Mendel University in Brno
Faculty of Business and Economics

Regional consequences of Economic and Financial crisis in Greece

Diploma thesis

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Abstract

MARTINCOVÁ, Michaela. *Regional consequences of Economic and Financial crisis in Greece,* Brno, 2016. 118 p. Diploma thesis. Mendel university in Brno.

The diploma thesis focuses on impacts of the financial and economic crisis on thirteen NUTS 2 regions of Greece. The objective of the diploma thesis is to investigate whether the crisis affected the process of convergence or divergence among Greek regions. For this purpose, Cluster analyses and β-convergence analyses are applied and run in two time-periods, examining process of convergence and divergence among Greek regions in years before and after the crisis outbreak. To reveal how the crisis influenced economic development of each of thirteen regions separately, macroeconomic analyses of Greek regions and sector division of Greek economy are done for the same time-period with use of important regional macroeconomic indicators.

Keywords

Greece, Greek regions, convergence, divergence, crisis, β-convergence analysis, cluster analysis, impact of crisis

Abstrakt

MARTINCOVÁ, Michaela. *Regionální dopady ekonomické a finanční krize na Řecko.* Brno, 2016. 118 s. Diplomová práce. Mendelova univerzita v Brně.

Diplomová práce se zabývá dopady finanční a ekonomické krize na třináct NUTS 2 regionů Řecka. Cílem práce je zjistit, zda krize ovlivnila proces konvergence nebo divergence Řeckých regionů. Pro tento účel byly použity Shluková a β-konvergenční analýza, které sledovaly proces konvergence a divergence mezi Řeckými regiony ve dvou časových obdobích, v letech před a po začátku krize. Vliv krize na každý ze třinácti regionů byl také zkoumán pomocí makroekonomické analýzy Řeckých regionů a sektorového rozdělení Řecké ekonomiky ve stejném časovém období za použití důležitých regionálních makroekonomických ukazatelů.

Klíčová slova

Řecko, regiony Řecka, konvergence, divergence, krize, β-konvergenční analýza, shluková analýza, dopad krize

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1 Introduction

In 2007, financial crisis of the United States of America erupted. Not only due to the globalization and interconnections of the markets, the financial crisis progressively affected countries throughout the world and converted to the global financial crisis. The credit crunch, which is believed to be a starting point for the crisis, had gradually but significantly shaken national economies of most of the countries in the world. As a result, the worldwide economic environment changed rapidly and had faced entirely new and unknown situations in the modern era of international economy. The European Union had been no exception to this economic harm and fell into a recession in 2009. What initially started as a financial crisis in the Northern America, turned into a sovereign debt crisis in Europe. It was for the very first time in history when the European Union was challenged by severe economic conditions in all of its member states. As a response to the new-emerged crisis, a rescue mechanism providing financial assistance to its members was created by the European Union. In order to secure financial stability and debt sustainability, financial support was received by countries evincing serious economic problems, namely Ireland, Portugal, Spain, Cyprus, Hungary, Latvia, Romania and Greece (Financial assistance in EU member states, 2014).

Greece belongs by both geographical and economic size to smaller countries, accounting for less than 2% of GDP of the European Union. After adapting the Euro in 2001, Greece enjoyed several years of fast growth boosted by low nominal interest rates. However, the weakness of Greek economy that was underlying for several decades was finally brought to the surface when the crisis reached Greece on October 2009. Irresponsibility of several consecutive governments led the public finances of Greece to a very poor shape, resulting in accumulated substantial debt almost exceeding twice the size of its economy (Kouretas, 2011). Thus, the combination of the crisis along with several hidden problems of the Greek economy had an immense impact on its economic performance. As soon as the crisis reached Greece, both values of GDP and GDP per capita of Greece decreased greatly which in turn caused a significant increase of unemployment level. The total GDP of Greece dropped by almost 23% when figures from years 2004 and 2013 are compared and level of unemployment of Greece, reaching 10.6% in 2004, increased up to alarming 27.5% by 2013 (ELSTAT). Despite the fact that Greece has been receiving financial support to address its economic imbalances since May 2010 which so far resulted in total number of three economic adjustment programmes, the debt crisis in Greece is still ongoing these days (Financial assistance to Greece,

2015). The global financial crisis revealed which countries and governments can manage to compete with unexpected economic conditions successfully, and which were incapable of managing such circumstances. Nowadays it is more than evident that Greece failed in this issue to a great extent and although has been provided large financial supports, it still cannot break out of its very arduous economic situation.

Located in southern part of the Balkan peninsula, Greece is divided into 13 administrative regions. Greek regions vary greatly as to their levels of GDP, GDP per capita, sector division or unemployment rates. These differences are given by several factors, as geographical location, number of inhabitants or natural resources by which is a region endowed. As a pole of economic development of Greece can be considered Attica as its economic performance accounts for almost half of the Greek economy and significantly exceeds remaining regions. The rests of the regions lags behind significantly, which can indicate large regional disparities among Greek regions.

The following chapters investigate regional consequences of the economic and financial crisis that strongly hit Greece in late 2009. This diploma thesis tries to find out how the regional disparities among Greek regions developed with its presence and whether it led to convergence or divergence across these regions. Economic performance of each of thirteen regions before and after the crisis eruption is evaluated in a form of macroeconomic and sector structure analyses. Subsequently, Cluster analysis and β-convergence analysis are applied in order to reveal whether the regions followed a convergent or divergent trend in the years before after the crises erupted. However, to better understand overall economic conditions of Greece, an introduction to an overall economic situation of Greece is provided in the literature review, discussing origins and implications of the crisis in Greece and also main economic indicators in years surrounding the crisis. One chapter is also dedicated to the phenomena of convergence which belongs among basic and very important economic assumptions that are essential for strengthening cohesion among the European Union member states.

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2 Objectives of the thesis

The main objective of this diploma thesis is to identify whether the Greek regions tended to converge or diverge before, during and after the economic crisis which erupted in Greece in 2009. Partial goal of the thesis whether was this divergence or convergence of the Greek regions caused by the fact that Greece was quite significantly hit by the financial crisis will be addressed too.

For the purpose of the thesis, two main econometric analyses will be applied in the Practical part. At first, Cluster analyses will be used to reflect development among Greek regions in an observed period. Results will be compared to indicate convergent or divergent trend among Greek regions for these periods. Subsequently, β-convergence analyses will be estimated for the same period in order to reveal how the crisis influenced development process among regions and whether its presence led to convergence or divergence at a regional level. To provide background information for boh of the crucial analyses and discussion part, macroeconomic analyses of the Greek regions and sector division of the Greek regions will be inluded in the Practical part as well. Methodology and description of the datasets used in the Practical part are discussed in chapter Methodology. Due to nature of the Greek economy, the origins of the crisis in Greece will be considered in the Literature review, arguing why the impact of the crisis was so immense on Greece in particular. Evaluation of an overall state of the Greek economy in the years surrounding the crisis within which are covered issues that could endanger convergence of Greek regions will be involved as well. The last chapter of the Literature review will be dedicated to the phenomena of convergence and its importance within the European Union.

Additionally, recommendations based on the results of empirical analyses and findings from the Literature review will be suggested to either support the process of convergence or to slow down the process of divergence of the Greek regions in the discussion section of the thesis.

3 Literature review

The main purpose of the literature review is to provide background information about the state of the Greek economy. To discuss economic performance of Greece, a review of scientific articles, statistics and literature is made. As to the division of this chapter, the first subchapter gives a closer insight into the origins and implications of financial and economical crisis in Greece. Subsequently, development of the Greek economy in years surrounding the crisis is discussed in the second subchapter, mostly touching on period between years 2004 and 2013. The last part of the literature review then deals with the phenomena of convergence and provides a theoretical foundation for further research and practical part.

3.1 Origins of financial and economic crisis in Greece

The financial crisis, unfolding in the second half of 2008, attacked many global advanced economies around the world. What started as a real estate crisis in the USA soon swamped real economies and, in some ways unexpectedly, eventually become "euro debt" crisis for Europe. The nature of the crisis led to some fatal consequences in several euro-area economies, namely Portugal, Spain, Ireland, Cyprus, Italy and Greece, and negatively affected both economic and socio-economic development (Ciro, 2012).

In Greece, the financial crisis contributed to a significant increase of the public debt and eventually burst out to the sovereign government debt-crisis, emerging in late 2009. Soon it became evident that the Greek's budget deficit and public debt would no longer be sustainable. The already vulnerable and woeful state of public finances that had been muddled for decades by irresponsible governments, and overall structural weakness of the country finally hit the wall (Kouretas, 2011). In the following subchapters, the main endogenous and exogenous causes that contributed to the financial and economical crisis in Greece are discussed.

3.1.1 Endogenous causes

The financial crisis revealed several long-standing macroeconomic imbalances and structural weaknesses that have been afflicting Greek economy from inside for decades. Some of the identified endogenous (or in other words 'internal') causes that contributed to the Greek financial and economic crisis and determined the depth and duration of the crisis are the following:

Public finance mismanagement

The mismanaging of public finances is a feature that has been weakening Greek economy for decades. In the study by Makrydakis, Tzavalis and Balfoussias, focusing on the period of 1958-1995 the failure of Greek government to manage intertemporal budget restrictions is clearly demonstrated, which in turn affected the sustainability of the budget deficit with a long term impact. The authors also detect endogenous factors as the main reason for the unsustainability of the Greek debt and point out that to elude the possibility of eventual insolvency in the future, it is necessary to step in (Makrydakis, Tzavalis and Balfoussias, 1999). Unfortunately, the recommendations had not been heard out, and over last 3 decades (1980-2009) the rising living standards in Greece had been financed by continuously increasing debt. This action crucially affected the health of the Greek economy and lead to an excessive budget deficit. The development of the debt-GDP ratio[1] in Greece is presented in Fig.1, focusing on a period of 1970-2012, highlighting the different governments and political regimes over that time. From the graph it is evident that the debt-GDP ratio was nearly constant, oscillating around 25% until late 70's. From 1981, when socialist government took the public finance management over, the debt-GDP ratio kept increasing and by the end of 1980's the public debt reached 80% of GDP. In contrary with the previous regime, when external borrowings served mainly for investment purposes, the socialist government used the external finances to boost the consumption to a higher level in order to increase living standards of Greek households. This deterministic fiscal policy is by some authors argued to be the main source of unsustainability that has been afflicting the Greek economy until recent times. Besides, during this period EU convergence and cohesion policies brought to the country quite high capital flows in the form of agricultural and infrastructure subsidies (Kouretas, Vlamis, 2010). In the period of 1990-1993 when the conservative government was in power, the increasing trend continued and by 1994 the debt-GDP ratio reached 110%. The GDP-debt ratio then stayed steady at this level until 1999. Within this 5-year-long period (1994-1999) the new socialist government stabilized the debt in order to fulfil Maastrich criteria and introduce new currency – the euro. Greece then adopted the euro on 1[St] January 2001 which brought several benefits to a country with historically high levels of inflation[2]. The reduction of

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[1] GDP-debt ratio is the ratio describing country's national debt to its GDP. A prudential limit for developed countries is estimated to 60% of GDP-debt ratio. Fiscal sustainability of a country can be then jeopardized when this limit is exceeded on a long-term basis (Chowdhury, Islam, 2012).
[2] In the years 1990-2000, the inflation was around 10% on average. After joining the Eurozone, the inflation decreased noticeably compared to previous decade and reached only 3.4% on average (Gibson, Hall, Tavlas, 2011).

inflation accompanied by decrease of nominal interest rates and exchange-rate uncertainty and generally higher credibility of the market increased both private and business investments. In years 2001 to 2008, the country was experiencing fast real growth rate of averaging 3.9% per year[3] and the economy, supported by low inflation environment, flourished. Nevertheless, instead of availing this advantageous situation, to fund relatively expensive lifestyle the governments ran 6% of GDP fiscal deficits on average a year. The debt-GDP ratio was quite stabilized between years 1999-2007 and oscillating around 100% level due to the high growth rate of the Greek economy as mentioned above. An alerting turn occurred in 2007 when the GDP-debt ratio rose up to 130% as a result of a dramatic increase in external borrowings (Kouretas, 2011). Since then, the GDP-debt ratio was continuously increasing and in 2011 reached alarming 145%, indicating that Greece is unlikely to pay its debts back. Apart from this immense increase of GDP-debt ratio, the share of government spending in the economy also rose. This made the government one of the most important customers for the private sector and deepened already low level of competitiveness of Greek economy at the same time (Antzoulatos, 2011).
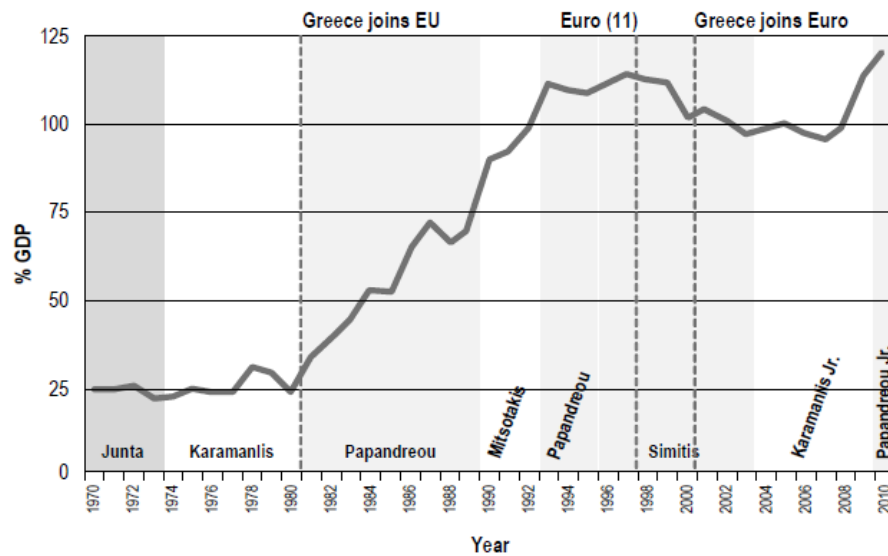
Fig. 1   The public debt to GDP ratio in Greece in years 1970-2010.
Source: Trading economics, Eurostat

Similarly to the past, the Greek government was failing its responsibilities again and the necessary fiscal consolidation was lacking. On top of that, the credibility of the government and Greece itself had been damaged

[3] After Ireland, it was the second highest GDP growth rate in the Eurozone (Gibson, Hall, Tavlas, 2011).

significantly when it was revealed that the Greek fiscal data reports had been continuously falsified[4] (Kouretas, Vlamis, 2010). Though, it should be pointed out here that the structural domestic weakness characterized by chronic fiscal deficits was not the only hidden problem that harmed Greek economy. The benevolent conditions on international financial markets, including very low interest rates up to 2007 played its negative role too. It did not ease only financing of the budget and the current account deficit but also private spending. As a result of inefficient supervision of European institutions over the European financial market and vague conditions of international financial market, the Greek banks used international savings to offset insufficient national savings (Antzoulatos, 2011). This issue is further discussed in the subchapter 3.1.2.

Lack of competitiveness
Another crucial attribute that besets the Greek economy on a long-term basis is a lack of competitiveness which has its roots in the 1970s. As a result of relatively high prices and wage increase, the competitiveness declined by 20% (measured by consumer prices) in the period of 2001-2009. Although the inflation was for Greek historical standards low in these years, it was still relatively high by the Eurozone standards. On average, the inflation in Greece exceeded the other the Eurozone countries by more than one percentage point a year (Gibson, Hall, Tavlas, 2011). At the same time, wages in both tradable (manufacturing industry) and non-tradable (construction, services, public sector) sector increased and exceeded the Eurozone average increases as well. The tradable-sector-wages appreciated by 5.5% in real terms and the non-tradable-sector-wages by surprising a 16.5%, hence undermining already historically low level of Greek competitiveness (Kouretas, 2011). According to the Global Competitiveness Index[5], Greece ranked 37th out of 104 countries in

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[4] In October 2009, the incoming government reported that the fiscal data in previous years had been falsified. The government deficit for 2008 was corrected from 5.0% to 7.7% (eventually edited to 9.4%) of GDP and the estimation for 2009 was increased from 3.7% to 12.5% (later to 15.4%) of GDP. The public debt estimate for 2009 was also edited from 99.6% to 115.1% (later to 126.8%) of GDP (Matsaganis, 2011).

[5] The Global Competitiveness Index (GCI) is announced annually in the Global Competitiveness Report by the World Economic Forum. It measures factors that influence productivity and prosperity and it can be also depicted as "the set of institutions, factors and policies, that set the sustainable current and medium-term levels of economic prosperity". The GCI is organized into 12 pillars and 3 sub-indexes: basic requirements (macroeconomic stability, state of public institutions etc.), efficiency enhancers (market size, goods and labour market efficiency etc.) and

2004 and since then its competitive position has been gradually deteriorating. Its ranking reached 56th place out of 133 countries in 2009 and alarming 98th place out of 142 countries three years later. Although its competitiveness position started to improve again after 2012, Greece is still ranked in quite high numbers compared to other European economies (Global competitiveness index, 2013).

The difficulty is that the lack of competitiveness does not affect only the position of Greece in international markets. The continuous decline of competitiveness of Greece and at the same time high growth rates that occurred after joining euro-area countries had also another consequence. It led the country to the persistent increasing deficit in the current account that became much higher than in other euro-area countries in years leading to the crisis. While in 2001 the current account deficit reached around 7% of GDP, in 2008 it was already 14.7% (Kouretas, 2011). Since 2001, the current account deficit was permanently above 5% of GDP and since 2006 above 10% of GDP almost every single year. According to historical experience, such a widening and persistent current account deficit would eventually lead to crisis, regardless of the presence or non-presence of budget deficit. Besides, what added up even more to this was an increasing level of de-industrialization of the Greek economy during last few decades and in particular for its young population, lacking prospects for decent employment. Last but not least, Antzoulatos also provides empirical evidence that the decline in the current account deficit is followed by the decline in the budget deficit, making the current account deficit the root cause of the Greek crisis. This is caused by the fact that the pressure of declining current account deficits forces governments to rise spending, which leads to an increasing budget deficit (Antzoulatos, 2011). Table 1 demonstrates unavoidability of the Greek crisis as a result of a strong interdependency of several macroeconomic indicators in years 2002-2008.

innvation and sophistication factors (innovation and business sophistication). Country coverage varies each year (Global Competitiveness Index, 2013).

Tab. 1   The current account deficit, the budget deficit, real GDP growth and competitiveness indicator of Greece in years 2002-2008.

Years	2002	2003	2004	2005	2006	2007	2008
Current account (% GDP)	-6.8	-6.5	-5.8	−7.6	−11.3	−14.5	−14.7
Budget Deficit (% GDP)	-4.8	-5.7	-7.4	−5.3	−3.9	−6.4	−7.8
Real GDP Growth (%)	3.4	5.9	4.4	2.3	4.5	4.3	1.3
Competitiveness indicator (CPI)	91.8	97.4	99.6	100.0	100.9	102.6	104.8

Source: OECD, 2010

Public sector ineffectiveness

Ineffectiveness of the public sector (public administration, education and social services) is another endogenous cause that is partly responsible for evolution of the Greek crisis to a such extent. Public sector of Greece is relatively large compared to the European Union average and accounts for more than 20% of overall economic activity of a country. Combined with private sector distortions lasting for more than last 3 decades, it has influenced the productivity of the Greek economy and was partly responsible for de-industrialization of the country. After joining the Eurozone in 2001, there was a significant real appreciation of non-tradable-sector wages (16.5%), as stated above. Simultaneously, this was accompanied by a steep increase of public sector employees in public welfare companies, municipalities and also General government, resulting in a gigantic public sector (Kouretas, 2011). Greece had the highest growth increase in public administration employment and public spending in comparison to EU-16 countries during the years 1995-2005 (Tepe, 2009).

