365 billion euro (graph 9). This happened because in May 2010 Greek Government decided to join the stability program created by EU, ECB and IMF and to sign the Memorandum with them. This memorandum, until July 2012, has lent to Greece loans whose total value is almost the same with its public debt in 2009 (it was 300 billion euro and the loans until now are 270 billion euro). The huge majority of these loans are for the repay of previous debt and interest rates and for the banks' rescue.

Graph 9: Greek public debt (% of National GDP)

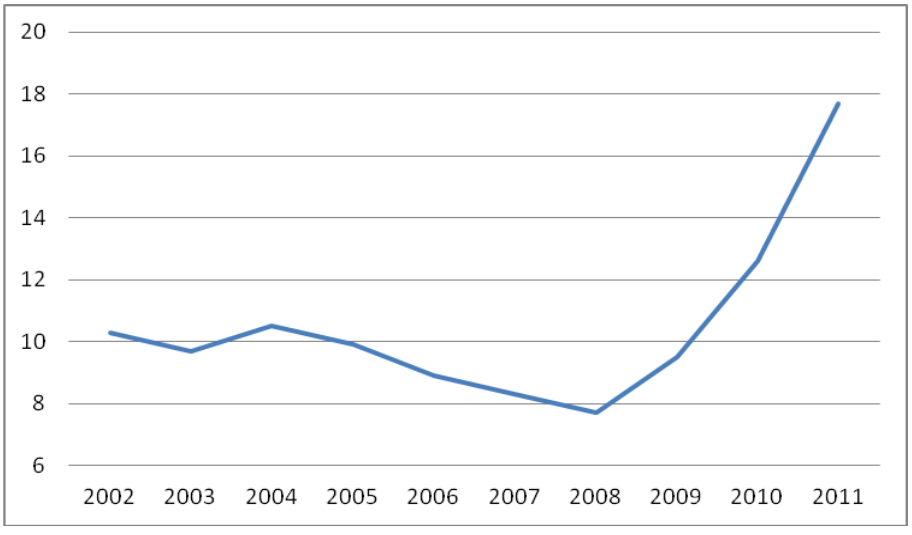


Source: Eurostat (2012)

However, the implementation of the program required from Greek government to implement a very strict (and inefficient taking into account the situation of Greek economy, 2 years after the program's implementation) combination of policy: austerity and budget cuts. So, Greek government had selected to cut its internal payments (salaries pushed down 30% in 2010-2012 in average in public and private sector and in pensions) and to borrow huge loans in order to pay off the old debt and to rescue the banking system. This huge austerity, which was implemented, led Greece to the biggest recession in its history indicating that this program is inefficient: through austerity the recession continues and increases resulting in not achieving the (wrong) goals of the Memorandum.

The situation would be very different if Greece was not in Eurozone and had its own national currency. Then, it would be available to implement its national currency policy, to devaluate its currency, to use other macroeconomic instruments without external control and to avoid all this process of internal devaluation. It is considered that in such a way Greek economy would have already recovered its stability and it would grow positively and faster (Lapavitsas, 2010).

Graph 10: Greek Annual Unemployment Rate



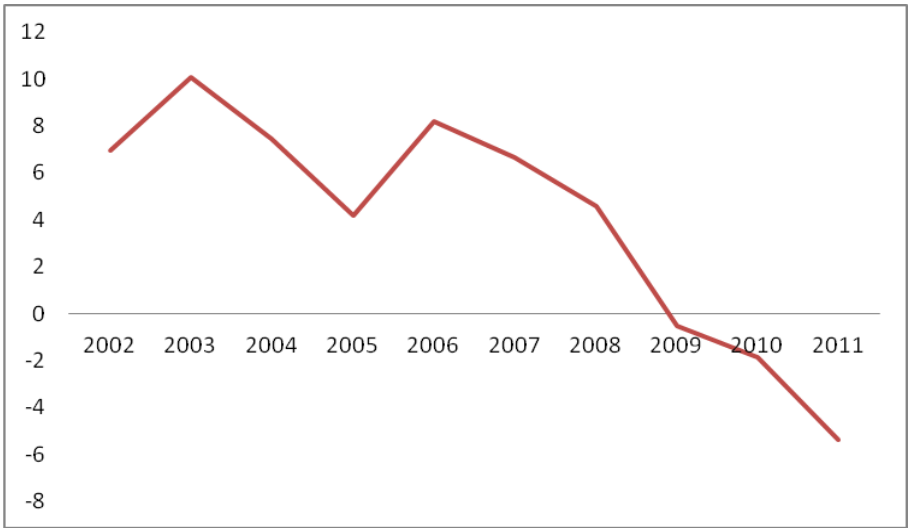
Source: Eurostat (2012)

Unemployment rate experiences the worst impact of crisis and the most negative implications of the austerity policies. Crisis' initial impact was obvious in 2008 and 2009 that unemployment rate increased (Eurostat, 2012). The stability program

implementation resulted in a large deterioration of the living standards of Greek workers and youths (labor conditions change, budget cuts and austerity measures). Unemployment rate in Greece in 2010 rocketed up in 14.8% and in 2011 in 17.7% (Graph 10). In the last quarter of 2011 unemployment rate reached 21% and in March 2012 21.9%. The situation in youth unemployment is much worse since more than 50% of young persons in Greece were unemployed in the beginning of 2012 (ELSTAT, 2012). In total, from 2010 until May 2012 there are 700,000 more unemployed persons in the Greek labor market.

With regards to economic growth, Greek economy exhibited wild fluctuation in 2002-2006 (graph 11). However, after 2007 growth rate began to fall and in 2009 it became negative. After the intervention of EU-ECB-IMF and the implementation of stability program, recession largely increased in -6% in 2011. Greece is the first national economy, after the Second World War, which in is in recession for a constant period of five years.

Graph 11: Greek Annual Growth Rate



Source: Eurostat (2012)

Summarizing the implications of the crisis' impact and the austerity policies implications of the last 4 years, there is a 50% decline of the real average income per capita and 8% decline in the labor cost (Robolis, 2012). The Institute for Labor of National Trades Council predicts that the unemployed persons will be over 1,200,000 in the end of 2012.

At this point it should be noted that all the data refer to registered unemployment. There is also the informal unemployment which is estimated around 6% in 2012. So, in totally there is prediction for more than 1,400,000 unemployed persons, i.e. 24%, in the end of 2012. In one year (from the first quarter of 2011 to the first quarter of 2012) 400,000 jobs were lost in Greece (Commission, 2012). According to the same report, there is 25% increase of the homeless people who are almost 20,000 now in the whole country.

Crisis affected in such a disastrous way Greece as a whole economy, but there were also regional/local implications. Each region reacted in a different way to crisis and to the full neoliberal policies of austerity and budget cuts implemented in order to confront crisis. As mentioned above, growth results in divergence since the big urban centers which satisfy a crucial threshold grow much faster (agglomeration economies) than other places. But what is really happening when there is recession? In other words is there a specific behaviour of regional inequalities in terms of economic cycles?

Berry (1988) claimed that during the economic cycle there is convergence or divergence depending on whether there is economic growth or economic recession, an approach which is in line with the argument of Myrdal that growth is a cumulative process because the rich and leading regions are "in a better position to take advantage of the opportunities generated by economic boom" (Petrakos et al., 2005).

This approach and evidence, which was indicated above, is in contrast to other studies (Dunford, 1993) and reports (Commission, 1999) which claim that regional inequalities decline in periods of economic growth and increase in periods of economic recession. This could happen mainly because the firms of the leading regions are more flexible and have developed higher levels of technology and because in periods of economic recession there are fewer available economic resources (because of the recession but also of the policies implemented to confront it –like budget cuts and austerity) for redistributing public policies (Hůlka, 2007). What is really happening in the Greek Regional Development in the period after 2008 that crisis struck the country?

4. Crisis' impact on Greek Regional Development

In such a way crisis affected Greek economy in a very negative way. However, was crisis' impact the same to all the Greek territory or it was differentiated depending on the special regional characteristics? Regional development has been affected by current global crisis since the collapse of financial sector resulted in "uneven economic shocks and recession" (Tomaney et al., 2010). Petrakos (2012) claims that the impact of crisis in Greece is largely differentiated from one region to another.

The impact of crisis on Greek Regions is examined in this section in a general view by making efforts to shed light of crisis effects on regional growth, regional income and other factors of regional development. Many studies have been already conducted investigating the impact of crisis on regional development in many countries. However, there are few for Greece: ministry of Regional Development and Competitiveness investigated the impact of economic crisis in the economies of Greek regions (2011) while Monastiriotis (2011) examined the impact of Greek austerity measures on geographical distribution of available income.

Petrakos (2012) claims that Attiki, in primary level, and the rest of the big urban centers, in secondary level, have experienced until now the most negative impact of crisis, On contrary, areas and regions located far away from these centers have not exhibited so strong effects of crisis.

Monastiriotis tries an *ex-ante* evaluation of the geographical distribution of the austerity measures that Greek government implements. In his study (2011) predicted that regarding the public investments and public spending the negative consequences of the austerity measures will be less important and less obvious in the most developed regions of the country.

In a big study of the Ministry of Regional Development and Competitiveness that a group of researchers conducted (2011) there are some certain conclusions from the statistical and empirical analysis that took place. Firstly, examining 13 economic indexes, the whole economic activity of Greece has largely declined with an exception of the "Greeks' overnight stays per capita" index.

The branch with the biggest decline[1] seems to be the construction one in all the regions of the country. The regions which have been mostly hit are these which were the most developed and the most exposed to international competition before crisis, like Attiki and Thessaloniki.

The most developed branches are more exposed to crisis. Specifically, the exports value per capita has largely declined in Attiki and Sterea Ellada while Voreio Aigaio and Thessalia experience fewer losses. Foreigners' overnight stays per capita decline in all the regions except Thessalia and Peloponnisos, which are traditionally less touristic. Sales of new private cars and construction have the biggest losses, especially in Attiki, Dytiki Makedonia and Voreio Aigaio that the decline is higher than 50% (while in all the other NUTS II regions is higher than 35%). Savings exhibit a very important decline in all the NUTS II regions and mainly in Attiki. In such a way, tertiary is the sector with the most important losses, in terms of both production and employment.

Some of the findings indicate a small regional (undesirable) convergence to lower levels of development took place. Finally, except the use of GDP per capita index for measuring the regional prosperity, this research group estimated the Composite Index of Crisis Impact Evaluation and the Composite Index of Regional Development for the Greek regions. According to the findings for the first Index, Attiki seems to experience the most significant negative consequences. After this, Thessaloniki, Voiotia, Fthiotida and Imathia are among the 15 NUTS III regions which have been mostly hit.

This trend, i.e. that the most developed NUTS III regions were mostly hit, has not resulted until now in regional convergence, since also the less developed regions have been largely hit by crisis. As a result the Greek spatial model of production has not changed. However, there is evidence that regional inequalities have declined after 2008 in NUTS II regions. These findings are in line with the theory of regional inequalities' cyclical behavior (Berry, 1988): in period of growth there is regional divergence and in period of recession there is regional convergence (to lower levels).

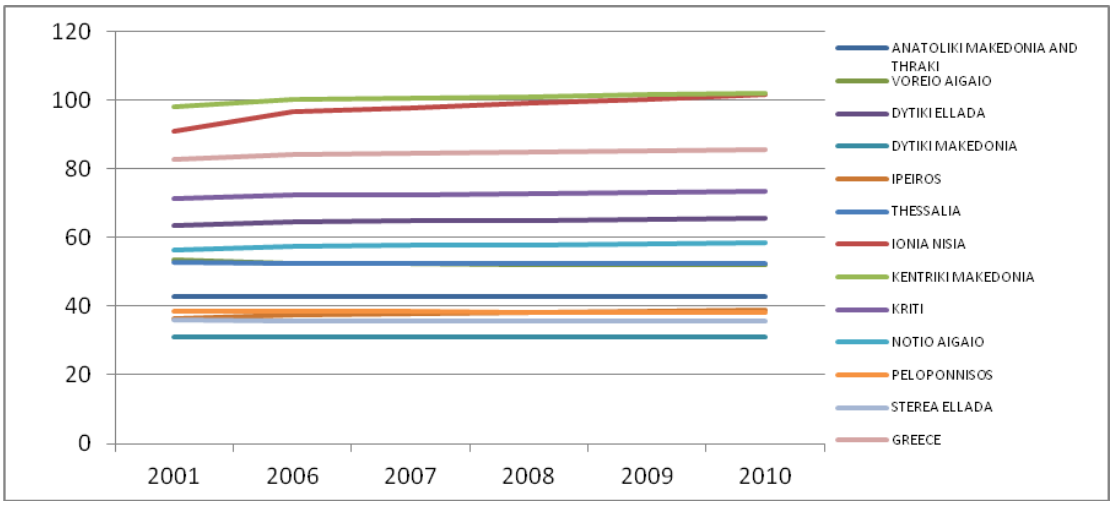
[1] The source of all the data from these paragraphs is the report of Ministry of Regional Development and Competitiveness.

In the rest of this section we examine the evolution of some of the most important indexes (with available data) for the Greek NUTS II and NUTS III regions.

POPULATION

Population in Greece has been stabilized in the last years varying between 10,000,000 and 11,000,000 inhabitants. Population density in the NUTS II regions is also stable in the last decade as it is shown in graph 12.

Graph 12: Population density of NUTS II regions 2001-2010

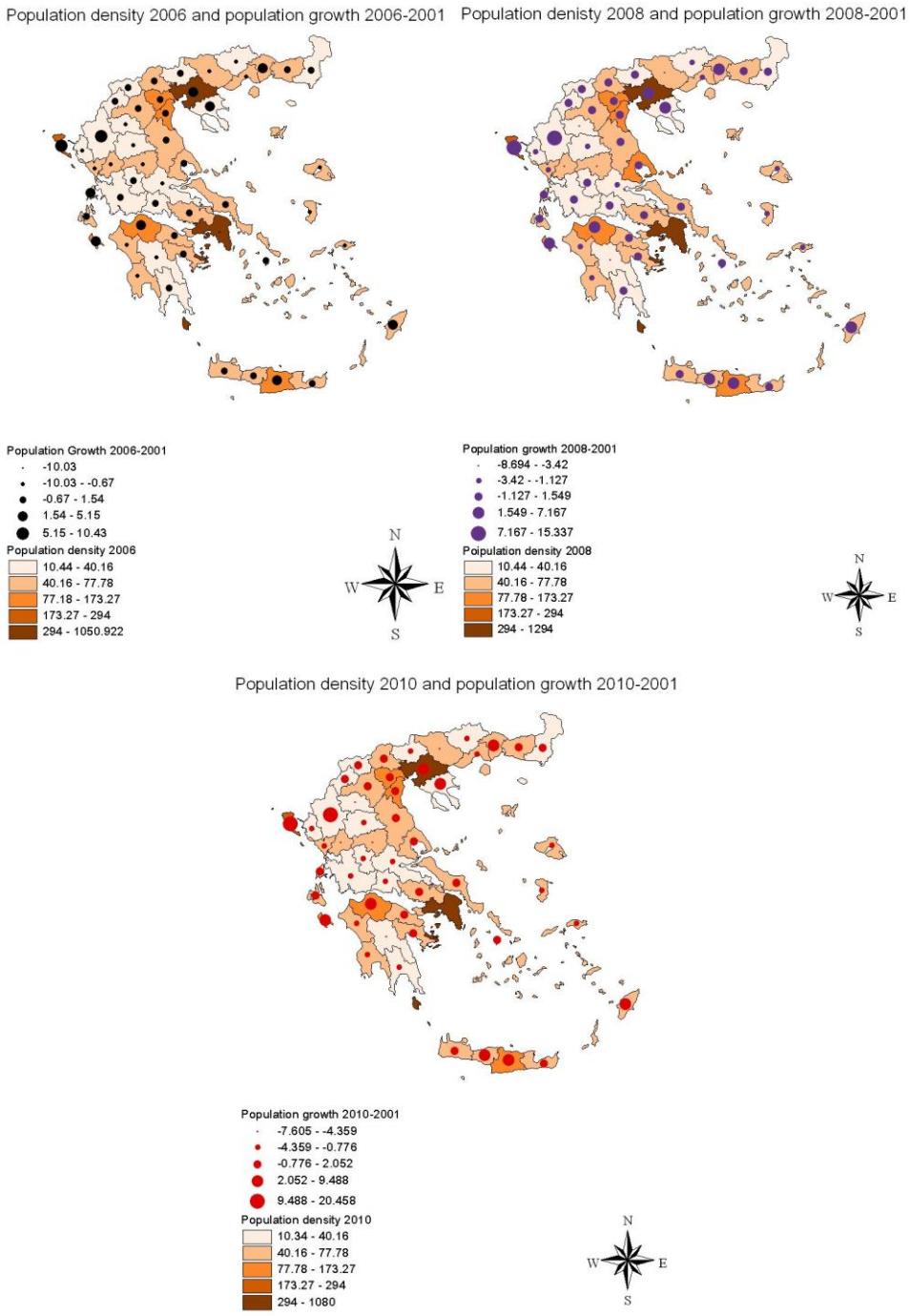


Source: ELSTAT (2012), own elaboration

*Attiki is not included in this diagram since the values of this region are much higher than all the others in this diagram

On the other hand, map 1 presents population density and population growth in the NUTS III regions. Ioannina, Achaia, Thessaloniki and Zakinthos seem to experience the biggest population growth in 2001-2006 while Attiki and Thessaloniki show the highest population density (also in the whole decade). In 2001-2008 Kerkira, Achaia, Thessaloniki and Heraklion exhibited the biggest population growth. In 2001-2010 Kerkira, Achaia, Thessaloniki and Ioannina experienced the biggest population growth.

Map 1: Population density and population growth of NUTS III regions

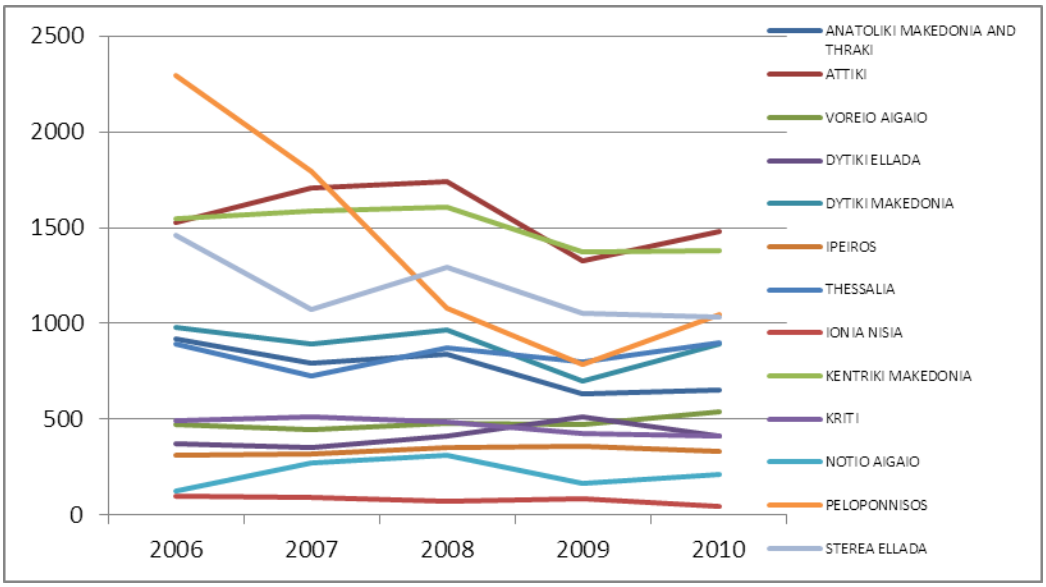


Source: ELSTAT (2012), Own elaboration

EXPORTS

Exports value is an important sector for each national economy. As it is presented in graph 2, Greece has a very low rate of exports, as % of national GDP, relatively to the EU27 and Eurozone. Below data about the exports are presented.

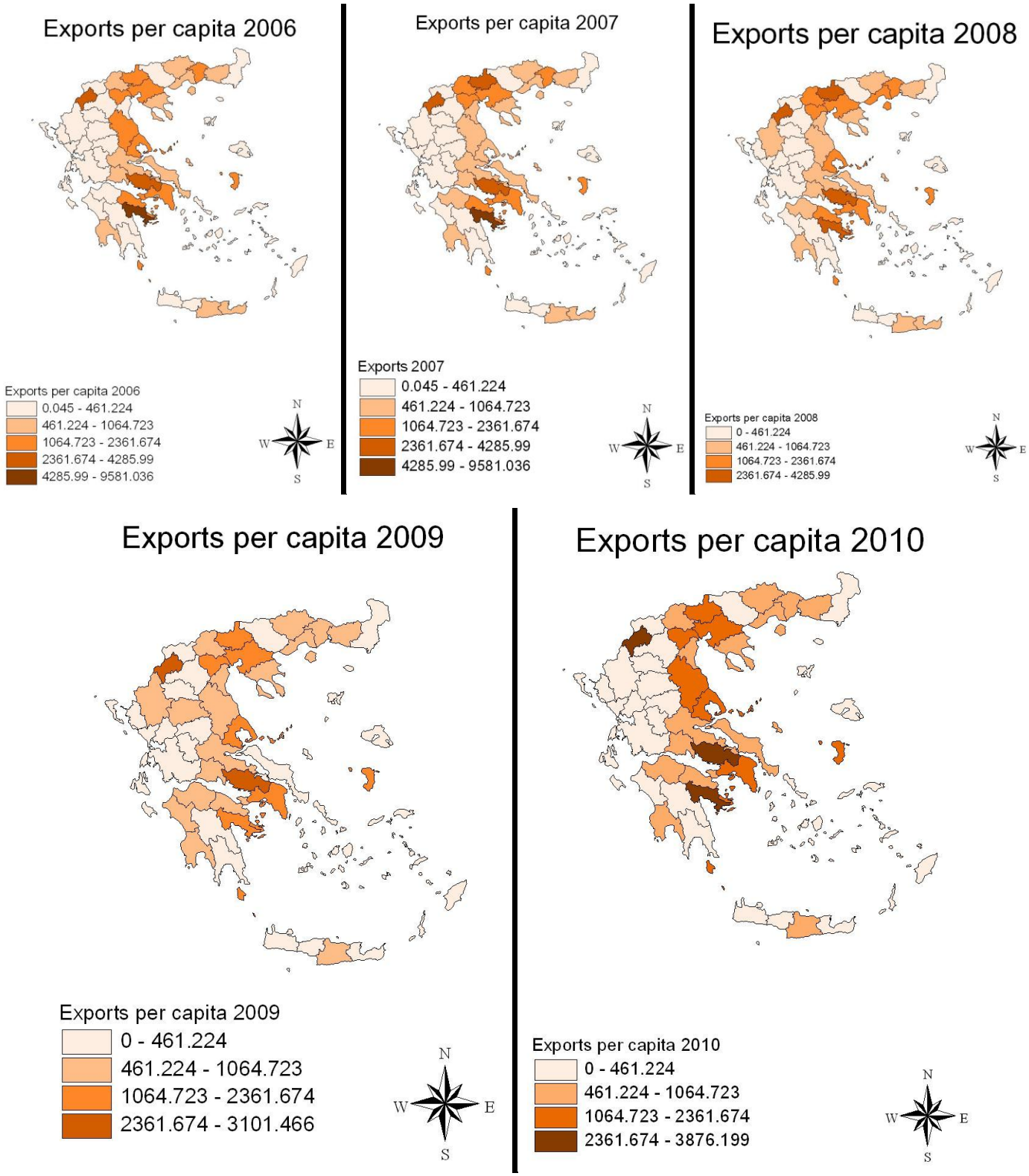
Graph 13: Value of exports per capita of NUTS II regions 2001-2010



Source: ELSTAT (2012), own elaboration

Crisis has largely affected exports sector of Greek economy as a whole (graph 2) and each one of the 13 NUTS II regional economies (graph 13). Peloponnisos experienced the biggest impact: from the first position in 2006 in value of exports per capita it exhibited a huge decline (from 2,350 euro per capita in 2006 to almost 1,000 in 2010) being in the 3rd position in 2010. Attiki experienced fluctuations in 2006-2010 being steadily in the 2nd position. The bottom of the table is occupied in all the 5 years from the regions of Ionia Nisia and Notio Aigaio; two insular regions specialized in tourism. Map 2 presents the situation in NUTS III regions: the western part of the country has much lower value of exports per capita in all the years and the trend of regional divergence is obvious comparing 2006 and 2010 map.

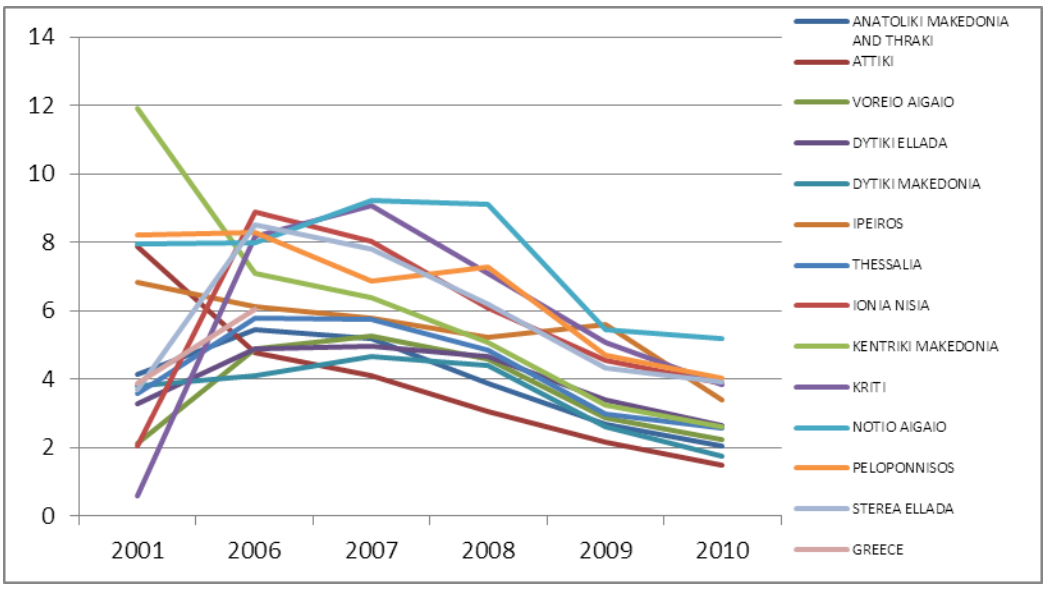
Map 2: Value of exports per capita of NUTS III regions



Source: ELSTAT (2012), Own elaboration

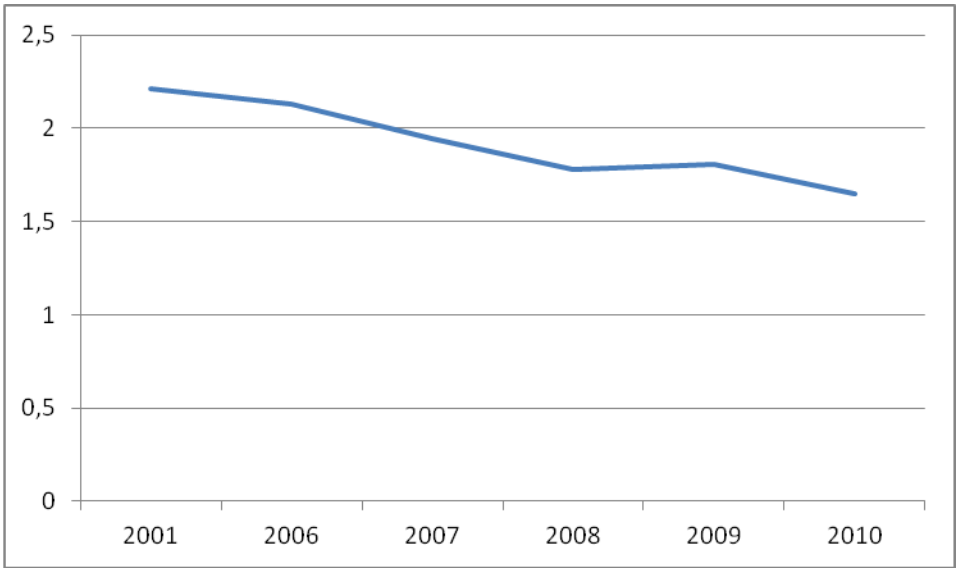
CONSTRUCTION

Graph 14: Volume of new buildings per capita of NUTS II regions 2001-2010



Source: ELSTAT (2012), own elaboration

Graph 15: WCV of volume of new buildings per capita of NUTS III regions, 2001-2010



Source: ELSTAT (2012), own elaboration

Construction is one of the most important sectors of Greek economy (Robolis, 2012). After 2007 and especially 2008 it experienced a huge decline (graph 14). All the regions exhibit the same negative pressure but the most affected are Attiki and

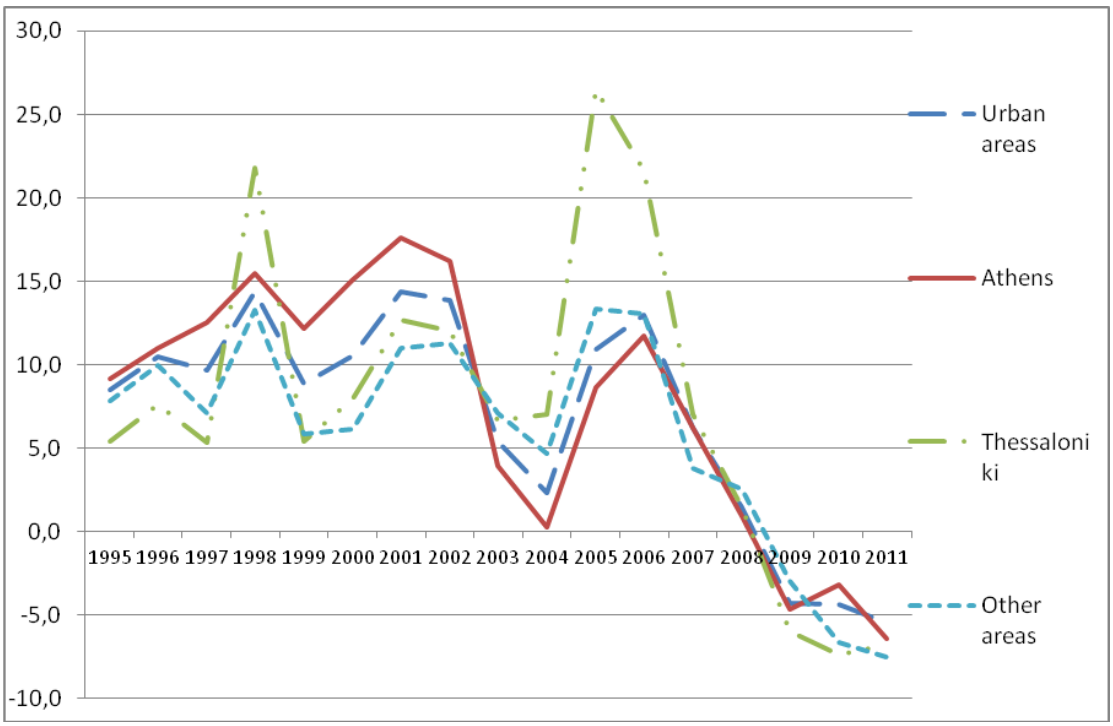
Kentriki Makedonia (which include the two big urban centers, Athens and Thessaloniki). The graph 14 is in line with graph 15 which presents the Weighted Coefficient of Variation of Greek NUTS III regions in 2001-2010. Regional convergence to lower levels of construction is the evidence of graph 15.