Inefficient public sector contributed to the loss of competitiveness, hence deterioration of the current account deficit. Both labour and capital were shifted from the private sector (particularly from export-oriented private sector) to the public sector. As mentioned above, there was a very close business relationship between public and private sector, majority of the business contracts of private companies were actually with the government. This resulted in the government being one of the most important customers hence the continuous decrease of competitiveness of the Greek economy as the private sector became too dependent on government contracts. It led to a certain indolence of a private sector which eventually ended up making less effort for development and research, and production focused on export and innovation of products

(Kouretas, 2011). Moreover, the scientific paper of Katsaitis and Doulos discusses that the EU structural funds towards Greece had an unfavourable impact on private investments in the past. This is due to the fact that the EU structural funds can only work in a favour of a country if there is a high institutional quality. As this institutional quality was lacking in Greece, the crowding out effect of private investments by government investments (financed by EU structural funds) occurred in Greece (Katsaitis, Doulos, 2009). Likewise, Jurlin and Cuckovic also proved low level of institutional quality of Greece in their Comparative Analysis of the Quality of Institutions in the European countries. In their analysis, Greece was ranked 15th out of 16 European countries, falling down from the European average throughout years 2003-2008 and leaving only Italy behind (Jurlin, Cuckovic, 2009).

The OECD[6] report on the central administration of Greece is another relevant source that agrees with the authors above. It describes the system of public administration as system generating conditions for corruption, supporting inadequate behaviour of individuals, resulting in clientelism. This is also supported by the Eurobarometer survey according to which 98% of Greek population consider corruption as a major problem in Greece. The report also reveals weak level of central authority resulting in difficult implementation of new policies and reforms, shortcomings of data collection, an inadequacy of human resources with limited mobility within the public sector, inefficient control mechanisms and ineffective cooperation within and between ministries. Ministries do not provide information easily and a sense of collective commitment is lacking, cooperation is usually based on a personal knowledge. The report also recognizes lack of transparency in budget management, in particular monitoring and controlling expenditures (OECD, 2011).

Grey economy and tax evasion

The last two interconnected problems of the Greek economy that are classified as endogenous are grey economy and tax evasion. Although some authors argue that the tax evasion is myth which had been used by the Greek socialist governments to avoid restructuring of public sector that could become politically costly, the data reveals that the problem of tax evasion in Greece exists (Beáta Farkas et al., 2013). The size of shadow economy and tax evasion had been continuously increasing over last few decades. Table 2 demonstrates

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[6] OECD is an Organization for Economic Cooperation and Development. Its aim is to stimulate economic progress and world trade and promote economic growth, prosperity and sustainable development. The first convention was signed in 1960 by 20 worldwide countries. Since then, 14 more countries have become new members of the Organization, including Greece, which joined the Organization on 27th September 1961 (OECD, 2015).

development of the shadow economy's size as a percentage of Greek GDP in selected years. In years 1999-2007, the size of the shadow economy in Greece stood for 27.5% of Greece's GDP on average which is double the OECD average (Schneider, Williams, 2013). Berger et al. argue, that shadow economy in Greece experienced rising trend since adaption of the Euro in 2001. Their study also provides evidence that there exists a positive relation between the size of shadow economy and debt-to-GDP ratio. Thus, to reach macroeconomic and financial stability of Greece it is necessary to apply policies that prevent from tax evasion (Berger et al,, 2014). Another suggestion how to decrease high percentage of shadow economy to GDP is to make shadow economy part of the official economy by absorption the shadow economy in the values of Greek GDP (Aristidis, Ioannis, 2014).

Tab. 2   Size of the shadow economy as a % of Greek GDP in Greece in selected years.

Years	1989	1994	1997	1999	2001	2003	2005	2007	2009
Shadow economy (% GDP)	22.6	28.6	29.0	28.5	28.2	27.4	26.9	26.5	25.0

Source: Schneider, Williams, 2013

Similarly to Southern European countries (Spain, Portugal and Italy) the share of the shadow economy in Greece equals up to 20% of national income. The causes of such a high percentage include tax and social security burdens, tax evasion related to low tax morale and poor quality of public institutions and services. Greek tax system lacks transparency and incites to frauds. Besides, there is also evidence which suggests that size of the shadow economy depends on the proportion of self-employed as a proportion of total employment. In Greece it is almost 50% of employed population that works in self-employment (Schneider, Williams, 2013). Estimated untaxed income of self-employed population for 2009 in Greece was 28 billion euro (31% of the deficit in 2009 and 48% in 2008). Primary tax-evading industries include medicine (doctors), accounting and financial services (financial agents), engineering, education (private tutors), and law. Two conclusions can be drawn from this. First, industries that require less paper work tend to evade the tax more. Second, the occupations of members of parliament relate closely with occupations that evade the tax. Not surprisingly, the same members of parliament then fail to apply reforms focusing on their own industries (Artavanis, Morse and Tsousoura, 2012). These conclusions are also supported by Transparency International *National Survey* on Corruption on Greece from 2010. The survey included questions into the prevalence of bribery in Greece, specifically asking respondents where their last bribe happened. Most of the bribes occurred in

following locations: hospitals, law offices, private medical practices, banks, vehicle inspection centres, companies, clinics, in engineering offices (Transparency International, 2010).
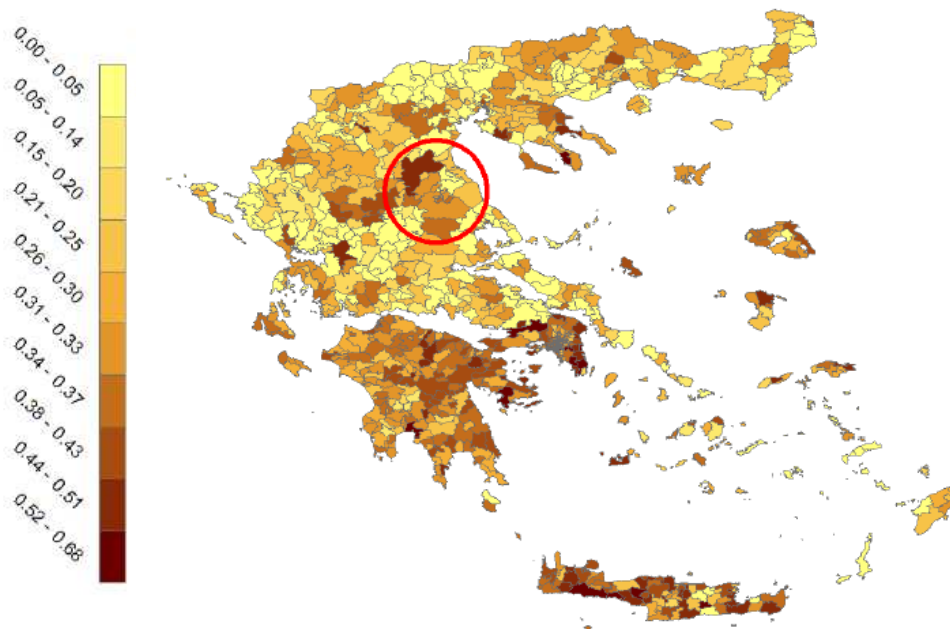
Fig. 2   Geographical prevalence of tax evasion in Greek prefectures in years 2003-2010. Source: Artavanis, Morse and Tsousoura, 2012

Geographical prevalence of tax evasion in Greek prefectures is shown in the Figure 2 and covers period of 2003-2010. The figure clearly shows that tax evasion in Greece is dispersed and that it is not a problem of a single region or prefecture. The legend on the left of the figure represents tax evasion in percents, the darkest colour stands for the regions where the tax-evasion reaches the highest level, the lightest colour the opposite. There is also an interesting story about the dark area in the red circle - Larissa. In 2011, the Financial Times reported Larissa as an area benefiting from European Commission subsidies to quite an extent. This area has the highest density of Porsche Cayennes cars in the whole Europe, and – not surprisingly – belongs to the high tax evasion districts (Artavanis, Morse and Tsousoura, 2012).

3.1.2   Exogenous causes

The exogenous, or in other words 'external', causes that determined the Greek financial and economic crisis can be described as following:

Bailout timing

Some argue that much of the responsibility rests with ECB and the Eurozone governments. Their delayed reaction and unclear messages to the financial markets about willingness to support Greece (and other the Eurozone countries facing financial problems after the crisis outbreak) both politically and financially drowned the Greek economy in even more trouble. The Greek financial market which had already been vulnerable lost credibility to even a larger extent and became untrustworthy which caused confusion of both economic agents and public. It eventually became clear that the Eurozone and ECB were ill-prepared and didn't react fast enough to the increasing issue of financial credibility. The reason for such a tardy reaction can be connected with vague and ambiguous message of EU treaties and the issue whether or not it is allowed to bail out a member state. A legal relevancy related to this issue occurred and was discussed in many Eurozone governments. In spite of this legal uncertainty, the Maastricht Treaty does not state that a Member state which happens to be in a financial difficulty shall not be supported, either from the EU sources or outside bodies, e.g. IMF, World Bank etc. (De Grauwe, 2010). In fact, the Article 103a of the Maastricht Treaty says the opposite, namely that:

"Where a Member State is in difficulties or is seriously threatened with severe difficulties caused by natural disasters or exceptional occurrences beyond its control, the Council, acting by a qualified majority on a proposal from the Commission, may grant, under certain conditions, Community financial assistance to the Member State concerned" (Treaty on European Union, 1992).

At the beginning of 2010, quite soon after the global financial crisis fully spread in Europe, the ECB still was not certain and did not provide any strategy responding the impending debt crisis. Thus, the financial markets could not be assured that the ECB would still be accepting downgraded Greek government bonds in the future. As this led the financial markets to ongoing speculations on the Greek government bonds, the ECB had to act in order to avoid a tragedy. In February 2010 the ECB then finally announced that the Greek government bonds will be accepted into 2011, regardless of the ratings of the rating agencies (Kouretas, Vlamis, 2010).

However, it is essential to mention that there was also another more serious and stronger reason for the delayed reaction of EU bodies and disagreements among euro-governments. It was continuing lack of political union that prevented the Member States and EU bodies from taking action. Though, it should be mentioned that monetary union such as Eurozone will not

be able to survive in the long-run if the political union and political integration is still lacking (De Grauwe, 2012).

Lack of solidarity funds
The second identified exogenous cause surrounds the impact of the lack of solidarity funds, resulting in the deepening weakness of the Greek economy. This factor is in some ways still related to the previous one because it deals with the missing political union as well as the overall organization of the Eurozone. Although Eurozone is a monetary union, budgets of its Member States are centralized on their national levels, not the European level. When it comes to the shocks (e.g. the financial crisis of 2008), such a decentralized system can then become very ineffective as solidarity financial support is not guaranteed automatically for the Member States (De Grauwe, 2012). In other words, if economic policies (wage and social regulations, budgetary policy etc.) are still run by the national governments, there will be no adjustment mechanism at the supranational level in force protecting member states that are in need (Kouretas, Vlamis, 2010).

In March 2010, the first 110 billion € (30 billion € provided by IMF and 80 billion € provided by EMU) rescue package with the interest rate of 5.5% for Greece was eventually approved by the ECB, the European Commission and IMF and a possible default of the enormous Greek debt was declined. The rescue package was supposed to cover Greek borrowings in upcoming 3 years at the cost of even more strict austerity measures that were applied soon after and aimed at spending cuts and tax increase (Matsaganis, 2011).

Financial markets
The benevolent conditions in international financial markets, especially historically low interest rates during the years 2002 to 2007, reflected on the financial crisis spread too. It became easier to finance not only the budget and the current account deficit but also private spending. The Greek banks used international savings to offset insufficient national savings to satisfy the demand of the market for credit. For both supply and demand side it simply became easier to borrow and lend at longer horizons. Reduction of interest rates, never experienced in Greece before, influenced also policies of the Greek governments, particularly fiscal policy that became very active and progressive during these years (as was mentioned above, it was in this period of time when Greece had the highest increase in public administration employment and public spending in comparison to EU-16 countries). It allowed and stimulated the Greek governments to increase public spending while overlooking the unceasing issue of declining competitiveness, a problem that occurred long

before joining the Eurozone. These actions resulted in an increase of private and public investments and high average annual real growth rate of 3.9%, indicating good state of the Greek economy (Antzoulatos, 2011).

However, during these years, generous financial markets failed to pay attention to long-term problems and sustainability of the Greek economy, huge fiscal imbalances and low competitiveness in particular. The study by Gibson, Hall and Tavlas argues that it was actually the financial markets that may have contributed to belief of Greek governments that the low interest environment would become a steady-state for the Greek economy future. Accommodating conditions of the financial markets allowed the imbalances of Greek economy to grow to unsustainable levels. Their econometric analysis provides evidence that the radical cuts in interest-rate spreads during the years 2001-2009 were undershot and did not correspond with the state of Greek economy. On the contrary, soon after the crisis affected Greece, the interest-rate spreads were overshot by financial markets in an opposite direction very sharply, not reflecting fundamental factors of Greek economy (Gibson, Hall, Tavlas, 2011).

3.2   Greek economy in the years surrounding the crisis

By 2004, the Greek economy was already on its way to the crises as has been discussed in the chapter 3.1. A combination of long-standing mismanagement of public finances, missing competitiveness, public sector ineffectiveness and high percentage of tax evasion resulting in a massive shadow economy already made the crisis in Greece inevitability, a tragedy that was waiting to happen. Thus, when the global economic and financial crisis hit Greece in late 2009, it became soon clear that its economy would be caught in a very arduous situation. This was aggravated even more by hesitation of ECB and Eurozone governments to provide Greece financial support and credibility. Moreover, the global financial markets and their benevolent conditions in years prior to the crisis outbreak bear a part of the blame too.

Following subchapter touches on performance of the Greek economy and its overall state in years surrounding the crisis, mostly focusing on period 2004-2013. However this part of the diploma thesis does not focus on regional economic development in particular, it includes indicators that influence regional economic performance. As majority of these indicators is not available on a regional level, yet are still essential for development and a process of convergence of a country and its regions, it was decided to include them in this part. Hence to provide a better background for further discussion and policy recommendations, the overview of Greek economy situation is made in the time-period which is also examined in the Practical part, including years before

and during the crisis. Following the available literature, important economic indicators are chosen to cover this topic and to understand the impact of the crisis on the entire Greek economy.

3.2.1   Economic indicators

This section deals with important indicators of the Greek economy and their development in the years surrounding the crisis. To outline economic activity of Greece in this time-period, indicators such GDP and its growth and components, development of debt along with current revenues and expenditures and balance of trade are presented. These are completed by real disposable income, private expenditures, and private sector borrowing and also by indicators related to labour market. In the end, barriers that prevent people setting up business in Greece are discussed. It should be pointed out that some of the figures presented bellow also include projection of respective indicators and their future development after the implementation of the austerity policy measures to Greek economy. The projections were made by Troika[7] in years following the outset of the crisis and reflect the possible impact of the economic adjustment practices on economic performance of Greece. However, to discuss and examine these practicies is out of the scope of this thesis.

Gross domestic product
Figure 3 presents development of the real GDP and GDP growth in Greece in years 2000-2012. From the graphs can be nicely seen that after adaption of the Euro in 2001, the Greek economy flourished and its GDP experienced a strong upward trend. Until 2008, Greece belonged to the fastest growing economies in the Eurozone with an annual increase of real growth rate around 4% on average. As demonstrated in the figure 3, this changed dramatically when the crisis entered the Eurozone and Greece in particular in 2009. Since then, Greece has lost more than 20% of GDP and its GDP growth rate has turned to continuous negative values. The impact of the crisis on Greek economy is also evident when comparing the GDP figures of the years before and during the crisis: while in 2008 GDP of Greece reached around 217 billion €, by 2012 it had fallen to less than 170 billion €.

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[7] Troika, sometimes also called European Troika, refers to grouping of the European Central Bank (ECB), the European Commission (EC) and the International Monetary Fund (IMF). Troika monitors and provides recommendations on policies that aim to solve crisis and also acts as an international lender in countries affected by the crisis.
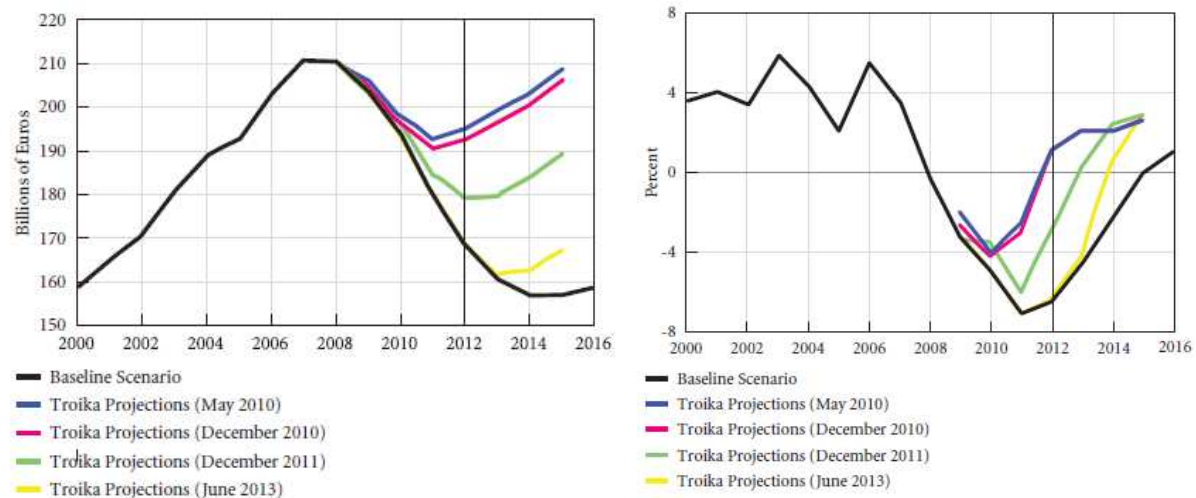
Fig. 3   Real GDP and GDP growth in Greece in years 2000-2012.
Source: Papadimitriou, Nikiforos and Zezza, 2013

Attention should be also paid to the determinants of GDP growth which is presented in the figure 4. Contribution of the aggregate demand to the real GDP growth rate in years 2004-2012 is shown in the left figure. The figure on the right then presents contribution to the real GDP growth rate from the same components in the equivalent of money in billion of €.

The figures below show that the crisis's had a significant negative impact on all of the GDP components. The main GDP component and growth determinant was in the years prior to the crisis consumption. Its position changed with the eruption of the crisis in 2009 and its share on contribution to the real GDP growth decreased greatly. Consumption was affected more than any other determinants which reflected in deterioration of GDP growth. The figure clearly shows that GDP and consumption stick closely together during the whole observed period. This makes consumption a component which has a crucial impact on GDP growth development. It should be highlighted that some areas of consumption have been challenged more than the others. A significant decline in consumption was recorded in particular by restaurants and hotels (Milatovic, Sanfey, 2015). This could significantly influence regions for which hospitability represents one of the major sources of income (mostly touristic regions such Crete or South Aegean) and could lead to a diverging trend across regions.
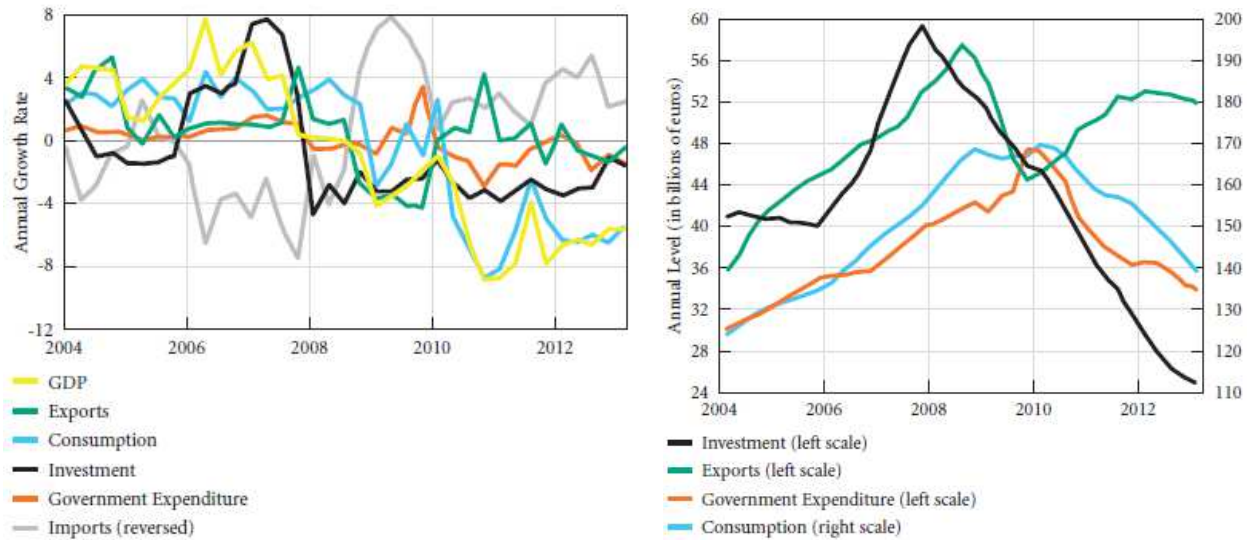
Fig. 4   Contribution to real GDP growth and components of GDP in Greece in years 2000-2012.
Source: Papadimitriou, Nikiforos and Zezza, 2013

Decrease in the years after the crisis eruption can be also spotted in investments and real government expenditure, both of which significantly contributed to the real GDP growth prior to year 2009. The decline of investments is troubling in particular as it has reached quite a low level compared to other European countries in the period during the crisis. Moreover, decreasing or uneven investements can cause higher regional disparities and lead to divergence. While in 2008 the total investment (household, public and business investments) share of GDP was estimated to be approximately 24% in Greece, it has experienced a downward trend since then and dropped by more than a half during the recession. As a result, the share of total investments on the GDP in 2013 was only 11% (Eurostat, 2015). Investments declined in most of the sectors, although the most significant drop was experienced in transport equipment, construction, agriculture and extractive industry (Milatovic, Sanfey, 2015). Last of the contributors, export, follows quite an unsteady trend in the observed period. However, the impact of the crisis on this determinant can be also visible in the late 2009 when its performance decreased by 7% in comparison with previous years.