REAL ESTATE

As it was quoted above, the sector that this global crisis began from is the real estate one of the USA in 2006. The huge decline in the prices which started from the USA and spread to the whole EU affected also Greece. Crisis affected much more the macroeconomic performance of the national and regional economy than the real estate sector.

However, the apartment prices annual growth exhibited a huge decline after 2006 and after 2008 they had a negative growth. The biggest impact is experienced by Athens and Thessaloniki the two big urban centers of the country and the most exposed to globalization: in this way of thinking it was expected that they would exhibit the biggest losses in real estate sector.

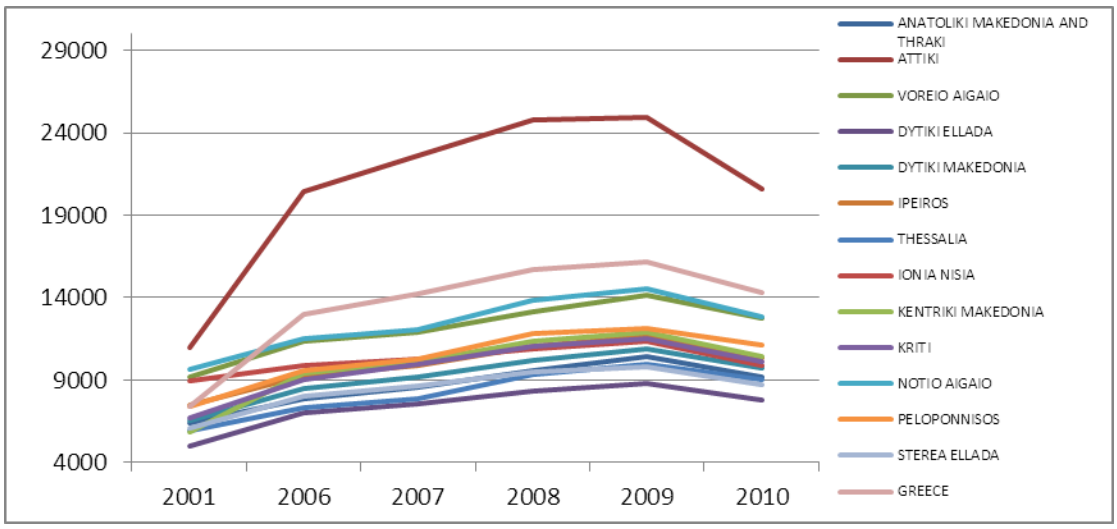
Graph 16: Change of apartment prices by geographical area 1995-2011



Source: Bank of Greece (2012)

PERSONAL SAVINGS

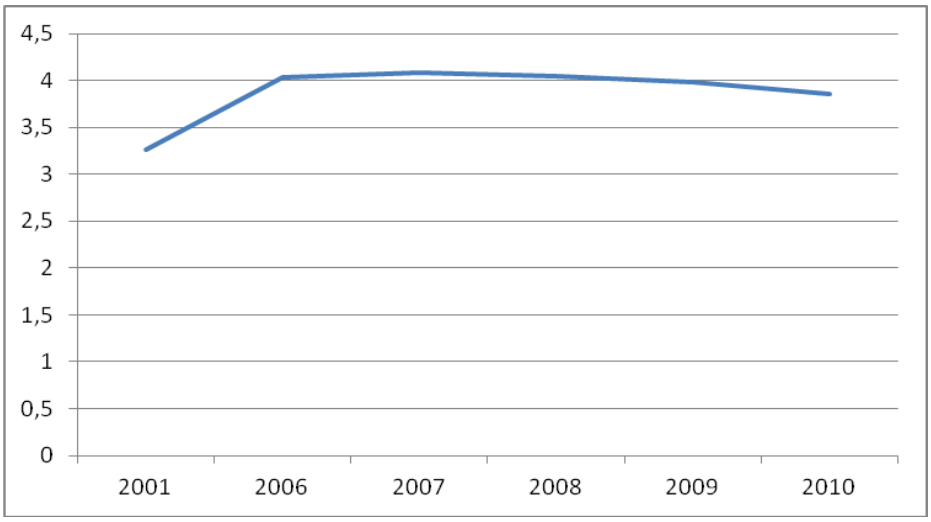
Graph 16: Personal savings per capita of NUTS II regions 2001-2010



Source: ELSTAT (2012), own elaboration

All the NUTS II regions had big losses of personal savings per capita after 2009. This was expected since unemployment increased and people started to spend their savings and since living expenditures became much higher (prices rocketed up). The most important decline is experienced by Attiki. With regards to NUTS III regions, there seems to be a slight regional convergence in terms of personal savings per capita after 2009 since all of them experienced big losses in this index (graph 17).

Graph 17: WCV personal savings per capita of NUTS III regions 2001-2010

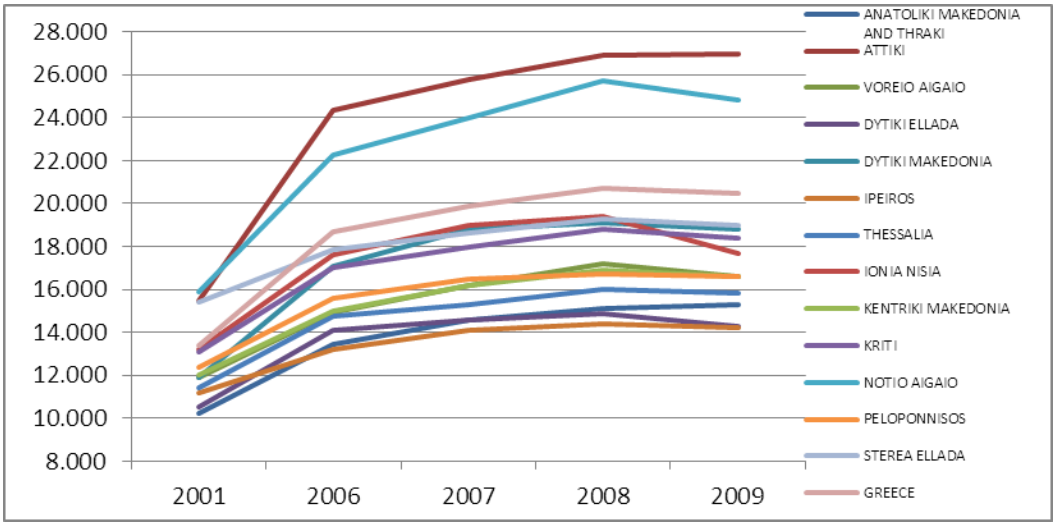


Source: ELSTAT (2012), own elaboration

GDP

GDP per capita is one of the most widespread indexes of economic prosperity in regional science. Graph 18 shows that after 2008 it experiences a small decline in all the Greek NUTS II regions and that there is regional divergence comparing to 2001.

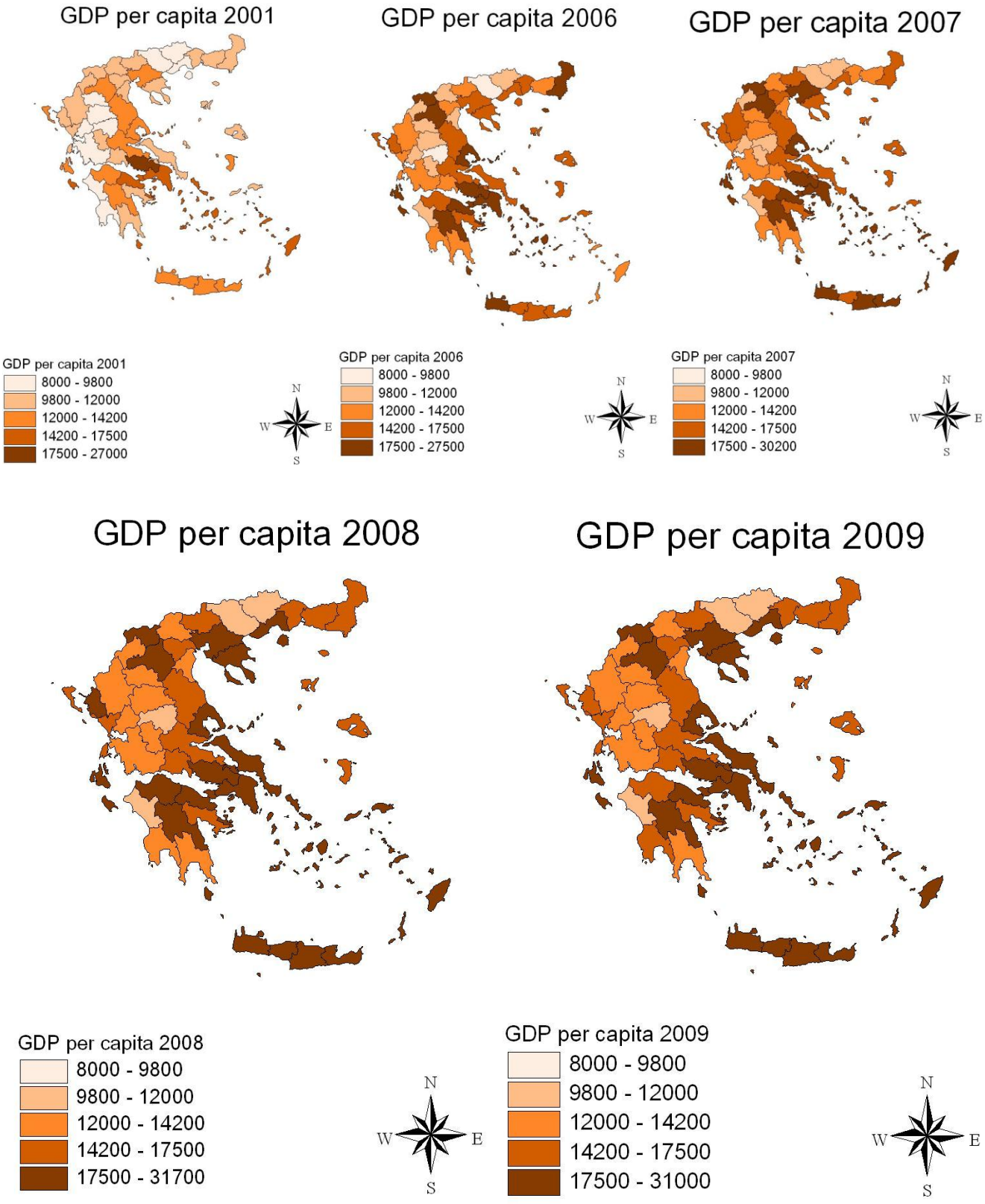
Graph 18: GDP per capita of NUTS II regions 2001-2009



Source: ELSTAT (2012), own elaboration

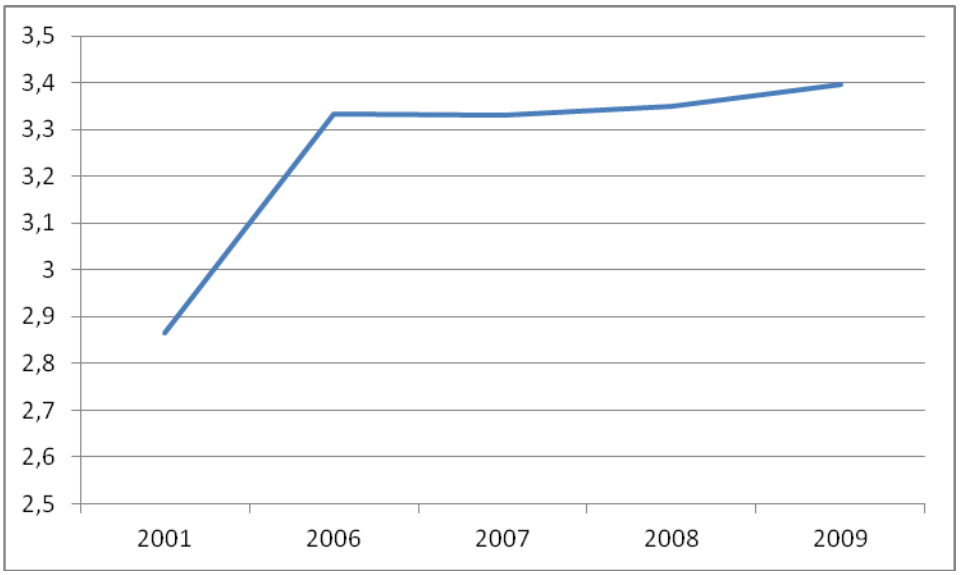
Map 3 shows that GDP per capita largely increases in the big majority of NUTS III regions of Greece from 2001 to 2008. After this year, it had a small decline.

Map 3: GDP per capita of NUTS III regions



Source: ELSTAT (2012), Own elaboration

Graph 19: WCV GDP per capita NUTS III regions 2001-2009



Source: ELSTAT (2012), own elaboration

In order to test regional convergence/divergence trend in the 51 Greek NUTS III regions we estimated the WCV (graph 19). From the data, it is indicated that regional divergence is the dominant trend, especially in 2001-2008, a period of economic growth. In 2009, regional divergence experienced lower levels but it was still persistent. Furthermore, we ran a β-convergence model whose results are presented below.

$$GDPPC_{2008}/GDPPC_{2001}=GDPPC_{2001}$$

$$GDPPC_{2009}/GDPPC_{2008}=GDPPC_{2008}$$

$$GDPPC_{2009}/GDPPC_{2001}=GDPPC_{2001}$$

Table 3: Results of β-convergence model for GDP per capita NUTS III regions

	2008-2009		2001-2009		2001-2009	
Variable	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
C	-0.557231	0.0000*	-5.184767	0.0000*	-5.802329	0.0000*
LOG(GDPC2001)			0.593638	0.0000*	0.657479	0.0000*
LOG(GDPPC2008)	0.054561	0.0000*				

*statistically significant in 1%

Source: Own elaboration

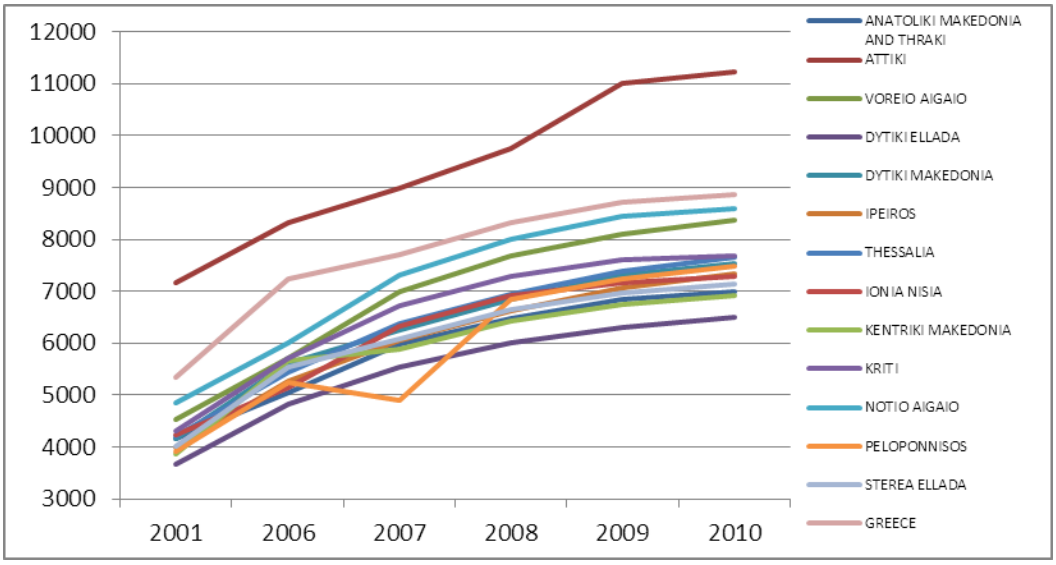
Initial GDP per capita 2001 and 2008 has a positive impact on GDP per capita change: regions with higher initial GDP per capita show higher GDP per capita change while regions with lower initial GDP per capita exhibit later lower GDP per capita change.

So, there is divergence in terms of GDP per capita in the periods 2001-2008 and 2000-2009, during which economic growth was dominant, and in 2008-2009, when economic recession started to take place. At this point it should be noted that the latest available data for GDP per capita in regional level are from 2009 economic year. In 2009, recession had not completely taken place since in the following years it became stronger. So, this could be only an initial indication of the evolution of regional inequalities in Greece in terms of GDP per capita. Certainly, in the period of economic growth there is divergence, an indication which supports the theory of Berry (1988).

INCOME

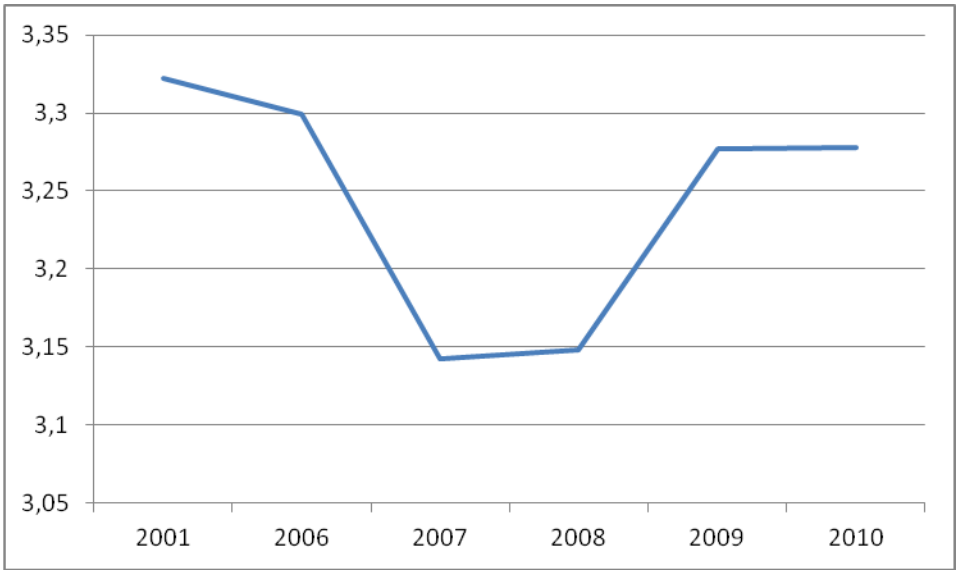
Registered income per capita has a continuous increase since 2001. Attiki is in the first position much higher than the other NUTS II regions (graph 20) and the national average. It is noticeable that after 2008 that crisis struck Greece there is no decline in registered income per capita.

Graph 20: Income per capita NUTS II regions 2001-2010



Source: ELSTAT (2012), own elaboration

Graph 21: WCV income per capita NUTS III regions 2001-2009



Source: ELSTAT (2012), own elaboration

We test regional convergence for NUTS III regions in 2001-2009. In the period of growth, after Greece joined Eurozone, graph 21 shows that there is regional convergence while after 2008, that crisis struck Greece, there is regional divergence which is not in line with the theory of cyclical behavior of regional inequalities (Berry, 1988). We ran also a β-convergence model whose results are presented below. Its results verify the findings of graph 21.

$INCPC_{2008}/INCPC_{2001}=INCPC_{2001}$

$INCPC_{2011}/INCPC_{2008}=INCPC_{2008}$

$INCPC_{2011}/INCPC_{2001}=INCPC_{2001}$

Table 4: Results of β-convergence model for GDP per capita NUTS III regions

	2008-2010		2001-2008		2001-2010	
Variable	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
C	-2.246639	0.0000*	3.290927	0.0000*	1.934773	0.0000*
LOG(INCPC2001)			-0.336101	0.0000*	-0.167400	0.0000*
LOG(INCPC2008)	0.259563	0.0000*				

*statistically significant in 1%

Source: Own elaboration

Initial income per capita in 2001 has a negative impact on income per capita change: regions with higher initial income per capita experience lower income per capita

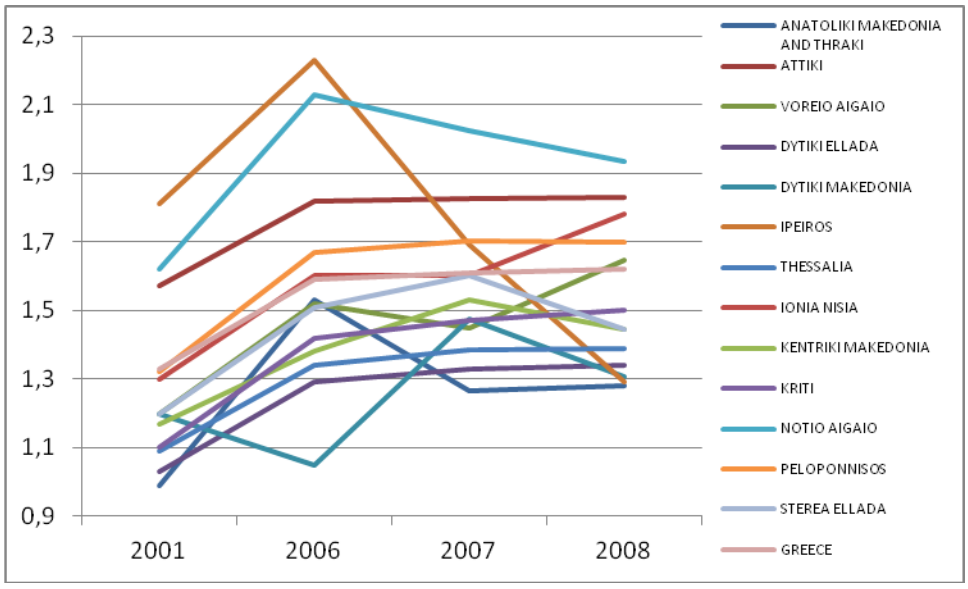
change while regions with lower initial income per capita show later higher income per capita change during 2001-2008. So, there is convergence in 2001-2008, a period of economic growth.

On contrary, initial income per capita 2008 has a positive impact on income per capita change: regions with higher initial income per capita exhibit higher income per capita change while regions with lower initial income per capita experience later lower income per capita change during 2008-2010. So, there is divergence in 2008-2010, a period of economic recession.

Totally, in 2001-2010, is seems that convergence trend is much stronger since in the β-convergence equation for 2001-2010 period, initial income per capita level has a negative coefficient. It seems, based on the econometric analysis, that this case is not in line with Berry (1988) and Petrakos & Saratsis (2000) but is in line with Dunford (1993) Hůlka (2007) who claimed that regional inequalities decline in periods of economic growth and increase in periods of economic recession.

ELECTRICITY

Graph 22: Household electricity per capita of NUTS II regions 2001-2008



Source: ELSTAT (2012), own elaboration

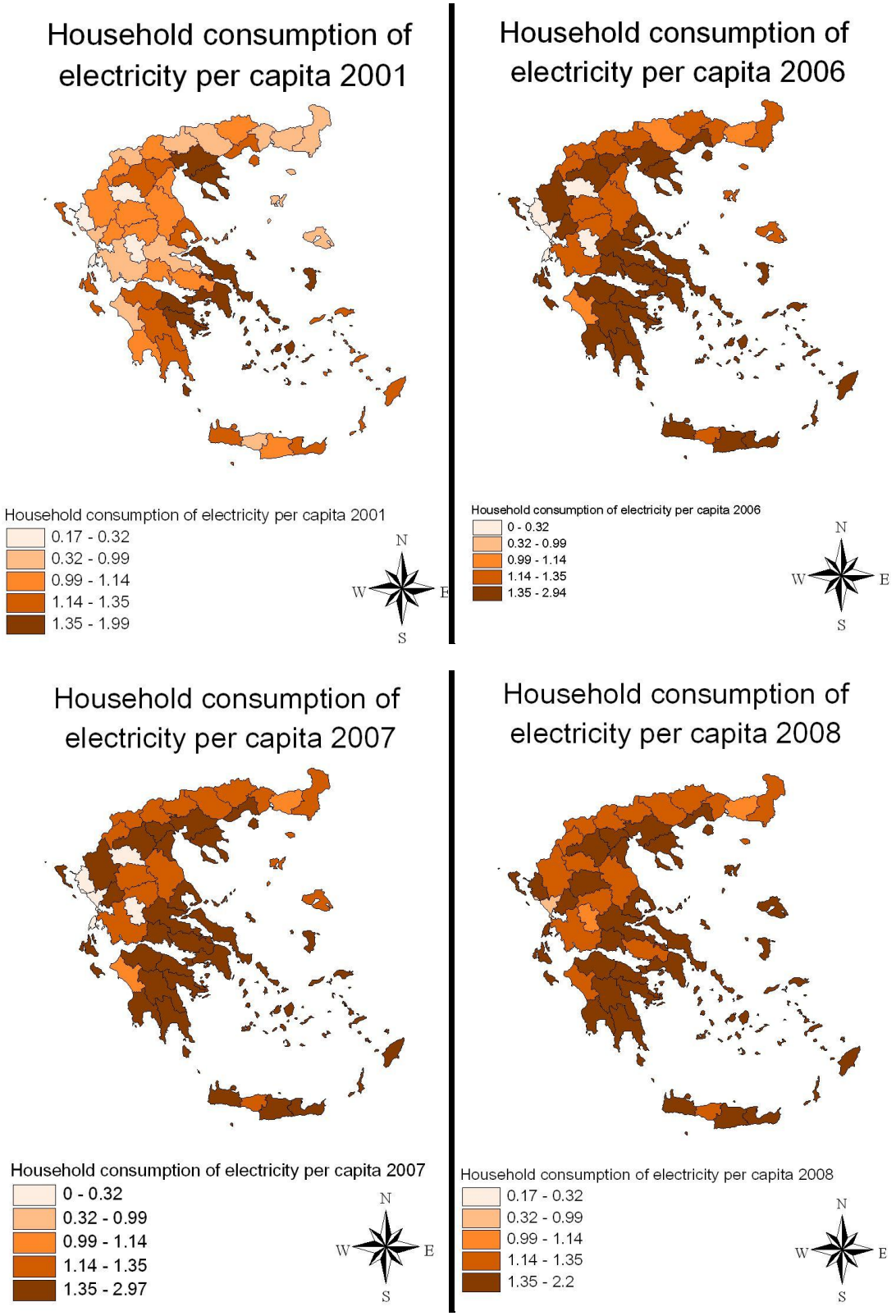
Household electricity consumption has fluctuations in 2001-2008 (graph 22). However, there seems to be a regional convergence in NUTS II regions comparing 2001 to 2008. Ipeiros was in the first position for 2001 and 2006 but it largely

declined in 2007 and 2008 that it was almost in the bottom of the graph. Attiki after 2006 experienced a stable evolution which is valid also for some other regions (Dytiki Ellada, Peloponnisos, Kriti and Greece in overall).

Map 4 presents the evolution of household consumption of electricity in NUTS III regions. It seems that there is a gradual increase to almost all the 51 prefectures of Greece even in Grevena and Evritania which were the only low household electricity consumption regions before 2007.

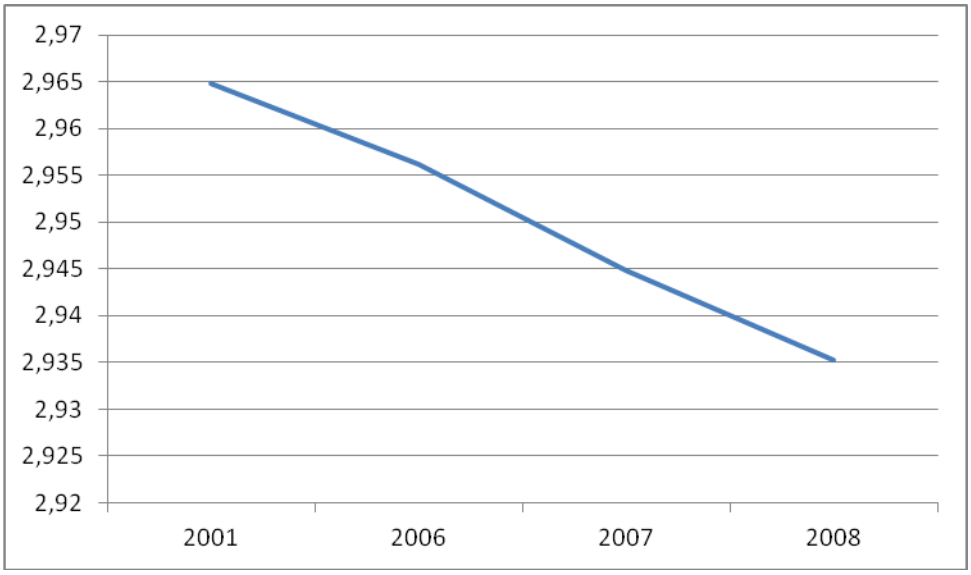
These findings are in line with the WCV which is estimated in graph 23 and shows a gradual and continuous regional convergence in terms of household consumption of electricity in Greek NUTS III regions in 2001-2008.

Map 4: Household consumption of electricity per capita of NUTS III regions 2001-2008



Source: ELSTAT (2012), Own elaboration

Graph 23: WCV household electricity consumption per capita 2001-2009

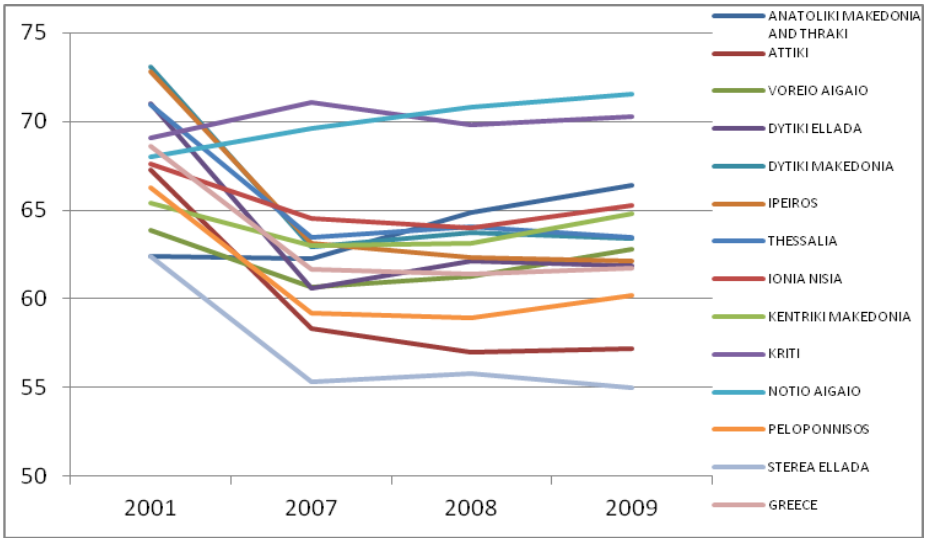


Source: ELSTAT (2012), own elaboration

EDUCATION

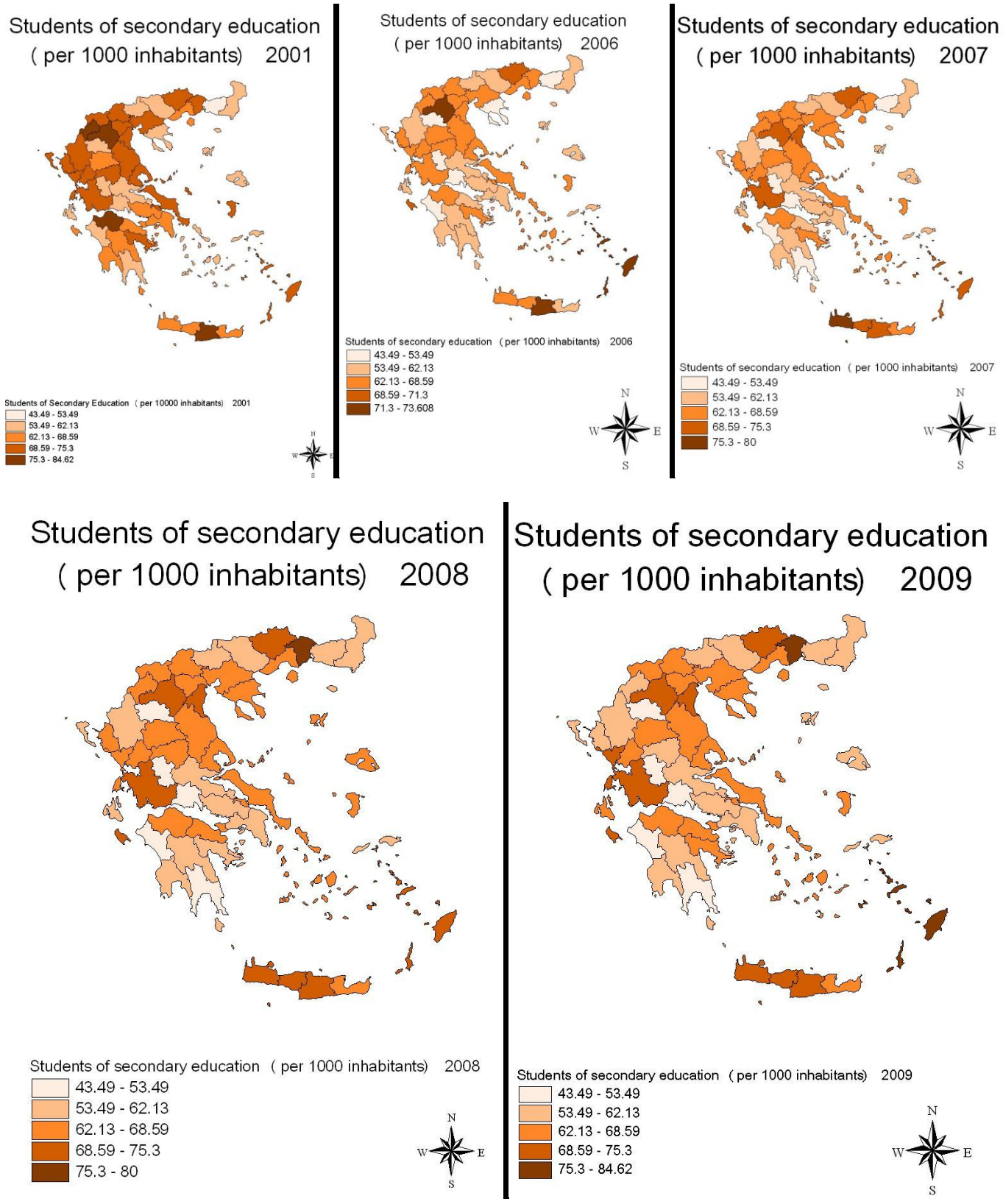
Human capital is an important index for every national and regional economy. In all the Greek NUTS II regions, students of secondary education per 1,000 inhabitants largely declined (graph 24) from 2001 to 2007 (around 10 students in 1,000 inhabitants). After 2007 in the most of the regions there was a small increase.

Graph 24: Students of secondary education (per 1,000 inhabitants) of NUTS II regions 2001-2009



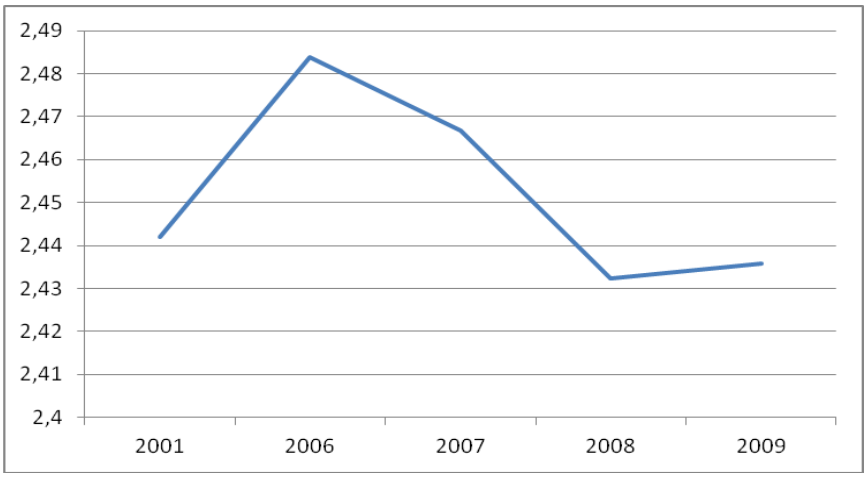
Source: ELSTAT (2012), own elaboration

Map 5: Students of secondary education (per 1,000 inhabitants) of NUTS III regions 2001-2009



Source: ELSTAT (2012), Own elaboration

Graph 25: WCV students of secondary education (per 1000 inhabitants) of NUTS III regions 2001-2009

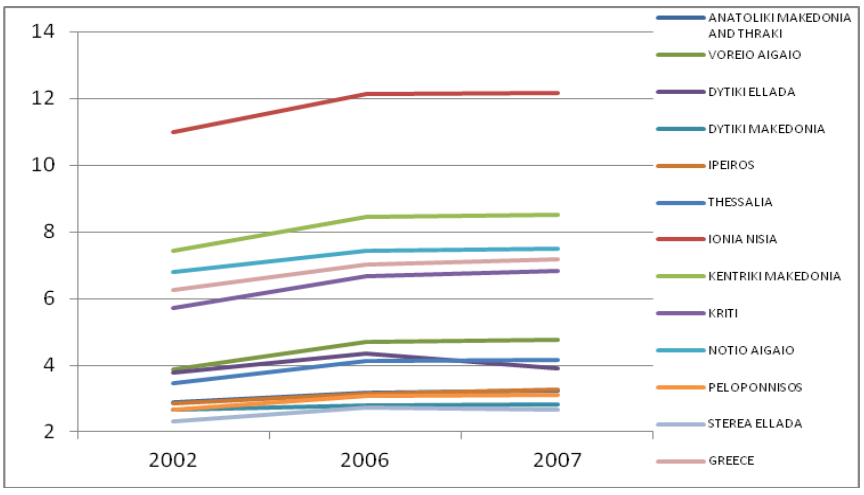


Source: ELSTAT (2012), own elaboration

In NUTS III regions, there is an overall decline in educated people until 2006; however there are some exceptions like Kozani, Irakleio and Dodekanisa (map 5) which result in a small divergence as it is indicated from the WCV in graph 25. In 2006-2009 there is convergence since the exceptions in which educated people increased are less (Xanthi is one of them). Generally, the differences and the changes are very small.

FIRMS' DENSITY

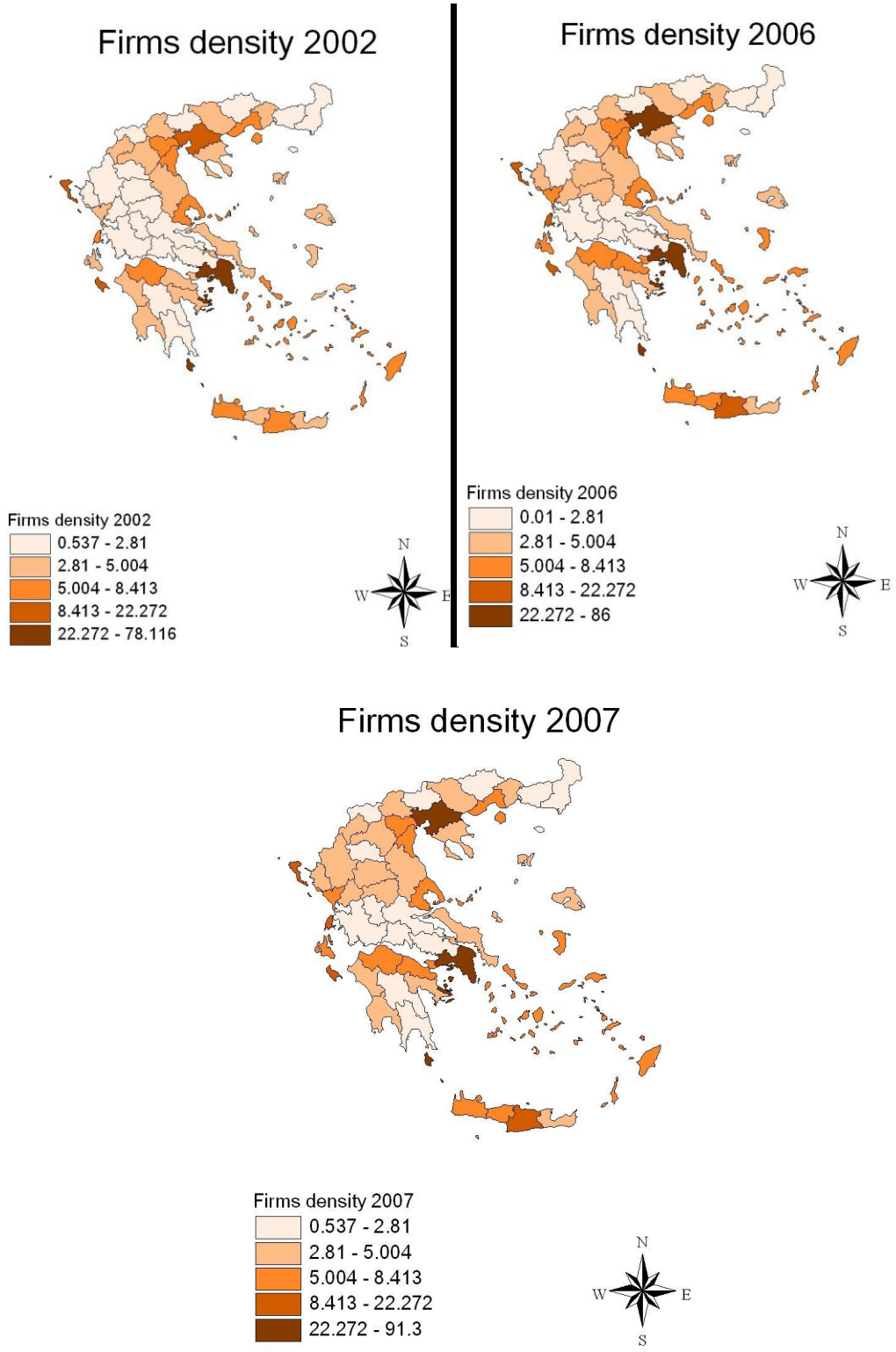
Graph 26: Firms' density NUTS II regions 2002, 2006 and 2007



Source: ELSTAT (2012), own elaboration

*Attiki is not included in this diagram since the values of this regions are much higher than all the others in this diagram

Map 6: Firms' density of NUTS III regions 2002, 2006 and 2007

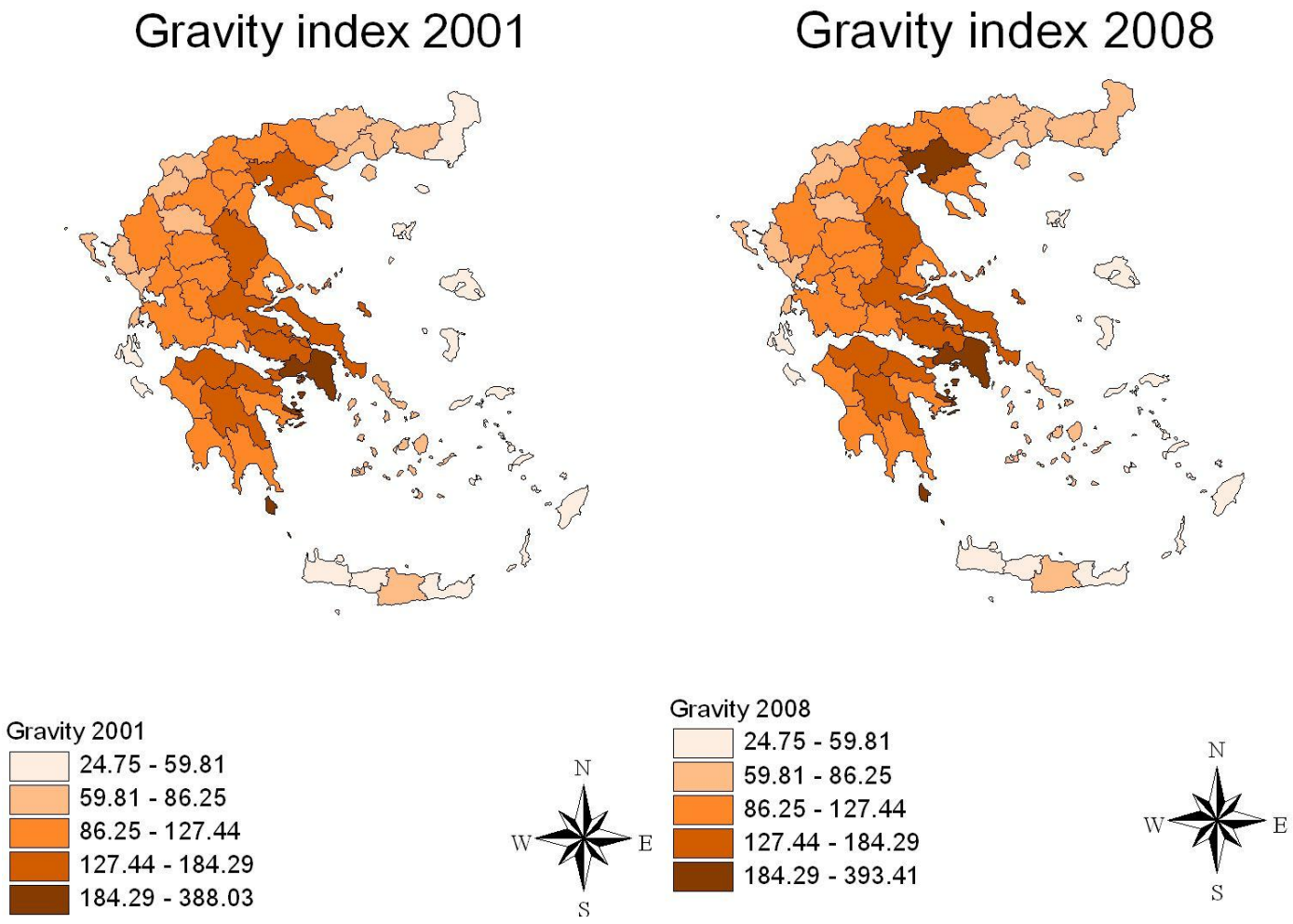


Source: ELSTAT (2012), Own elaboration

Firms' density is an index of how many firms are in a particular area (like a region). The highest firms' density is exhibited in the agglomeration economies, i.e. in the big urban centers. So, firms' density is also an index of agglomeration. This is the reason that Attiki and Kentriki Makedonia are in the first positions of graph 26. Generally no big changes are observed in the evolution of firms' density from 2001 to 2007; however there is an increasing tendency. There are no data available for firms after 2008 that crisis struck Greece and hundreds of thousands firm closures took place. The same findings can be observed in map 6 which shows the situation in NUTS III regions.

GRAVITY

Map 7: Gravity index of NUTS III regions 2001 and 2008

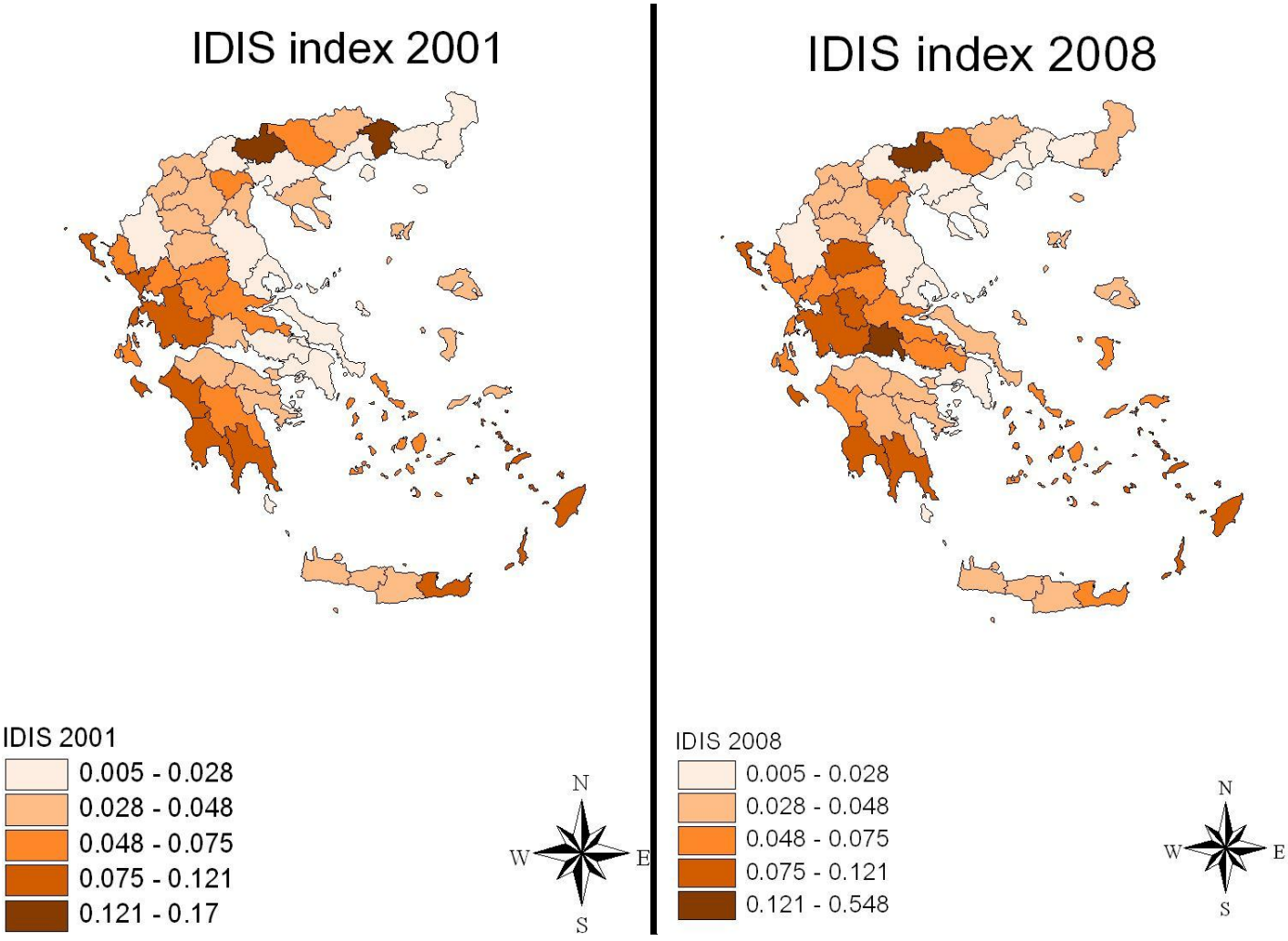


Source: ELSTAT (2012), Own elaboration

Gravity index shows the level of centrality or peripherality of one region. High values of the index, also, show regions with big market size. The level of centrality between 2001 and 2008 has not significantly changed, except Thessaloniki that it slightly increased (map 7). Generally the most central regions are these which are close to the axis that connects Attiki and Thessaloniki.

DISSIMILARITY

Map 8: Index of dissimilarity of NUTS III regions 2001 and 2008



Source: ELSTAT (2012), Own elaboration

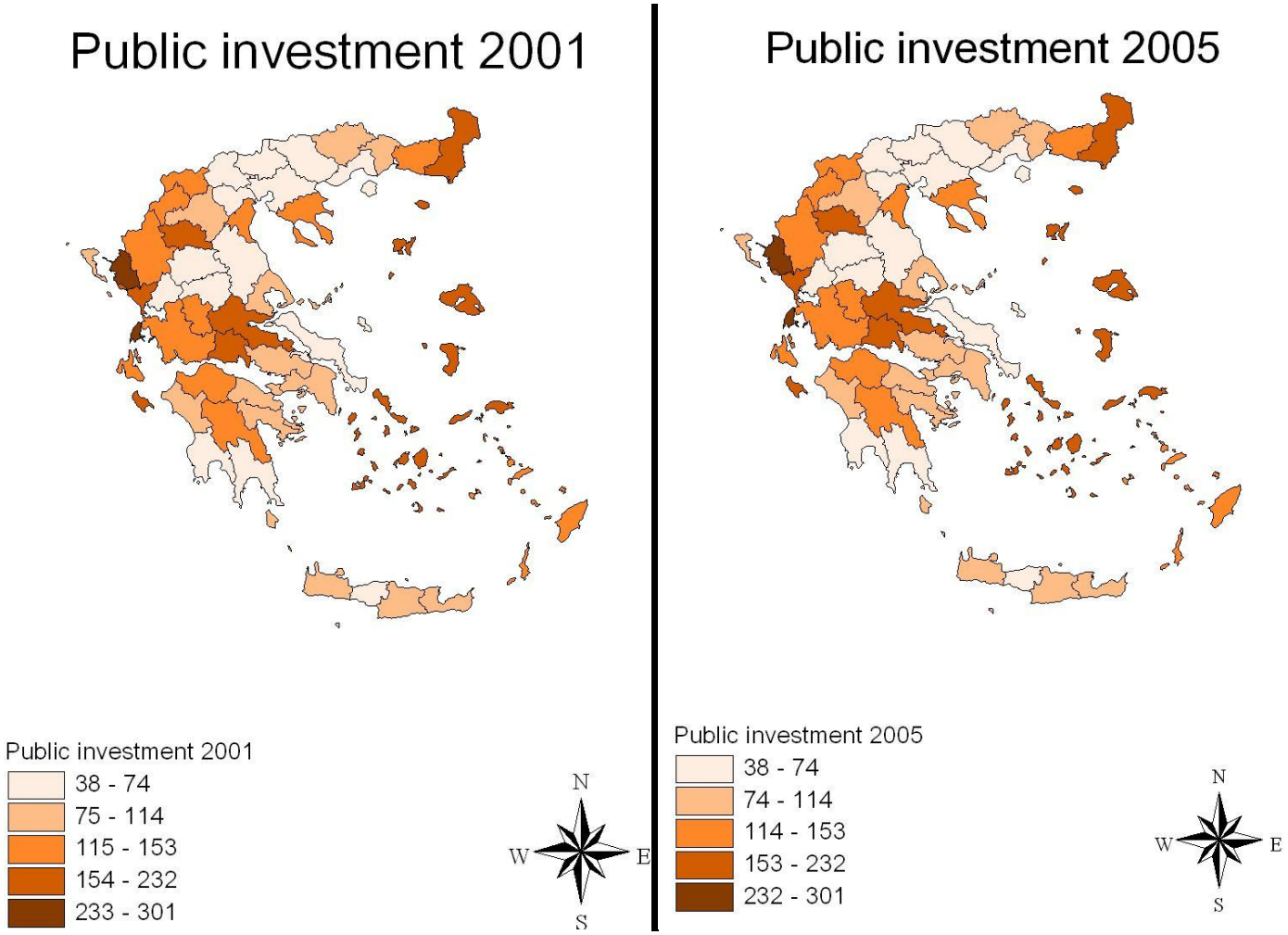
Index of dissimilarity of industrial structures shows the level of dissimilarity of the industrial structure of one region comparing to the national one. Attiki and Thessaloniki which largely influence the national structure (due to their big weight) are very little differentiated from national structure in both 2001 and 2008 while Kilkis

(in both 2001 and 2008), Xanthi (2001) and Fokida (2008) are the most differentiated prefectures.

PUBLIC INVESTMENT

Public investment allocation can determine the trend of regional development in many national economies. In Greece public investment rate was the highest in Thesprotia and Lefkada (map 9) in both 2001 and 2005 while prefectures of Kentriki Makedonia (including Thessaloniki), Thessalia and Peloponnisos experienced the lowest levels. Attiki is in the second group of prefectures with the second lowest public investment rate.