As to the sector structure of the Greek economy and its contribution to the national GDP, a sector that contributes to GDP of Greece the most is services, followed by industry and agriculture sector. While the service sector, with tourism, real estate activities and retail in the foreground, accounted for about 73% of national GDP in 2004, in 2013 it increased to approximately 82%.

Besides tourism, the services sector includes for example public administration, telecommunications and other professions. With the crisis outbreak in 2009, this sector did not experience a sharp decline but managed to keep more or less the same level of GDP contribution since then (around 82%). The second biggest sector contributor to national GDP is industry sector which is, due to the geographical conditions of a country, mostly located in the region Attica. It includes industries such mining, quarrying or products processing. On the contrary to the services industry sector was hit by the crisis significantly. While in 2004, contribution of industry sector to the national GDP reached almost 22%, it started to decline after the crisis eruption and in 2013 it was estimated to contribute by less than 14%. As the third biggest GDP contributor is ranked agriculture sector (including also fishing and forestry) which is situated mostly in regions Central Macedonia, Thessaly and Western Greece. This sector experienced downward trend after the crisis spread out in Greece too, although the slump was not as significant as in the industry sector. While in 2004 agriculture sector contributed to national GDP by about 5%, its contribution after the crisis outbreak started to decline and fell to approximately 4% by 2013 (Statista, 2015).

Debt development, current revenue and current expenditure
Figure 5 provides shows development of Greek gross debt in years 2000-2012. It is evident that the debt has been gradually increasing and in 2011 reached a striking level of about 170% of country's GDP. One more thing should be highlighted here. Compared to other European countries like Spain, Portugal, Ireland or Italy, Greece had been reaching by far the highest debt-to-GDP ratio in the years prior to the crisis, which deepened in particular after year 2000. Besides, when comparing budget revenues and expenditures with EU-27 and EU-17, budget revenues of Greece have been significantly lower that the European average (Ozturk, Sozdemir, 2015).
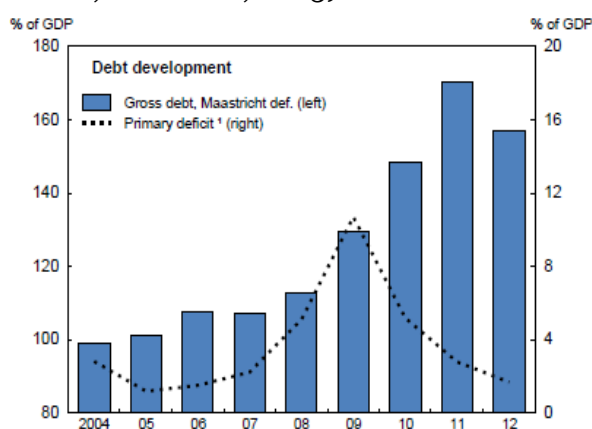
Fig. 5   Development of debt in Greece in years 2000-2012.
Source: OECD report, 2013

Figure 6 depicts major components of government current expenditure (figure on the left) and government current revenues (figure on the right) in years 2000-2012. When looking at the government current expenditure, it is visible that social benefits increased with the crisis breakout. This is logical because amount of social benefits that is paid to the public is directly dependent on the countries unemployment level.
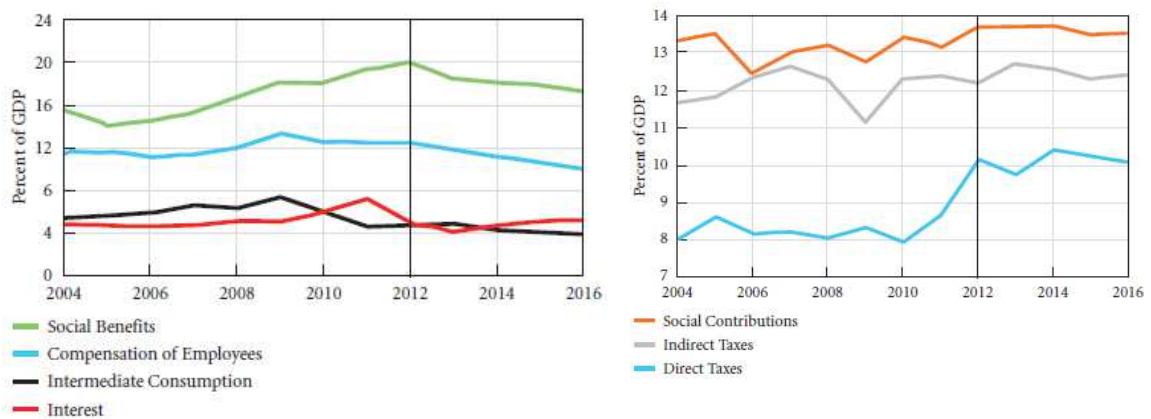
Fig. 6   Government current expenditure and current revenues in years 2000-2012.
Source: Papadimitriou, Nikiforos and Zezza, 2013

In Greece, the level of unemployment has risen remarkably and reached up to 25-30% in the years following the crisis outset. An opposite trend can be observed in the remaining components. Both employee compensation and intermediate consumption experienced a sudden decline in year 2009 and had been keeping this downward trend until 2012. In comparison with the 2007 level, employee compensation declined by 1.2 billion € and intermediate consumption by 5.6 billion €. Moving to the government current revenues, among its main sources belong social contribution and indirect and direct taxes. Both social contribution and direct taxes revenues experienced decline in 2008 but managed to recover to their pre-crisis level by 2012. According to the findings of IKA, the largest Greek social institution, 10% of organizations avoided payments of social contributions in 2008. It was also revealed that over a quarter of workers in Greece were not declared, usually from fields of construction, tourism and retail (Matsaganis and Flevotomou, 2010). If these trends will keep spreading in the future, it could endanger a process of convergence across Greek regions as it tends to cause income inequalities and thus development of regions. Hence, a collection of taxes and social contributions should be a priority for the Greek government. Some authors even

argue that a large part of Greek debt (over 80%) is a responsibility of tax payers along with insufficiency of policies and measures (Ozturk, Sozdemir, 2014). Direct taxes revenue has risen remarkably in 2010 and kept its upward trend until 2012. Comparing with years before the crisis, direct taxes brought to the government about 1 billion € more than in 2007.

Balance of trade and export of goods
Figure 7 highlights the balance of trade in Greece in years 2005-2013. It can be seen that although export started to decline in 2009 it returned and even surpassed its pre-crisis level by 2013. This can be explained by the fact that most of Greek exports headed to countries outside of the Eurozone, for example Turkey and Bulgaria that did not suffer from the Eurozone debt crisis. Import to Greece experienced significant decline in 2009 (from 34% of GDP in 2008 to 24% in 2009) as well but since then no further decline has been monitored. Thus, as a result of these changes, the balance of trade in Greece improved as demonstrated in figure 7.
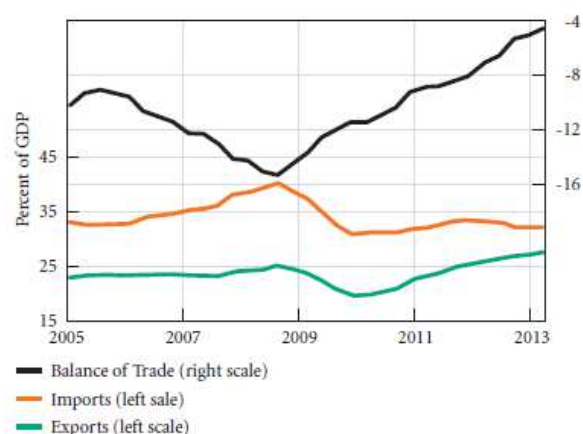
Fig. 7   Balance of trade in years 2005-2013 .
Source: Papadimitriou, Nikiforos and Zezza, 2013

Real disposable income and private expenditure and private sector borrowing
Development of real disposable income and private expenditure in the period of 2004-2012 is shown in figure 8. The figure clearly illustrates that private expenditure in Greece are driven by income that households dispose. Though, it should be noted that this trend for a while changed between years 2008 and 2010. While private expenditure declined as a response to the current economic situation, current disposable income did not follow the same path and maintained the same level until 2010 when it decreased as well. From the figure is also evident that both real disposable income and private expenditure have fallen to negative values in 2010 and remained there since then.
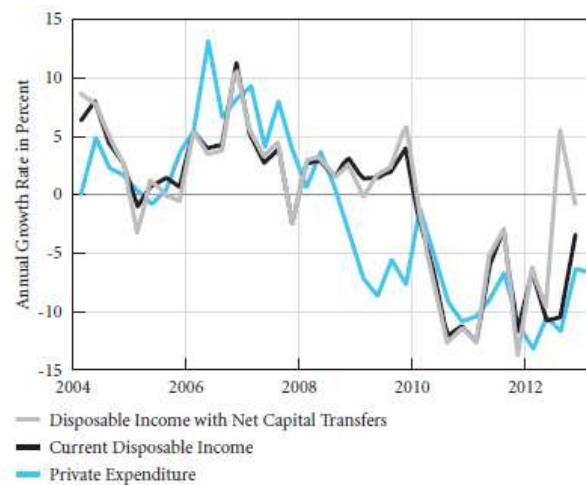
Fig. 8   Real disposable income and private expenditure in years 2004-2013.
Source: Papadimitriou, Nikiforos and Zezza, 2013

Besides, possibility to access credit and tendency of enterprises and households to borrow determine the rate of private expenditure as well. Figure 9 presents private sector borrowing in years 2005-2013. It shows that borrowing of households, nonfinancial and corporate nonfinancial sectors experienced increasing trend in the years prior the crisis. Since 2009, all three variables begun to decline and by 2011 found themselves in negative values.
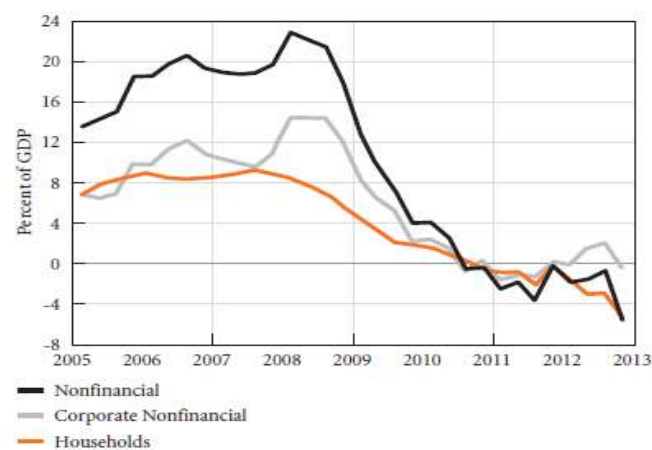
Fig. 9   Private sector borrowing in years 2005-2013.
Source: Papadimitriou, Nikiforos and Zezza, 2013

Labour market
Focusing on labour market of Greece, it is evident that this area has been hit by the crisis severely. As Greece was already facing structural and long-term unemployment in the years prior to the crisis the overall situation deteriorated

even further with the crisis outbreak. Affected have been all age-groups of workers with youth taking a lead. In 2011, youth unemployment rate increased up to 37%, almost a double of the Eurozone average. Regarding the industries of Greek economy, the greatest negative impact on employment was observed in construction sector. On the contrary, a sector employing the highest number of workforce in Greece, tourism, did not experience a significant decline in employment.

As a response to the crisis, austerity measures were subsequently implemented in Greece and, against Troika's expectations, deepened the rate of unemployment even more. The level of unemployment in Greece has been historically exceeding the Eurozone average and has risen even more since 2009, reaching a striking rate of almost 23% in 2012. In 2013 the rate of unemployment reached more than 27% and in 2014 Greece ranked as a country with the highest unemployment rate in the EU-28 with 26.5%. By that time, over one million of Greek citizens have lost their job since the crisis started (Eurostat, 2015). Figure 10 illustrates the development of the unemployment rate in Greece in years 2000-2012.
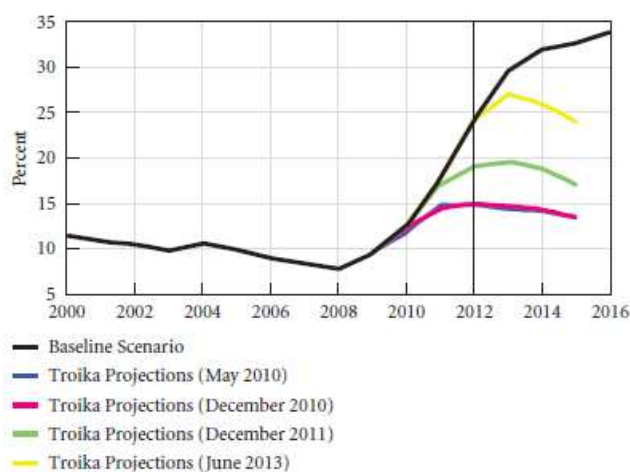
Fig. 10   Unemployment rate in years 2000-2012.
Source: Papadimitriou, Nikiforos and Zezza, 2013

The last figure outlines the development of Greek unit labour cost in years 2008-2013. It should be mentioned that in the period 2000-2009, the unit labour cost in Greece was reaching by 20% higher rates than the rest of the Eurozone, which had a negative impact and undermined its competitiveness. Since 2009, unit labour costs started to decrease slightly and have kept this downward trend since and have been sharply falling since the end of 2011, as demonstrated in figure bellow. This dramatic fall might relate to labour market reforms from 2011 which basically focused on four main priorities, namely

decentralization of wage bargaining system, softer employment protection, the minimum wage reduce and higher working time flexibility (OECD, 2013).
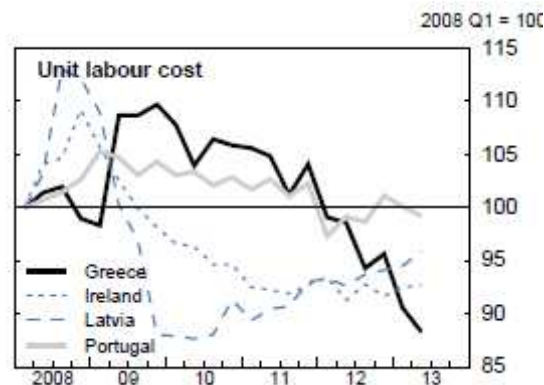
Fig. 11   Unit labour costs in years 2008-2013.
Source: OECD report, 2013

This step had a positive impact on export prices and international competitiveness of Greece however deteriorating of labour market situation, although in a slower motion since 2012, has continued (OECD, 2013).

Barriers to starting a business
The business climate in Greece is rather weak compared to other worldwide economies and the Greek government aims to boost and prioritize an efficient business environment through recently implemented measures. However, there are still number of barriers preventing people from setting up and expanding businesses, in particular for small and medium sized companies. These obstacles include high barriers to entry the market, complex and protracted licensing procedure, bureaucratic and administrative burdens, inefficiency of public sector, obstacles related to use of land and others.
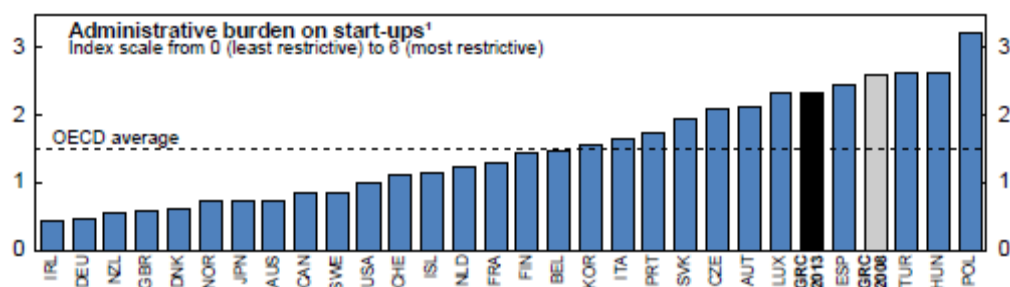
Fig. 12   Administrative burden on starting new business
Source: OECD report 2013

As can be seen in figure 12, Greece ranks quite high in comparison with other countries at administrative burdens imposed on starting-up new business.

In spite of a certain progress between years 2011 and 2013, administrative burdens for setting up business are still relatively high. Thus, to remove barriers to entry and develop business, the whole process of starting new business should be simplified, reviewed and made more efficient. This step could then positively result in international competitiveness of Greece and boost economy of less economically developed regions (OECD, 2013).

3.3 The phenomena of convergence

Following subchapters focus on defining convergence and its approaches alongside with introduction of methods used in its measurement. The last part of this chapter is then dedicated to a summary of existing empirical studies that examine the issue of convergence in both national and regional levels in worldwide, European and particularly Greek context.

3.3.1 Definition of convergence

The phenomena of convergence belong among basic and very important economic assumptions that are essential for strengthening of cohesion of the European Union member states. Economic and social cohesion is, according to the Treaty establishing European Communities, recognized as one of the most important operational priorities. The European Cohesion Policy focuses on economic and social progress along with a high level of employment leading to balanced and sustainable development of the member states and their regions. To achieve cohesion, economic policy measures focused on enhancing growth and simultaneously reducing regional development disparities should be applied (Monfort, 2008). Elimination of development gaps among member state countries strengthens the European Union economy as whole, mending its competitive position in the world and its resistance to both symmetric and asymmetric shocks (Veugelers, Mrak, 2009). Moreover, convergence is also a very important factor related to the issue of European political and economic integration.

Although widely used, convergence is still rather an ambiguous concept. According to the literature, the definition of convergence varies and is modified depending on its use and a type of examined problem which can greatly affect overall results. In the Economic Survey of Europe convergence is depicted as a tendency of rich and poor regions to narrow disparities of real per capita incomes in the long run (Economic Survey of Europe, 2000). In the study of Barro and Sala-i-Martin which follows the neoclassical growth model a slightly different interpretation can be found. The authors describe the issue of convergence as a situation in which poorer economies tend to grow faster than

richer economies in the terms of their per capita incomes and therefore catch-up on them (Barro and Sala-i-Martin, 1992). The term "catching-up" or "catch-up" can be then explained as a process involving wide range of areas in which poorer, or in another words less developed economies attempt to reach economic standards set by richer or in other words more developed economies (Veugelers, Mrak, 2009). To sum up, convergence basically stands for a situation in which difference between two or more variables diminishes in time and thus becomes insignificant, more precisely converges to zero. Convergence is then understood as a catching up process in which a certain level is to be reached (steady-state), more precisely a process of reducing the difference between two (or more) variables in time (Nevima, Melecký, 2011).