Map 9: Public investment of NUTS III regions 2001 and 2005



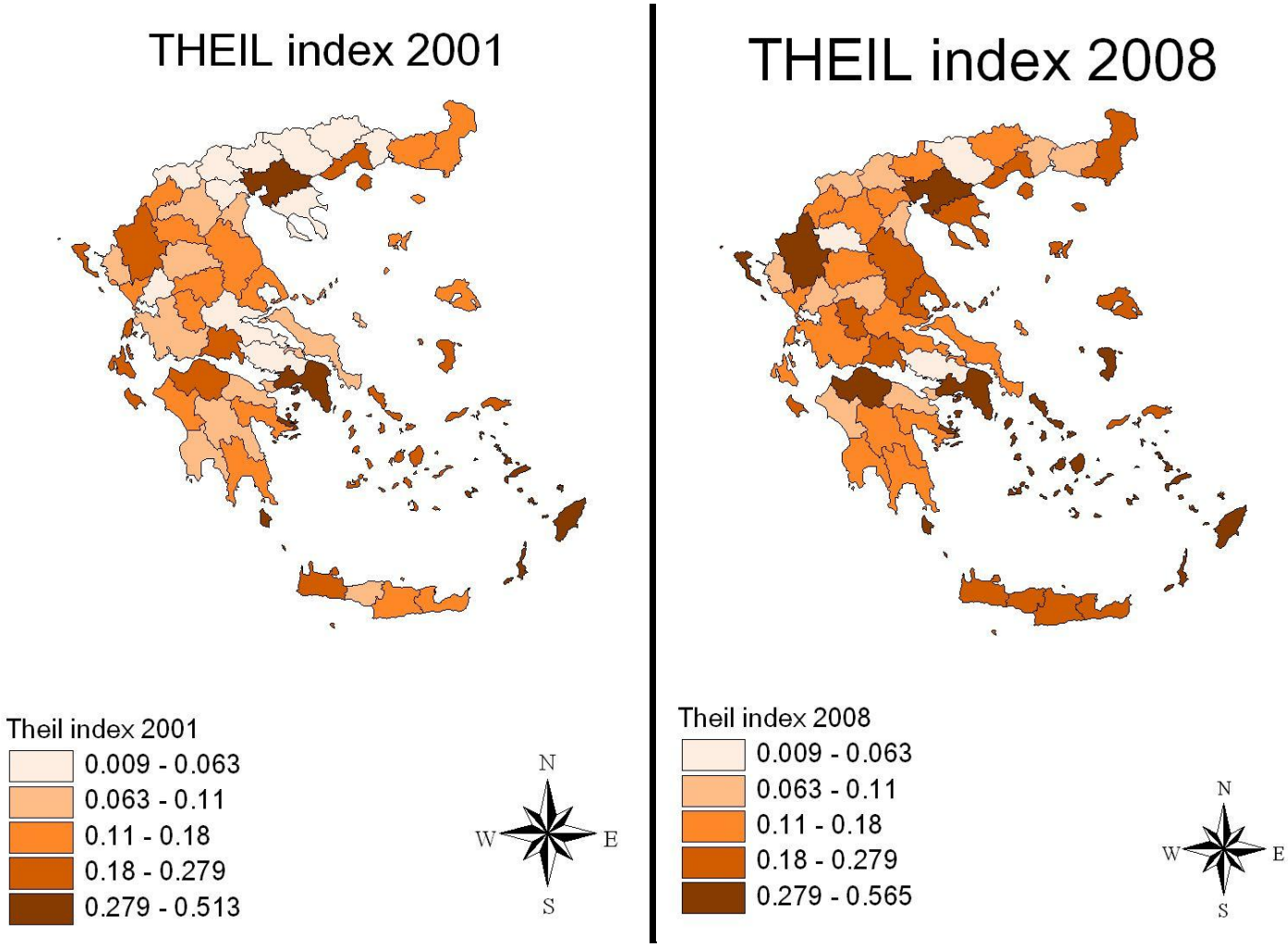
Source: ELSTAT (2012), Own elaboration

SPECIALIZATION

Regional specialization (overall and in each sector) is quoted below since it is considered as one significant determinant factor for regional development in Greece, a national economy highly specialized in services and especially tourism.

The most specialized regions are more vulnerable to external or internal economic shocks. The most specialized NUTS III regions in Greece in 2001 and 2008 were Attiki, Thessaloniki and Dodekanisa (map 10) while the most diversified regional economies were these of Viotia (2001 and 2008), Fthiotida (2001), Grevena (2008), Serres (2008) and the majority of the prefectures of Kentriki Makedonia NUTS II region (2001).

Map 10: THEIL index of NUTS III regions 2001 and 2008

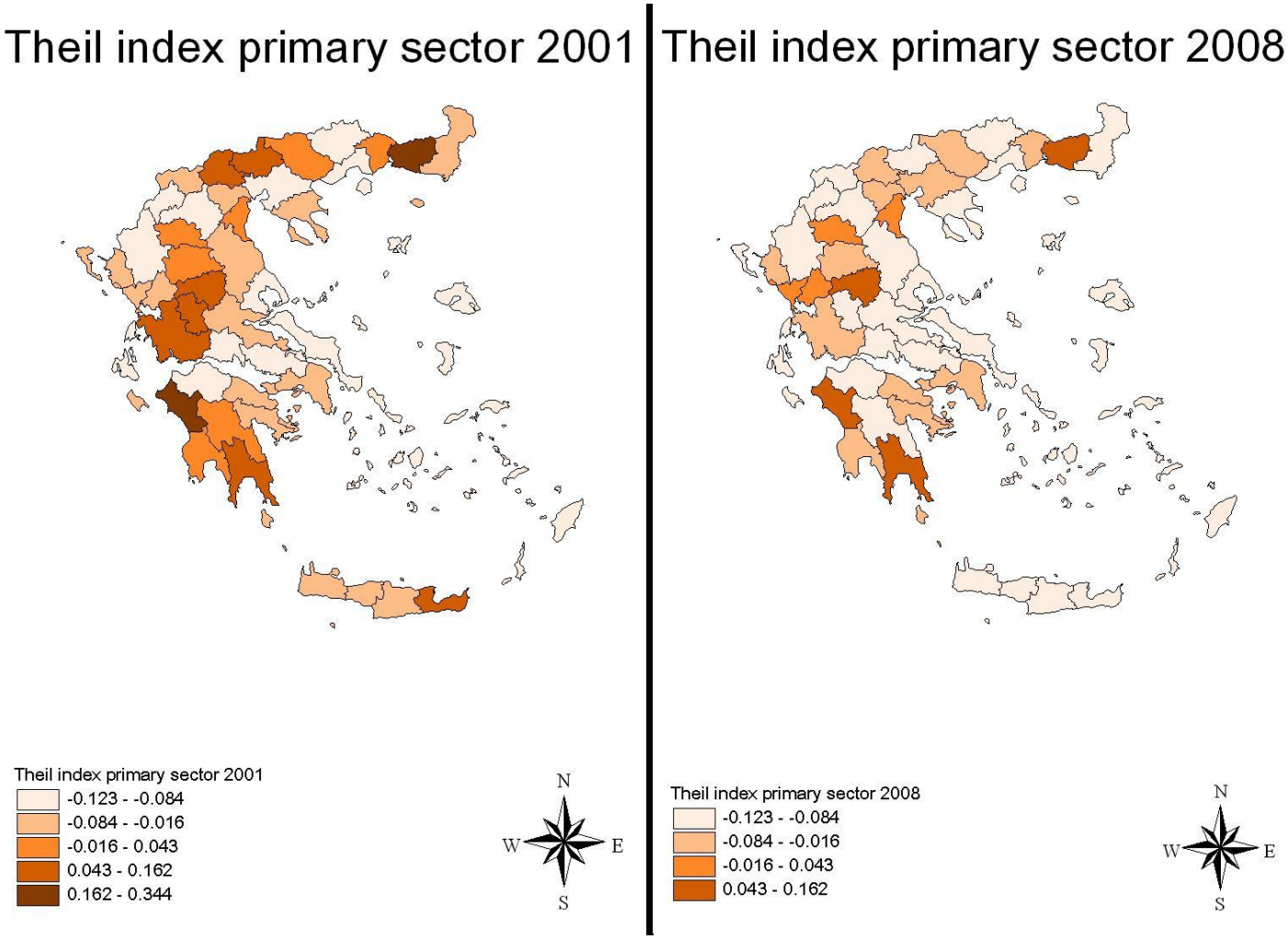


Source: ELSTAT (2012), Own elaboration

SPECIALIZATION IN AGRICULTURE

Primary sector that was largely developed until 1980 in Greece has been in sharp decline in the last decades. However, there are still some regions which are relatively specialized in agriculture: Rodopi and Ileia, primarily, and prefectures of Kentriki Makedonia and Thessalia in 2001 (map 11). In 2008 specialization in agriculture declined even more: the same regions are again the most specialized but in much lower levels of Theil index.

Map 11: THEIL index in primary sector of NUTS III regions 2001 and 2008

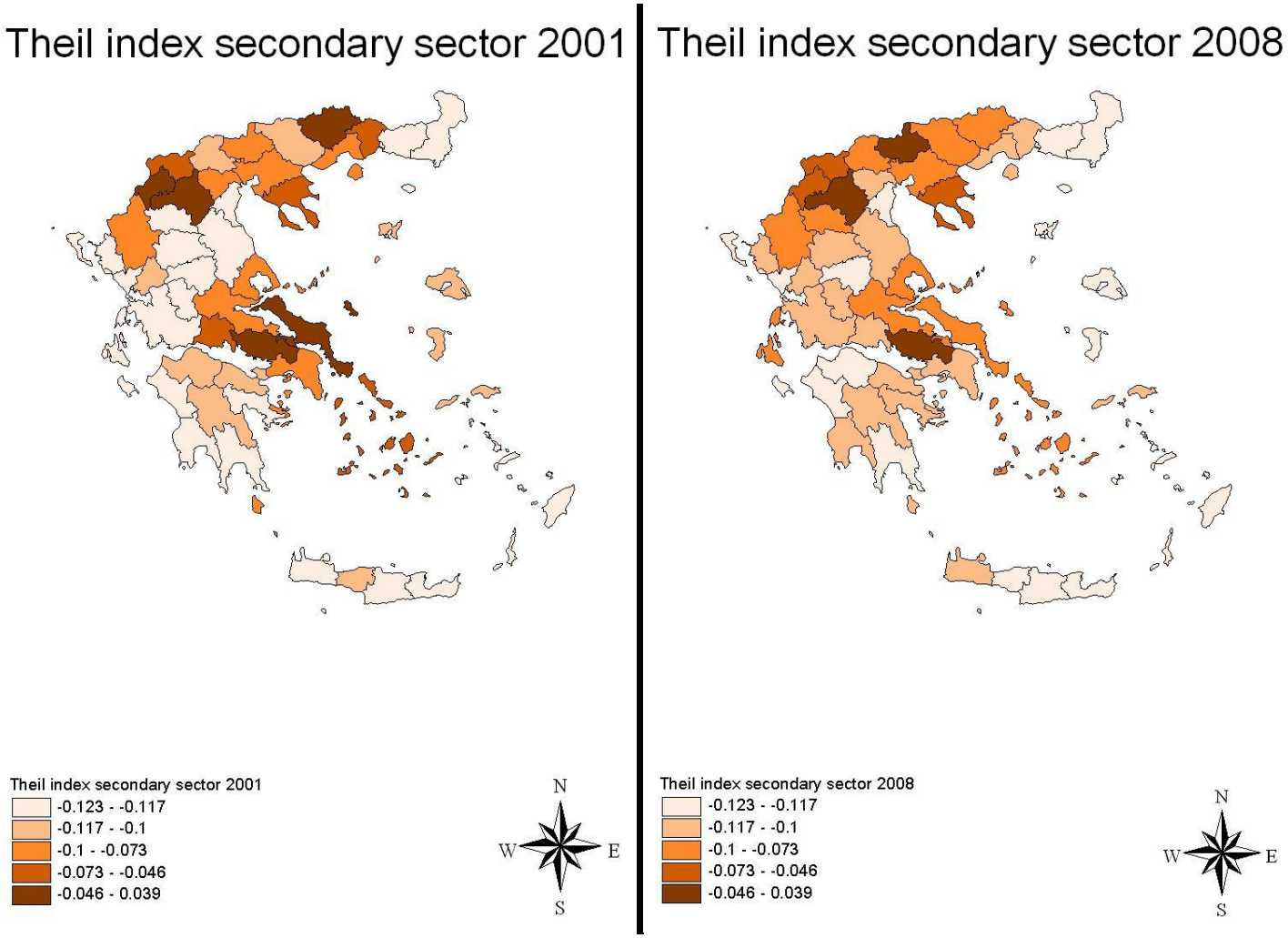


Source: ELSTAT (2012), Own elaboration

SPECIALIZATION IN MANUFACTURING

Manufacturing is another similar case with this of agriculture: after 1980 and mainly 1990 it hugely declined since a violent tertiarization of Greek economy took place after Greece joined the EU. There are not many changes between 2001 and 2008: the most specialized NUTS III regions are Viotia, Kozani, Florina, Kilkis and Thessaloniki (map 12). In these regions there are the most important industrial areas of Greece: Viotia, the satellite region of Attiki (this is the reason that Attiki is absent from these regions) and Thessaloniki (plus the satellite region of Kilkis).

Map 12: THEIL index in secondary sector of NUTS III regions 2001 and 2008

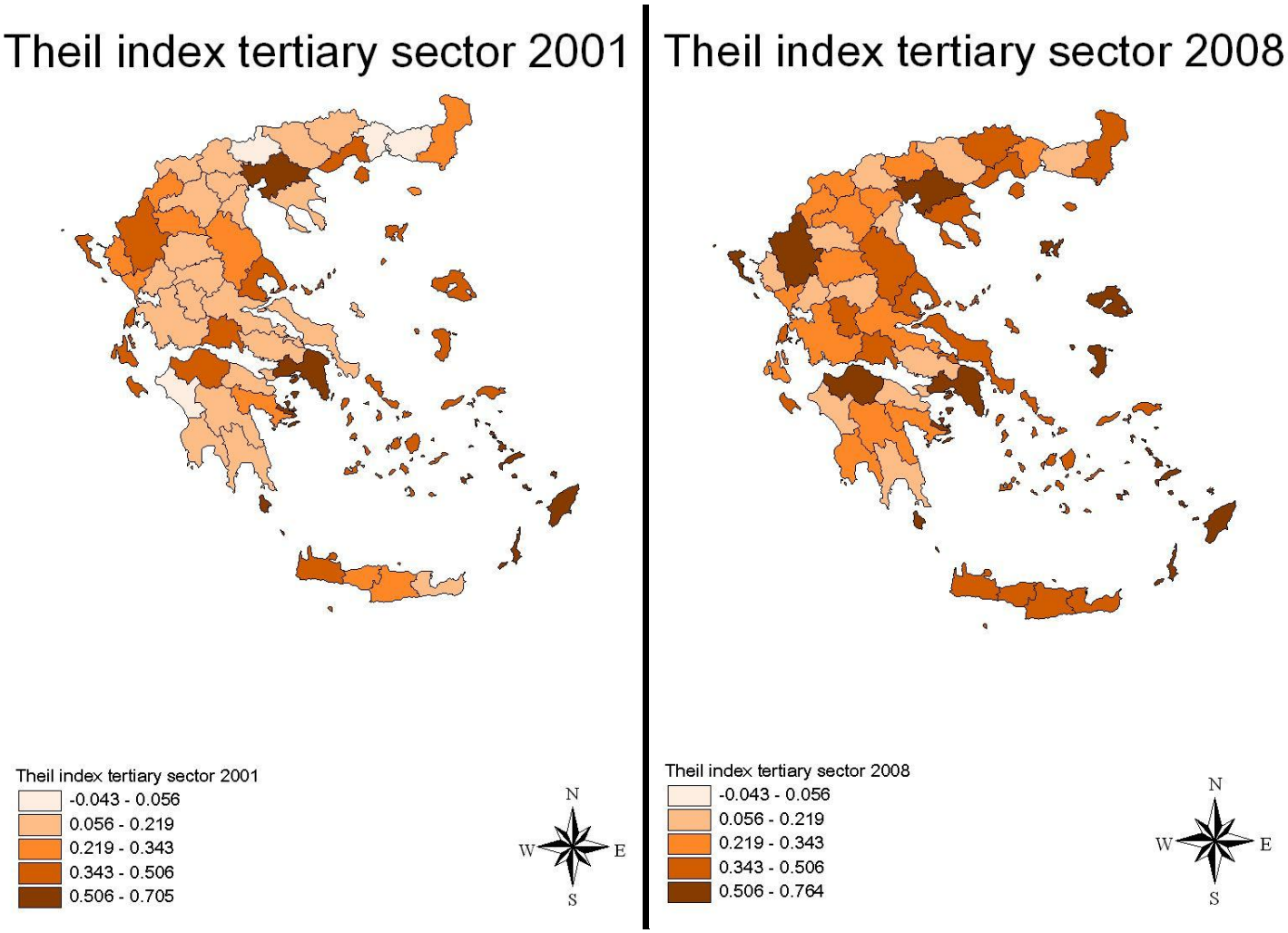


Source: ELSTAT (2012), Own elaboration

SPECIALIZATION IN SERVICES

Finally, map 13 presents data about regional specialization in tertiary sector which is the dominant sector of Greece (around 65-70% of national GDP and employment). Insular regions are specialized in tourism while the rest of the regions are specialized in services and finance. There is an overall increase of tertiary sector from 2001 to 2008 (combined with the decline of agriculture and manufacturing in the same period). In 2001 Attiki, Thessaloniki and insular regions are the most specialized in tertiary sector while Ileia and Rodopi (specialized in agriculture) and Xanthi and Kilkis (manufacturing) exhibit the lowest level of specialization in tertiary sector. In 2008 in almost all the regions the level of specialization has largely increased: Attiki, Thessaloniki, Achaia, Ioannina and the insular Kerkyra, Dodekanisa, Lesvos and Chios are the most specialized prefectures while some prefectures of Peloponnisos, Western Greece and Kentriki Makedonia exhibited the lowest levels of specialization in tertiary sector.

Map 13: THEIL index in tertiary sector of NUTS III regions 2001 and 2008



Source: ELSTAT (2012), Own elaboration

We counted the times that each prefecture appears in the regions which were mostly hit by crisis according to 7 indexes change in 2008-2010 (unemployment rate, exports per capita, new buildings per capita, personal savings per capita, GDP per capita, income per capita and human capital). The most vulnerable prefectures in Greece, which were hit mostly by crisis, are the following (in the parenthesis are the times that each of them appears to the top-hit-by-crisis prefectures): Kerkira (5), Zakinthos (3), Kilkis (2), Voiotia (2), Lasithi (2), Chania (2), Fthiotida (2), and Florina (2).

In an effort to categorize them the most vulnerable regions are a mix of insular regions mainly specialized in tourism (Kerkira, Zakinthos, Chania, and Lasithi), satellite regions of Attiki (Voiotia) and Thessaloniki (Kilkis), old industrial regions (Fthiotida), border regions (Florina).

The absence of Attiki and Thessaloniki (the metropolitan regions) may be explained since the data available that the change is estimated is until 2010 and according to Robolis (2012) crisis hit firstly the periphery and border regions and after 2011 autumn the big industrial centers (Attiki and Thessaloniki). However, in this initial crisis' impact among the most vulnerable regions are the satellite regions of the metropolitan centers: much of the economic activity of the metropolitan regions has relocated to their satellite regions (Voiotia and Kilkis).

Table 5: The trend in Greek prefectures after 2008

Economic index	**Increase/decline**	**Regional convergence/divergence**
Unemployment rate	Increase	Convergence
Exports per capita	Decline	Divergence
New buildings per capita	Decline	Convergence
GDP per capita	Decline	Divergence
Registered income per capita	Increase	Divergence
Personal savings per capita	Decline	Convergence
Household electricity consumption per capita	Decline	Convergence
Students in secondary education	Decline	Divergence

Source: Own elaboration

The sectors with the biggest losses seem to be unemployment rate, new buildings per capita and exports per capita. It seems that there is convergence in unemployment rate (not desirable),

Concluding, there are 4 economic areas that regional convergence exists and 4 others that there is regional divergence (table 5). Regional convergence is not considered as the desirable one since it takes place with a negative direction. Unemployment rate had a huge increase and regions converged in higher levels. Construction largely declined and regions converged in much lower levels. The same seems that happened also with personal savings per capita and household electricity per capita.

On the other hand, exports per capita had a large decline but regions diverged. The same also seems that happened with GDP per capita (until 2009 that data is available). Registered income per capita had a gradual increase until 2010 resulting in regional divergence. Finally, human capital index exhibited a significant decline; however regions diverged.

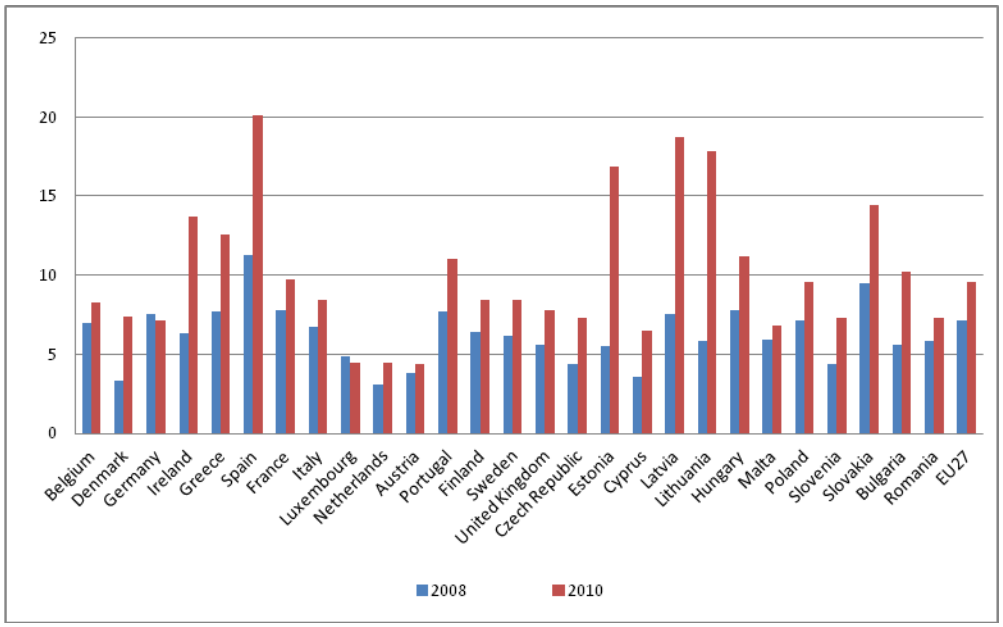
Taking into account the findings of the study of Ministry of Regional Development and Competitiveness (2011) there seems to be regional convergence in terms of NUTS II regions in Greece after crisis. However, regarding NUTS III regions the trend is not clear: there is regional convergence in 4 economic areas but there is also regional divergence in other 4. The most developed regions are hit mostly by crisis but in addition the less developed regions are hit, too. So, there is not clear evidence. However, the spatial model of development in Greece has not changed: there is still huge geographical concentration of economic activity in the two metropolitan regions: Attiki is still the leading region. The change that took place is that now Attiki's GDP is 45% above the average Greek regional GDP than the 50% that it was before crisis. But what is situation in terms of regional unemployment, the factor that has the most negative impact during crisis?

5. The Geography of Unemployment in Greece of crisis

It is believed that crisis had the biggest impact on unemployment in the whole Greek economy. In this section efforts are made in order to analyze in detail crisis's impact on regional unemployment. Specifically the geographical cross sectional dynamic of crisis shock on unemployment is investigated by examining the geographical distribution of unemployment, the determinant factors of regional unemployment and the trend: whether the regions have converged or diverged in terms of unemployment. All these are examined by a Weighted Least Squares (WLS) model.

There are several studies which examined the impact of crisis on unemployment in the EU: Marksoo et al. (2010) in Central and Eastern MS of the EU by focusing on the regions of Estonia and Poland, Marelli et al. (2011) in the EU27 in national level and in the 271 NUTS II of the EU27 and Blazek and Netrdova (2012) in the 10 new MS of the EU and their regions. Although the area of examination is different to each of them, the conclusion is common: that crisis had a hug negative impact on unemployment in the EU and that in the 24 of 27 MS there is a (negative) regional divergence in terms of unemployment (Marelli et al., 2011; Blazek & Netrdova, 2012), i.e. unemployment rate increased much more in the regions with low unemployment rate than in regions with high. The data below indicate the situation:

Graph 27: Unemployment rates before and after crisis in EU27



Source: Eurostat (2012)

More specifically, in Greece the unemployment until 2008 had some certain characteristics. First of all, employment and unemployment are largely affected by the absence of productive structure (Petrakos, 2012) or the adoption of an inefficient productive structure (Robolis, 2012).

"Characteristic is that in the last 20 years, every year in average 80,000 persons are joining the labor market (from school, universities etc.). From them only the 40,000 are employed finally and the rest 40,000 become unemployed. Only in the year of Olympic Games (2004) there were 46,000 intakes and 34,000 unemployed persons. This is a structural problem since even when GDP increases (economic growth) there is recruitment of 40,000 persons. Public sector is the security valve since it recruits thousands of persons especially in the years of elections (both before and after the elections). In the four years period (between the two elections) there are totally 160,000 unemployed and in the year of the elections there are 100,000 recruitments in public sector."

(Robolis, 2012)

Table 6: Unemployment rate and unemployment rate growth in NUTS III regions

	Unemployment rate							Unemployment rate growth							
Region	2001	2006	2007	2008	2009	2010	2011	06-07	07-08	08-09	09-10	08-10	10-11	09-11	08-11
AITOLOAKARNANIA	12.7	9.2	10.3	9.1	9.2	11.7	18.4	12.0	-11.7	1.0	27.7	29.0	56.7	100.2	102.2
ARGOLIDA	10.6	7.7	7.1	7.1	8.8	8.8	11.4	-7.8	0.0	24.1	0.0	24.1	29.3	29.3	60.6
ARKADIA	10	12.2	11.3	10.6	10.6	13.9	15.4	-7.4	-6.2	-0.3	31.4	31.0	10.9	45.7	45.3
ARTA	11.7	10.7	12.7	10.9	11.9	12.9	19.2	18.7	-14.2	8.9	8.9	18.6	48.5	61.7	76.1
ATTIKI	9.7	8.3	7.6	6.5	8.8	12.3	17.6	-8.4	-14.5	36.1	39.0	89.2	43.1	98.9	170.8
ACHAIA	16.1	10.7	9.6	10.2	10.2	13.5	19.3	-10.3	6.3	-0.2	32.9	32.6	42.7	89.6	89.2
VOIOTIA	10.7	10.9	11.1	10.0	12.8	12.0	16.3	1.8	-9.9	27.7	-5.7	20.4	35.3	27.6	63.0
GREVENA	13.7	-	0.9	4.8	6.4	6.4*	6.4*	-	433.3	33.3	-	-	-	-	-
DRAMA	18.1	19.5	17.5	15.5	13.3	16.0	20.6	-10.3	-11.4	-14.0	20.1	3.3	28.6	54.5	32.9
DODEKANISA	17.8	9.3	11.0	10.1	14.3	15.5	16.9	18.3	-8.2	41.5	8.6	53.7	8.9	18.3	67.3
EVROS	8.7	11.2	8.2	8.0	14.2	17.4	20.8	-26.8	-2.4	77.2	22.9	117.7	19.4	46.7	160.0
EVVOIA	11.6	9.9	10.4	10.3	12.3	17.2	24.8	5.1	-1.0	19.0	40.6	67.3	43.9	102.4	140.8
EVRITANIA	12	9.4	7.6	8.8	16.0	16*	16*	-19.1	15.8	81.8	-	-	-	-	-
ZAKINTHOS	15.4	15.2	9.2	8.7	9.2	12.5	7.6	-39.5	-5.4	6.0	35.2	43.3	-39.0	-17.6	-12.6
ILIA	17	7.1	8.6	9.1	8.6	8.2	12.0	21.1	5.8	-5.9	-4.5	-10.1	46.7	40.1	31.9
IMATHIA	13.3	15.1	12.9	9.2	7.9	11.3	14.5	-14.6	-28.7	-14.6	44.0	23.0	28.1	84.5	57.6
IRAKLEIO	10.7	7.3	5.1	6.7	8.9	13.0	17.9	-30.1	31.4	32.6	46.4	94.1	37.6	101.4	167.2
THESPROTIA	11.5	8.1	5.7	5.4	10.2	10.2*	10.2*	-29.6	-5.3	88.9	-	-	-	-	-
THESSALONIKI	11.3	8.9	8.8	8.5	11.3	14.9	21.8	-1.1	-3.4	33.0	32.0	75.6	46.1	92.8	156.5
IOANNINA	12.6	9.3	8.6	9.8	11.4	11.4	16.1	-7.5	14.0	15.8	0.1	15.9	41.7	41.8	64.3
KAVALA	11.8	12.2	10.7	9.2	9.5	13.0	20.3	-12.3	-14.0	3.2	37.5	41.8	55.6	113.9	120.7

KARDITSA	13.4	5.8	6.6	6.5	7.1	11.2	10.6	13.8	-1.5	8.7	59.0	72.8	-5.6	50.0	63.1
KASTORIA	23.6	24.9	15.5	18.6	16.9	18.8	24.3	-37.8	20.0	-9.4	11.3	0.8	29.6	44.2	30.6
KERKIRA	16.3	11.5	11.2	10.5	11.2	17.3	16.6	-2.6	-6.3	6.7	54.4	64.8	-4.1	48.1	58.1
KEFALLONIA	12.8	-	1.8	1.7	5.3	5.3*	5.3*	-	-5.6	211.8	-	-	-	-	-
KILKIS	14.6	15.7	15.1	11.9	8.8	12.8	15.6	-3.8	-21.2	-25.7	45.0	7.7	21.7	76.5	31.1
KOZANI	15	12.2	11.8	12.8	12.3	14.3	21.6	-3.3	8.5	-4.0	16.5	11.8	50.9	75.8	68.8
KORINTHIA	8.4	6.2	6.1	7.6	9.4	12.3	17.2	-1.6	24.6	24.2	30.8	62.5	39.3	82.2	126.3
KYKLADES	10	8.1	5.3	3.9	8.0	12.0	11.4	-34.6	-26.4	104.2	50.2	206.8	-4.7	43.1	192.3
LAKONIA	7.2	4.9	6.0	5.4	5.1	7.3	11.3	22.4	-10.0	-5.2	41.8	34.5	55.6	120.6	109.3
LARISA	9.6	9.0	9.5	9.7	10.5	13.1	15.4	5.6	2.1	8.1	24.6	34.8	17.8	46.8	58.8
LASITHI	10.7	6.5	5.4	3.8	7.6	8.5	10.1	-16.9	-29.6	99.8	12.4	124.6	18.4	33.0	165.8
LESVOS	10	10.9	8.8	4.4	8.4	13.1	16.0	-19.3	-50.0	90.9	56.6	198.9	21.7	90.5	263.6
LEFKADA	9.3	8.8	4.2	5.7	9.3	9.3*	9.3*	-52.3	35.7	63.2	-	-	-	-	-
MAGNISIA	11.8	7.8	5.9	8.1	9.6	13.4	22.9	-24.4	37.3	18.7	39.8	66.0	70.4	138.1	182.7
MESSINIA	10.6	7.9	7.7	6.1	6.8	8.0	14.3	-2.5	-20.8	12.2	16.9	31.1	78.8	109.0	134.4
XANTHI	13.4	8.1	9.5	6.6	11.1	16.4	23.3	17.3	-30.5	68.5	47.1	147.8	42.5	109.5	253.0
PELLA	10.8	9.3	8.9	6.2	6.7	8.9	15.0	-4.3	-30.3	8.0	32.3	42.9	69.2	124.0	141.9
PIERIA	11	8.1	9.2	10.0	9.4	13.6	22.7	13.6	8.7	-5.9	45.0	36.5	66.3	141.2	127.0
PREVEZA	12.9	11.7	13.7	11.6	10.6	13.5	12.8	17.1	-15.3	-9.0	27.7	16.2	-5.0	21.3	10.3
RETHIMNO	10.9	6.8	7.6	10.3	12.9	13.6	5.1	11.8	35.5	25.1	5.3	31.8	11.3	17.2	46.6
RODOPI	8.8	5.9	5.7	6.2	7.0	9.4	13.6	-3.4	8.8	13.1	33.6	51.1	45.2	94.0	119.4
SAMOS	10.1	5.4	5.4	2.6	2.7	2.7*	2.7*	0.0	-51.9	3.8	-	-	-	-	-
SERRES	13.6	6.5	5.0	5.8	5.1	7.8	10.7	-23.1	16.0	-12.4	54.2	35.2	36.5	110.5	84.5
TRIKALA	9.9	8.8	7.3	7.1	7.8	8.7	16.3	-17.0	-2.7	10.5	11.0	22.6	87.2	107.7	129.6
FTHIOTIDA	10.2	6.0	4.4	2.9	4.4	8.2	15.9	-26.7	-34.1	51.8	85.7	181.8	94.6	261.2	448.3
FLORINA	13.2	15.2	15.5	8.5	11.2	16.4	26.8	2.0	-45.2	32.0	46.0	92.7	63.6	138.9	215.3
FOKIDA	13	9.3	15.5	14.6	14.0	8.1	11.3	66.7	-5.8	-3.9	-42.0	-44.3	39.0	-19.4	-22.6
CHALKIDIKI	10.7	5.8	6.0	5.8	6.7	13.4	14.7	3.4	-3.3	15.1	101.1	131.4	9.5	120.3	153.4
CHANIA	10.6	6.9	4.2	4.6	7.0	9.3	17.7	-39.1	9.5	51.6	33.3	102.0	90.5	153.8	284.8
CHIOS	11.7	8.0	7.4	6.0	3.7	4.0	13.4	-7.5	-18.9	-37.9	6.2	-34.1	238.8	259.8	123.3
GREECE	10.8	8.9	8.3	7.7	9.5	12,5	17.7	-6.7	-7.2	23.4	31.6	62.3	41.6	86.3	129.9

Source: ELSAT (2012)

*data for 2009

Best performance
Worst performance

Unemployment evolution in Greece, in the first decade of 2000's, after Greece joined the Eurozone until 2008 that crisis struck the country, is characterized by a gradual decline from almost 11% to 7.5% (Table 6). Drama, Kastoria, Kilkis, Florina and Fokida are the prefectures which exhibited the biggest problems regarding unemployment while Kefallonia, Lakonia, Lefkada, Rodopi and Fthiotida experienced

the lowest unemployment rates in 2001-2008. There is an increase of unemployment rate in only 17% of the regions.

Alexiadis and Eleftheriou (2010) found that the most resilient regions in terms of unemployment in 1988-2009 were these which are specialized in tourism: Ionia Nisia and Kriti. Attiki and Thessaloniki, the two big urban poles of the country, show a different behavior in terms of unemployment. Attiki experienced unemployment rates lower than the national average in 2001-2008 while Thessaloniki exhibited higher.

Traditionally, there are regions which show development dynamism in terms of employment (Kriti, Notio Aigaio). There are, also, regions which show dynamism in terms of GDP but do not do the same in terms of employment (Sterea Ellada, Dytiki Makedonia) and show high unemployment rates (Petrakos & Psycharis, 2004). In terms of employment in each sector, there are regions which are extremely specialized in services like Attiki: 75% of the total employment in the region and 48% of the services employment in the country; in manufacturing like Dytiki Makedonia: 34.5% of the total employment in the region but only 3.5% -due to its very small size- of the manufacturing employment in the country; in agriculture like Peloponnisos: 37% of the total employment in the region and 11% of the employment in agriculture in the country (ELSTAT, 2012).

All these changed after 2008. Unemployment in crisis is a phenomenon which takes place in a national level since there is a huge increase from 8% in 2008 to 21% in the end of 2011 (Petrakos, 2012). However, it has also regional variations.

As it is presented in table 6 the regions that crisis hit firstly were the descending and peripheral NUTS III regions: prefectures from the regions of Notio Aigaio, Kriti, Thraki, Kentriki Makedonia, Dytiki Makedonia and Sterea Ellada. The first victims were mainly the insular and cross-border (the firms which survived relocated to states with common borders with Greece) regions (Petrakos, 2012). Generally, unemployment rate has been rocketed up from 2008 until now. Specifically, unemployment increased in 38 of the 51 prefectures (2009), in 48 (2010) and in 46 (2011). In 2008-2011 unemployment increased in 49 of the 51 prefectures of Greece.

Table 7: The most resilient and most vulnerable regions in Greece, 2008-2011

TOP 10 PUBLIC SECTOR	BOTTOM 10 PUBLIC SECTOR	TOP 10 AGGLOMERATION ECONOMIES	BOTTOM 10 AGGLOMERATION ECONOMIES	TOP 10 SPECIALIZED REGIONS	BOTTOM 10 SPECIALIZED REGIONS	TOP 10 UNEMPLOYMENT CHANGE (HIGH UN CHANGE) - MORE VULNERABLE REGIONS	BOTTOM 10 UNEMPLOYMENT CHANGE (LOW UN CHANGE) - MORE RESILIENT REGIONS
KEFALLONIA	ILIA	MAGNISIA	ZAKINTHOS	CHANIA	GREVENA	LESVOS	FOKIDA
CHIOS	EVVOIA	LARISA	KERKIRA	LESVOS	VOIOTIA	PIERIA	ZAKINTHOS
LESVOS	SERRES	IMATHIA	LAKONIA	KYKLADES	SERRES	EVROS	SAMOS
THESPROTIA	IMATHIA	XANTHI	MESSINIA	IOANNINA	PELLA	FTHIOTIDA	PREVEZA
GREVENA	PIERIA	KAVALA	AITOLOAKARNANIA	CHIOS	KORINTHIA	CHANIA	GREVENA
SAMOS	KORINTHIA	ATTIKI	ARKADIA	ACHAIA	ILIA	THESSALONIKI	ILIA
LEFKADA	AITOLOAKARNANIA	THESSALONIKI	LEFKADA	THESSALONIKI	RODOPI	EVVOIA	KEFALLONIA
EVRITANIA	PELLA	KILKIS	LESVOS	KERKIRA	THESPROTIA	MAGNISIA	LEFKADA
FOKIDA	RODOPI	FLORINA	SAMOS	DODEKANISA	ARTA	XANTHI	KILKIS
ATTIKI	VOIOTIA	VOIOTIA	KYKLADES	ATTIKI	XANTHI	FLORINA	KARDITSA

In the period after 2008 that crisis struck Greece many changes took place regarding unemployment rate change. As it is shown in map 15 the 10 prefectures with the highest unemployment rate change are: Lesvos, Pieria, Evros, Fthiotida, Chania, Thessaloniki, Evvoia, Magnisia, Xanthi and Florina. The 10 prefectures with the lowest unemployment rate change are: Fokida, Zakinthos, Samos, Preveza, Grevena, Ilia, Kefallonia, Lefkada, Kilkis and Karditsa. In table 7 there are some interesting data.

There is no prefecture from the bottom 10 of "unemployment rate change" in the top 10 "specialized" ones. On contrary, two of them are among the 10 more diversified prefectures. Furthermore, two of the top 10 prefectures regarding "unemployment rate change" are included in the 10 most specialized NUTS III regions in 2008. So, the more specialized the region is, the more vulnerable it becomes.

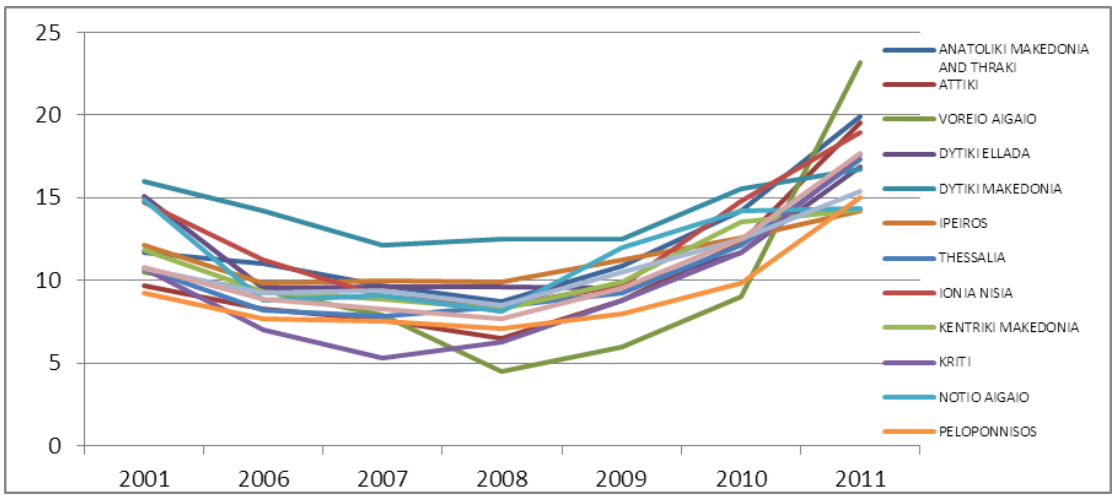
Concerning agglomeration economies, three of the bottom 10 "unemployment change" prefectures are among them with the lowest levels of agglomeration economies index while only one is among them with the highest levels of agglomeration economies index. On the other hand, three of the of the top 10 prefectures regarding "unemployment change" are in the top 10 agglomeration

economies NUTS III regions while only one is in the bottom 10. So, regions with high levels of agglomeration economies are more vulnerable than regions with low levels of agglomeration economies, which is line with Petrakos (2012).

With regards to "public sector employment share", in the top 10 there are 4 regions of the bottom 10 "unemployment change" and one of the top 10, while in the bottom 10 there are two of the top 10 "unemployment change" and only one of the bottom 10 "unemployment change". The trend is not easy to be found in this index, however, regions with high public sector employment share are considered as more resilient.

The level of unemployment rate growth is huge: in Fthiotida unemployment increased 448% in 2008-2011, in Chania 284% and in Lesvos 263%. On contrary, in Fokida it declined 23%, in Zakinthos 12% and in Preveza it increased only 10%. In annual growth rates the most impressive is that unemployment increased 239% in Chios in 2010-2011 and in Kefallonia 212% in 2008-2009.

Graph 28: Unemployment rate evolution in NUTS II regions, 2001-2011



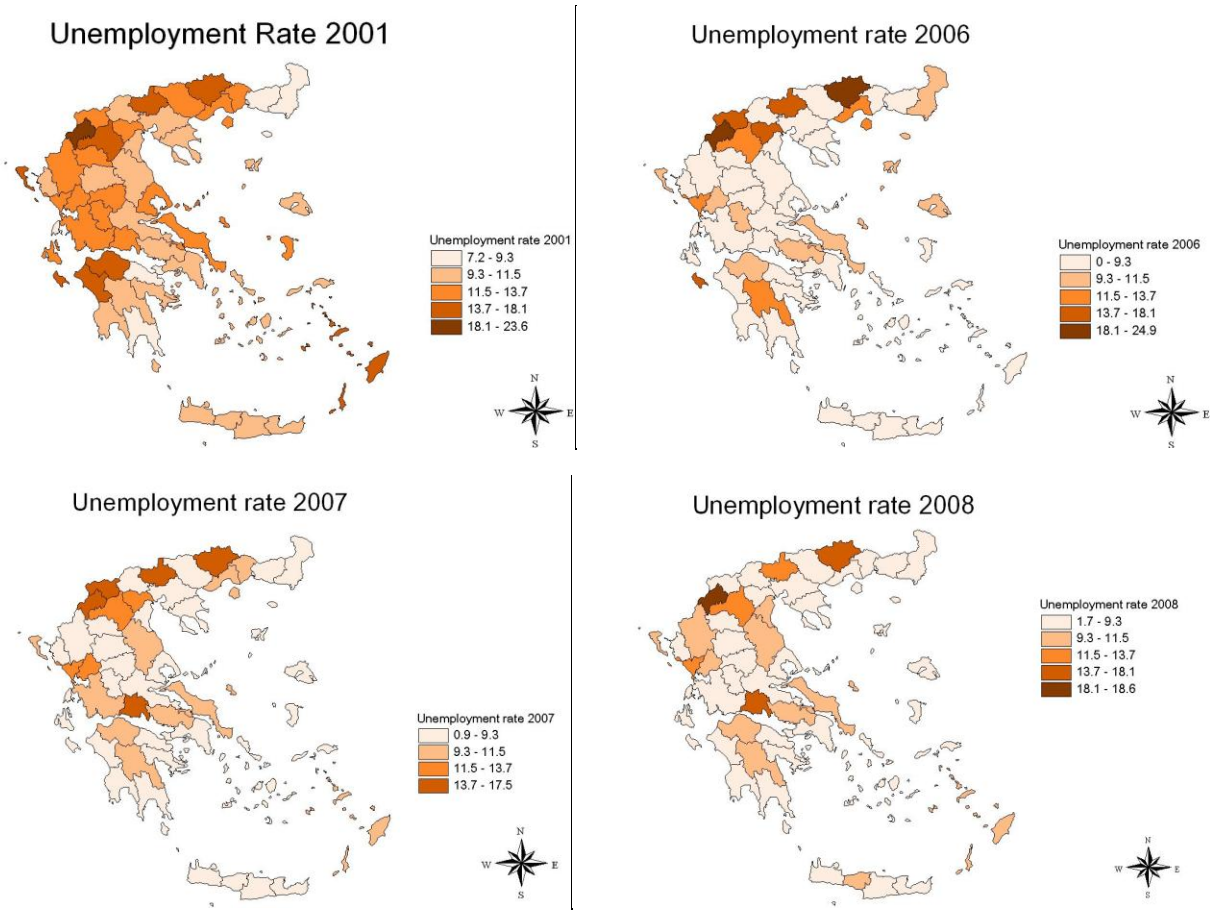
Source: ELSTAT (2012), own elaboration

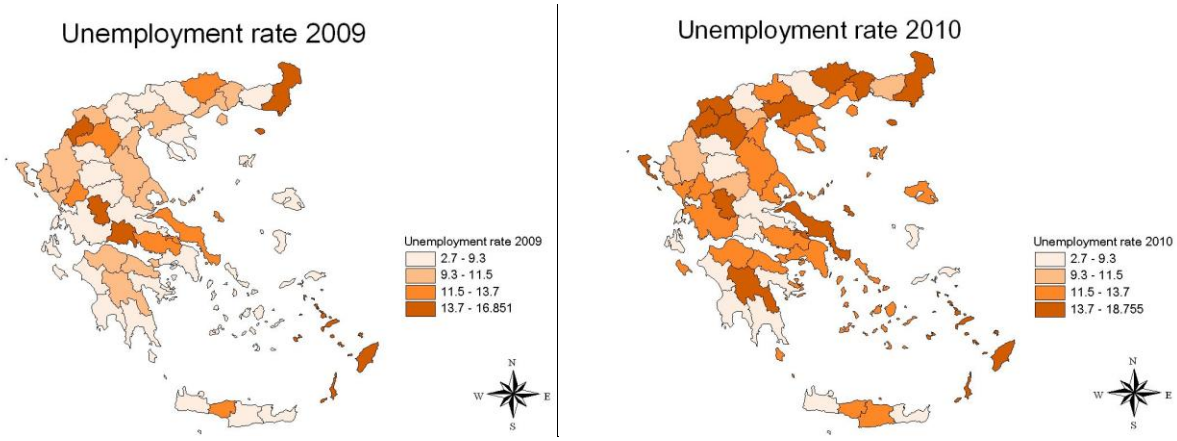
Noticing that Attiki and Thessaloniki are not in the highest unemployment rates growth until 2010 it is considered that crisis hit firstly the declining peripheral regions where unemployment is higher than the national average (in 2009 and 2010). After autumn of 2011 crisis hit the three big industrial centers of the country (where 80% of national GDP is produced): Attiki, Thessaloniki and the industrial area of Oinofyta in Viotia, one of the satellite prefectures of Attiki (Robolis, 2012). Their unemployment

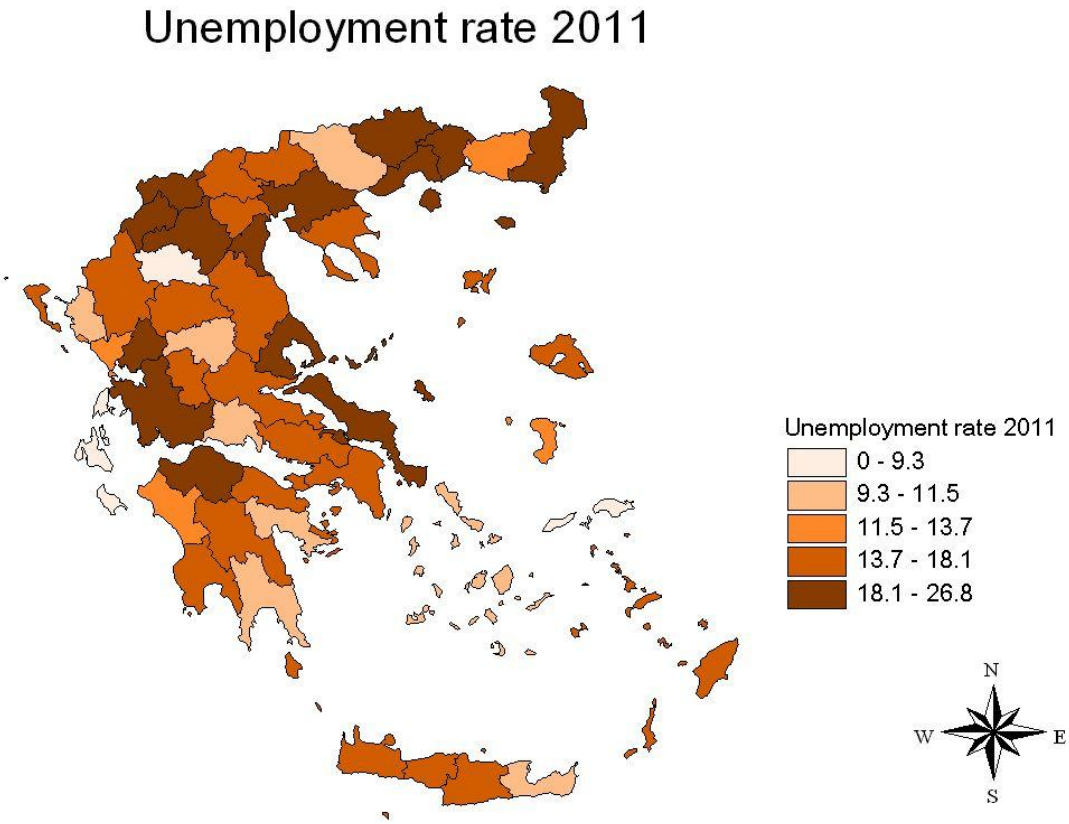
started to be over the national average since hundreds of thousands of layoffs and firms' closures took place, especially after 2010.

Concerning unemployment rate evolution in the 13 NUTS II regions (graph 28) the data show that the majority of them follow a certain trend of decline after 2001 and Eurozone access and increase after 2008 that crisis struck Greece except three regions: Kriti, Voreio Aigaio and Dytiki Makedonia. The change is more obvious after 2008, i.e. the beginning of crisis, when unemployment had rocketed up to all of the regions. The most fluctuated case is this of Voreio Aigaio region, which is insular and semi-specialized in tourism, since after 2001 and until 2008 the unemployment rate declined in a significant level (having the lowest rate in the whole Greece) but after 2008 it rocketed up to 24% (2011), the highest rate in the country. On contrary, another insular and specialized in tourism region, Notio Aigaio, and Kentriki Makedonia, a semi-diversified region, experienced the lowest unemployment rate in 2011 (14.4% and 14.3%).

Map 14: Unemployment rate of NUTS III regions 2001-2011

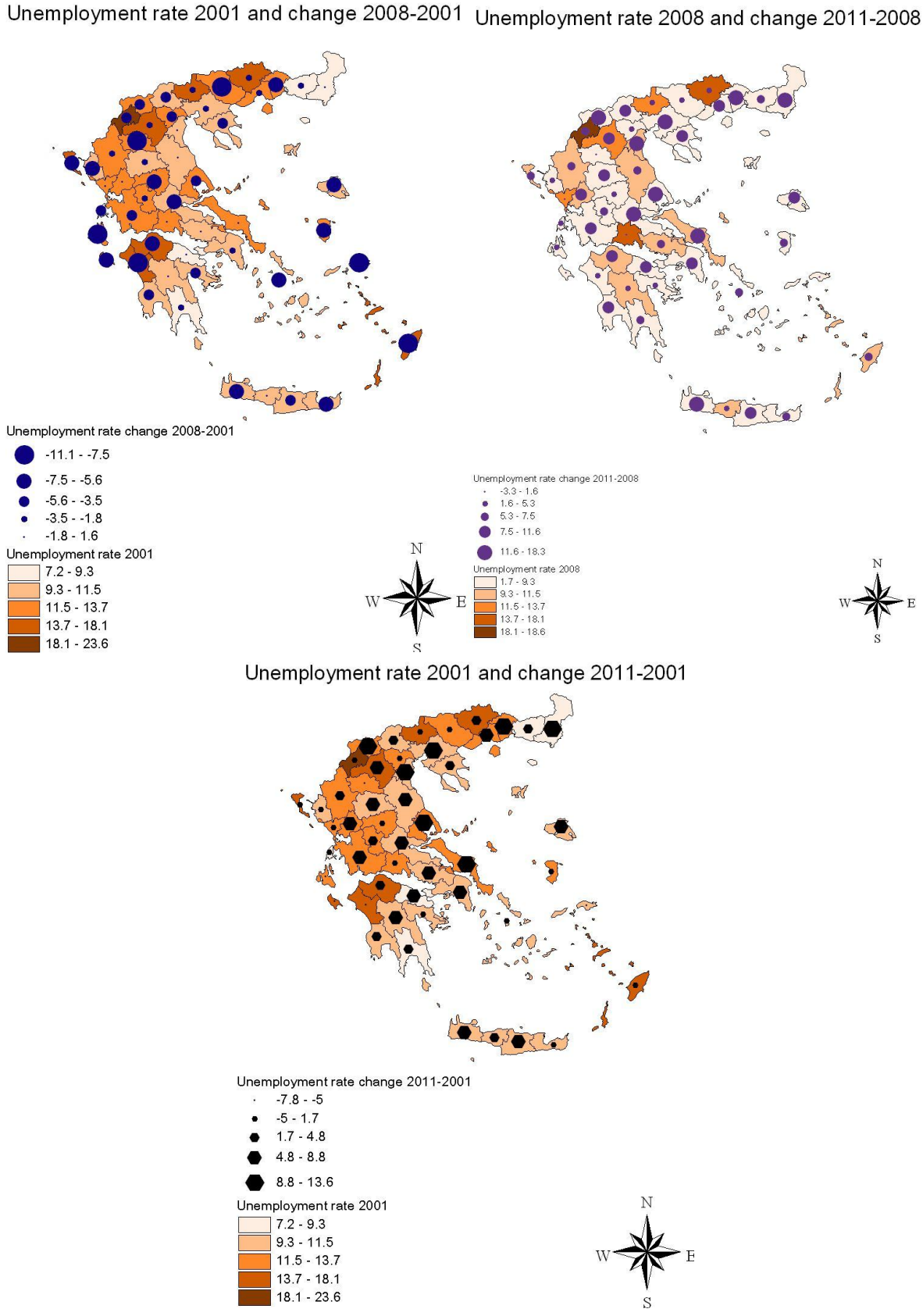






Source: ELSTAT (2012), own elaboration

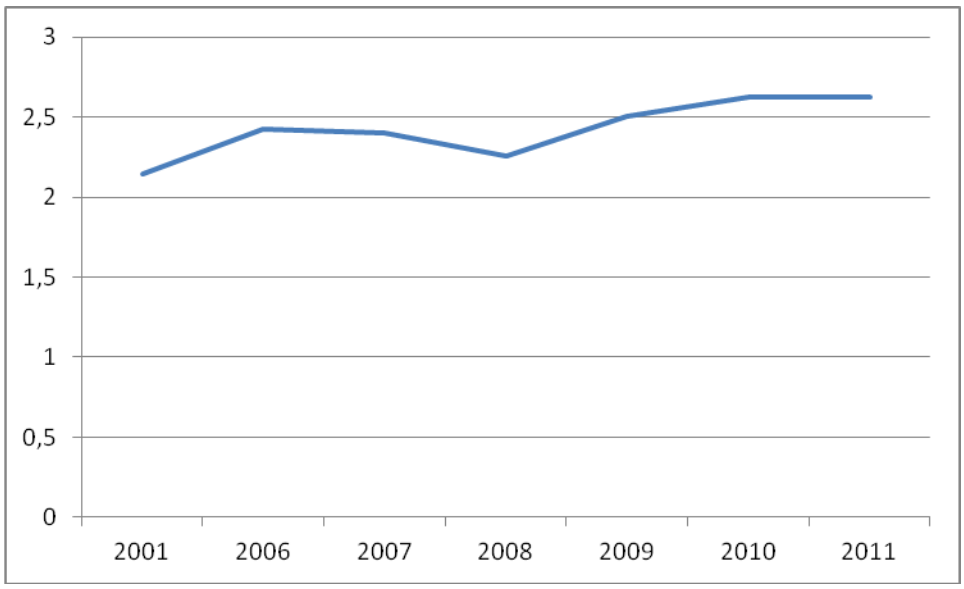
Map 15: Unemployment rate and unemployment rate change of NUTS III regions



Source: ELSTAT (2012), Own elaboration

Map 14 presents interesting data regarding unemployment rate evolution in NUTS III regions between 2001 and 2011. In 2006, 2007 and 2008 comparing to 2001, unemployment has gradually declined. This period is characterized by Greece's access in Eurozone. After 2009 unemployment began to increase (comparing to 2008 and 2007). In the final year 2011, the most of the regions unemployment has largely increased. The biggest problems are in the regions of the axis which connects Attiki and Thessaloniki and in the regions of Western Greece. In order to control the convergence/divergence trend we estimate the Weighted Coefficient of Variation for unemployment rate in NUTS III regions.