In order to comprehend the term convergence better, different approaches to convergence are shortly mentioned too. Based on economic indicators, economic literature usually provides two fundamental types of convergence: nominal convergence and real convergence. These can be then extended by either conditional or unconditional concepts. The term *nominal convergence* is within the European Union used in relation with approaching of macroeconomic indicators. A variable used for estimating the nominal convergence can be for example interest rates. This approach is applied in particular when new countries are entering the Eurozone with a condition of fulfilling Maastricht criteria (Abrhám, Vošta, 2011). *Real convergence* is a process in which economies catch up with the economical level of other developed economies. The variable used for measuring the real convergence is usually GDP per Capita. This variable prevents from issues related to price levels differences and represents the real amount of services and goods produced by the economy in a certain time-period. Another way of describing real convergence is as a process of structural aligning of economies or using innovative technologies. Divergence is then a term used for an opposite situation (Slavík, 2005). The European Cohesion Policy focuses on this approach as well (Gáspár, 2010). The case of real convergence is often connected with the concept of *absolute* (unconditional) *convergence*. Barro and Sala-i-Martin define the term of absolute convergence as a process in which economies tend to converge to the steady-state in the long run. They assume that the steady-state is same for all the economies. This also implies that existing disparities are continuously eliminated because economies with lower income per capita automatically catch up with economies having higher income per capita. The Sollow neoclassic theory of growth draws upon the approach of absolute convergence too (Barro, Sala-i-Martin, 2004). The concept of *conditional convergence* is also presented. Within this approach, assumption of the steady-state being identical for all the economies is not considered. This

approach applies to the economies that experience similar conditions and have similar structural parameters (savings, policies, technologies). That can be demonstrated for example by a similar shape of their production function. Thus, to converge, economies need to follow a similar trend regarding certain parameters. If that is not the case, economies diverge (Nevima, Melecký, 2011).

3.3.2 Measuring convergence

As to measuring convergence, different approaches can be applied. The results of analysis are sensitive to several factors, such as geographical area that is examined (countries, regions, group of regions/countries), datasets, models, period of time examined and last but not least chosen approach. There are basically three methods that examine existence of convergence: distributional, β-convergence and times series approach. *Distributional approach* usually employs σ-convergence. Sigma is defined as a standard deviation of log GDP per capita values among economies in time. It draws upon the neoclassical model of growth according to which all the economies tend to converge to the same level of development or the same economic performance (Melecký, Nevima, 2011). According to the σ-convergence, that presents a negative tendency in a time period, dispersion of incomes among economies should fall over time (Gáspár, 2010). The concept of *β-convergence* is defined as a process in which poor economies (with lower GDP per capita) tend to grow faster than rich economies (with higher GDP per capita) over a long-run and is further discussed in chapter 4 Methodology and subchapter 5.2 β-convergence. *Times series approach* finds its origins in stochastic concepts (e.g. cointegration). In case of presence of unit root in time series, an extreme case of divergence is observed (Gáspár, 2010).

3.3.3 Summary of empirical evidence

A vast number of empirical studies analysing convergence in both regional and national geographical contexts was carried out in the past. The literature in general agrees that technology development (both external and internal) is an important factor for countries' progress, yet it's not an overall cure for success. Several scientific studies (Blanchard, 1996; Transition report of the EBRD) identified as the main drivers related to development of countries within the European Union these three key factors: macro-economic stability, quality of institutions and structural reforms (e.g. competition policies, political reforms and reforms of the economic system etc.) (Veugelers, Mrak, 2009).

As to the testing the existence of convergence in a worldwide context, authors Barro and Sala-i-Martin (1991 and 1995) and Sala-i-Martin (1996) tested income disparities in terms of GDP per capita and growth in number of

countries. By applying an equitation that agrees with neoclassical approach of analysis, they proved that unconditional convergence exists in prefectures of Japan, U.S. states and regions in the period 1880-1998 and in a 73 regions of seven European countries in the period 1950-1985. According to their results, they agree with assumption that poor economies tend to grow faster (in terms of GDP per capita and product) than rich economies. Conditional and unconditional β-convergence was also reported in several groups of economies on a regional level worldwide in studies of De la Fuente (2000), Durlauf and Quah (1999) and Sala-i-Martin (1996). The theory of neoclassical model is also supported by Coulombe and Lee (1995), who reveal convergence in provinces of Canada in the years 1961-1991, or Cashin (1995), who suggests existence of β-convergence in seven Australian states. Beside the fact that authors above are in general in support of β-convergence, they also coincident with beta's estimated value and quite small and stable rate of convergence (approximately 2% per year) across datasets with which economies tend to converge to their steady-state (Magrini, 2004).

When moving the issue of convergence to the Europe as whole, a decent number of scientific studies have been conducted as well. Conditional convergence was reported in number of studies examining various groups of NUTS regions in Europe (see for example Button and Pentecost, 1999; Armstrong 1995; Neven and Gouyette, 1995; Cuadrado-Roura et al. 2000; Fagerberg and Verspagen, 1996; Tondl, 1999 and 2001; Martin, 2001; Magrini, 2004; Romeo-Avila, 2009; Melecký and Nevima, 2011; Abrhám and Vošta, 2011). The authors in general agreed that the concept of convergence in Europe is more unsteady and feeble than in other examined areas and have experienced changes in time. While up to the end of 1970s was the existence of conditional β-convergence rather significant, it stopped during 1980 and then started again at pretty low speed. Besides, the results are also very dependent on a choice of countries and level of their NUTS regions examined and also selection of additional explanatory variables (Margini, 2004). Opposite to this, Pagano's (1993) study focusing on convergence in Europe in years 1950-1988 finds that the convergent process even reversed as a result of oil shocks that occurred during 1970's. Existence of economic dualism[8] between North-Eastern and Southern regions of Europe is reported by the study of Neven and Gouyete (1994). Vošta and Abrhám add to this that the dynamic of economic growth and development has been very different in the European Union member states in

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[8] Economic dualism is a term referring to the coexistence of two separate economic systems within one country. It implies that one of the systems is more advanced than the other one. The systems are determined by development levels, technology and demand.

the last couple of decades. While some of the member states had been reaching favourable dynamics in terms of growth (Ireland, Sweden, Finland, Spain, Greece), the others, mostly represented by big economies, experienced low rate of growth (Italy, Germany, France, Portugal, Austria). This changed dramatically with the eruption of the global economic crisis of 2008 which affected the former growth leaders in particular. Different dynamics of economic growth led to convergence of economic level of member states. This convergent process was a result of narrowing the gaps between new and old member states and their GDPs per capita was in most cases catching up with EU average. Though, the authors conclude that the crisis had just a little significant impact on pace and direction of convergence within EU-27 (Vošta and Abrhám, 2011).

Looking at tendency to converge in regions of European countries, the regularity of the results is not as evident as in the previous case. As the European Union and its policies directly promote cohesion, analysing the existence of convergence became an interest for number of authors. The results weigh strongly in favour of convergence in majority of the cases and convergence was reported for example for regions of Spain (de la Fuente and Vives, 1995), Austria (Hofer and Wörgötter, 1997), Italy (Fabiani and Pellegrini 1997, Paci and Pigliaru 1995), UK (Chatterji and Dewhurst, 1996), Czech Republic (Hančlová, 2010; Melecký and Nevima, 2010), Greece (Siriopoulos and Asteriou 1998; Christopoulos and Tsionas, 2003; Tsionas, Sakkas and Baltas, 2014) and others. Though, the values estimated in relation to the rate of convergence in these countries vary widely (Magrini, 2004). These results are in contrast with the study of Mauro and Podrecca (1994) that empirically tested evidence of convergence across Italian regions, concluding no existence of convergence and suggesting presence of economic dualism between northern and southern Italy.

With focus on Greece in particular, examining regional convergence has become quite an intense area of study for many economists. The empirical studies that cover a broad period of time test convergence in both regional and prefecture levels and bring rather arguable results. According to Athanasiou et al (1995), Greek regions experienced an increasing trend in regional disparities during the first decades after the World War II. Subsequently, the regional disparities decreased in the following years. Analysis of Tsionas examined β-convergence of Greek NUTS III prefectures in years 1971-1993 and revealed evidence of economic dualism and no evidence of convergence (Tsionas, 2002). Authors Syriopoulos and Asteriou (1998) tested existence of β-convergence in the period 1971-1996 within Greek NUTS II regions and came to the similar conclusion. They reported economic dualism between southern and northern

regions of Greece and refuted existence of convergence. These results are also supported Syriopoulos, Karagianni and Asteriou (1998) who, while using another methodology, confirm economic dualism across southern and northern Greek regions for the same time period. These conclusions are argued in the study by Petrakos and Saratsis (2000) who assume tendency of prefectures to converge in the period 1971-1991. Regional convergence within Greek prefectures was also carried out by Tsionas, Efthymios and Christopoulos (2003) covering the period 1971-1995. According to their results the Greek prefectures tend to converge. The study of Benos and Karagiannis (2007) confirms this result. The study is dedicated to testing convergence at both regional (NUTS II) and prefectural (NUTS III) levels in years 1971-2003. The authors indicate existence of β-convergence only among prefectures, not regions, and report no evidence of σ-convergence at any of these levels. The study of Tsionas, Sakkas and Baltas indicates that during the period 1995-2005 the convergence was absent across NUTS II regions however the reported evidence of convergence across NUTS III regions – prefectures (Tsionas, Sakkas and Baltas, 2014).

Heterogeneous conclusions presented in the number of studies above confirm assumption that results are highly sensitive and determined by various factors employed in the analysis (geographical context, dataset, method an approach chosen, examined period). Choice of methodology and dataset can and in most cases will significantly influence the overall results of analysis. Empirical studies examining process of regional convergence in Greece in recent years are rather rare, especially with a regard on potential impacts of the crisis on regional development. Hence, as it is worth to research this area more, the chapter 5 is dedicated to examining this issue.

4 Methodology

In this chapter, detailed theoretical description of methodological approaches, their calculations and datasets used in a practical part is described. Chapter methodology consists of four subchapters and is divided in a same logic as the practical part of this diploma thesis. One important thing should be mentioned here. However the initial aim of the thesis was to evaluate economic performance and convergent processes of Greek regions in periods before the crisis, during the crisis and after the crisis, this approach was abondoned and examined were only pre-crisis and crisis period for basically to two reasons: unavailability of some of the data for years 2014 and 2015 that were supposed to cover the period after the crisis and also strong negative values of all economic indicators in year 2013, indicating that Greek economy was still in reccession.

It should be also highlighted that for the purpose of this diploma thesis, regional classification of Greek NUTS 2 regions is applied in the whole practical part. Greece is divided into thirteen NUTS 2 regions, namely Attica, Central Greece, Central Macedonia, Crete, Eastern Macedonia and Thrace, Epirus, Ionian Islands, North Aegean, Peloponnese, South Aegean, Thessaly, Western Greece and Western Macedonia. For a better understanding and orientation, a map of Greek NUTS 2 regions can be found in appendix 1.

4.1   Macroeconomic analyses

At first, macroeconomic analyses of all 13 Greek regions is made, covering period of 2004-2013. In this analyses development of four important economic indicators is presented at a regional level, namely GDP, GDP per capita, GDP growth and unemployment rate as these were the main economic indicators available from the Hellenic Statistical Authority (ELSTAT) in a requested time-period. Data are adjusted for inflation. The macroeconomic analyses, as well as the other chapters of the practical part, are run in the same logic. Thus, two periods are examined: a pre-crisis one focusing on years before the crisis hit Europe (2004-2008) and period reflecting years in which crisis in Europe was already present (2009-2013). Development of all four indicators is discussed in both time-periods in order to provide a clear understanding of economic performance in each of 13 regions of Greece. Like this, both impact and depth of crisis on particular regions can be observed.

4.2 Sector division

As a next step, economic development of particular sectors of each of 13 Greek regions can be observed. For examining sector structure of Greek regions would be suitable to use components of Greek GDP as they reflect economic development of a region. However the Hellenic Statistical Authority (ELSTAT) does not provide any estimates of GDP components on a regional level. Thus, as another suitable indicator of economic development regional components of GVA are employed instead. GVA is widely used as a measure of regional competitiveness and productivity and, similarly to GDP, estimates output and economic activity. Also the sector structure is evaluated for two time-periods, period before the crisis and period after the crisis outbreak. The pre-crisis period includes averages of regional GVA values of respective sectors for years 2004 to 2008. The period after the crisis outbreak then contains averages of regional GVA values of respective sectors for years 2009 to 2012. Year 2013 is not included due to unavailability of data.

The components of Greek GVA at a regional level include 14 sectors in total. These contain Agriculture, forestry and fishing; Extractive industry and manufacturing including mining and quarrying, electricity and gas supply; Construction; Retail; Transportation and storage; Accommodation and food services; Information and communication; Financial and insurance activities, Real estate activities; Professional, scientific and technical activities. This is followed by constituents of public sector that include Public administration, Education, Health and social work activities and Art and entertainment. Each sector of economy is graphically presented, including both pre-crisis and crisis averages.

4.3 Cluster analysis

Cluster analysis is the first crucial analyses of this diploma thesis. It is a classification technique that focuses on grouping data according to their similarities into clusters in that way, that the objects in a respective clusters are considered to be relatively homogenous. It is a widely used method for revealing socio-economic inequalities among various geographical units, such countries within the same union or regions of a country (Bacher, 1996). It is believed, that differences among economic indicators should not be too large in order to sustain the welfare of a country (or union) as whole. Results of such analyses can then be used as a portfolio for development policies on either regional or union level (Rovan, Sambt, 2003).

In this diploma thesis, cluster analyses aims to group together Greek regions into homogenous groups (clusters) to reveal which regions tend to have similarities and common features and thus converge to each other. Also for this analysis, year 2004 is chosen as an initial year. However, cluster analysis as well as sector division of Greek regions examine only 9-year period, namely years 2004-2012. As mentioned above, this was caused due to unavailability of the data for year 2013. The cluster analysis is run in a similar logic as sector division analyses, thus dataset is divided into two time periods: pre-crisis period covering years 2004 to 2008 and period during the crisis covering years 2009 to 2012. Average values of respective variables are calculated for each of these periods. The pre-crisis period includes averages of regional GVA values of respective sectors, GDP, GDP per capita, GDP growth and unemployment rate for years 2004 to 2008. The period after the crisis outbreak then contains averages of regional GVA values of respective sectors, GDP, GDP per capita, GDP growth and unemployment rate for years 2009 to 2012.

Like this, two different models of cluster analysis, so called dendrograms, are presented. The first dendrogram is focusing on pre-crisis period while the second one covers crisis period. For calculations of cluster analyses, statistical software STATISTICA was employed. The data set was firstly tested for correlation and all the variables considered were standardised. The correlation test revealed existence of correlation among variables which can be explained by the fact that all of used variables are dependent on GDP thus their correlation has its logic and was expected. As this correlation wouldn't have an impact on results of the analyses, data set was used for clustering. For the purpose of this diploma thesis, hierarchical method of clustering techniques is used for both models as it is by far the most commonly used and popular approach. Ward hierarchical method was chosen for both models to identify the number of clusters as it reflects the reality of the results in the best way.

The data set for cluster analyses was obtained from the Hellenic Statistical Authority (ELSTAT) and is adjusted for inflation. Following economic yearly data at their regional level are applied: GDP, GDP per capita, GDP growth, unemployment rate and 14 components of GVA of Greece (Agriculture, forestry and fishing; Extractive industry and manufacturing; Construction; Retail; Transportation and storage; Accommodation and food services; Information and communication; Financial and insurance activities, Real estate activities; Professional, scientific and technical activities; Public administration; Education; Health and social work activities; Art and entertainment). The data were chosen as they reflect an overall economic development of regions and their share on industries with at least a slight respect to a social development as well, represented by unemployment rate. To provide a better explanatory value

to the analysis, it would be suitable to include also variables reflecting not only economic, but also social and demographic development of regions (for example aging index, index of daily migration, vital index or number of students per 1000 inhabitants) (Rovan, Sambt, 2003). However, these variables were not available at regional levels, thus could not be involved in the analyses.

4.4 β-convergence analysis

β-convergence analyses is applied as a second key analyses. This analyses is commonly used by the European Commission for examining regional economic evolution and revealing whether regions tend to converge or diverge. For purpose of β-convergence analysis, methodology of authors Melecký and Nevima is followed. The methodological aspects of this approach influence estimation of an econometric model and thus results of regional convergence or divergence. These includes mainly the selection of a geographical area that is examined (for the purpose of this thesis NUTS 2 regions), the length of the period examined (for the purpose of this thesis 10 year period from 2004 to 2013), periodicity of the data (for the purpose of this thesis yearly data), the selection of variables that are examined with respect to their availability on a regional level and selection of steady-state.

The econometric model deals with convergent process in which the change of GDP per capita of Greece is determined by the change of GDP per capita of a respective region by application of non-linear regression model. For estimation of convergence, the steady-state needs to be defined at first. The steady-state is defined as GDP per capita of Greece. The presumed hypothesis is that the overall economic performance of Greece (characterised by variable GDP per capita of Greece) had an increasing trend in the years examined. This variable and its development in time are understood as a level for initial evaluation of real convergence. Hence, it is tested how the economic performance (characterized by variable GDP per capita of region) of the respective Greek regions catches up on the steady-state (GDP per capita of Greece) in observed period. Besides, while calculating the real convergence, the technique of dummy variables for Greek regions is applied too. The dummy variables are assigned individually for each of the regions before the model is estimated (Nevima, Melecký 2011).

Formula of nonlinear regression model of panel data used for the calculation of β-convergence analysis is presented below:

$$\ln y_{GR,t} = \alpha + \beta \ln x_{r,t} + \sum \gamma_r D_{r,t} + \varepsilon_{r,t}$$

where:

$y_{GR,t}$	endogenous variable (GDP per Capita of Greece)
$x_{r,t}$	exogenous variable (GDP per Capita of NUTS 2 regions)
α	intercept
β	slope of a regression model
γ_r	variance parametr of fixed effect of regional intercept
$\varepsilon_{r,t}$	random variable
$D_{r,t}$	dummy variable for region's specifications
$D_{r,t}=1$	if the data are for region „r" in time „t" (if not, D r ,t=0)
r	Greek regions NUTS 2, r=1,2...13 (13 regions of Greece)
t	time, t=2004,2005...2013

By estimation of this panel model, it is possible to gather more information than in the classical linear regression model its application was also considered. Other benefits that the application of this approach brings is detection of stochaistic effects, construction and estimation of more complex models with corresponding number of degrees of freedom and eliminating of variations caused by aggregation of data sets used (Nevima, Melecký, 2011).

The model is estimated for two 5-year periods by Gretl software. Firstly, the pre-crisis period of years 2004-2008 is examined by the first model. This is followed by the estimation of the second model, focusing on a period covering years 2009-2013 which represents a period of the crisis and also a period in which the crisis is believed to be subsiding in most of the economies. Once both models are calculated, comparison of both periods can be done resulting in a stating whether the regions tend to converge or diverge after the crisis hit the Greek regions.

Originally, the model was to be divided into three periods, namely pre-crisis period (2004-2008), period during the crisis (2009-2011) and post-crisis period (2012-2013). This method was eventually rejected due to the insufficient number of observations that are likely to have no statistical significance. Moreover, when measuring disparities among regions, the results are in general very sensitive to the number of observations. To resolve this problem, number of observations could be suitably increased by the data with a higher periodicity. It could be done by application of quarterly regional data that would ensure sufficient sample of observations. However, quarterly data of regional GDP per capita were not available. Thus, in order to avoid doubtful results and increase the number of observations, the period during the crisis and the post-crisis period were joined together and compared to the pre-crisis period. The comparison of the results of these two periods then reveals the impact which crisis had on the process of convergence or divergence of the 13 Greek regions.

As it implies from the text above, the data set of the model for calculating the real convergence in thirteen Greek regions comprises of yearly data of regional GDP per capita and yearly data of national GDP per capita during the observed 10-year-period (2004-2013). As the dependent (endogenous) variable is used variable national GDP per capita. This variable stands for the steady-state of the β-convergence to which the regions tend to converge. As the depending variables (exogenous) are then used yearly regional GDP per capita values for each of 13 Greek regions covering the observed 10-year-period. Before the actual calculation, the data set is also tested for econometric assumptions by which is proved that dataset is acceptable for further examination. The data were obtained from the Hellenic Statistical Authority (ELSTAT) and are adjusted for inflation. In spite of expectations of the diploma thesis author, the regional data for the years 2014 and 2015 were not available at the time when the thesis had been compiled. Hence, as written above, the division into three observed periods that was originally inteded to be done was not possible due to the low number of observations.

5 Practical part

In this part of the diploma thesis, macroeconomic analyses of Greek regions and sector division of Greek regions that is subsequently followed by cluster and β-convergence analysis can be observed. In general, practical part focuses on years surrounding the crisis, thus 2004-2013. First of all, introduction into macroeconomic aspects of Greek regions is made in a form of macroeconomic analyses. Economic development of sectors of Greek regions is subsequently presented, examining the period before and after the crisis outbreak. Each sector of economy is observed and discussed separately. This is then followed by cluster analyses which also examines two time periods – period before and after the start of the crisis and classifies regions into respective clusters according to their similarities. Finally, β-convergence of Greek regions is tested, revealing whether the regions tend to converge or diverge after the crisis eruption.

5.1   Macroeconomic analyses of Greek regions

To provide a better understanding of economic performance of 13 Greek regions, this subchapter focuses on important economic indicators at a regional level in years surrounding the crisis, thus 2004-2013. By examining a development of economic indicators in these years, an impact of the crises on particular regions can be observed. Important economic indicators that were available and gathered by the Hellenic Statistical Authority (ELSTAT), namely GDP, GDP per capita, GDP growth and unemployment rate are employed to analyze economic situation of Greek regions. Initially, this section was meant to be a part of the chapter 3 however available literature did not provide relevant information covering the issue of economic performance from a regional perspective in years surrounding the crisis.

As mentioned above, years 2004-2013 are examined. This time-period is divided into two periods. A pre-crisis one focusing on years 2004-2008, thus years before the crisis hit Europe. Second period already reflects years in which crisis in Europe was already present, namely years 2009-2013. All out of four economic indicators of Greek regions are discussed, focusing on both pre-crisis period and period during the crisis.

5.1.1   GDP of Greek regions

Gross domestic product, often referred to as GDP, can be considered as one of the most important economic indicators. GDP is used for measuring national income and output of n economy, in other words economic activity. Thus, it can

reveal how economic stability and health of the economy changed over a certain time-period (Burda, Wyplosz, 2009). Hence, by comparing regional figures of Greek GDP, development of Greek economy and also particular 13 regions can be observed. In table 3 is presented 5-year evolution of GDP in pre-crisis period, years 2004-2008. Table 4 then shows evolution of GDP in the period during the crisis from 2009 to 2013. From the tables can be clearly seen that region with the highest share on GDP is region Attica which represent almost half of total Greek GDP (approximately 48%) and in observed 10-year period overcome a yearly contribution of 94 billion € on average. Attica can be thus considered as a region on which an overall economic performance of Greece is highly dependent. Attica is followed by Central Macedonia that holds more than three times lower share on GDP (14 %) and oscillate about the limit of 27 billion €. The rest of Greek regions hold significantly lower share of total GDP, between 5% and 1%, and contribute between 10 and 2 billion € to total GDP on average in the observed period. In this group, Thessaly, Crete, Western Greece and Central Greece oscillate around 10 billion € yearly contribution on average which makes them the greatest contributors in this group. On the other hand, among the smallest contributors belong North Aegean and Ionian Islands which contribute by less than 4 billion € on average in observed pre-crisis period. The rest of the regions then contribute to total GDP by between 4 and 8 billion € a year in average, namely Peloponnese, Eastern Macedonia and Thrace, South Aegean, Western Macedonia and Epirus.

Tab. 3   Gross domestic product, adjusted for inflation, by regions in pre-crisis period 2004-2008 in million €.

Region/ Year	2004	2005	2006	2007	2008
Attica	92 554	93 503	100 028	104 438	104 119
Central Greece	9 545	9 728	9 786	9 837	9 741
Central Macedonia	27 129	27 175	28 933	30 152	30 014
Crete	9 796	9 779	10 354	10 535	10 556
East. Macedonia and Thrace	7 761	7 895	7 907	8 433	8 538
Epirus	4 513	4 539	4 670	4 723	4 660
Ionian Islands	3 683	3 792	3 900	4 018	4 005
North Aegean	2 672	2 804	2 942	3 100	3 134
Peloponnese	8 295	8 430	8 960	9 250	9 067
South Aegean	6 411	6 646	6 953	7 190	7 231
Thessaly	10 599	1 0377	10 832	10 972	10 904
Western Greece	9 682	9 750	10 423	10 471	10 235
Western Macedonia	4 715	4 735	4 980	5 092	4 924

Greece Total	197 355	199 153	210 668	218 211	217 127

Source: Own elaboration, data ELSTAT

In the pre-crisis period, GDP followed an increasing trend during years 2004 to 2007 in almost all the regions (apart from Crete and Thessaly that declined in 2005) and it began to decline slightly in 2008. Total GDP of Greece was increasing in this period yearly by 2.4% on average and an average yearly increase experienced by regions was 2%. From 197 355 million € in 2004 total GDP of Greece increased up to more than 217 127 million € in 2008. Average increase of GDP of Attica reached 3% a year, after North Aegean (4.1%) and South Aegean (3.1%) the highest in the country, with especially high increase of GDP in year 2006 (almost 7% in comparison with previous year). Central Greece, the second biggest contributor to total GDP experienced only 0.5% increase of GDP on average. Regions which yearly contribution to total GDP oscillates around 10 billion €, namely Thessaly, Crete, Western Greece and Central Greece were increasing their GDP rather differently, between 0.5 and 2% on average a year. The same implies for the smallest contributors to Greek GDP, regions North Aegean and Ionian Islands, which were increasing their GDP between 2-4%. The last group of regions contributing to total GDP by between 4 and 8 billion € a year in average, namely Peloponnese, Eastern Macedonia and Thrace, South Aegean, Western Macedonia and Epirus, experienced an average yearly increase of their GDP between 1-3%. In 2008, some regions already experienced decline in their GDP and total GDP of Greece dropped by approximately 3%.

Moving to crisis-period of 2009-2013, in 2009 the crisis had already a visible impact on all Greek regions and GDP kept declining trend since then, severely hitting economic performance of Greece. When comparing pre-crisis and crisis period, Greece lost approximately 12.6% of its total GDP. While in 2009 total GDP of Greece reached 207 726 million €, it was dropping significantly every year and in 2013 fell to 160 739 million €. An average yearly decrease experienced by regions was 5.6% and total GDP of Greece was decreasing in this period by 5.8% on average every year. Attica's yearly decrease was almost 6% on average and in total lost approximately 11% of its GDP in comparison with the previous period. Central Macedonia, the second most important region for Greek economy in terms of GDP contribution experienced similar yearly decrease to Attica, 6.3% on average and recorded loss about 13.8% of GDP with respect to the previous period. As these two regions account for those that generate majority of Greek GDP, decline in their GDP is particularly harmful for health of entire Greek economy. Regions contributing to GDP by approximately 10 billion €, namely Thessaly, Crete, Western Greece

and Central Greece experienced similar yearly decrease in their GDP between 5-6% on average. All of them also experienced significant losses of their GDP with respect to previous period, resulting in loosing between 14.6-18% of their GDP. Group of regions contributing to total GDP by between 4 and 8 billion € a year in average, namely Peloponnese, Eastern Macedonia and Thrace, South Aegean, Western Macedonia and Epirus, dealt with an average yearly decrease between 5-6.5% in their GDP and dealt with the loss between 11-16.7% of their GDP in comparison with period before the crisis. The smallest contributors to Greek GDP, regions North Aegean and Ionian Islands, then experienced an average decline of their GDP by between around 5% a year and in comparison with a previous period suffered a loss between 10.5-17.7% of their GDP.

Tab. 4   Gross domestic product, adjusted for inflation, by regions in period during the crisis 2009-2013 in million €.

Region/ Year	2009	2010	2011	2012	2013
Attica	100 590	95 646	87 282	81 714	76 723
Central Greece	9 135	8 565	7 837	7 352	7 025
Central Macedonia	28 468	26 552	24 463	22 469	21 648
Crete	10 038	9 372	8 464	7 803	7 885
East. Macedonia and Thrace	8 113	7 928	7 083	6 586	6 534
Epirus	4 466	4 317	3 980	3 651	3 802
Ionian Islands	3 671	3 472	3 041	2 928	2 861
North Aegean	2 977	2 804	2 544	2 396	2 390
Peloponnese	8 817	8 191	7 612	7 092	7 076
South Aegean	6 655	6 267	5 641	5 370	5 278
Thessaly	10 332	9 527	8 649	8 180	8 359
Western Greece	9 618	9 348	8 397	7 886	7 657
Western Macedonia	4 847	4 373	3 947	3 704	3 500
Greece Total	207 726	196 362	178 942	167 129	160 739

Source: Own elaboration, data ELSTAT

Thus, to summarize, the most significant decrease in GDP was recorder by region Central Greece (lost almost 18%of its GDP), Ionian Islands (17.7%), Western Macedonia (16.7%) and Thessaly (16.1%) in comparison with pre-crisis years. It should be also pointed out here as well that Attica, the most important region for Greek economy, lost rather low percentage of GDP (around 11%) in comparison with the remaining regions with respect to the previous period. It is evident from the figures presented above that in 2013 Greece was still caught in a deep recession and its economy was deteriorating a year by year from 2009. During years 2008 and 2013 total GDP of Greece was decreasing by 6% on

average which is quite a significant difference in comparison with 2.5% average increase in pre-crisis years. The most severe year for the Greek economy was year 2011 when total GDP decreased almost 9% in comparison with the previous year. Although the decrease of GDP became smaller in 2013 (about -4%), the impact of the crisis on the Greek economy and all of its regions was still apparent.

5.1.2   GDP per capita of Greek regions

GDP per capita is used for measuring economic activity and reflects standard of living of inhabitants in a particular geographical area (country, region etc.). Basically, GDP per capita is counted as total annual GDP divided by population of a respective geographical unit. Thus for the purpose of this thesis, it enables us to make a reliable comparison of economic activity and prosperity of Greek regions that have various sizes of population. Like this, a relevant economic evolution of Greek regions can be observed as the figures are not distorted by size of a region and its population.

Development of GDP per capita in the pre-crisis period is presented in table 5. In the following table 6, development of GDP per capita is shown focusing on years during the crisis. It should be pointed out here that although figures of regional GDP diverged quite significantly in previous subchapter (especially when comparing GDP values of Attica and Central Macedonia with the remaining regions), it can be seen that in case of GDP per capita the differences among regions diminished and quite remarkably. Focusing on the pre-crisis period, Attica is still reaching the highest figures (as in the case of GDP) and thus is the richest region of Greece during the observed period pre-crisis period (with an average of 23 283 € per inhabitant in initial year 2004). Attica is quite closely followed by South Aegean (with 20 148 € per inhabitant in 2004). The poorest region of Greece can be spotted Eastern Macedonia and Thrace with 12 746 € per inhabitant in 2004. Remaining regions also record rather similar values of GDP per capita, oscillating between 18 000 and 13 000 € per inhabitant. The pre-crisis period can be characterized by an upward trend in GDP per capita values in all the regions with a slight decrease in most of the regions in 2008. An exception can be seen in year 2005 in regions Thessaly (2.3% decrease), Crete (1% decrease) and Central Macedonia (0.3% decrease), in 2006 in region Eastern Macedonia and Thrace (0.1% decrease) and in 2007 in Attica (3.1% decrease). Nevertheless, all of the regions increased their GDP per capita in comparison with an initial year 2004. At the end of the pre-crisis period in 2008 Attica reached the highest level of GDP per capita of a country again with 25 851 € per inhabitant, followed by South Aegean with 21 925 € per inhabitant. Both of these regions exceeded level of GDP per capita of Greece

which was in 2008 19 410 € per inhabitant. On the contrary, the position of the poorest region was replaced by region Epirus with 13 396 € per inhabitant in 2008. The highest average yearly increase of GDP per capita was recorded by North Aegean (4.3%), Attica (2.7%) and Central Macedonia (2.2%), the lowest by Central Greece (0.3%) and Thessaly (0.6%). An average yearly increase of GDP per capita experienced by regions was 1.8% and GDP per capita of Greece rose by 2.1% on average a year.

Tab. 5   Gross domestic product per capita, adjusted for inflation, by regions in pre-crisis period 2004-2008 in €.

Region/ Year	2004	2005	2006	2007	2008
Attica	23 283	23 435	24 988	24 215	25 851
Central Greece	17 158	17 444	17 495	17 547	17 348
Central Macedonia	14 255	14 210	15 058	15 624	15 506
Crete	16 240	16 083	16 892	17 050	16 958
East. Macedonia and Thrace	12 746	12 934	12 926	13 758	13 916
Epirus	13 036	13 105	13 471	13 600	13 396
Ionian Islands	17 695	18 146	18 595	19 108	19 028
North Aegean	13 137	13 818	14 539	15 349	15 548
Peloponnese	14 070	14 272	15 137	15 606	15 297
South Aegean	20 148	20 698	21 460	21 983	21 925
Thessaly	14 153	13 823	14 392	14 559	14 468
Western Greece	13 786	13 896	14 875	14 954	14 635
Western Macedonia	16 117	16 209	17 082	17 497	16 962
Greece Total	17 851	17 953	18 931	19 548	19 410

Source: Own elaboration, data ELSTAT

From comparing values in both pre-crisis and crisis tables, it can be observed that GDP per capita, experienced an increase in the pre-crisis period. However, even in this case a massive impact of the crisis on economic development and thus living standards of Greek inhabitants is evident. All Greek regions recorded an extreme loss of their GDP per capita and its negative growth rate after the crisis erupted in Greece. The greatest decrease is evident in region Central Greece losing more than 18% of its GDP per capita when the values of pre-crisis and crisis period are compared. Central Greece is followed by South Aegean with 17.7% decrease and Ionian Islands with 17.5% decrease. It should be pointed out here that Attica, the key region for Greek economy, experienced the lowest decrease of 9.2% of GDP per capita from all the regions when comparing pre-crisis and crisis values. The second lowest decrease was the recorded by North Aegean (11.3%). By the end of the examined crisis period in 2013, Attica

still managed to keep its position of the richest Greek region as in the pre-crisis period and was followed by South Aegean. Again, both of these regions overcame level of GDP per capita of Greece which dropped to 14 537 € per inhabitant by 2013. Similarly to the initial year 2004, the poorest region was again region Eastern Macedonia and Thrace with GDP per capita 10 485 € per inhabitant in 2013. The highest average yearly decrease of GDP per capita was recorded by Ionian Islands (-6.5%), Central Greece (6.4%) and Central Macedonia (6%) and by far the lowest by Epirus (3.7%).

Tab. 6   Gross domestic product per capita, adjusted for inflation, by regions in period during the crisis 2009-2013 in €.

Region/ Year	2009	2010	2011	2012	2013
Attica	24 983	23 863	21 361	20 740	19 648
Central Greece	16 248	15 236	14 298	12 995	12 423
Central Macedonia	14 699	13 751	12 403	11 704	11 366
Crete	16 035	14 939	13 781	12 392	12 599
East. Macedonia and Thrace	13 229	12 949	11 283	10 585	10 485
Epirus	12 837	12 435	11 025	10 499	11 013
Ionian Islands	17 450	16 555	14 987	13 855	13 568
North Aegean	14 802	13 958	12 489	11 532	11 454
Peloponnese	14 889	13 863	12 834	11 962	11 982
South Aegean	20 042	18 788	17 743	15 577	15 242
Thessaly	13 728	12 706	11 197	11 015	11 278
Western Greece	13 791	13 476	11 800	11 618	11 366
Western Macedonia	16 772	15 237	15 935	12 909	12 335
Greece Total	18 568	17 605	16 087	15 066	14 537

Source: Own elaboration, data ELSTAT

An average yearly decrease of GDP per capita experienced by regions was 5.5% in the observed period and GDP per capita of Greece rose by 5.6% on average a year. In total, Greece lost 12.6% of GDP per capita when comparing with the previous pre-crisis period and the worst situation was again experienced in 2011 (which was the same year for the greatest loss of GDP) when the greatest decrease of GDP per capita appeared in Greece (8.6%) in comparison with previous year. On the other hand, decrease of GDP per capita was the lowest in 2013 when comparing with the rest of the crisis years (3.5%).

5.1.3   GDP growth rate of Greek regions

National economic health of a country, or in this case a region, can be determined by growth rate of GDP. Positive values of GDP growth rate indicate good and flourishing economic situation, negative values then mean the opposite and refer to an approaching recession. It is generally agreed that GDP growth rate should be between 2-3% in order to be healthy and sustainable for economy. Values of GDP growth rate exceeding 4%indicate issues related with inflation or an asset bubble (Economy watch, 2010).

Tab. 7   Growth rate of Gross domestic product by regions in pre-crisis period 2004-2008.

Region/ Year	2004*	2005	2006	2007	2008
Attica	-	1.03	6.98	4.41	-0.31
Central Greece	-	1.92	0.59	0.53	-0.98
Central Macedonia	-	0.17	6.47	4.21	-0.46
Crete	-	-0.18	5.88	1.75	0.20
East. Macedonia and Thrace	-	1.72	0.15	6.65	1.25
Epirus	-	0.59	2.88	1.14	-1.34
Ionian Islands	-	2.96	2.86	3.02	-0.32
North Aegean	-	4.93	4.94	5.36	1.10
Peloponnese	-	1.63	6.29	3.23	-1.97
South Aegean	-	3.66	4.63	3.41	0.56
Thessaly	-	-2.09	4.38	1.30	-0.63
Western Greece	-	0.70	6.90	0.46	-2.26
Western Macedonia	-	0.42	5.17	2.24	-3.30
Greece Total	-	0.91	5.78	3.58	-0.50

Source: Own elaboration, data ELSTAT, 2004* initial year.

Tables 7 and 8 reveal what GDP growth rate was experienced by Greek regions in observed 10-year period. Impact of the crisis is evident in all regions although it can be spotted that regions reacted to the crisis differently. The period before the crisis can be characterized by mostly positive growth rate of GDP (apart from Crete and Thessaly in 2005). In year 2005, an average GDP growth rate was around 1.3% with North Aegean experiencing the highest growth rate at almost 5% level in comparison with the previous year. In year 2006 an average GDP growth increased and reached almost 4.5% on average. In this year, it was Attica with almost 7% growth rate at a leading position. However increase of growth rate started to diminish already in year 2007 and an average growth rate recorded by Greek regions was 2.9% (with exception of Eastern Macedonia and Thrace, Ionian Islands and North Aegean that were the only regions their GDP

growth rate increased). The highest growth was experienced by Eastern Macedonia and Thrace (6.6%), the lowest in Western Greece and Central Greece (around 0.5%) In 2008, 9 out of 13 regions already experienced a slightly negative GDP growth rate, in average resulting in approximately -0.7% GDP growth rate per region. A region that was hit the most in this year was Western Macedonia (-3.30%), on the other hand the highest growth rate was present in Eastern Macedonia and Thrace.

Tab. 8   Growth rate of Gross domestic product by regions in period during the crisis 2009-2013.

Region/ Year	2009	2010	2011	2012	2013
Attica	-3.39	-4.91	-8.74	-6.38	-6.11
Central Greece	-6.22	-6.24	-8.50	-6.20	-4.45
Central Macedonia	-5.15	-6.73	-7.87	-8.15	-3.65
Crete	-4.91	-6.64	-9.68	-7.82	1.06
East. Macedonia and Thrace	-4.98	-2.28	-10.67	-7.02	-0.79
Epirus	-4.16	-3.33	-7.81	-8.28	4.14
Ionian Islands	-8.36	-5.41	-12.41	-3.72	-2.29
North Aegean	-5.00	-5.82	-9.26	-5.82	-0.24
Peloponnese	-2.75	-7.11	-7.06	-6.83	-0.23
South Aegean	-7.96	-5.83	-9.99	-4.80	-1.72
Thessaly	-5.25	-7.79	-9.21	-5.43	2.19
Western Greece	-6.03	-2.80	-10.17	-6.09	-2.90
Western Macedonia	-1.57	-9.76	-9.74	-6.17	-5.49
Greece Total	-4.33	-5.47	-8.87	-6.60	-3.82

Source: Own elaboration, data ELSTAT

In 2009, thus a year the crisis entered Greece a negative GDP growth rate was already present in all 13 regions, in average being approximately -5.1% per region. Sensitive respond to a crisis can be seen in South Aegean, which from almost 0,6% GDP growth rate in 2008 dropped to almost -8% in 2009. On the contrary, the lowest decrease of GDP growth can be spotted in Western Macedonia (-1.6%). In following years the GDP growth rate maintain in negative values as well. In 2010, an average decrease of GDP growth rate recorded by regions was approximately -5.7% with western Macedonia dropping the most to -9.8% and Eastern Macedonia and Thrace dropping the least to -2.3%. However, situation got significantly worse in 2011 in all the regions when GDP growth rate reached an alarming -9.3% on average. Regions that suffered the most were Ionian Islands (-12.4%), Eastern Macedonia and Thrace (-10.7%) and

Western Greece (-10.2%) although it can be said that all of the Greek regions felt the impact of the crisis remarkably during this year. Peloponnese managed in this year the best and had a lowest decrease -7.1%. From 2012 the decrease of GDP growth rate became smaller in Greece which indicates that Greek economy tended to revived. Although all the regions maintained their negative values, an overall situation and health of Greek economy improved when comparing with year 2011. On average, in 2012 was the GDP growth rate estimated for approximately -6.4% per region. The worst situation arose in Epirus (-8.3%), on the contrary the lowest decrease occurred in Ionian Islands (-3.7%). In 2013, the diminishing trend continued and GDP growth on average was -1.6%. Positive values were recorded by Epirus, Thessaly and Crete, however the greatest loss was experienced by Attica (-6.1%) which is also the greatest GDP contributor as mentioned above. From the figures presented above can be stated that year 2011 turned out to be the toughest for all the regions in terms of impact of economic crisis on their economic performance, prosperity and living standards of its inhabitants.