Graph 29: WCV Unemployment Rate of NUTS III regions, 2001-2011



Source: ELSTAT (2012), own elaboration

WCV, as it is shown in graph 29, indicates a divergence in 2001-2006, a period of economic growth after Greece joined Eurozone, and a small convergence in the next two years until 2008. After WCV slightly increases; that means that there was a small divergence in terms of unemployment rate. So, Eurozone access and crisis struck in Greece had as a result regional divergence in terms of unemployment rate. In addition, we run a β-convergence WLS model to check the trend in unemployment rate change in 2001-2011. The model takes the form:

$$Y_{t+k}/Y_t = aY_{r,t} + \varepsilon_{r,t}$$

Y_{t+k}/Y_t is the dependent variable of unemployment ratio for region r under consideration between the initial year t and a final year $t+k$, $aY_{r,t}$ is the independent variable (initial conditions) for region r under consideration in the base year t, a is the coefficient of the independent variable, and $\varepsilon_{r,t}$ is the disturbance term, which follows the normal probability distribution with zero mean and constant variance [i.e. $\varepsilon_{r,t} \sim N(0, \sigma_t^2)$].

We run three times the β-convergence model:

$\mathbf{U_{2008}/U_{2001}=U_{2001}}$

$\mathbf{U_{2011}/U_{2008}=U_{2008}}$

$\mathbf{U_{2011}/U_{2001}=U_{2001}}$

Table 8: Results of β-convergence model for unemployment rate in NUTS III regions

	2008-2011		2001-2008		2001-2011	
Variable	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
C	1.584161	0.0000*	-0.450737	0.1616	2.265765	0.0000*
LOG(UN2001)			0.024934	0.8575	-0.733297	0.0000*
LOG(UN2008)	-0.447967	0.0001*				

*statistically significant in 1%

Source: Own elaboration

Initial unemployment in 2001 and in 2008 has a negative impact on unemployment rate change: regions with higher initial unemployment show lower unemployment change while regions with lower initial unemployment show later higher unemployment change. So, there is (undesirable) convergence in higher unemployment rate especially in 2008-2011. In 2001-2008 initial unemployment is not statistically significant. These findings are not in line with the findings of WCV (graph 29).

In total, unemployment of 2008 was doubled in 2011 (from 450,000 to 900,000 unemployed persons (from 7.7% to 17.6%). The 320,000 job positions which were created in 2000-2008 were lost in two years (2009 and 2010), since in 2009 there were 60,000 firms' closures and 60,000 more in 2010 (Robolis, 2012). Robolis makes

efforts to explain the reason that Greece had the highest increase in unemployment rate change in the whole EU:

"Wage reduced (in order to push down the labor cost, despite the findings of INE that labor cost is only the 20% of total production cost) and consumption tax increased. These had as a result the decline of demand (in the market) which resulted in a decline of the production in the firms. These firms (which are in 95% small family enterprises) produce, traditionally, only for domestic consumption and they are not export-oriented. As we saw, within Greece the demand and the available income declined, too. All these contributed to hundreds of thousands of firms' closures and hundreds of thousands of layoffs resulting in huge unemployment and weakness of absorbing the 80.000 persons who get into the labor market every year."

(Robolis, 2012)

On the other hand it should not be ignored the influence of the EU:

"Greece is a productive system with many weaknesses. It is in the South, difficult to produce, difficult to compete, there are no policies for production but only policies orientated in consumption. This has been the productive system. Even if we had good politicians we would have (and we already have) confronted the problem which is structural: Greece cannot compete with the productive engine of the Core of the EU. So, there is a trade deficit which results in fiscal deficit and public debt increases."

(Petrakos, 2012)

The hypotheses

From all these issues, quoted above, there are some certain estimations on which we can build our hypotheses, on which we can construct the explanatory basis of what has happened with regional unemployment in Greece after 2008 that crisis struck the country. Four concepts, until now, are considered to be the central issues of regional unemployment trend:

1. The cities. The concept which is very important in geographical science and is considered as a determinant factor of economic growth (Henderson, 1988; Thrift, 1994; McCann, 2001) seems to have a positive impact on unemployment rate change. In other words, the big urban centers and the regions with largely developed agglomeration economies seem to exhibit the highest unemployment rate change. This evolution is in line with the theory of economic cycles (Berry, 1988; Petrakos & Saratsis, 2000). So, is it a city story?

2. Specialized economies. There is much evidence that specialized regions are the most vulnerable, especially in case of economic recession (Simon, 1988; Diamond & Simon, 1990). The evolution of regional unemployment rate change in Greece after 2008 seems to be in line with these studies, especially in case that a region is specialized in the (bubble) financial sector. Specialization is so important?

3. Public sector dependence. Public sector dependence on national economies like Greece is very important for the regional development, especially in case of economic recession (Petrakos, 2012) since a dependent-on-public-funding private sector region is highly exposed to public sector and may experience the highest unemployment rate change. However, until now the results are contradicting. So, is it a story of public sector dependence?

4. Initial conditions. Initial unemployment rate seems to have a negative impact on unemployment rate change, i.e. regions with higher initial unemployment show lower unemployment change while regions with lower initial unemployment show later higher unemployment change. Are initial conditions the most significant?

Methodology

To our knowledge, this is the first study which investigates extensively the geographies of unemployment in Greece after 2008 that crisis struck the country. Alexiadis and Eleftheriou (2010) studied regional unemployment trends in the 13 Greek NUTS II regions in the period 1988-2009. Using the secondary data we run a WLS, cross-section econometric model in order to examine the geographical dynamic of unemployment, i.e. the determinant factors of regional unemployment before and after crisis and the characteristics of the regions which were mostly hit by crisis.

The model will be estimated using WLS, a method which provides a different estimation which overcomes an important disadvantage of OLS, i.e. all observations which have different relative importance, are treated as equal (Kallioras and Petrakos, 2010). The variable of economically active population (2001 and 2008) weights the observations of the model. By weighted indexes we measure one size taking into account the population and its different values across space and time (Akita & Miyata, 2010). Ordinary Least Squares method ignores the size of each region and treats all the observations as equal (Artelaris et al., 2010). WLS method allows us to estimate the trend that regions affect proportionally to their relative size.

This issue has been largely ignored by the regional development literature. There are some recent studies which take it into account (Chakravorty, 2000; Fedorov, 2002; Ezcurra & Rapun, 2006; Petrakos and Artelaris, 2009; Artelaris et al., 2010). The comparison between OLS and WLS can reveal that there are different results and conclusions when regions are not appropriately weighted to their size (Petrakos and Artelaris, 2009).

The model takes the following form:

$$Y_{r,t\_t+k} = \sum_{\lambda=1}^{n} \left(\alpha_\lambda X_{\lambda,r,t}\right) + \varepsilon_{r,t}$$

Y_{r,t_t+k} is the dependent variable of unemployment rate change for region r under consideration between the initial year t and a final year $t+k$, $X_{\lambda,r,t}$ is the set of λ independent variables (initial conditions) for region r under consideration in the base year t, a_λ is the set of the coefficients of the λ independent variables, and $\varepsilon_{r,t}$ is the disturbance term, which follows the normal probability distribution with zero mean and constant variance [i.e. $\varepsilon_{r,t} \sim N(0, \sigma_t^2)$].

The dependent variable of the model is the unemployment rate change (ΔU). There are two different base years: 2001 and 2008. The three different periods are 2001-2008, 2008-2011 and 2001-2011. In the first period, after Greece joined Eurozone, economic growth is dominant, in the second economic recession due to crisis is huge and the third period sign depends on the trend: whether economic growth in the first 7 years or the economic recession in the last 3 years had a bigger impact on the total period of the 10 years.

The explanatory variables originate from the initial years (2001, 2008) in each of the three models because a variable begins to show its impact on the independent variable after an important period of 2-3 years (Kallioras & Petrakos, 2010). Specifically:

$\mathbf{\Delta U_{2008\text{-}2001} = X_{2001}}$ → How the factors in the first year of the euro affected the growth of unemployment in 2001-2008 (euro's impact on unemployment)

$\mathbf{\Delta U_{2011\text{-}2008}=X_{2008}}$ → How the factors in the first year of crisis affected the growth of unemployment in 2008-2011 (crisis' impact on unemployment)

$\mathbf{\Delta U_{2011\text{-}2001}=X_{2001}}$ → How the factors in the first year of the euro affected the growth of unemployment in 2001-2011 (crisis and euro impact on unemployment)

In order to examine the trend in unemployment evolution in Greece we chose two important initial years: 2001, when Greece joined Eurozone and many things changed in its economic structure and 2008, when crisis struck Greece (and Europe) affecting all the dimensions of its socio-economic life. We test the impact of these initial years to the final year 2011 which is the last year with available data.

We also run another model two times, each one for a year before 2008 (2006) that crisis struck Europe and Greece and one for a year after 2008 (2010). In this way a comparative analysis takes place:

$$Y_{r,t} = \sum_{\lambda=1}^{n} \left(\alpha_\lambda X_{\lambda,r,t}\right) + \varepsilon_{r,t}$$

$Y_{r,t}$ is the dependent variable of unemployment rate for region r under consideration in the year t, $X_{\lambda,r,t}$ is the set of λ independent variables for region r under consideration in the year t, a_λ is the set of the coefficients of the λ independent variables, and $\varepsilon_{r,t}$ is the disturbance term, which follows the normal probability distribution with zero mean and constant variance [i.e. $\varepsilon_{r,t} \sim N(0, \sigma_t^2)$].

The dependent variable is unemployment rate in 2006 and 2010. The explanatory variables are from the same years (2006, 2010) with dependent variable.

Theory

So, in this section we examine which regions had the most important impact of the crisis; in order to do this the determinant factors of unemployment change are investigated.

It is assumed that firms are operating in an imperfect competitive market and their decision for production factors aims at maximizing their profits (Layard et al., 1991). There have been efforts to distinguish the factors of regional unemployment as

"equilibrium" or "disequilibrium" (Patridge & Rickman, 1997) and "endogenous" or exogenous" (Chalmers & Greenwood, 1985; Elhorst, 2003). However, in this study the factors are distinguished between labor supply and labor demand factors. There have, also, been efforts to distinguish the factors based on these dimensions but for other fields like regional entrepreneurship (Verheul et al., 2002). At this point it should be noted that according to Patridge and Rickman (1997) the disequilibrium factors rise from labor supply whereas equilibrium factors from labor demand.

This study differentiates with many others which investigate regional unemployment and its determinant factors by focusing not on widely used factors like wages, migration, participation rate and others but on mainly economic factors (like GDP, regional specialization, geographical centrality) in an aggregate (regional) level. In other words, this study focuses on the labor demand factors for two reasons: because they are considered to matter a lot in the period of the economic crisis and because the data of labor supply factors are not widely available.

The labor supply dimension of determinant factors of regional unemployment includes all these factors which have an impact on the changes in the labor force and indicate the available skills: educational level and population growth (natural and migration) are two of these factors.

The labor demand dimension covers the factors which indicate in what level a regional economy can offer jobs to the people depending on its characteristics. Some of them are: GDP, population growth, firms, firms' density and agglomeration economies, initial unemployment. In this side, which describes the regional characteristics, the geographical factors should also be included: geographical centrality of the region, regional specialization and diversity and industry shares. It is considered that all the issues related to the public sector and the state should be also included since the state as an institution determines the public investment, the employment share in public sector and the public sector output share.

There are also some other factors like private cars per capita and household consumption of electricity which indicate the level of centrality of the region and the new buildings per capita and savings per capita which show the wealth and the level of consumption of one region. At this point it should be noticed the evidence which shows that the regional variation of unemployment and employment in periods of

economic growth is a result of jobs' creation and not a result of jobs' destruction (Faberman, 2005; Essletzbichler, 2007). Institutional interventions like minimum wage, employment security, unemployment benefits and others are not examined sine they are completely the same for all the 51 NUTS III Greek regions.

GDP per capita: Regional product is one of the most common used indicators of regional labor demand (Isserman et al., 1986; Elhorst, 2003). According to Okun's Law, GDP has a negative impact on unemployment (Okun, 1962) in an imperfect relationship: for every 2% increase in GDP there will be a 1% decline in unemployment rate. Zagler (1999) found also a negative relationship between growth and unemployment due to the effect of the efficiency wages in a monopolistically competitive economic framework. Okun's law is confirmed in the studies of Weber (1995), Moosa (1997), Lee, (2000), Sögner (2001), Harris and Silverstone (2001) and Adanu (2005). The relationship between GDP and unemployment is unstable and exhibits strong spatial dependencies and the threshold of GDP growth which is adequate in order unemployment to decline is much higher than this of employment to increase (Kosfeld & Dreger, 2006).

However, after Okun's studies, there were controversial results. The higher the economic growth the more the unemployment rate increases since capital returns rise and obsolescence becomes faster (Aghion & Howitt, 1992, 1994; Postel-Vinay, 2002). Elhorst (2003) claimed that the negative relationship might be a cross-sectional finding which is not permanent over time.

The final impact (positive or negative) of economic growth on unemployment depends on whether the firms of a region are able to update their technological progress in a continuous way or not (Mortensen & Pissarides, 1998). If they are able to do it economic growth reduces unemployment and if they are not able to do it economic growth increases unemployment. In addition, in a study for Greece, Okun's law was confirmed for 6 of the 13 NUTS II regions in 1971-1993 (Christopoulos, 2004).

In this study the index that is used is GDP per capita and there is not a certain suggestion for the expected sign of the index. Petrakos (2012) predicted a positive impact on unemployment rate change since crisis hit mostly the wealthiest and most

developed regions. Robolis (2012) claimed that it would not be significant since GDP is very small and spatially accumulated in three regions.

Geographical centrality of region: The level of centrality or peripherality of the Greek regions is an important factor for the characteristics of regional economies (Petrakos et al., 2012). It is measured by GRAVITY index, whose origin is in Newtonian Physics, as it was proposed by Harris (1954), taking into account the geographic position of one region as an increasing function of market size. Regions with big market size and central regions experience high values of the index. Petrakos (2012) claimed that the more central a region is the higher the unemployment rate change becomes, since the bubble took place in the most central regions.

Regional industrial specialization - diversification, industry mix and employment shares: Regional specialization occurs when a regional economy is specialized in a specific sector. This process is also measured and described as the industry mix of one region (Elhorst, 2003). There are studies which show that regional industrial diversification pushes down unemployment rate (Simon & Nardinelli, 1992; Izraeli & Murhpy, 2003).

This happens because regional employment concentration in one sector, in which the region is specialized, is always in threat of increased unemployment in a possible recession of this sector. The sector could decline because it is exposed in various dangers like business cycles, environmental policies, change in demand conditions for the specialized products (Izraeli & Murphy, 2003). In this way regional diversity could be considered as one of the most efficient solutions to this problem.

Regional specialization in this study is measured by THEIL index as it was proposed by Theil (1972). We test the hypothesis that high values of Theil have a positive impact on unemployment rate change since the most specialized regions were mostly hit (Petrakos, 2012), as it was shown above.

Regional unemployment largely depends on the sector that the regions are specialized in: whether it is a declining or a growing industry. Growing industries exhibit low unemployment rates while declining industries high ones. The extreme situation is the collapse a sector; in this case unemployment hugely increases. Thus, the sign of

employment shares in each of three sectors may vary according to the time period, the place and its specific conditions that the study took place.

In such a way there are studies that found a negative effect of agricultural employment share on regional unemployment (Taylor & Bradley for the UK in 1994, Elhorst for the EU12 in 1995, Patridge & Rickman for the USA in 1995 and Taylor & Bradley for Germany and the UK in 1997) and a positive effect (Malizia & Ke for the USA in 1993 and Taylor & Bradley for Italy in 1997).

Regarding manufacturing employment share, Summers (1986) and Blackley (1989), both for the USA, found a positive impact on unemployment rates while Elhorst (1995) for the EU12 regions found a negative one. Finally, focusing on services employment share there are studies which experience a positive effect on unemployment rate (Patridge & Rickman in 1995 for the US, Taylor and Bradley in 1997 for the UK, Germany and Italy) and a negative effect (Hofler & Murphy in 1989 for the USA and Holzer in 1993 for the US).

The situation of the employment in each of the three sectors in Greece is the following: there is a de-industrialization and tertiarization of Greek economy in terms of employment share and participation in GDP after 1981 that Greece joined the EU (INE GSEE, 2010; Petrakos et al., 2012). Also, in the period before crisis services exhibited important employment increase while manufacturing, primarily, and agriculture, in secondary level, experience high unemployment increase. The only branch of manufacturing which is increasing is this of construction (INE GSEE, 2009). Banking sector experienced the highest increase in employment in 1983-2007 (INE GSEE, 2010). Since 2008, that crisis struck Greece, the agriculture is the only sector that unemployment has not increased. On contrary, manufacturing and services exhibit huge losses of employment.

Regional specialization in agriculture in this study is measured by THEIL index in primary sector (in employment) and is expected to have a negative impact on unemployment rate change since the regions specialized in agriculture are considered to be more resilient since they are not dependent on state funding (like the other two sectors), they show high rates of self-employment and they are not specialized in financial (tertiary) sector which was mostly hit by crisis (Petrakos, 2012).

Regional specialization in manufacturing in this study is measured by THEIL index in secondary sector (in employment) and is expected to have a positive impact on unemployment rate change since manufacturing was a continuously declining sector in terms of both production and employment in the years before crisis; this trend did not change during crisis; on contrary it increased. Also, it depends on public sector in which huge cuts took place.

Regional specialization in services in this study is measured by THEIL index in tertiary sector (in employment) and is expected to have a positive impact on unemployment rate change because, despite it has been the most increasing sector, in terms of employment, and the core of Greek economy, in terms of product in the last 20 years, it is the sector that had the biggest and most significant losses (in both terms of product and employment) by the crisis (Petrakos, 2012). It is the sector which is the origin of the crisis.

Industrial Dissimilarity: Industrial diversity, i.e. when a region has many different growing sectors, is a very important concept for regional economies, widely examined in the last years and is suggested to have a negative impact on regional unemployment according to many studies (Taylor and Bradley, 1983; Simon, 1988; Neumann and Topel, 1991; Malizia & Ke. 1993). This happens since a regional economy with industrial diversity provides greater opportunities for labor reorganization between industries.

In this study industrial diversity is measured by the index of dissimilarity of industrial structures as it was proposed by Jackson and Petrakos (2001): IDIS is estimated by the sum of the square differences between the shares of employment in each sector in one region and the respective shares in the national (benchmark) economy in one year (Kallioras & Petrakos, 2010). So, there is a comparison between regional and national economy: whether they are similar or not. In this study it is expected to have a negative impact on unemployment rate change as also Petrakos claimed (2012) since bigger diversification results in higher regional employment resilience.

Human Capital: Human capital, in the labor supply factors side, is related in a positive way to labor demand or, in other words, negatively related to unemployment rate (Chalmers & Greenwood, 1985; Simon, 1988; Holzer, 1993; Malizia & Ke, 1993; Patridge & Rickman, 1997; Raphael & Rice, 2002). High human capital means that

people have skills which are required from employers or that people can conduct better quality searches and that regions can avoid of getting trapped in a low-skill poverty situation (Elhorst, 2003).

However, there are many cases that the phenomenon of "brain drain" takes place: the highly educated persons (Borjas, 2000) of one place are not hired by the local, regional or national labor market and they prefer to migrate to other places that they can find a job which fits in their preferences (Mountford, 1997; Stark & Wang, 2002; Beine et al., 2008; Docquier et al., 2009). However, this phenomenon is mainly experienced in developing countries (Ashenfelter & Ham, 1979). There are several "pull" (working environment, compensation and wage packages, living conditions) and "push" (political instability, cost of living, inability to find a job) factors (Güngör & Tansel, 2008).

The last push factor, i.e. the inability to find a job in the place that they studied, results in structural unemployment (Robolis, 2012): the local, regional or national labor market has not the suitable job positions for these highly educated persons (mainly in terms of scientific object) resulting in educational or structural unemployment (King, 1987; Gillis et al., 1996; Fan & Stark, 2007) and in their (possible) migration. The phenomenon of "brain drain" indicates a way that human capital may have a positive impact on unemployment.

In this study the index that is used is Students of Secondary Education per 1,000 inhabitants and there is not a certain suggestion for the expected sign of the index since on the one hand human capital has a negative effect on regional unemployment but, on the other hand, it is very possible that Greek regions exhibit structural unemployment as a result of the brain drain phenomenon. Petrakos (2012) and Robolis (2012) estimated a positive impact since crisis hit mostly the specialized persons since the structure of production cannot absorb specialized persons (structural unemployment). Specifically, in 2005 the unemployment rate of the persons who graduated from a bachelor was the same with them who attended two or three years of primary school (ELSTAT, 2005).

Public investment: Public investment is the aid which is given from the state to the regions etc. This aid has a variety of dimensions: capital aid to industry, regional development grants and regional selective assistance (Willis, 1985). Regarding

employment there the subsidies to industries and regions and education and training programs.

If labor supply is inelastic the public investment does not affect unemployment (van der Ploeg, 2006). However, if labor supply is elastic then public investment has a negative effect on unemployment (Clark & Murphy, 1996; van der Ploeg, 2006; Lei & Hai, 2011) since it creates job positions, even after a certain period (Willis, 1985). Therefore, it would be useful if the state had a plan for the allocation of this investment.

Public investment in this study is measured by the total amount of public investment that is allocated in each region and it is expected to have a negative impact on unemployment rate change (Petrakos, 2012).

Initial unemployment: Regional unemployment rate is lagged over time and space (Chalmers & Greenwood, 1985; Blanchard & Katz, 1992; Hyclak, 1996; Clark & Murphy, 1996; Groenewold, 1997; Marelli et al., 2011). So, regions and specific periods that exhibited high unemployment rates -the initial conditions- may have a very significant impact n regional unemployment and may determine the convergence or divergence trend (testing β-convergence). The sign of the impact of initial unemployment mainly depends on the economic situation of each specific period (economic growth or economic recession).

In this study the initial unemployment rate is used as a determinant factor of unemployment rate change. However, there is no certain suggestion for its impact. Marelli et al. (2011) testing the effect of crisis on regional unemployment change in EU NUTS II regions found that the higher the unemployment change in 2004-2007 the lower the unemployment change in 2007-2010. So, in the EU the regions suffering from high unemployment change in 2004-2007 exhibited the lowest unemployment change in 2007-2010, i.e. after crisis.

It is more possible that a negative relationship occurs between initial unemployment rate and unemployment rate change. This is, also, the finding of the β-convergence equation that was presented above: there is a regional convergence of the 51 Greek NUTS III regions in 2008-2011 since regions with higher initial unemployment show

lower unemployment change while regions with lower initial unemployment exhibit later higher unemployment change.

Private cars per capita: Car ownership generally increases employment since it contributes to better access to distant job centers, like city center or specific areas in a metropolitan area (Kasarda, 1989; Stoll et al., 2000), to lower commuting time (Holzer et al., 1994), to a better job search in more than one areas (Henly, 1999) and to availability for additional trips to day care providers (Gurley & Bruce, 2005).

An important barrier to employment is the transportation (Perkins and Homer, 2002). An effective way to solve this problem is the private form of transportation according to Cervero et al. (2002). So, people who own a car are most likely to be employed (Ong, 1996; Raphael & Rice, 2002; Bansak et al., 2010). In addition, this causation can run in the opposite direction, i.e. the employed persons are able to buy a car.

For Greece, it is a biased variable since there are many private cars in rural areas which are for rural use (Petrakos, 2012). Generally it is another index of wealth of a region. It is measured, in this study, by private cars per 1,000 inhabitants and there is not a certain suggestion for the expected sign of the index since on the one hand it pushes down unemployment, as it was quoted above, but on the other hand this index indicates also the centrality and the development of a region; unemployment rate hit more central and wealthier regions.

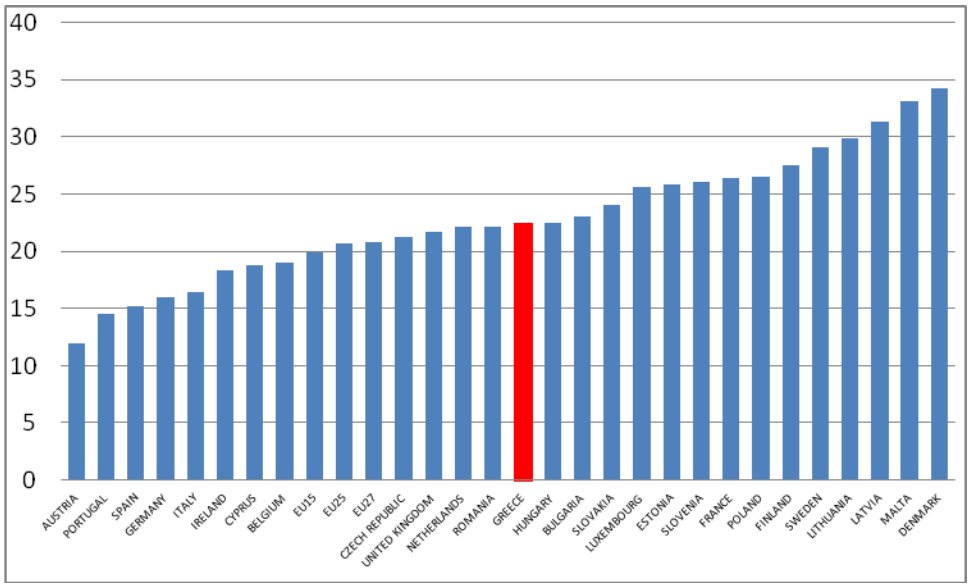
Public sector dependence: In an environment of economic growth, the decline of public employment seems to reduce overall unemployment rate in a study conducted in the industrialized OECD countries over 1960–2000 (Yann et al., 2002). Also, the public employment decline results in increasing private labor supply (van der Ploeg, 2006). However, there is no evidence on this situation in case of economic recession.

Regions with big public sector in Greece are expected to exhibit lower unemployment change since there were no layoffs in the public sector until now. However, there were neither many intakes since the law "10:1" was adopted. According to this law for every 10 retirements from the public sector there is only one hiring. So, employment declined in public sector in all the regions. According to Petrakos (2012) and Robolis (2012) the regions with high levels of public sector have also high levels of private sector since there is a special structure and function in Greek economy:

tertiary and secondary sectors highly depend on public sector and funding. For these two reasons the regions with high public sector dependence are considered to have the highest unemployment change. In addition, financial, primarily, and manufacturing, in secondary level, are the sectors which were mostly affected by the crisis.

According to the annual report for Greek economy of INE GSEE (2010), in Greece, in 2009 the 22% of the total employment and the 34% of the employees was in public sector. According to the formal census of civil servants from the Minister of Finance, in 2010, there were almost 768,000 civil servants, around 17.8% of total employment. In the end of 2011 the civil servants declined to 630,899 persons (15.7% of total employees) since the law "10:1" was adopted.

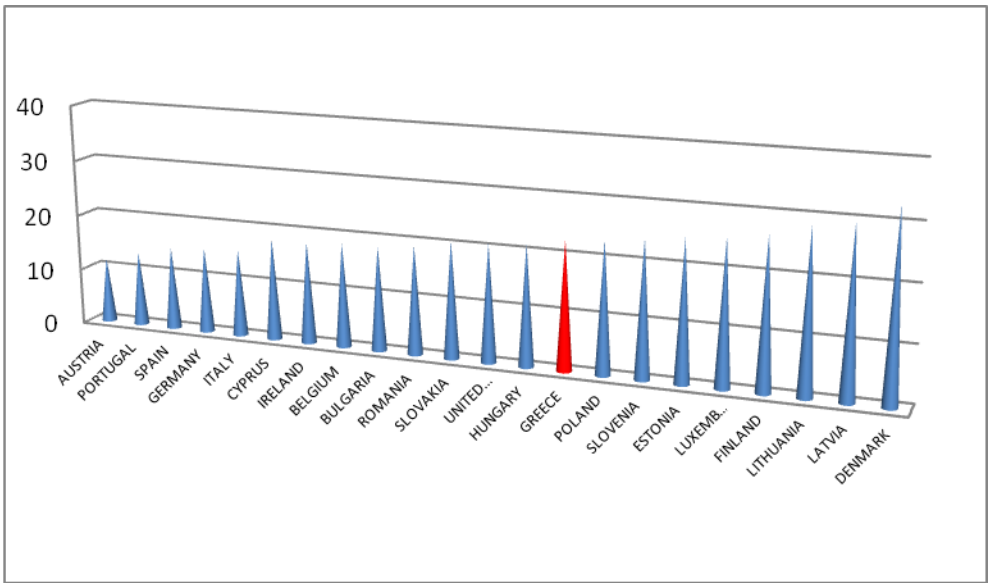
Graph 30: Employment in public sector in 2005 (% of total employment)



Source: ILO (2012), own elaboration

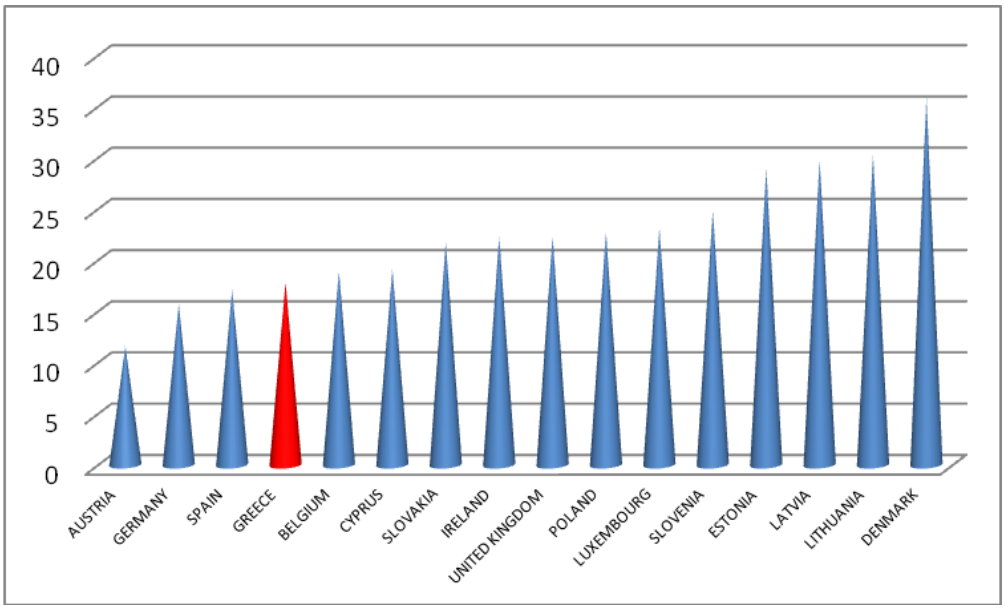
As it is indicated in the three graphs (30, 31, 32) Greece has not a very large public sector as mainstream media of all the European countries propagandize: in 2005 Greece is the MS with the 13th higher public sector employment share among the 27 MS of the EU, even if it is higher than the EU15, EU25 and EU27. In 2008, public sector in Greece declined and was 14th among 22 MS of the EU that there are data available. Finally, in 2010, after the implementation of "10:1" rule, Greece had the 4th lowest public sector employment share among 16 MS of the EU. This situation indicates that public sector employment in Greece has already largely declined.