5.1.4   Unemployment rate of Greek regions

In the tables 9 and 10 development of unemployment rate of Greek regions in period before and during the crisis can be observed. Unemployment rate is used as a measure for level of unemployment in a particular geographical area (country, region, prefecture etc.) Level on unemployment is calculated when labour force of a particular geographical area is divided by number of people unemployed in the same area. Unemployment rate includes people that are jobless, in other words unemployed, though actively seeking for a job. It is classified as a lag indicator that reflects impacts of economic events such as crisis with a certain delay. This is caused as a consequence of reluctance of employers to which it takes some time to give their employees a notice when a recession occurs in the economy. It implies that unemployment rate can be understood as an indicator confirming the results of previous economic indicators (Koning and Mosley, 2001).

        In the pre-crisis years 2004-2008, almost all the regions experienced a downward trend in unemployment rate during all these years. In year 2004, the national level of unemployment was 10.6% However, 7 regions exceeded this value including Central Macedonia (12.3%) which is the second greatest contributor to the total GDP of Greece after Attica. The national level of unemployment decreased to 10% in 2005. The same 7 regions exceeded this level quite significantly again apart from region Ionian Islands that managed to decrease its unemployment rate by almost 3%. As follows, year 2006 reached a national level of unemployment 9% and in 2007 it decreased even more to

8.4%. Focusing on year 2008, only two regions, namely Crete, Thessaly and Western Macedonia already experienced increase in their rates of unemployment in comparison with year 2007 and national level of unemployment was 7.8%.

To summarize, the national unemployment rate of Greece was at the average level 9.2% and kept decreasing in the observed 5-year period. The highest level of unemployment can be spotted in Western Macedonia which average unemployment rate was 14.7% and which continuously exceeded the national rate of unemployment in years 2004-2008. On the contrary, the lowest unemployment rate in this tame period was experienced by Crete on an average level 6.9%.

Tab. 9   Unemployment rate by regions in pre-crisis period 2004-2008 in %.

Region/ Year	2004	2005	2006	2007	2008
Attica	9.3	9.1	8.5	7.8	6.7
Central Greece	12.8	11.0	9.2	9.4	8.5
Central Macedonia	12.3	11.2	9.5	9.1	8.4
Crete	7.8	7.2	7.2	5.4	6.5
East. Macedonia and Thrace	13.2	11.9	11.1	9.9	8.8
Epirus	11.1	11.5	9.8	10.0	9.9
Ionian Islands	11.4	8.6	11.3	9.1	8.4
North Aegean	9.6	10.6	9.6	8.1	4.7
Peloponnese	9.0	8.6	7.5	7.3	7.0
South Aegean	9.0	9.6	9.0	9.5	8.4
Thessaly	9.8	9.5	8.2	7.8	8.4
Western Greece	12.6	10.7	9.7	9.9	9.9
Western Macedonia	16.5	18.1	14.2	12.1	12.5
Greece Total	10.6	10.0	9.0	8.4	7.8

Source: Own elaboration, data ELSTAT

Comparing the figures of unemployment rate in the period before the crisis with the period in which the crisis was already present, the impact of the crisis is more than evident. In this period, all the regions followed an increasing trend and their values of unemployment rate were rising in significantly year by year. In 2009, all the regions (apart from regions Western Greece and western Macedonia that decreased slightly) experienced increase in the rate of unemployment compared to figures in year 2008 and the national unemployment rate of Greece increased up to 9.6%. Year 2010 meant even higher increase in unemployment for all regions and the national rate of

unemployment reached the level of 12.7%. The figures kept increasing in years 2011 and 2012 and in year 2013 the national level of unemployment approached an alarming value of almost 28%. In this year, the highest level of unemployment occurred in Western Macedonia. Though, more striking fact can be found out here. Two greatest contributors to national GDP, Attica (18.8% on average) and Central Macedonia (20% on average), experienced one of the highest level of unemployment in these year too that had to influence the economic performance of whole Greece to a great extent.

To summarize, the national rate of unemployment of Greece in years 2009-2013 was reaching the average level of 18.4%, a double of an average level in the previous period and kept an increasing trend in this 5-year period. Similarly to the previous period, the highest level of unemployment can be observed in Western Macedonia which average unemployment rate was 22.4% and which was quite closely followed by Central Macedonia. On the contrary, the lowest unemployment rate in this tame period was experienced by Ionian Islands on an average level of 14.2% and Peloponnese on an average level of 14.5%.

Tab. 10   Unemployment rate by regions in period during the crisis 2009-2013 in %.

Region/ Year	2009	2010	2011	2012	2013
Attica	9.1	12.6	18.0	25.8	28.7
Central Greece	10.5	12.5	19.0	27.9	28.2
Central Macedonia	10.1	13.7	19.8	26.2	30.2
Crete	9.1	12.0	15.8	22.3	24.9
East. Macedonia and Thrace	11.1	14.5	20.2	22.9	26.8
Epirus	11.2	12.6	16.5	22.5	27.4
Ionian Islands	9.6	14.6	14.1	14.8	18.1
North Aegean	6.6	9.5	14.9	21.8	22.0
Peloponnese	7.9	9.6	13.8	19.2	22.0
South Aegean	12.4	14.6	15.3	15.4	21.4
Thessaly	9.2	12.1	16.9	22.7	25.4
Western Greece	9.8	11.9	17.6	25.6	28.4
Western Macedonia	12.4	15.4	23.1	29.7	31.5
Greece Total	9.6	12.7	17.9	24.4	27.5

Source: Own elaboration, data ELSTAT

However, it should be also highlighted that data presented in both tables do not include people that are not actively seeking for a job, thus the actual unemployment rate is most likely even higher than presented.

5.2   Sector division of Greek economy

In this subchapter economic development of particular sectors of each of 13 Greek regions can be observed. The sector structure is divided into two time-periods: period before the crisis (2004-2008) and period after the crisis outbreak (2009-2012). Both periods include averages of regional GVA values of respective sectors for an observed time-period. Year 2013 is not included due to unavailability of data. The components of Greek GVA at a regional level include 14 sectors in total. Each sector of economy is graphically presented and separately discussed.

Agriculture, forestry and fishing
Figure 13 shows development of agriculture, forestry and fishing sector in Greek regions. Due to simplification, in the following lines is this sector called only agriculture sector. The agriculture sector accounted only for about 4.2% of total GVA in the pre-crisis period, falling to 3.5% in the years following the crisis. It can be clearly seen that region that contributes to GVA the most and thus is a leader of agriculture production in Greece is Central Macedonia, followed by Thessaly and Western Greece. Prior to the crisis, Central Macedonia counted for about 20% of Greek agriculture sector, Thessaly for 13% and Western Greece for 11%. Regions Peloponnese, Crete and Central Greece then held 10% of Greek agriculture sector. With the crisis outbreak all the Greek regions experienced decrease in their agriculture production and in average the decline of this sector was about 22%. A region that was affected by the crisis the most was Crete which production fell by 34% after 2009. Central Greece was then the second most affected region and lost approximately 26% of its production, followed by Central Macedonia, Eastern Macedonia and Thrace and Peloponnese which production decreased by quarter. In total, the GVA of agriculture sector declined by 24% compared to years prior to the crisis.

It should be highlighted here that, as mentioned above, agriculture sector stood only for about 4% of Greek GDP during the crisis period (2009-213), thus its decline has had a smaller significance for overall economic performance of Greece. In spite of that it still affects those regions for which agriculture sector is not inconsiderable source of income.
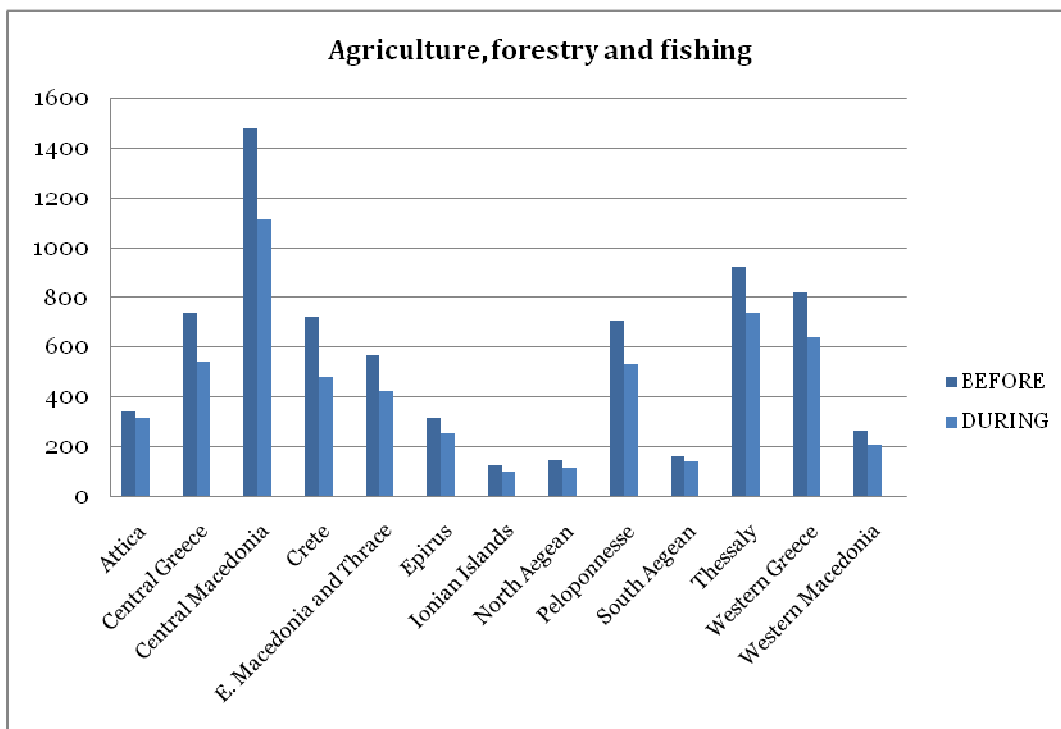
Fig. 13   GVA of agriculture, forestry and fishing sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Extractive industry and manufacturing
Development of extractive industry (including mining and quarrying, electricity and gas supply) and manufacturing are presented in figure 14. The extractive industry and manufacturing sector accounted for 12.4% of total GVA in the pre-crisis period and decreased to 10.4% in years after the crisis erupted in Greece. Extractive industry and manufacturing sector is considered as the second greatest contributor to total Greek GVA (after services). Among the greatest contributors to the GVA is ranked region Attica at the first place that held 36% of this sector in Greece in years prior to the crisis. Attica is followed by regions Central Macedonia (15%) and Central Greece (12%) which shares on GVA are significantly lower. The remaining regions then held less than 10% of production in this sector in terms of GVA. A region that suffered the greatest lost out of all 13 regions was region Western Greece. It's production declined by almost 32% in comparison with period before the crisis. Second greatest lost of production was recorded in South Aegean (declined by 28%) and Attica (declined by 25%). The downward trend was recorded in all the regions in the years following the crisis, in average declining by 21%. The overall decline of this industry was 22% in comparison with years prior to the crisis.
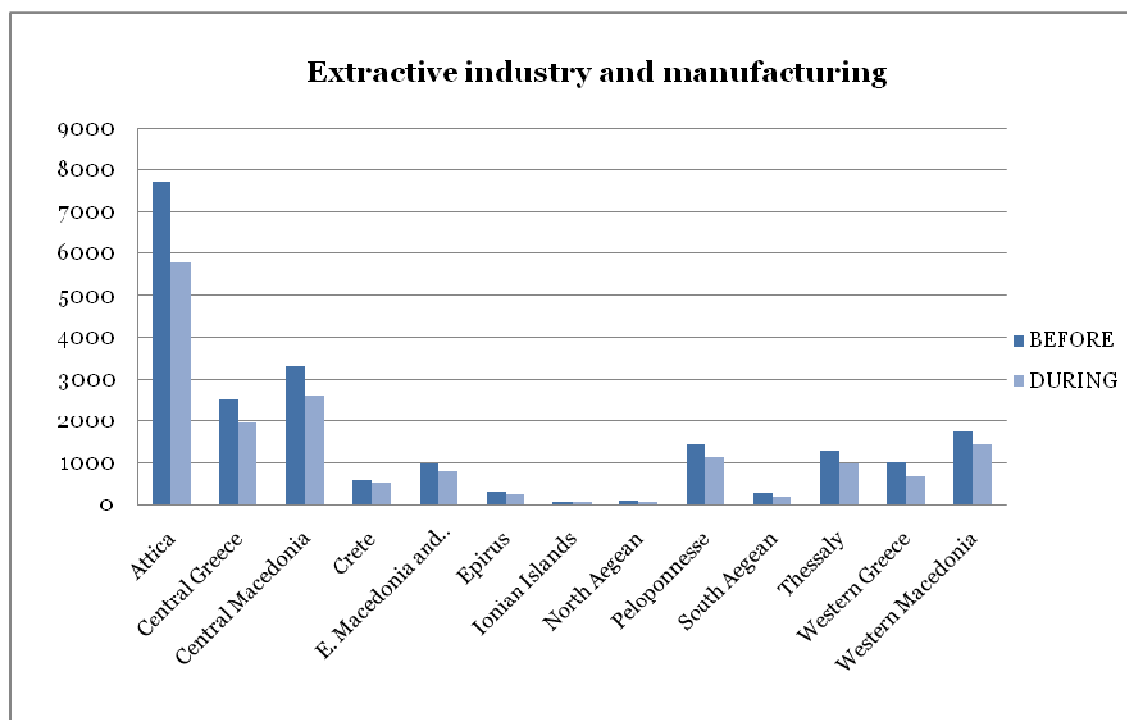
Fig. 14   GVA of extractive industry sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

As industry sector is counted for the second greatest contributor to Greek GDP (after services being at the first place) its decline's had a weighty impact on Greek economic performance. As a result of the crisis, contribution of this sector to Greek GDP fell from 22% in 2004 to less than 14% in 2013. It should be also mentioned here that the share of extractive industry and manufacturing on GDP is quite low in Greece when compared to the European Union countries where this sector contributes to GDP by 25% on average (Milatovic, Sanfey, 2015).

Construction
Another sector of Greek economy that is examined, construction, is presented in figure 15. The construction sector accounted for 7.8% of total GVA in the pre-crisis period, falling to 3.9% in the years following 2009. As can be observed from the graph, the most significant contributor to GVA is Attica that held approximately 42% of this sector in years prior to the crisis. Central Macedonia follows with remarkably lower share on GVA, accounting for approximately 14%. The remaining regions lag behind significantly, contributing only by 4% on average to GVA. With respect to the pre-crisis period, the greatest loss was during the years 2009 and 2012 recorded in region Thessaly that decreased by 61%. Thessaly was followed by Attica and Central Macedonia which lost about

57%. Significant downswing of construction was also experienced by other regions, for instance Western Macedonia decreased by 56%, Eastern Macedonia and Thrace decreased by 54% and Epirus decreased by 53% in comparison with the period before the crisis. In total, the GVA of construction sector declined by 53% compared to years prior to the crisis and an average decline of construction sector experienced by regions was 50%.

However share of construction sector on Greek GDP is relatively small, this sector is in general context considered to be a measure of a crisis impact on economy of a country. Hence, a strong declining trend that occurred in the construction sector after 2009 might show how greatly the crisis impacted the economy of Greek regions.
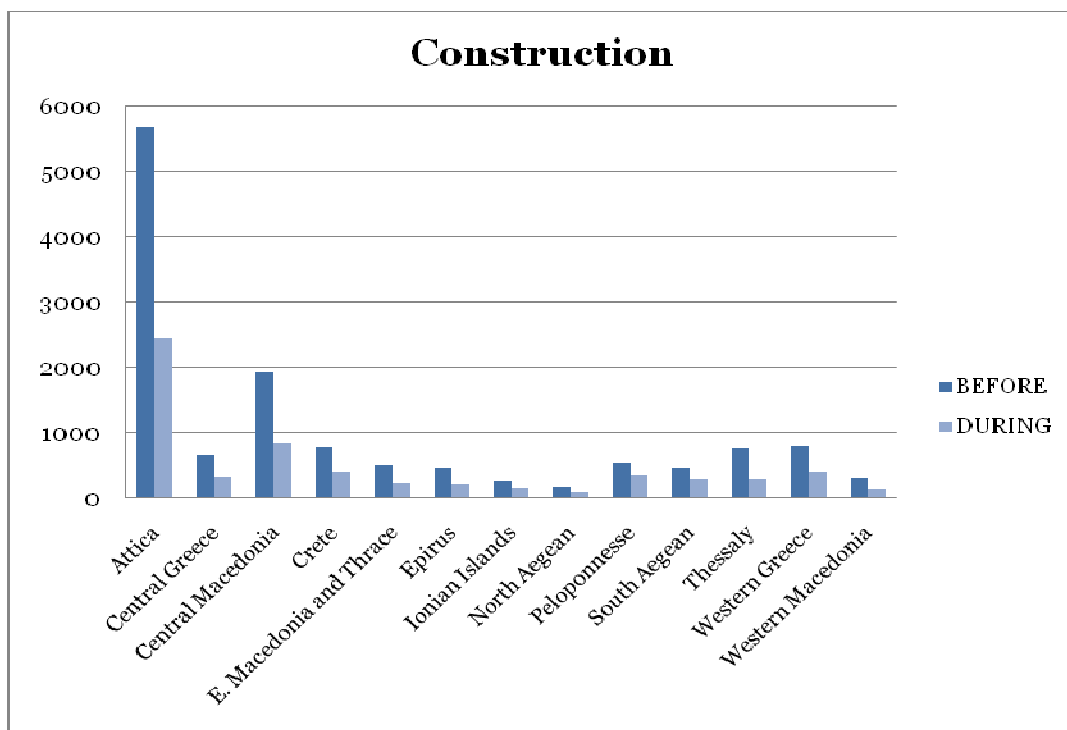
Fig. 15   GVA of construction sector among Greek regions in million € in years 2004-2012. Source: Own elaboration, ELSTAT

Retail
When looking at the figures of retail sector, it can be understood that services have a considerable impact on a overall performance of the Greek economy. Being part of the services, the greatest contributor to the total GVA, retail sector is the second greatest contributor to the total GVA of Greece (after Real estate activities sector). It accounted for 13.9% of total GVA in the pre-crisis period and, similarly the other sectors previously discussed, during the years 2009 to 2012 experienced decrease and felt to 12.7 %. Regions contributing to GVA of