Graph 31: Employment in public sector in 2008 (% of total employment)



Source: ILO (2012), own elaboration

Graph 32: Employment in public sector in 2010 (% of total employment)



Source: ILO (2012) & INE GSEE (2010), own elaboration

In this study we use the indexes of the employment share in public sector and the public sector output share. It is expected that the impact of public sector dependence on unemployment rate change in Greece is negative. On the one hand there were neither layoffs in public sector nor intakes, according to the law "10:1". So, employment in public sector decreased in all the regions especially these with high

public sector. In addition, the regions highly exposed to public sector, which shrank in economic terms, may have the most layoffs since private sector is highly depended on public funding and generally public sector (Petrakos, 2012). However, public sector is still an obstacle in the huge unemployment increase in the Greek regions since there were no layoffs (only fewer intakes). And this effect is expected to be stronger than the other two which were described above.

Buildings per capita: Buildings per capita is an index of construction sector. The effect of this sector in unemployment depends on the level of its development, on which stage of the economic cycle we refer to and on the special characteristics of the reference economy. Greek economy had largely developed its construction sector after 1985 and the deregulation of productive structure when Greece joined the EU.

It is expected to have a positive impact on unemployment rate change since the highest rates in sectoral unemployment are in the firms which are suppliers to construction companies -the total unemployed persons related, when they were employed, to construction are estimated to 1,000,000 persons- (Robolis, 2012). On the other hand a, still, high construction activity may result in positive shocks in employment, having a negative impact on unemployment rate change.

Agglomeration economies: Agglomeration economies emerge due to the externalities under perfect competition, increasing returns under monopolistic competition and spatial competition under strategic interaction (Fujita & Thisse, 1996) This factor has many indexes (firms' density, agglomeration index) but it generally describes the effect of agglomeration economies, a mechanism which generates economic growth, on unemployment rate. In this way of thinking, Elhorst (1995), Molho (1995a, 1995b), Coles and Smith (1996), Sato (2001), Duranton and Puga (2004) and Mitra and Sato (2007) found and suggested that agglomeration economies have a negative impact on unemployment rate.

It is one of the most important factors which drive the regional variation in terms of unemployment (Francis, 2009). Agglomeration, also, contributes to a better matching rate, due to the interaction in more dense areas, and to the decline of search frictions and unemployed workers (Helsey & Strange, 1990; Sato, 2001).

However, Zenou (1999) claims that agglomeration economies may increase unemployment since there are too high and rigid urban efficiency wages (Zenou, 2000), urban search frictions (Wasmer & Zenou, 1999) and a spatial mismatch (Breuckner & Martin, 1997). In this way the existence of agglomeration economies may cause higher unemployment change.

In this study we test agglomeration economies using two indexes: agglomeration index and firms' density. There is no certain suggestion for the impact of agglomeration economies on unemployment rate change since the evidence is contradicting and it largely depends on the specific characteristics of each case. However, there is evidence that crisis in Greek economy hit mostly the cities (Petrakos, 2012).

Household consumption of electricity per capita: Household consumption of electricity per capita is an index of wealth and development of one region (Dhakal, 2009; Petrakos, 2012) since this energy consumption is accumulated in the big cities of the urban regions (Raufer, 2007; Zhang et al., 2011). So, it is suggested that this index has a positive impact on unemployment rate change since crisis hit mostly the wealthiest and most developed regions.

Savings per capita: In periods of employment people tend to save money while in periods of unemployment dissave (Ioannides, 1981). So, probably, savings per capita have a negative impact on unemployment rate. Furthermore, according to Petrakos (2012), it is a biased variable since it depends on local behavior of each region; how people spend their money and in which places someone has many choices of spending money (in Athens someone has a variety of things to do and spend money but in Alexandroupoli, for instance, not).

On the other hand central and urbanized regions are wealthier and probably experience higher savings per capita. In this way of thinking, there is no certain suggestion for the impact of savings per capita on unemployment rate change.

Population growth: Population growth is a phenomenon which takes place due to natural change or due to migration. It is an important determinant factor of unemployment and it can have positive or negative impact (Dailey & Campbell, 1980). Studies, until now, show that population growth has a negative relationship to

unemployment rate (Carlino & Mills, 1987; Clark & Murphy, 1996; Izraeli & Murhpy, 2003): when population increases the unemployment rate falls maybe because the demand pressures oblige production to increase.

However, there is also evidence for a positive impact of population growth on unemployment rate (West et al., 1987) due to the "institutional overload" (Price & Clay, 1980: 593): the labor-market overload caused mainly by migration may increase unemployment, since when the population is growing, finding a job position is becoming more difficult (Harrigan & McGregor, 1993).

In this study we use the index of population growth and there is no certain suggestion for its impact on unemployment rate change.

Firms: Firms result in job positions and especially in this crisis' period it is important for one region to have as many firms as it is possible. It is expected that the more the firms that there are in a region the lower the unemployment rate change becomes.

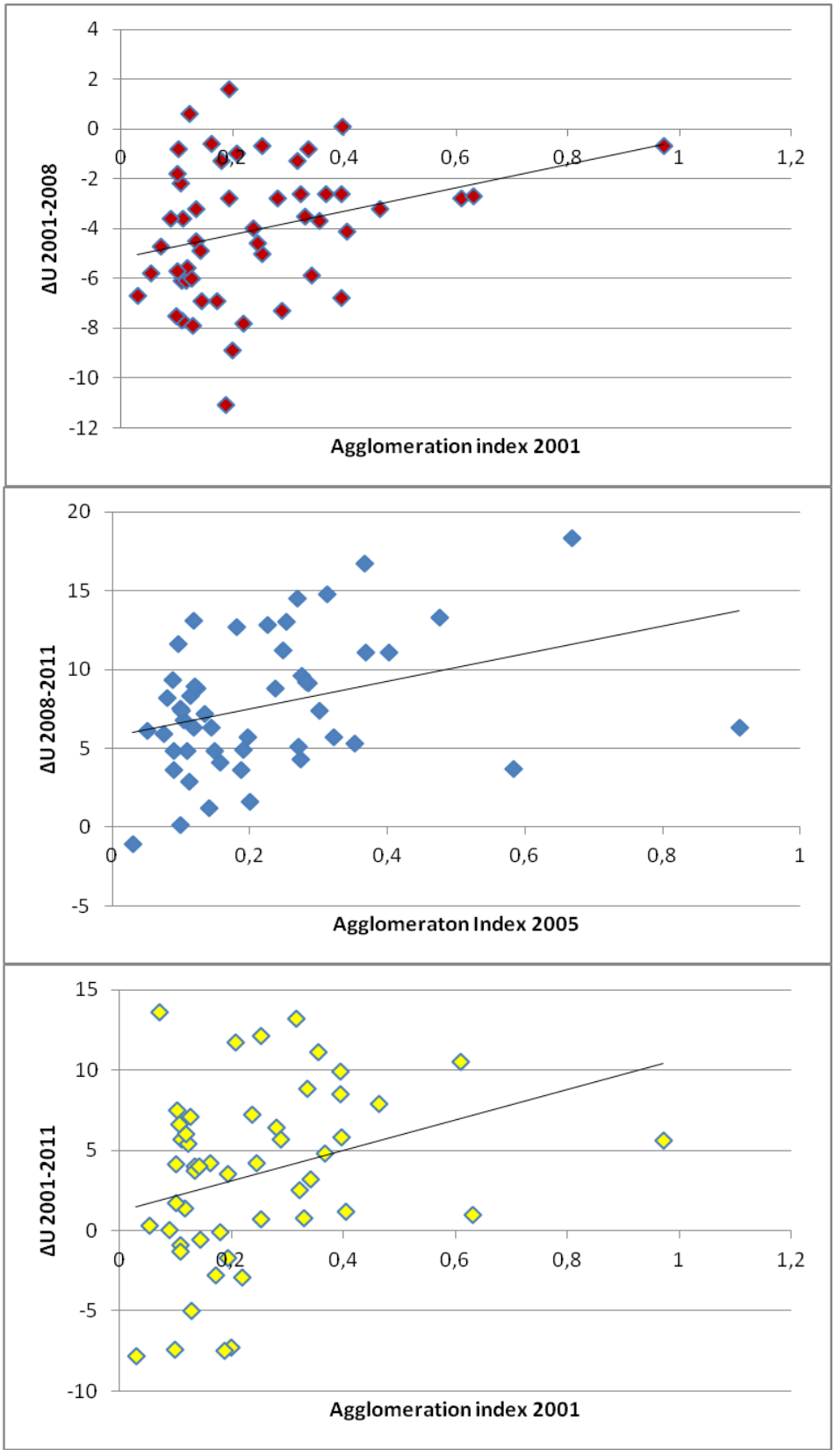
Data

In this model, which studies unemployment change pattern in the 51 NUTS III regions of Greece, we use data (indicators of economic performance) from Greek Statistical Agency (ELSTAT), Eurostat and other institutions (like the Bank of Greece, the Public Enterprise of Electricity, the Chamber of Hotels, the General Agency of Commerce and the General Agency of Center of Information of Ministry of Economics). This data is related to general regional indicators as described above, and allows us to build an initial picture of the situation.

Correlations

Below we present some indicative correlations for the independent variable ΔU (unempoyment rate change).

Graph 33: Correlation between unemployment rate change and agglomeration economies



Source: ELSTAT (2012), own elaboration

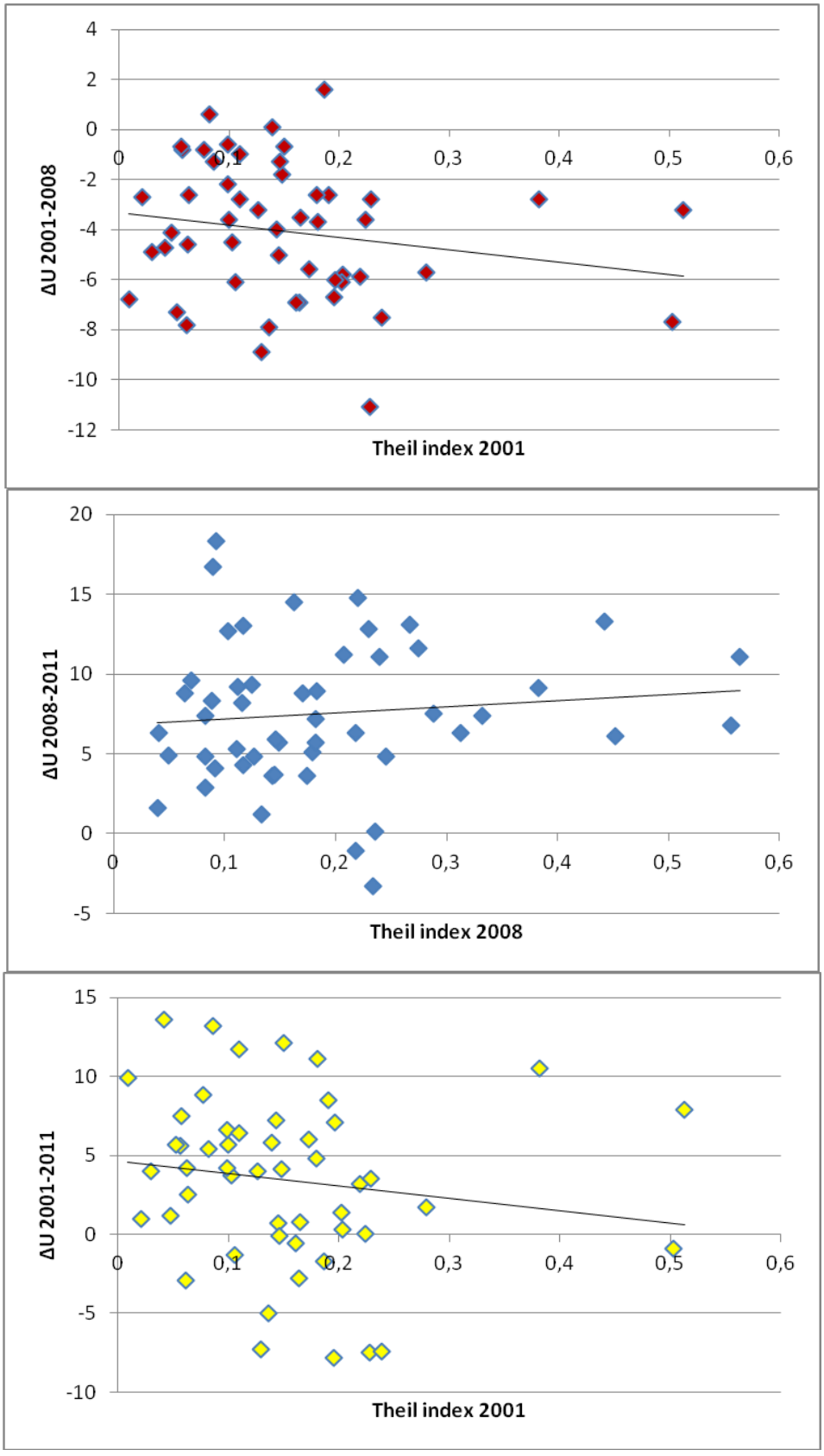
The cities (agglomeration economies) seem to have a positive impact on unemployment rate change in all the periods that are examined (growth, recession, overall). On othe one hand cities offer more opportunities to find a job but on the other hand the hyper-urbanization in hyper-populated areas makes it much difficult to find a a job for many people.

Specialization's impact (measured by Theil index) seems to exhibit a change between economic growth and recession period: in economic growth period it has a negative impact on unemployment rate change, i.e. specialized regions are less vulnerable to unemployment dynamics (which is also valid for overall 2001-2011). On contrary, in recession it has a positive impact: specialized regions are less resilient to unemployment dynamics.

The regional employment share in public sector has been ever measured only once: in 2009 census of ministry of Interior Affais; however it is cosnidered that it has not changed dramatically in 2000-2010 but only after 2010 when "10:1" rule implementation began (Petrakos, 2012). Public sector employment share has a negative effect on unemployment rate change in all the examined periods since there are not layoffs but only increased retirements and declined intakes.

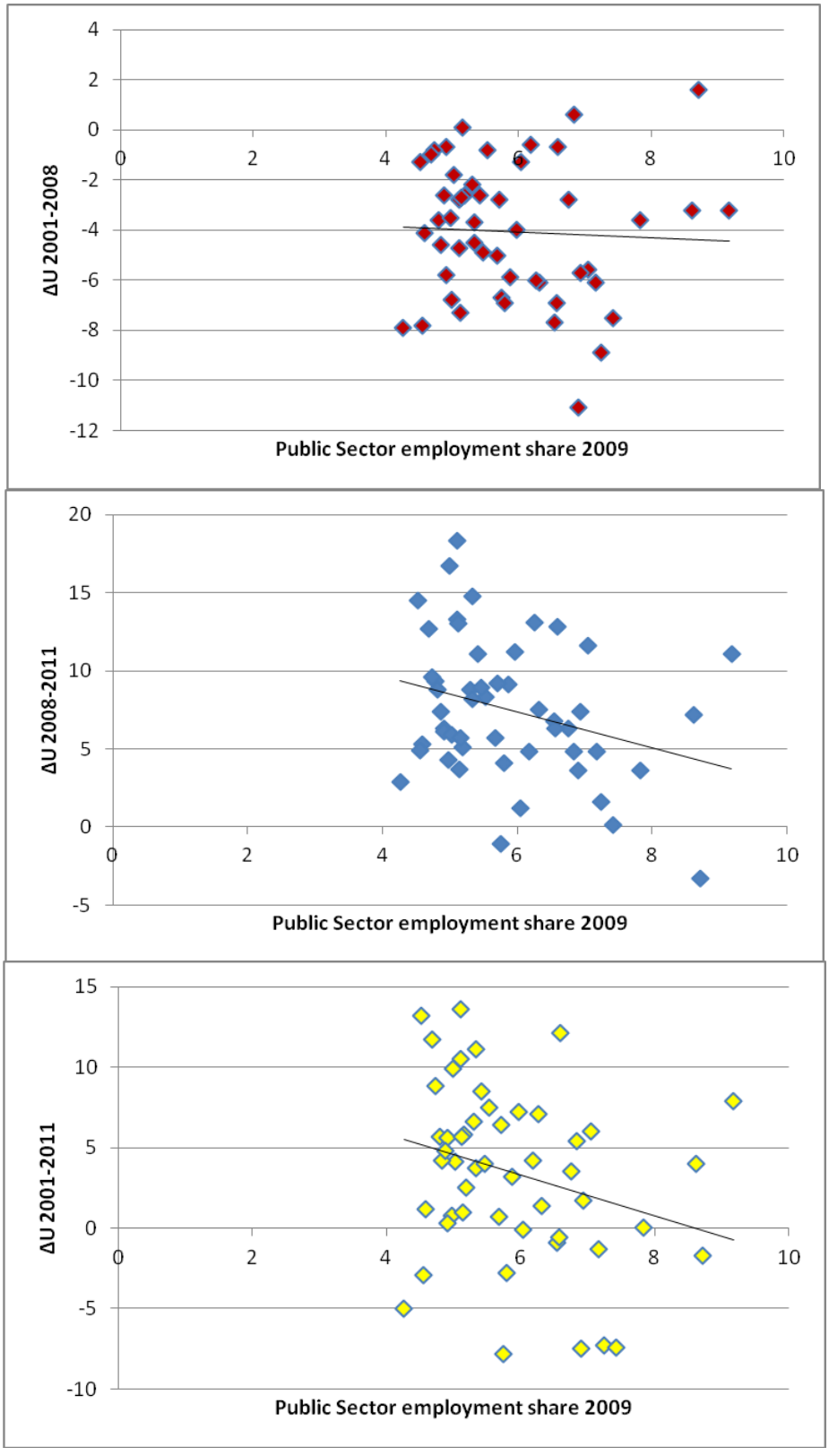
In all periods (economic growth 2001-2008, economic recession 2008-2011, overall 2001-2011) initial unemployment rate influences negatively unemployment rate change. This means that regions with higher initial unemployment show lower unemployment change while regions with lower initial unemployment show later higher unemployment change. This is in line with the findings of β-convergence model for unemployment rate change that we ran in this section.

Graph 34: Correlation between unemployment rate change and specialization



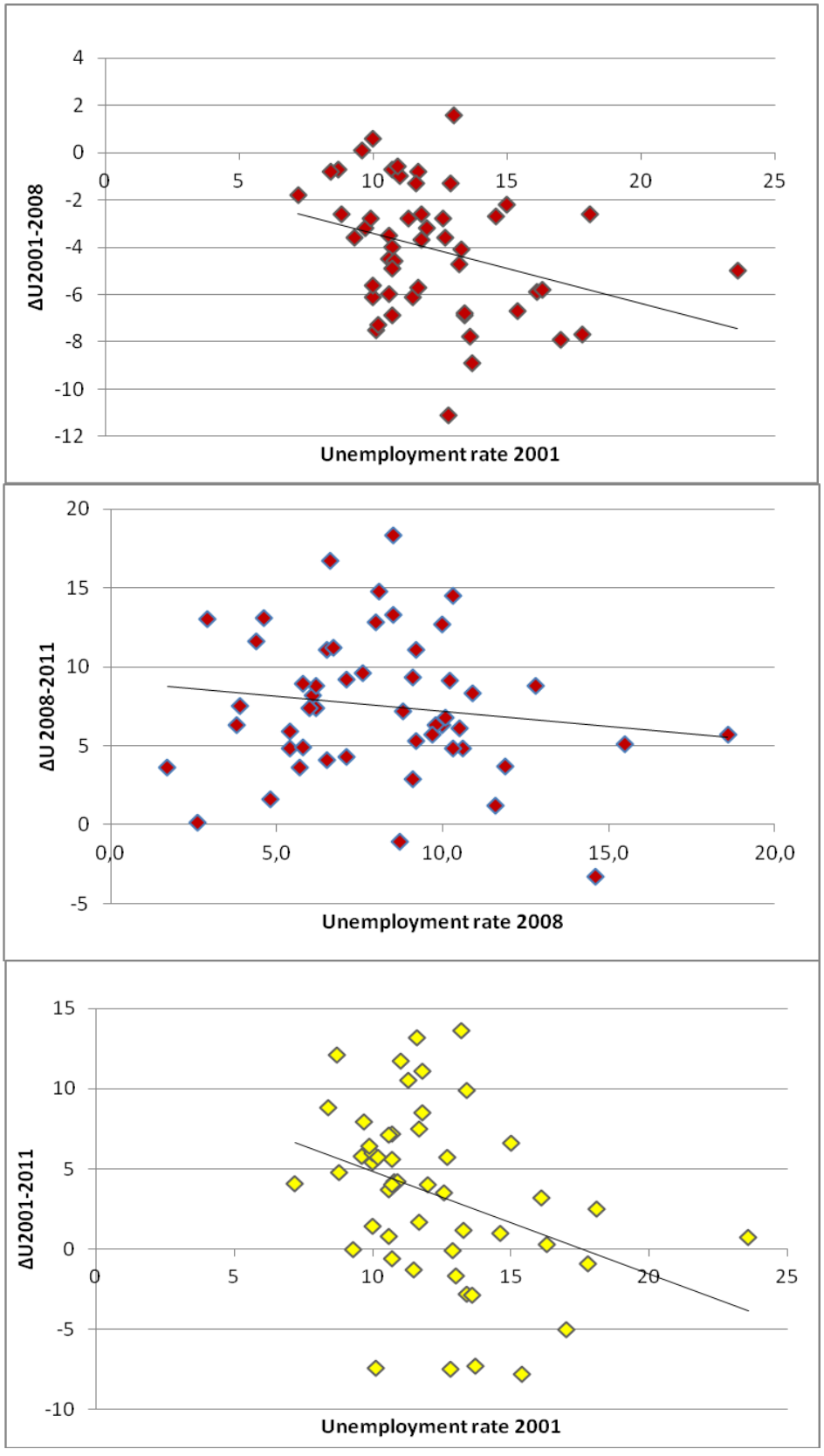
Source: ELSTAT (2012), own elaboration

Graph 35: Correlation between unemployment rate change and public sector employment share



Source: ELSTAT (2012), own elaboration

Graph 36: Correlation between unemployment rate change and initial unemployment



Source: ELSTAT (2012), own elaboration

Results

Before starting to present and explain the results we should clarify the situation regarding the dependent variable unemployment change (ΔU). When ΔUa> ΔUb there are three cases: A. that the unemployment in region a increases more than the unemployment in region b. B. that the unemployment in region a decreases less than the unemployment in region b. C. that the unemployment in region a increases while the unemployment in region b decreases. In this case region b has a better performance regarding unemployment than region a.

When ΔUa< ΔUb there are also three cases: A. that the unemployment in region a increases less than the unemployment in region b. B. that the unemployment in region a decreases more than the unemployment in region b. C. that the unemployment in region a decrease while the unemployment in region b increases. In this case region has better performance regarding unemployment rate than region b.

1st model:

Table 9: Results of the model for 2001-2008

	1st model		2nd model		3rd model	
Variable	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
C	-0.585016	0.8173	-2.456554	0.3511	-2.564903	0.3456
GRAVITY			0.014273	0.0587***	0.020531	0.0134**
IDIS	-22.29107	0.0199**	-27.13528	0.0372**	-64.63783	0.0272**
IDIS^2					369.7945	0.0532***
UNEMP	-0.427935	0.0002*	-0.474337	0.0002*	-0.490942	0.0000*
THEIL01	-3.273964	0.0060*	-6.043834	0.0757***		
THEILIN1					52.61450	0.0036*
THEILIN1^2					406.5012	0.0060*
PUBINV01	-0.012963	0.0089*				
PUBSEC02			-0.642338	0.0124**		
THEIL01*IDIS			66.11534	0.2820		
FIRMS					-2.79E-05	0.0012*
DSAVHIGH					1.253534	0.0313**
SECEDU	0.068699	0.0663***	0.070257	0.0623***	0.072921	0.0303**

*statistically significant in 1%

**statistically significant in 5%

***statistically significant in 10%

Also, when it is written that one factor has a "negative effect on unemployment rate change" we account of the sign in the correlation and we mean that when the factor increases it causes lower unemployment change and the opposite. Also, when there is the choice to account of the sectoral Theil indexes we choose to have two of the three:

the two highest in order to examine the effect of the sectors in which the regions are most specialized. However, in the case of manufacturing and services this is not possible because high multicollinearity is observed between them. For variables that some observations miss for one year we account of the closest (temporally) year that is available. The overall explanatory power of all versions of the 5 models is quite satisfactory since the R^2 is in the average level of a WLS model (Kallioras & Petrakos, 2010).

In the first period, 2001-2008, i.e. after Greece joined the Eurozone the model showed the following results. GRAVITY has a positive impact on regional unemployment rate change: the most central regions exhibit higher unemployment change because the majority of the people are going there to find a (better) job. IDIS has a negative impact while IDIS^2 has a positive one: up to a point when there is high structural dissimilarity of production comparing to national average there is low unemployment change. Maybe some regions have comparative advantages of which the regions take advantage and they push down unemployment. After a point it is the opposite.

THEIL01 influences in a negative way unemployment change since the regions with the highest specialization show the lowest unemployment rate change. These regions take advantage of specialization (comparative advantages etc.). In sectoral specialization THEILIN1 and THEILIN1^2 have a positive impact on unemployment change showing that the regions with the highest specialization in manufacturing, exhibit the highest unemployment rate change, even after a specific point. This happens since manufacturing sector is in decline during the last 15 years.

UNEMP has a negative impact on unemployment rate change, i.e. regions with higher initial unemployment exhibit lower unemployment change while regions with lower initial unemployment show later higher unemployment change.

PUBINV01 has a negative impact on unemployment change: in the regions that the state invests more than the others, the unemployment rate change is lower. In the same way, PUBSEC02 has also a negative impact, i.e. the higher the public sector output share is, the lower the unemployment rate change becomes because layoffs are not possible for the public sector.

FIRMS affect unemployment change in a negative way. So, the more firms are located in a region, the lower the unemployment rate change is since these firms supply a big number of job positions. The dummy variable DSAVHIGH shows that the regions that exhibit higher rates of personal savings per capita than the national average experience higher unemployment rate change.

Finally, the phenomenon of structural unemployment takes place since SECEDU has a positive impact on regional unemployment rate change. So, there is not the suitable (quantitatively and qualitatively) productive capacity to absorb the graduates of secondary education.

Table 10: Results of the model for 2008-2011

	1st model		2nd model		3rd model	
Variable	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
C	19.22577	0.0000*	-4.600368	0.3375	-4.916775	0.3223
GRAVITY	0.015743	0.0129**	0.039988	0.0005*	0.045855	0.0005*
IDIS	-30.12775	0.0315**	-32.91551	0.0120**	-31.92576	0.0136**
UNEMP	-0.660173	0.0015*	-0.661509	0.0011*	-0.688544	0.0007*
THEIL08			9.315681	0.0016*		
THEILAGR8	-17.08979	0.0675**			-7.968941	0.3793
THEILSE8	7.993485	0.0025*			6.908336	0.0150**
EMPSHPUS	-1.716892	0.0000*				
PUBSEC07			-1.996278	0.0024*	-2.371396	0.0007*
FIRMS			-2.49E-05	0.0837***		
FIRMSDEN			-0.102487	0.0306**		
SECEDU			0.305773	0.0001*	0.297583	0.0001*
BUILDC			-0.435497	0.0634***	-0.545409	0.0244**

*statistically significant in 1%

**statistically significant in 5%

***statistically significant in 10%

In 2008-2011, the period after crisis struck Greece, UNEMP has a negative impact on unemployment rate change, i.e. regions with higher initial unemployment exhibit lower unemployment change while regions with lower initial unemployment show later higher unemployment change.

IDIS has a negative impact: when there is high structural dissimilarity of production comparing to national average there is low unemployment change. Maybe some regions have comparative advantages of which the regions take advantage and they push down unemployment. THEIL08 shows that the higher the specialization is, the

higher the unemployment change becomes. THEILAGR8 indicates that regions with specialization in agriculture show more resilience to unemployment shocks. This is happening since the primary sector is the sector with the lower impact from crisis due to its high rate of self-employment, its independence from public sector and its "economic distance" from tertiary sector which was mostly hit by crisis. In the third model it is not significant.

The opposite takes place with specialization in services sector (THEILSE8) which has a positive impact on unemployment change indicating that regions specialized in this sector are very vulnerable to unemployment shocks. Services sector has been the most developed (70-75% of GDP) sector in Greece during the last 20 years. We should also account of the reality that crisis had started and hit mainly the tertiary sector.

GRAVITY, like in 2001-2008, has a positive impact on unemployment change: the most central regions exhibit higher unemployment change because the majority of the people are going there to find a (better) job. On contrary, the higher the firms density is, the lower the unemployment change becomes. This takes place normally in big agglomerations where there are many firms resulting in an increase of the available job positions.

BUILDPC shows that regions with high index of new buildings per capita exhibit lower unemployment rate. This happens, in spite of the great decrease of building sector in Greece, because new buildings mean construction resulting in lower unemployment rate. Structural unemployment is still persistent while firms' presence pushes down the unemployment rate.

Finally, public sector employment share affects negatively unemployment change: the regions with the highest employment share in public sector exhibit the lowest unemployment rate change since no layoffs took place in the public sector. Crisis and the adjustment program forced mainly private sector to proceed on hundreds of thousands layoffs. In the same way, the higher the public sector output share is, the lower the unemployment rate change.

In overall period between 2001-2011, which includes both Greece's access to Eurozone and crisis beginning, we found the following results: GRAVITY shows that the most central regions exhibit higher unemployment change because the majority of

the people is going there to find a (better) job. IDIS has a negative impact while IDIS^2 has a positive one: up to a point when there is high structural dissimilarity of production comparing to national average there is low unemployment change. Maybe some regions have comparative advantages of which the regions take advantage and they push down unemployment. After a point it is the opposite.

Table 11: Results of the model for 2001-2011

	1st model		2nd model		3rd model	
Variable	**Coefficient**	**Probability**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
C	19.73726	0.0000*	4.919817	0.4024	5.430640	0.3683
GRAVITY	0.038212	0.0015*	0.043405	0.0113**		
IDIS	-217.1078	0.0039*	-118.1020	0.0701***	-39.50470	0.0326**
IDIS^2	1286.531	0.0036*	771.6066	0.0528***		
UNEMP	-0.737613	0.0009*	-0.769819	0.0005*	-0.983067	0.0000*
THEIL01			7.079744	0.6471		
THEIL01^2			-5.259707	0.8685		
THEILAGR1	-16.70788	0.0373**			0.792324	0.9116
THEILAGR1^2	15.22722	0.6904				
THEILIN1					29.40935	0.0520***
PUBSEC02	-2.887665	0.0000*			-0.713783	0.0000*
HOUELEPC					4.466387	0.0322**
FIRMSDEN			-0.383739	0.0002*		
CARPC			0.427362	0.0056*		
SECEDU					0.174139	0.0297**
AGGL01	-8.707808	0.0367**				

*statistically significant in 1%
**statistically significant in 5%
***statistically significant in 10%

UNEMP indicates that regions with higher initial unemployment show lower unemployment change while regions with lower initial unemployment experience later higher unemployment change.

THEILAGR1 and THEILAGR1^2 show that the higher the specialization in primary sector is, the lower the unemployment change becomes. This is happening since the primary sector is the sector with the lower impact from crisis due to its high rate of self-employment, its independence from public sector and its "economic distance" from tertiary sector which was mostly hit by crisis. After a point, the extremely high specialization in primary sector has a positive impact on unemployment rate change but it is no significant.

Specialization in manufacturing makes the regions more vulnerable to unemployment, since this sector is in recession during the last 15 years, especially in the period after crisis that a very big number of layoffs took place in this sector.

HOUELEPC is an index of richness and wealth of the regions. So, people are migrating to the wealthiest and richest regions in order to find a (better) job. As a result in these regions the unemployment rate change is higher. The "cars per capita" index is higher in big agglomerations where the unemployment change is higher. Also, the cars per capita index is higher in wealthier and more central regions where the unemployment change is higher. However, maybe this is a biased variable since in Greece there are many private cars in the rural areas which are used mainly for agricultural activities.

PUBSEC02 shows that the higher the public sector output share is, the lower the unemployment rate change becomes since no layoffs took place in the public sector. Structural unemployment is persistent in the overall period. Agglomeration indexes (AGGL01 and FIRMSDEN) have a common negative impact on unemployment change: cities exhibit lower unemployment rate change.

2nd model:

Table 12: Results of the model for the first year/pre-crisis (2006)

Variable	Coefficient	Probability
C	2.328359	0.6339
HOUELEPC	-0.525854	0.7250
SECEDU	0.117871	0.1471
SAVPC	0.000608	0.0846***
BUILDPC	-0.423393	0.0667***
CARPC	-0.224084	0.0395**
EXPORTS	0.000256	0.4007
GDPPC	0.000237	0.0977***
INCPC	-0.000394	0.7079
POPDENS	-0.003942	0.2772
POPGROW	0.146156	0.1070

**statistically significant in 5%

***statistically significant in 10%

Explanation:

The results for 2006 show that savings per capita which are higher in the most central regions influence positively unemployment rate change. Regions with high index of

new buildings per capita exhibit lower unemployment rate. This happens, in spite of the great decrease of building sector in Greece, because new buildings mean construction resulting in lower unemployment rate. CARPC is a biased variable since in Greece there are many private cars in the rural areas which are used mainly for agricultural activities (Petrakos, 2012). However, it has a positive impact on regional unemployment. Finally, the most developed regions exhibit higher unemployment rates since the majority of the people is going there to find a (better) job. This is not in line with Okun's law.

Table 13: Results of the model for the second year/post-crisis (2010)

Variable	Coefficient	Probability
C	1.636178	0.6179
HOUELEPC	4.842618	0.0452**
SAVPC	-0.000616	0.0451**
BUILDPC	-0.316775	0.4636
CARPC	0.122106	0.0517***
EXPORTS	0.000101	0.8189
GDPPC	8.51E-05	0.6017
INCPC	0.000653	0.4451
POPDENS	-0.002728	0.3903
POPGROW	0.180458	0.0016*

*statistically significant in 1%

**statistically significant in 5%

***statistically significant in 10%

Explanation:

The results for 2010 indicate that HOUELEPC, which is an index of richness and wealth of the regions, has a positive impact on regional unemployment. So, many people are migrating to the wealthiest and richest regions in order to find a (better) job. As a result in these regions the unemployment rate is higher. Savings per capita is a biased variable since it depends on local behavior of each region; however it shows a negative impact on regional unemployment. "Cars per capita" index, which is also a biased variable, is higher in big agglomerations where the unemployment rate is higher. Finally, the regions with high population growth exhibit higher unemployment rates.

Table 14: Overall evaluation of the results of the first model

Name	Variable	Impact (growth period)	Impact (recession period)	Impact (overall period)
GRAVITY	Geographical centrality of one region	Positive	positive (expected)	Positive
IDIS	Index of Dissimilarity of Industrial Structures	negative	negative (expected)	Negative
THEIL	Theil index of specialization (in terms of employment)	Negative	positive (expected)	-
THEILAGR	Specialization in agriculture (in terms of employment)	-	negative (expected)	Negative
THEILIN	Specialization in manufacturing (in terms of employment)	Positive	-	Positive
THEILSE	Specialization in services (in terms of employment)	-	positive (expected)	-
UNEMP	Initial unemployment rate	Negative	negative (expected)	negative
PUBINV	Public investment	Negative	-	-
PUBSEC	Public sector output share (% of regional total output)	Negative	negative (expected)	Negative
EMPSHPUS	Public sector employment share (& of total regional employment)	-	negative (expected)	-
FIRMS	Number of firms	Negative	negative (expected)	-
FIRMSDEN	Firms' density	-	negative (no expected)	Negative
AGGL	Agglomeration index	-	-	Negative
SECEDU	Students of secondary education (per 1000 residents)	Positive	positive (expected)	Positive
DSAVHIGH	Dummy variable for savings per capita: 1 if it is higher than the national average, 0 if it is lower	Positive	-	-
BUILDC	New buildings per capita	-	negative	-
HOUELEPC	Household consumption of electricity per capita	-	-	Positive
CARPC	Private cars per capita	-	-	Positive

Source: Own elaboration

There are some interesting points that can be made regarding the results and the overall table of our models. Firstly, there are some contradicting results: crisis has hit much more the big urban centers (Petrakos, 2012; Robolis, 2012) which is verified from the signs of gravity, cars per capita and household consumption of electricity per capita but is not in line with the findings of firms' density and agglomeration index (for 2008-2011 or 2001-2011).

Another interesting point is to observe the changes of behavior of specific factors in case of economic growth (in the period after Greece joined Eurozone) and in case of economic recession (after crisis struck Greece). The only case like this in our model is this of specialization: it is beneficial for a region during economic growth but it is not during economic recession.

After Greece joined Eurozone there was a gradual decline of regional unemployment rate in a background of economic growth without, however, any significant results of convergence (according to β-convergence model). Correlation shows that there was a slight convergence of regional unemployment (graph 36). On contrary, WCV shows that regional divergence was the dominant trend in 2001-2008. With regards to the determinant factors in this period regional dissimilarity and specialization seem to have the strongest negative impact on unemployment rate change while regional specialization in manufacturing and geographical centrality are considered as the factors with the strongest positive effect.

The period after 2008, largely stigmatized by global crisis, changed completely the conditions in Greek society: standards of living largely deteriorated, unemployment racketed up to 22% in March of 2012, 50% of youth are unemployed, Greece was trapped in a pathway of huge economic recession: the only national economy, after World War II, experiencing economic recession for five years in the raw. Unemployment increased in the 96% of the NUTS III regions.

Regional unemployment trend seems to be the convergence in higher rates (undesirable convergence) according to β-convergence model and correlation (table 8 & graph 36): regions with higher initial unemployment show lower unemployment change while regions with lower initial unemployment experience later higher unemployment change. On contrary, WCV indicates a slight regional divergence trend in terms of regional unemployment rate.

The determinant factors with the strongest negative influence on regional unemployment rate change in 2008-2011 seem to be regional dissimilarity, regional specialization in agriculture and dependence on public sector while these with the strongest positive impact are considered to be regional specialization in services, regional specialization and geographical centrality.

In overall period 2001-2011, which includes both economic growth and economic recession and the impact of both Eurozone access and global crisis, unemployment change is positive in almost all the regions: in the 88% of the Greek NUTS III regions unemployment increased in 2001-2011. According to β-convergence model and correlation results (table 8 & graph 36) there is a regional (undesirable, i.e. to higher unemployment) convergence trend; again, the opposite is the finding of WCV is the opposite since it shows that regional divergence is the dominant trend of 2001-2011.

Regarding the determinant factors of regional unemployment rate change, regional dissimilarity, regional specialization in agriculture and dependence in public sector show the strongest negative impact whereas regional specialization in manufacturing, household electricity consumption per capita and education indicate the strongest positive impact.

Finally, it is certainly a story of initial conditions (for its presence in all the models as a significant negative determinant factor), regional (sectoral) specialization-diversification and public sector dependence: initial unemployment has a negative impact on unemployment rate change in all the periods under examination, regional specialization benefits in growth but hurts in recession. Regional specialization in manufacturing in growth and in overall period increases unemployment rate and specialization in services has a very negative impact on unemployment rate change since it is the origin sector of current crisis. On contrary, specialization in agriculture pushed down unemployment rate in recession and overall period.

Diversification is beneficial in all the periods and public sector dependence is an obstacle to unemployment rate increase. There is not a certain conclusion for agglomeration economies from the findings of the models; however taking into account the findings of the correlation between unemployment rate and agglomeration economies (graph 33) and the opinions of Petrakos (2012) and Robolis (2012) until now the regions with big cities were mostly hit. So, during growth period the urban

centers are the drivers of regional economies; however, in recession in Greece cities and urban areas have the most negative impact, i.e. they constitute a problem.

Table 15: Overall evaluation of the results of the second model

Name	Variable	Impact (2006)	Impact (2010)
BUILDPC	New buildings per capita	Negative	-
GDP	GDP per capita	positive	-
HOUELEPC	Household consumption of electricity per capita	-	positive (expected)
SAVPC	Savings per capita	positive	negative
CARPC	Cars per capita	negative	Positive
POPGROW	Population growth	-	Positive

Source: Own elaboration

In this model, whose results may not be the most suitable since the factors need a certain period of 2 or 3 to start revealing their impact (Kallioras & Petrakos, 2010), there are some interesting points that should be noticed: there is an enhancement of the claim that regions with big cities are mostly hit since household consumption of electricity per capita has a positive impact on unemployment rate in 2010.

It is also interesting to observe that for savings per capita and cars per capita variables there is a change in their impact on unemployment from 2006 to 2010: the higher the cars per capita during growth the lower the unemployment and the opposite during recession and the higher the savings per capita in growth period the higher the unemployment rate and the opposite in recession.

Finally, we propose a typology of the resilient and vulnerable regions in both growth and recession periods in terms of unemployment taking into account the findings of the models, the opinions of the interviewees and the literature review:

Table 16: A proposed typology of the Greek NUTS III regions

	Growth period		**Recession period**	
Resilient Greek NUTS III region	Public dependence	High	Public dependence	High
	Initial unemployment	High	Initial unemployment	High
	Regional Specialization	High	Regional diversification	High
	Regional diversification	High	Regional Specialization in agriculture	High
			Agglomeration economies	Low
Vulnerable Greek NUTS III region	Public dependence	Low	Public dependence	Low
	Initial unemployment	Low	Initial unemployment	Low
	Regional Specialization in Manufacturing	High	Regional Specialization	High
			Regional specialization in services	High
			Agglomeration economies	High

Source: Own elaboration

6. Policies implemented to confront crisis

This is, more or less, the situation of society in Greece after 2008 that crisis struck the country and more specifically this is the evolution of regional inequalities and of regional unemployment rate change due to crisis' impact. Greek government reacted after the first months of crisis in 2008. However, Greek government did not act in its own: the reaction and the policies in order to confront crisis' impact were directed mainly by the EU and Commission. A detailed analysis regarding the policies implemented in order to confront unemployment increase and a more general analysis about the policies planned for crisis take place in the following lines.

The main spirit of the fully neoliberal policies implemented in the EU is to save and protect the banks and he financial sector. The measures decided and implemented showed that people, the workers and the youth would pay this protection to the financial sector (Lapavitsas, 2010): huge budget cuts and austerity measures were implemented initially to Greece and Ireland and after to Portugal, Spain and Italy (the famous PIIGS). These measures had as a result the deepening of recession caused initially by crisis creating in this way a cycle without end: recession by crisis-austerity-deeper recession.

In this way of acting, Greek government was one of the first that planned the protection of banks: a few months after Lehman Brothers bankrupt subsidized the banks with 28 billion euro, in November 2008 (Papadogiannis, 2008). However, the firms of broader private sector became skeptical to action being doubtful regarding the aims of the banks: the provision or not of money for the support and stimulation of economy (Mpourdaras, 2008). In 2008-2010, there have never been measures for stimulating employment, development.

The introduction of stability program in May 2010 had as a result some of the biggest austerity measures that a national government has ever implemented. There were in total two agreements for almost 270 billion euro which is the 122% of national GDP and the 74% of general government debt of Greece. Each of these agreements was accompanied by an austerity measures package which largely deteriorated the living standards of workers and youth. Actually, these measures were not constant but they would be renewed and evaluated each time that Greek government was supposed to receive the installments of the loans.

The austerity measures were summarized in three big laws: Memorandum I (May 2010), Medium Term Financial Strategy Framework (June 2011) and Memorandum II (February 2012). The most important measures of these laws are: cut of 2 salaries annually in the public sector, increase of retirement age to 65 (from 63), push down of minimum wage in private sector, minimum pension, general push down of salaries and pensions in public sector, 1.5 billion cut in Public Investment Program, increase of Value Added Tax (VAT) from 13% to 23%, abolition of national and sectoral collective agreement. Also, new harder measures (11.5 billion euro) are over negotiations from Greek government with the EU and IMF in order to be decided during the autumn of 2012.

The general reaction of Greek Government was general very pathetic (Robolis, 2012) without any effort for negotiations with the representatives of the EU, IMF and ECB. Greek Government accepted the whole fiscal adjustment to take place in 3 years (which is impossible as it was also indicated by the real situation) and did not proceed in the necessary structural changes (Petrakos, 2012). This took place due to the political parties system which pressed very much the situation and because there is a very strong relationship between the concepts of "political party" and "state" in Greece (Petrakos, 2012). The representatives (well known as "Troika") did not know the special characteristics of Greek economy and their data did not depict the reality. Robolis comments on their econometric model:

"If the deficit declines 1%, the GDP gets down 0.5%, and unemployment increases 0.3%. This model has no relationship with the reality and what finally happened. Because of this all of their prediction is false and because of this every 3 months there are reviews and reconsiderations of the goals and the means of the stability program.

INE (Institute of Labour) was claiming that this regression and these variables were not the suitable ones. For another economy maybe this model would be suitable. In Greece if there is 1% recession, the unemployment increases 1%, too."

(Robolis, 2012)

Also, the program and the policies did not take into account of confronting tax evasion which is huge in Greece, mainly for the richest individuals and companies. Also, pushing down the salaries, except of deteriorating the living standards and the purchasing power of citizens, create, also, deficits of many resources in insurance funds, which are in a very bad economic situation being obliged to borrow almost every 15 days (Robolis, 2012). Their function is not sustainable when there are more than 1,200,000 unemployed people, salaries' cut, orientation to part-time

employment, tax evasion of 8 billion euro orientated for insurance funds and 11 billion euro more from financial obligations to insurance funds from previous years. These were the proposals of Troika; however there were not any proposals from the Greek side.

So, in the background of big recession, on the one hand there were the loans that Greece received. These money were used in order to the rescue the banks with almost 100 billion euro and to pay off the older loans and interests. On the other hand there were the austerity measures which were unfair (only the lower classes and stratums were influenced) and deteriorated the living standards by decreasing the welfare state. The final result was the loss of almost 30% of national GDP in almost 4 years and in an increase of unemployment from 8% to 23%.

Especially for employment protection in order to confront the huge unemployment increase the reaction of the Greek government was almost absent in the period after 2008 (Robolis, 2012). In the same time the regional dimension of these policies was even smaller (Petrakos, 2012). Also, there is general agreement that these policies were not successful at all.

In order to have a broader view of this topic it seems necessary to study what was happening in the past regarding the employment policies.

"Before 2008 there were only passive employment policies, i.e. policies which aimed at stopping the big unemployment. These policies were keeping unemployment in stable levels (9% or 450.000 persons) and were not giving a chance of hiring more persons. Public sector had always the role of protection against unemployment increase and destruction of social cohesion: every time that the unemployment was ready to overcome these levels there were always recruitments in the public sector. Also, Olympic Games played a role in pushing down unemployment.

Looking back, after 1950, the policies focused on the modernization of primary sector (with tractors, fertilizers etc.) which resulted in a transfer of job positions from primary sector and rural areas to the urban areas and to the other two sectors. This had as a result internal migration. However, these two sectors, exactly due to their domestic orientation, cannot absorb and recruit so many persons, except the construction branch growth, resulting in external migration.

Central problem for employment is that Greek economy needs a productive restructuring in both levels of sectors and branches of production and of geographical regions."

(Robolis, 2012)

There have been some programs which promote employment: they were more managing the problems and imbalances in labor market instead of giving permanent solutions by creating new job positions which are a result of investments since there

were no investments (Robolis, 2012). Relocation of resources in activities with unemployed persons and enhancement of employment through subsidies to firms are some actions of these programs (Petrakos, 2012).

Another type of intervention were the centers of employment promotion which subsidized employment with programs of professional training which was also an action of managing than confronting regional unemployment with very few possibilities of success (Petrakos, 2012). Professional training is applied with a false methodology in Greece: there are blank cognitive fields whose research focused on subjective criteria of many employers in local level (Robolis, 2012), i.e. there is not a central plan of the way of training (Petrakos, 2012). After these programs, 50% were finally employed and only 20% were employed in the field that they attended the professional training program.

The policies were not adequate in terms of speed and since they were not accompanied by policies in other sectors and they have never been the outcome of real research (Petrakos, 2012). They are based on ad hoc criteria and they do not prevent the situation but they are reactive.

In conclusion, the policies were not the suitable ones, they were applied very late and they were almost absent in terms of intense, speed and necessity for the Greek economy. Even the policies which were implemented did not have the desirable outcome not only because of the austerity and its deepening (the main reason) but also because of these policies' unsuitability.

7. Conclusions

In the last section of this study the conclusions are drawn, the discussion over the topic is overviewed and topics for future research are introduced. After the whole research, its results and the evaluation of the overall situation it is considered that the conclusions which could be drawn can contribute to a better analysis of current situation and the impact of crisis. These conclusions are discussed below.

This study examined the impact of global economic crisis on regional inequalities in Greece and especially on regional unemployment by focusing on the geographical cross sectional dynamic of crisis shock on unemployment.

Greece has some special characteristics which make it a very different case than the average MS of the EU: small family enterprises in a family network, export base very weak, specialization in tertiary sector but comparative advantage in agriculture, outward FDI is low, extremely high geographical concentration of population and economic activity in the two metropolitan regions of Attiki and Thessaloniki.

In the last period the situation of Greek economy has largely worsened: it had high trade deficit, Olympic Games resulted in a huge deficit, Greece was obliged to borrow in order to repay its older debt and the interests and there was and there is still high tax evasion of the upper class. In such a way, the revenues of the state were not increasing resulting in the high increase of deficit and of public debt.

Greece joined the EU which has two main characteristics: market integration and the (geographical, economic and social) division between Core and Periphery MS (or South and North) which is inherent to the architecture of the EU. Greece is also a member of the Eurozone which has the inherent characteristic to create trade surpluses for the Core economies and trade deficits for the Peripheral ones. In this background, there is evidence for high regional inequalities and regional divergence among the Greek regions until 2008.

In 2008 global economic crisis struck Greece in a very negative way, probably the most significant until now in the whole EU: Greece is the only national economy, after the WW II, which is in recession for five continuous years. The impact of the crisis was deeper in the public debt, the fiscal deficit and in the production, affecting in this way the whole economic and social life of Greek territory. In order to confront

crisis' impact Greece joined also the stability program of IMF-EU-ECB which borrowed to Greece huge loans but which also resulted in one of the biggest waves of austerity and budget cuts ever.

The impact of crisis was not the same in all the regions. As shown in chapter 4 the regional dimension of crisis' impact is important despite crisis is a phenomenon which takes place in national and not in regional level. There seems that among NUTS II regions regional convergence took place in Greece after 2008. However, for NUTS III regions three is not a clear trend: there is regional convergence in 4 economic areas but there is regional divergence in 4 economic areas, too. At this point it should noticed that the regional convergence in this case is not the desirable one since it takes place in areas like unemployment, which means that there is a general increase of this index. Nevertheless, it is clear that the most developed regions are hit mostly by crisis; However, the spatial model of development in Greece has not changed: there is still huge geographical concentration of economic activity in the two metropolitan regions: Attiki is still the leading region.

Employment is probably hit mostly by crisis and the policies implemented to confront it: unemployment increased from 8% to 23% in 4 years (from 2008 to 2012). Now, Greece is in the second position within the EU regarding unemployment, while it takes the first place for young unemployment which in May 2012 was higher than 55%. It is characteristic that the 320,000 job positions which were created in 2000-2008 were lost in two years (2009 and 2010), since in 2009 there were 60,000 firms' closures and 60,000 more in 2010. However, unemployment phenomenon has also its regional dimension.

The first regions to be hit were mainly the insular and cross-border ones (generally declining peripheral regions) and afterwards crisis impact was much more obvious in the urban and mainly metropolitan regions. After autumn of 2011 crisis hit them and unemployment there started to be over the national average since hundreds of thousands of layoffs and firms' closures took place, especially after 2010.

In terms of the trend, WCV of regional unemployment rate shows that there was regional divergence while β-convergence model showed exactly the opposite: an undesirable regional convergence to higher levels of unemployment rate. Correlation

indicated that there has been regional convergence (the same result with β-convergence model).

The special characteristics of each region are connected with some determinant factors which influence the unemployment rate change after crisis struck Greece. Among others there are 4 determinant factors which have been in the centerpiece of the focus of this study: the cities, the public sector size, the initial conditions and the regional specialization/diversification and in which sector. It is shown that these are the most significant factors through the models that we ran in this study (WLS cross sectional econometric model).

Initial conditions are very important in all the periods (before and after crisis, overall period) with a significant negative impact on regional unemployment rate. Regional diversification is beneficial in all the periods. Regional specialization in manufacturing in growth and in overall period increases unemployment rate and specialization in services has a very negative impact on unemployment rate change since it is the origin sector of current crisis. On contrary, specialization in agriculture pushed down unemployment rate in recession and overall period.

Also, public sector dependence is still an obstacle to unemployment rate increase. There is not a certain conclusion for agglomeration economies from the findings of the models; however taking into account the findings of the correlation and the findings of the interviews until now the regions with big cities were mostly hit. So, during growth period the urban centers are the drivers of regional economies; however, in recession in Greece cities and urban areas have the most negative impact.

In such a way of thinking, a proposed profile for the resilient (against unemployment increase) regions in Greece after crisis combines high initial unemployment, low index of agglomeration economies, high public sector dependence, regional diversification and regional specialization in agriculture (a sector which was not hit so much by crisis). On contrary, the profile of the vulnerable region in Greece is a combination of low initial unemployment, big urban centers presence, low public sector dependence, regional specialization and mainly on financial sector (which was hit mostly by crisis).

Finally, the policies which were implemented in order to confront crisis' impact seem to be not the most suitable: they are inefficient since they are always out of target because they bring more austerity to Greek society. The austerity measures are unfair from their origin and goal: the Greek Government aims at saving the banks and the financial sector with the money of the people, of the workers and the youth by hugely deteriorating their living standards. This is something that should stop immediately before the complete destruction of people's lives.

Through this study there were many lessons. First of all, it was the first integrated experience with an econometric model for the student who conducted it. This was a total different and new experience which will be very helpful for the following years. Also, the way that the student got engaged with the scientific research is extremely valuable for the continuation of his future scientific and research career.

Except all these, there were some important difficulties and limitation which were faced during this study that has also some weaknesses. Firstly and most significantly, the section of the data. This study shed light in a certain situation whose period was very close to the conduction of this research. As a result the data availability, especially, for the later period was very difficult. This situation worsened because the main focus of this study was on Greece and its regions since the statistical agency and its data is not in the best availability and validity. Thus, this study was conducted only with the verified available data. As a result, there were limitations and weaknesses in both the model and the conclusions that we made efforts to extract.

Secondly, we noticed also weaknesses in the technique of the econometric model. Problems of multicollinearity occurred prohibiting us in such a way to apply the same structure of the model for all of the three periods. If we were able to do it, the comparison among the factors and the behavior of regional unemployment change in each period of reference is considered that would have been much better.

Thirdly, due to the short period after the struck of crisis that this study was conducted there were some very unbalanced results: dramatic changes took place in the last years in the Greek society and economy. In such a way unemployment growth of 400% increase occurred in some extreme cases of regions largely hit by crisis. It is considered that this research studied the initial impact of crisis in a very short period after it struck Greece.

Future research

Because of this it is considered as necessary furthermore future research on crisis' impact in a longer period with more available data. Nevertheless, the aim of this research was to shed light on the initial impact of crisis on Greek Regional Development, focusing on unemployment, by studying the picture of current (within crisis) situation. Issues regarding regional development in Greece and the impact of current crisis may be the most important in Greece since at this period the Greek economy and its regional economies need development mostly than ever.

Furthermore, a more detailed investigation for each determinant factor with more available data, especially after the publishing of national census in autumn 2012, is considered as both interesting and necessary. Also, time limitations (the period of the conduction of this research was about 5 months) did not allow us to construct the best available version of the econometric model by solving the problems of multicollinearity; because of this it is considered that future research should be related to a more sophisticated econometric model, with higher technique and with already solved the problem of multicollinearity.

Finally, the use of more data regarding real estate, which was the sector that crisis emerged in the USA in 2006, should probably be considerable for future research. In this way of thinking, GIS techniques with more accurate visualizations of the geographical reality would be very useful.

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