Greece the most are regions Attica, holding 45% and Central Macedonia, holding 18% of retail sector in Greece which can be seen in figure 16. However, also other regions as Crete (5%), Thessaly (5%) and Western Greece (5%) contribute quite significantly to GVA as well. The remaining regions represent approximately only 3% of this sector in Greece. The downward trend was experienced in all the regions in the years following the crisis, in average declining by 20%. Regions that suffered the greatest decline were touristic regions such as North Aegean (decreased by 27%), Thessaly (decreased by 25%), Crete and Ionian Islands (both decreased by 24%) and North Aegean (23%). This could be explained by lower number of tourists visiting the area that either postponed or shortened their visit as a response to the crisis presence. To summarize, the total GVA of retail sector declined by 15% compared to years prior to the crisis. This can be considered as quite a low figure when looking at the sectors previously described.
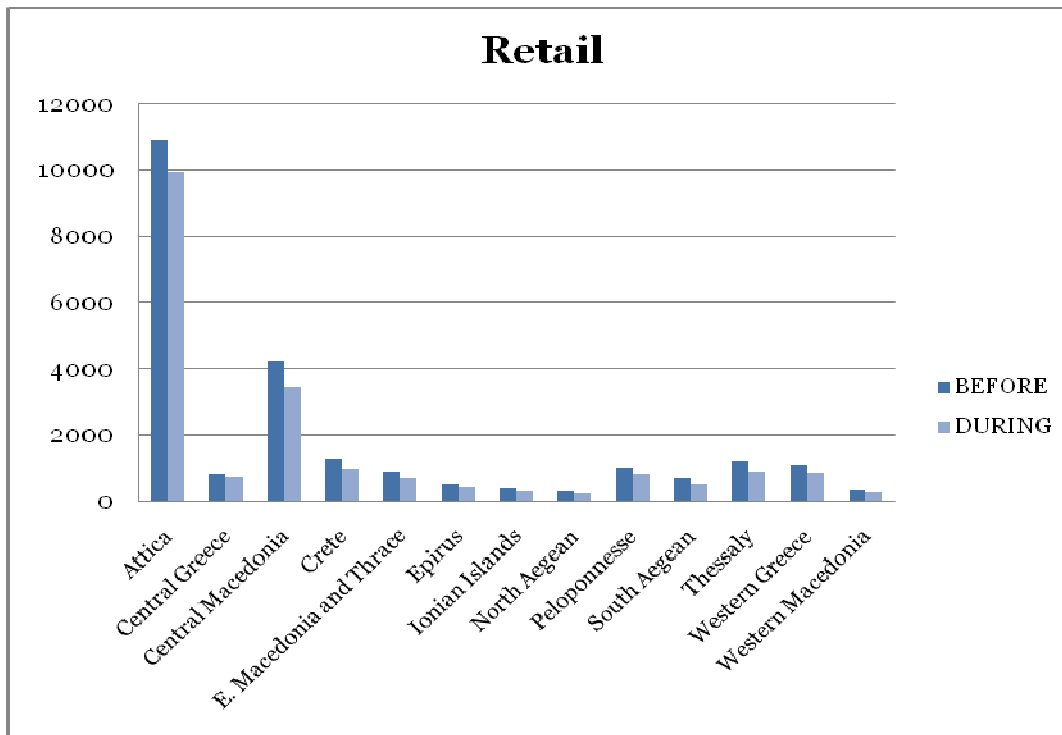
Fig. 16   GVA of retail sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Transportation and storage
Transportation and storage sector accounted for 8% of total GVA in the pre-crisis period, falling to 7.1% after the crisis hit Greece. Transportation and storage sector is also classified among services, a crucial contributor to Greek economy. The development of the sector can be observed in figure 17. The

greatest share of this sector is, like in the previous cases, held by Attica (51%). The remaining regions represent in average only 4% of this sector in Greece, with Central Macedonia (8%), South Aegean (8%) and Western Greece (6%) in the foreground. On average declining by 20%, the downward trend was experienced in all the regions after the crisis eruption. Compared to the pre-crisis period, the greatest lost was recorded by regions South Aegean (decreased by 32%), Ionian Islands (decreased by 28%) and Western Greece (decreased by 26%). The overall GVA of this sector decreased by 17% compared to years prior to the crisis.
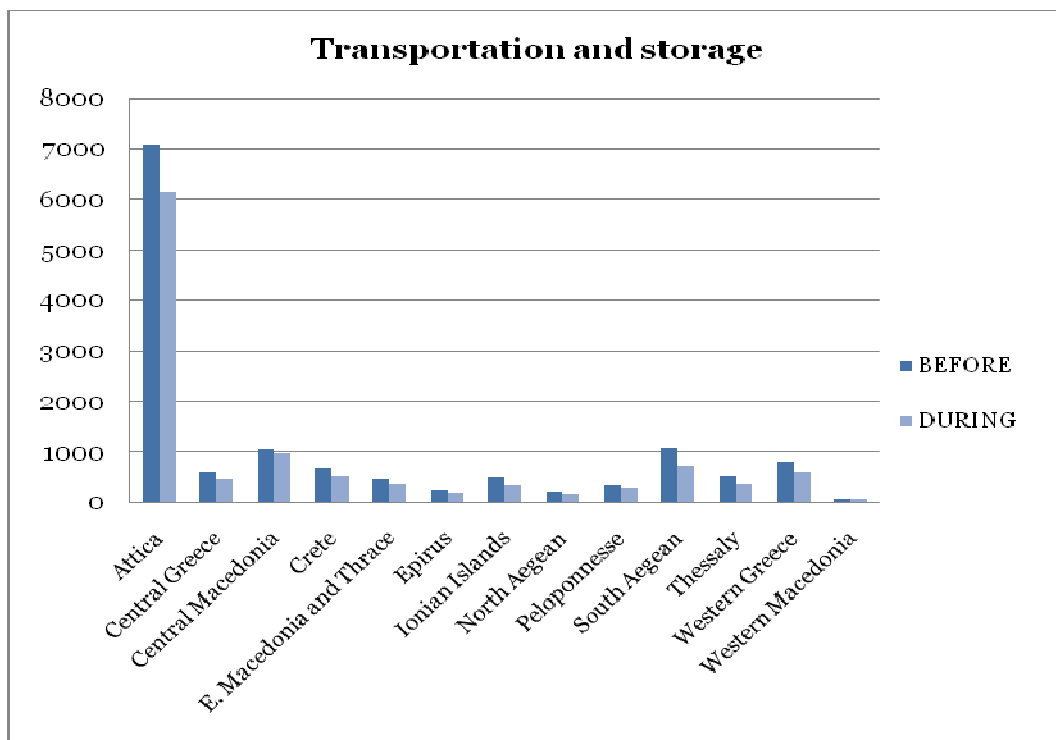
Fig. 17   GVA of transport and storage industry among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Accommodation and food services
Accommodation and food services is another sector that can be classified among services. When looking at figure 18, it can be spotted that the crisis had a negative impact on the development of this sector as well. While accommodation and food services sector represented 5.4% of total GVA in the period before the crisis dropping to 4.8% after 2009. A region dominating accommodation and food services is Attica, holding approximately 27% of the sector. Regions Central Macedonia (14%), South Aegean (13%), Crete (11%) and Ionian Islands (8%) follow, with the remaining regions accounting for

approximately 4% of this sector on average. After the period following a crucial year 2009, a declining trend was experienced by all the regions in this sector. The greatest decrease was recorded by Ionian Islands (30%) and Thessaly (28%). On average, regions experienced decrease of 21%. The total GVA of this sector than declined by 17% compared to the pre-crisis period.
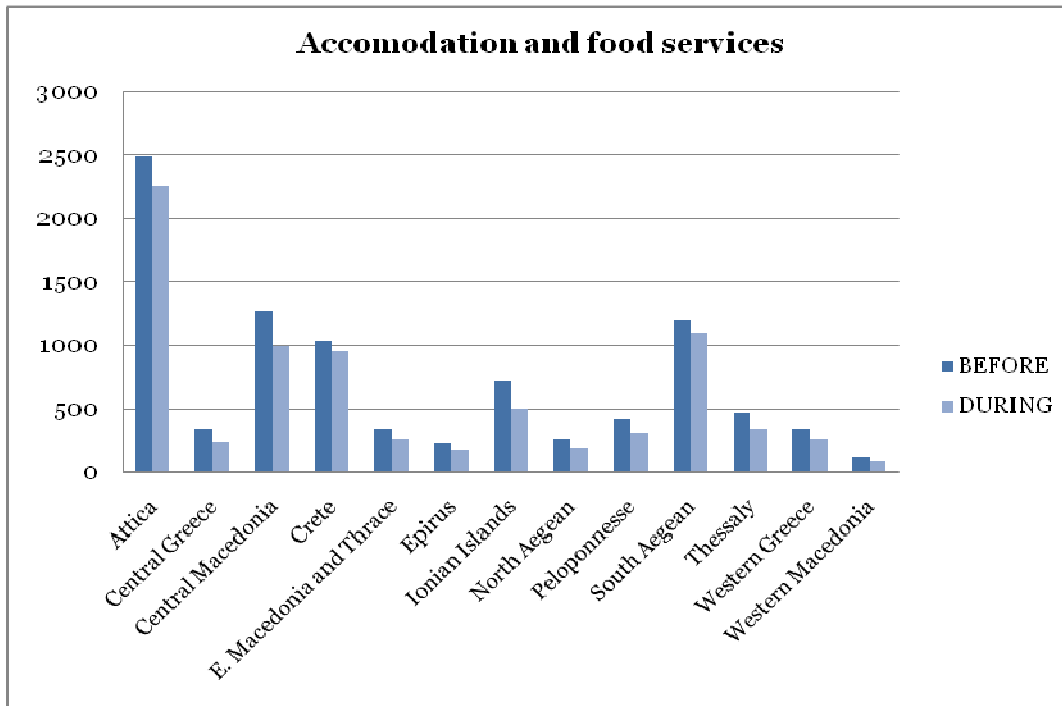
Fig. 18   GVA of Accommodation and food services sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Information and communication
The figure 19 shows development of information and communication sector, another service-related sector. Information and communication sector represented 4.1% of total GVA of Greece in the period prior to the crisis and after 2009 dropped to 3.8%. As can be seen from the graph, Attica is a region contributing to GVA out of all the regions the most, holding 74% of this sector in Greece. The remaining regions significantly limp along, and except Central Macedonia which holds 8% of the sector, contribute to GVA by only 2% on average. The impact of the crisis can be observed in this sector as well. With respect to the pre-crisis period, the greatest decline was recorded in regions Thessaly (28%), Peloponesse (23%) and Central Greece (23%). An average decrease in information and communication sector experienced by regions was

16%. In total, the GVA of information and communication sector declined by 14% compared to years prior to the crisis.
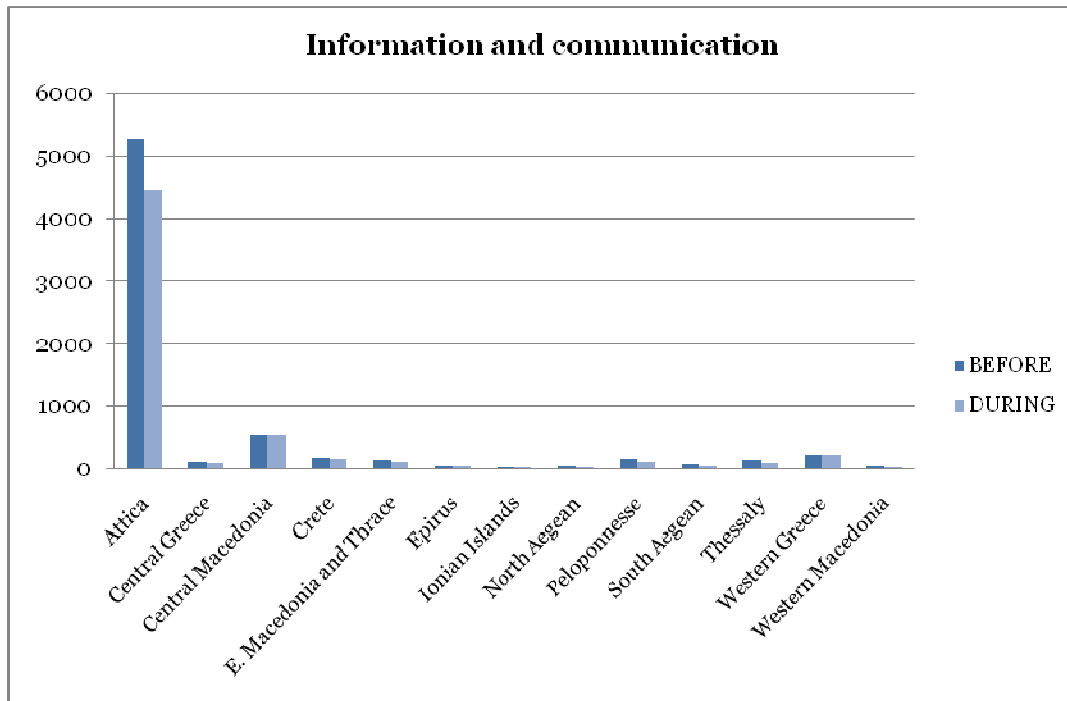
Fig. 19   GVA of Information and communication sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Financial and insurance activities
Financial and insurance activities represent another from services-oriented sectors and can be observed in figure 20. Financial and insurance activities sector accounted for 4.9% of total GVA of Greece in the period prior to the crisis and in the period during the crisis slightly decreasing to 4.6%. Even here is Attica the region with the greatest contribution to GVA, representing 69% of this sector in Greece. Another important contributor, although rather distant from Attica's performance, is region Central Macedonia, holding 10% of this sector in Greece. The remaining regions share the rest of the sector and on average holding only approximately 2%. Although the decline occurred in this sector in comparison with the pre-crisis period as well, the impact of the crisis was not that obvious as in the previous cases. With a respect to the years prior to the crisis, the total GVA of the financial and insurance activities sector decreased only by 8%. On average, the regions experienced 10% decrease in activities related to finances and insurance when comparing with the pre-crisis period, with South Aegean (decreased by 13%), Eastern Macedonia and Thrace,

Peloponnese, Western Macedonia and Western Greece (each decreased by 12%) being the most affected.
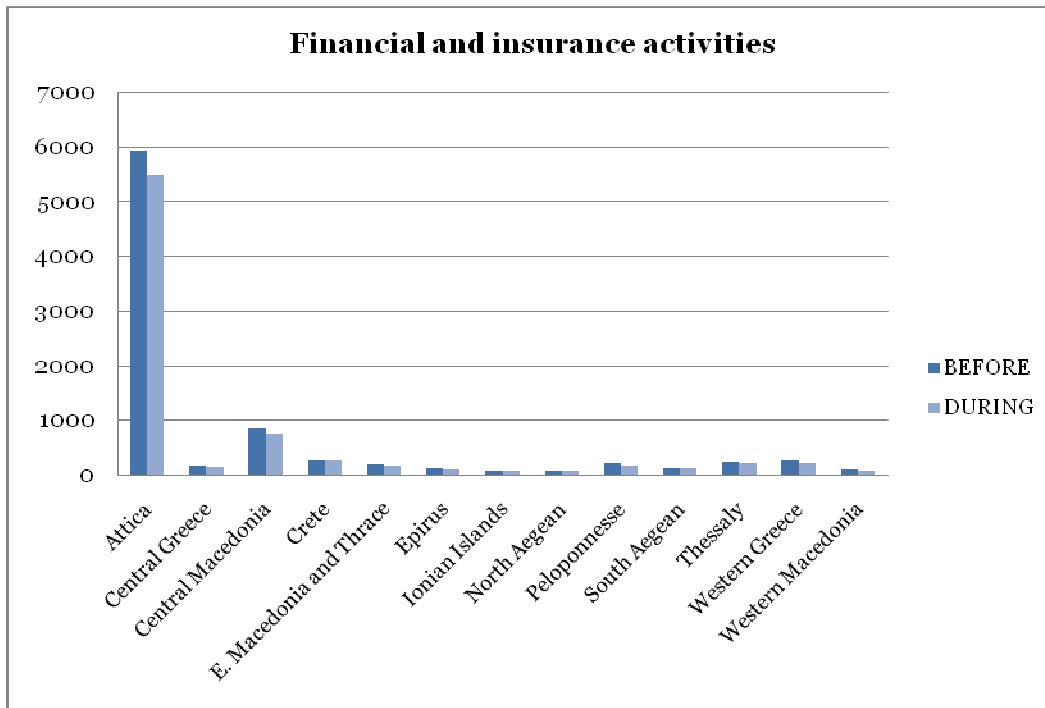
Fig. 20   GVA of financial and insurance sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Real estate activities
In figure 21, development of the real estate activities sector can be observed. Alongside with some of the previous sectors, it is classified as a service as well and accounts for a massive one-fifth of the Greek economy. The real estate related activities are thus, as part of the services sector, the greatest contributor to the total GVA of Greece and in the pre-crisis period accounted for 13%. Although challenged by the crisis, in the period that followed after 2009 its contribution increased up to 18.2 %. The figures show that the real estate activities sector managed to strongly resist the crisis and kept its position of the greatest contributor to GVA of Greece. It should be also mentioned here that the largest sub-sector is renting and operating of real estate that reflects importance of Greece as one of the major European tourist destination, making the tourism industry a very reliable source of income and a drive for the Greek economy and its growth (Milatovic, Sanfey, 2015).

By holding 60% of the sector, a region that dominates the real estate activities in Greece is Attica, followed by Central Macedonia which holds

significantly lower share of 11%. The remaining regions occupy approximately 3% of this sector on average. As it implies from figure 21, the real estate activities sector did not experience any decline with the crisis outbreak and on the contrary kept growing during the crisis period. However, although the crisis did not cause the decline of the sector, its growth has been slowed down. Regions experienced increase 31% on average in comparison with the period before the crisis. Among the regions that experienced the greatest increase belong regions Eastern Macedonia and Thrace (increased by 39%), South Aegean (increased by 35%) and Ionian Islands (34%). With respect to the previous time-period, the total GVA of the real estate activities sector increased by 30%. From the figures presented above it is clear that this sector is crucial for overall economic performance of the Greece and also a drive for its economic growth.
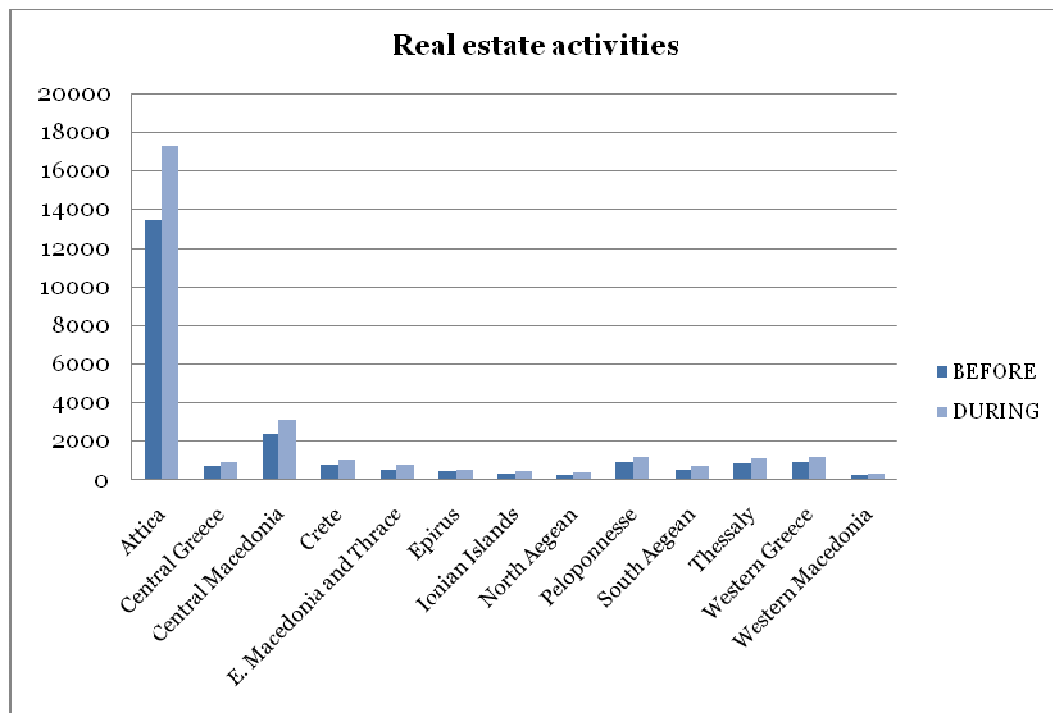
Fig. 21   GVA of real estate activities sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Professional, scientific and technical activities
Professional, scientfic and technical activities is another sector of Greek economy that is representing services and its evolution is presented in figure 22.

In the pre-crisis period, professional, scientific and technical ativities sector acounted for 4.1% of total GVA of Greece. During the years following the crisis eruption, its contribution to total GVA of Greece then slightly decreased to 3.9 %. The most significant share is also in this sector held by Attica with its 63%. Attica is followed by Central Macedonia which holds 13% of the sector. Regions that remain represent in average only 2% of the sector. North Aegean was the only region that experienced increase (7%) in comparison with the pre-crisis period. All the other regions followed a downward trend in the years after the crisis erupted, with an average decrease 11%. Regions that suffered from the situation the most and thus during the crisis period experienced the greatest decline in comparison with the previous period were Thessaly (decreased by 30%) and Eastern Macedonia and Thrace (decreased by 29%). In total, the GVA of professional, scientific and technical activities sector decreased by 14% compared to years prior to the crisis. This result can be considered as quite a small loss compared to losses in some of the sectors described above that were significantly higher.
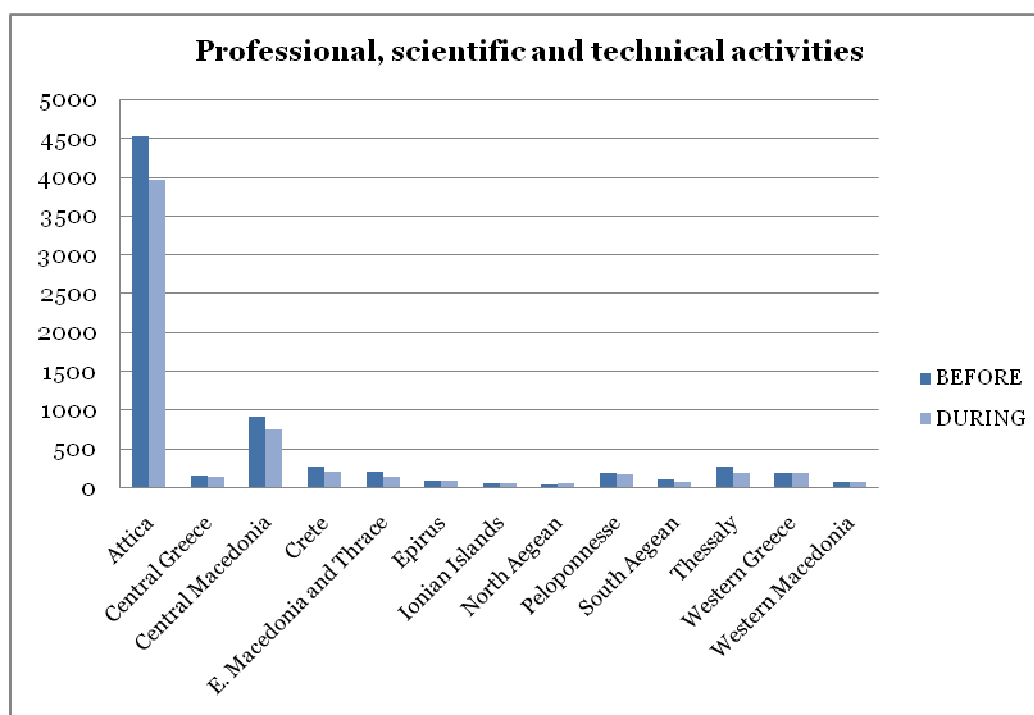
Fig. 22   GVA of professional, scientific and technical activities sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Public administration

Public administration can be also included among service-related sectors and alongside with education and social services belong to the public sector. As discussed in the chapter 3.1.1, public sector and its ineffectiveness was identified as one of the main endogenous causes that is partly responsible for evolution of the Greek crisis to such a huge extent. The overall public sector is relatively large and when looking at its partial components, it can be found out that quite a significant amount is dedicated to public administration, more exactly defence and military spending (Milatovic, Sanfey, 2015).

In the years prior to the crisis, public administration sector accounted for 8.9% of total GVA of Greece and in the period during the crisis even spread out and increased up to 10.1%. From figure 23 can be clearly observed that Attica holds the majority, more precisely contributes to GVA of this sector by 47%. Attica is followed by Central Macedonia, holding 14% of the sector. Remaining regions lag behind substantially, and on average occupy approximately 3% of the sector. Although some of the regions experienced a relatively insignificant decrease in comparison with the pre-crisis period (Ionian Island decreased by 13%, Central Greece by 5%, Crete by 2% and Peloponnese by 1%) the total GVA of this sector increased by 6% with a respect to the pre-crisis period. Regions then increased by 6% on average in comparison with the period before the crisis, with a region Eastern Macedonia and Thrace on the foreground which grown by 36%.
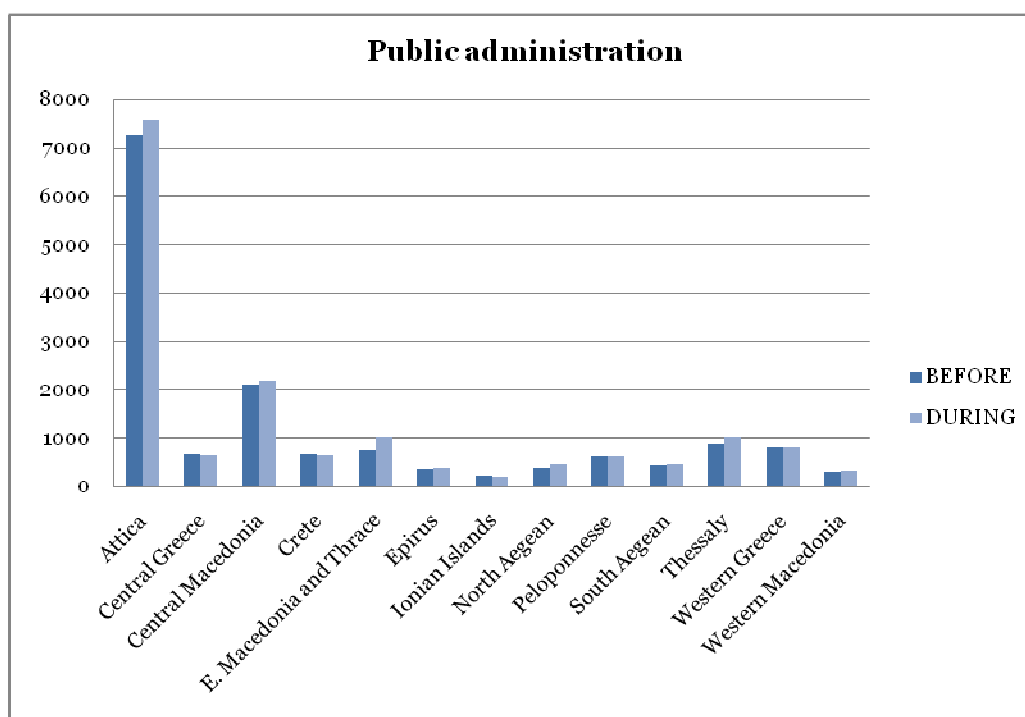
Fig. 23   GVA of public administration sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Education

Education is another service belonging to the Greek public sector. In the years prior to the crisis, education accounted for 5.7% of total GVA of Greece and in the period during the crisis increased up to 6.2%. From figure 24 can be seen that Attica, with its 39% in the first period, is the greatest contributor to GVA of this sector. Attica is followed by Central Macedonia, holding 17% of the sector. Remaining regions on average occupy approximately 4% of the sector on average. Similarly to the public administration sector, some of the regions experienced a relatively small decrease in comparison with the pre-crisis period, (Thessaly decreased by 4%, Western Greece and Eastern Macedonia and Thrace by 3% and Attica by 1%) although the total GVA of this sector increased by 1% with a respect to the pre-crisis period. Regions then increased by 2% on average in comparison with the pre-crisis period, with a region North Aegean and its 7% increase in a lead.
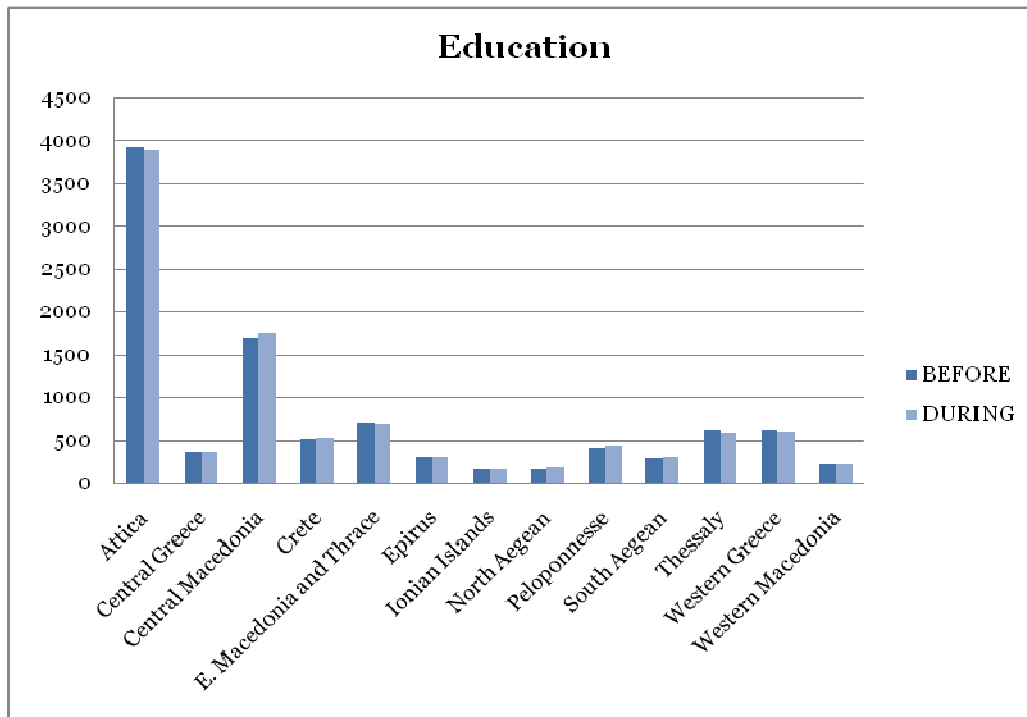
Fig. 24   GVA of education sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Health and social work activities
Health and social work activities belong among services provided by the public sector as well and its develoment can be observed from figure 25. In the years before the crisis erupted in Greece, this sector held about 5.8% share on the total GVA of Greece, dropping to approxiately 5.4% in the following period. The greatest share on GVA is contributed by region Attica that helds approximately 47% of a sector. Central Macedonia then follows with its 17%. The regions that remain hold on average 3% of the sector. Opposite to the previous public sector services – public administration and education – health and social work activities sector recorded a 6% decrease in its total GVA with a respect to the period before the crisis. Except regions Eastearn Macedonia and Thrace(increased by 10%), Western Greece (increased by 8%) and Epirus (increased by 1%), all the other regions experienced decrease and on average declined by 6% with a respect to the previous period. A region that was affected the most and lost 25% in comparison with the pre-crisis period was South Aegean. In total, GVA of the health and social work activities sector declined by 6% when compared to the period not affected by the crisis.
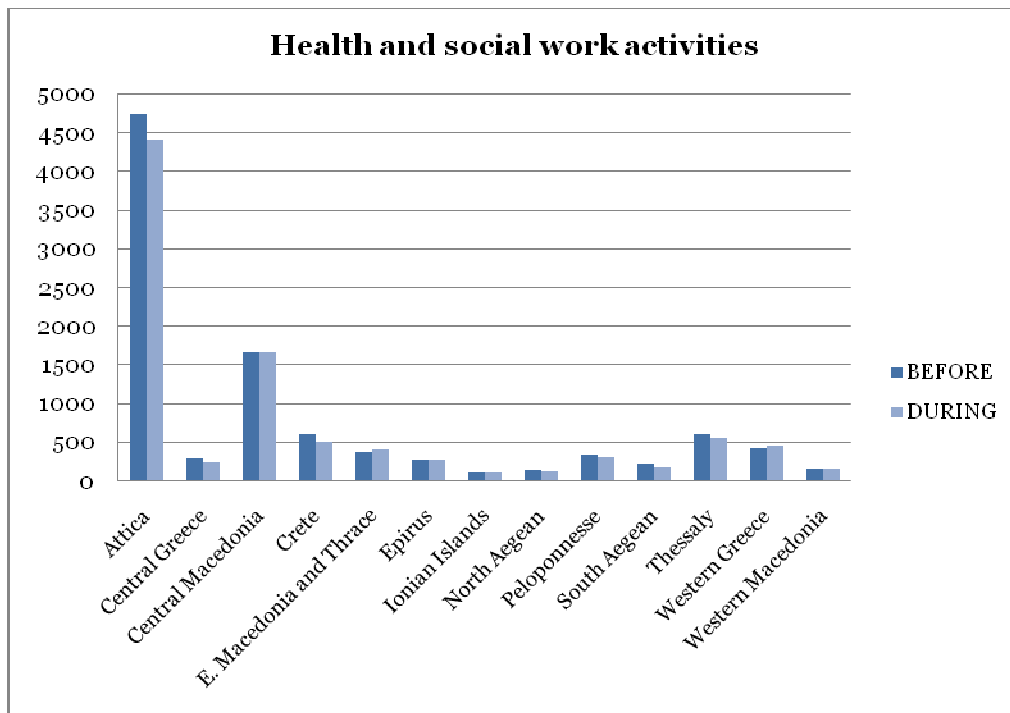
Fig. 25   GVA of health and social work activities among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Art and entertainment
The last examined sector art and enterteinment can be also included among services and is presented in figure 26. In the pre-crisis period, art and entertainment sector accounted for 4.7% of total GVA of Greece. During the years following the crisis outbreak, its contribution to total GVA of Greece slightly decreased to4.5 %. Also in this sector is the most significant share held by Attica with its 51%. Attica is followed by Central Macedonia which holds 15% of the sector. Rest of the 11 regions represent only 3% of the sector on average. In this sector there were only three regions that experienced increase in comparison with the pre-crisis period, namely Ionian Islands (increased by 22%), North Aegean (increased by 10%) and Peloponnese (increased by 5%). All the other regions followed a declining trend in the years after the crisis started, with an average decrease by 4%. Regions that faced the greatest loss in comparison with the previous pre-crisis period were Attica (decreased by 17%), Epirus (decreased by 15%) and Central Macedonia (decreased by 11%). In total, the GVA of art and entertainment sector decreased by 12% compared to years prior to the crisis.

Art and entertainment
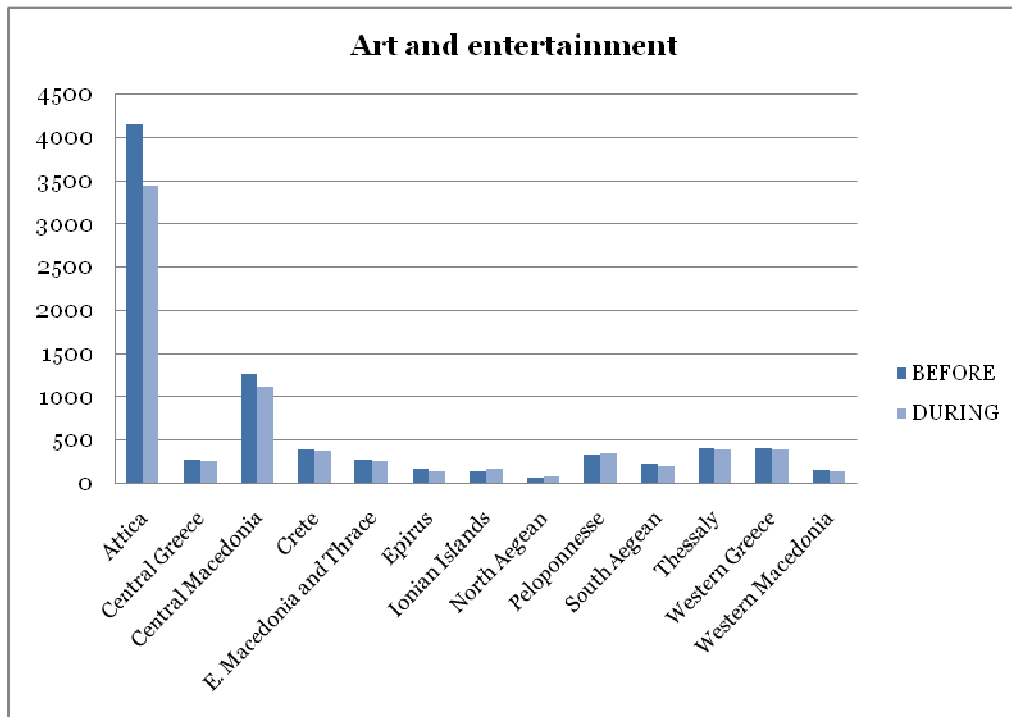
Fig. 26   GVA of art and entertainment sector among Greek regions in million € in years 2004-2012.
Source: Own elaboration, ELSTAT

Summarizing findings of the sector divison of Greek regions, it can be conluded that Greece is highly dependent on economic performance of Attica, which dominated all of the fourteen sectors (apart from agriculture) in both periods before and during crisis. Values of all the regions in most of the sectors dropped significantly and the greatest loss was recorded by construction sector (53%), mostly declining by approximately half in all the regions with comparison with pre-crisis period. The second greatest decrease was recorded by agriculture sector (24%), which was in both periods mostly held by Central Macedonia (20% share) with Thessaly (13% share) and Western Greece (11%share) behind. Extractive industry and manufacturing sector then decreased by 22% with a respect to a previous period and thus was the third one most affected sector by the crisis. On the other hand, some sectors experienced increase despite of the crisis presence, namely real estate activities sector (increased by approximately 30%) and public sectors such public administration (increased by 6%) and education (increased by 1%). The analyses also revealed that the most important sector for Greek economy are services (accounted for approximately two-thirds of Greek GVA), followed by industry (12%) and agriculture (4%) as to their contribution to the total GVA. While services sector did not face a sharp decline

after the crisis outbreak, both industry and agriculture sector experienced a downward trend after the crisis as mentioned above.

5.3   Cluster analysis

In this subchapter, cluster analysis is examined. Cluster analysis is used as a common method for revealing social-economic inequalities among various geographical areas, such countries or regions. The rationale of using this approach, possible limitations and methodology are discussed in more detail in chapter 4. For the purpose of this diploma thesis cluster analyses basically divides 13 Greek regions into various groups, so called clusters, according to their similarities so that the regions located in the same cluster have homogenous features. To follow previous parts of this chapter in the same logic, also cluster analysis is run in two time-periods, a period before the crisis eruption and a period during the crisis, resulting in two models. The first model focuses on 5-year pre-crisis period covering years 2004 to 2008. The second model examines 4-year period during the crisis covering years 2009 to 2012. As mentioned above, year 2013 could not be included in this model due to unavailability of the data. As a result, two dendrograms that graphically reflect common features of Greek regions in various clusters are created. Both models are evaluated and discussed separately.

5.3.1   Model for years 2004-2008

As mentioned, the first model focuses on years before the crises entered Greece, the pre-crisis period. The pre-crisis model describes 5-year long period of years 2004 to 2008. In figure 27 it can be observed into which clusters were regions divided before the crisis hit Greece. The regions are classified into three main clusters according to their common features. One thing should be pointed out here when reading the dendrogram: apart from clusters that are quite apparent, attention should be also paid to the height of vertical lines of these clusters as they indicate degree of differences among regions. The longer the line, the greater is the difference among regions and vice versa. Both models are evaluated and separately (Drout and Smith, 2012).

         The first cluster includes only one region – region Attica. This cluster is the most distant from the rest of the clusters and also has the highest vertical line in comparison with the others. These characteristics imply that there are large dissimilarities among Attica and regions in remaining clusters. This is also confirmed by findings from the previous chapters, Macroeconomic analyses of Greek regions and Sector division of Greek economy, in which is demonstrated that region Attica differs from the rest of the regions to a great extent. At first,

Attica with approximately 50% share is by far the greatest contributor the total GDP of Greece. Besides, it was also found out that Attica dominates all the sectors of Greek economy (apart from agriculture sector) and due to its high levels of GDP per capita is the richest region of a country in an entire observed period. The last examined indicator, unemployment rate also revealed that Attica managed to be a region with a rather low level of unemployment (8.3% on average) in comparison with some of the others regions in this time-period. Thus, having Attica in an isolated and distant cluster has its clear reasons and can be justified by Attica's large differences from other regions.

The second cluster indicates similarities of three regions, namely North Aegean, South Aegean and Ionian Islands. These regions recorded similar levels of GDP growth (between 2-4%) and also their rates of unemployment resembled, oscillating between 8.5-9.8% on average in the observed period. Similarities were also observed in some of their sector shares, especially Agriculture and services, mainly those belonging to the Greek public sector. While North Aegean belonged among the poorer regions in terms of its GDP per capita, South Aegean and Ionian Islands had the second and the third highest GDP per capita in a country and their values were rather similar in the observed 5-year period. In order to explain this difference, one sub-cluster is created by South Aegean and Ionian Islands that are closer to each other and North Aegean created a separated sub-cluster.

Str. diagram pro 13 případů
Wardova metoda
Euklid. vzdálenosti
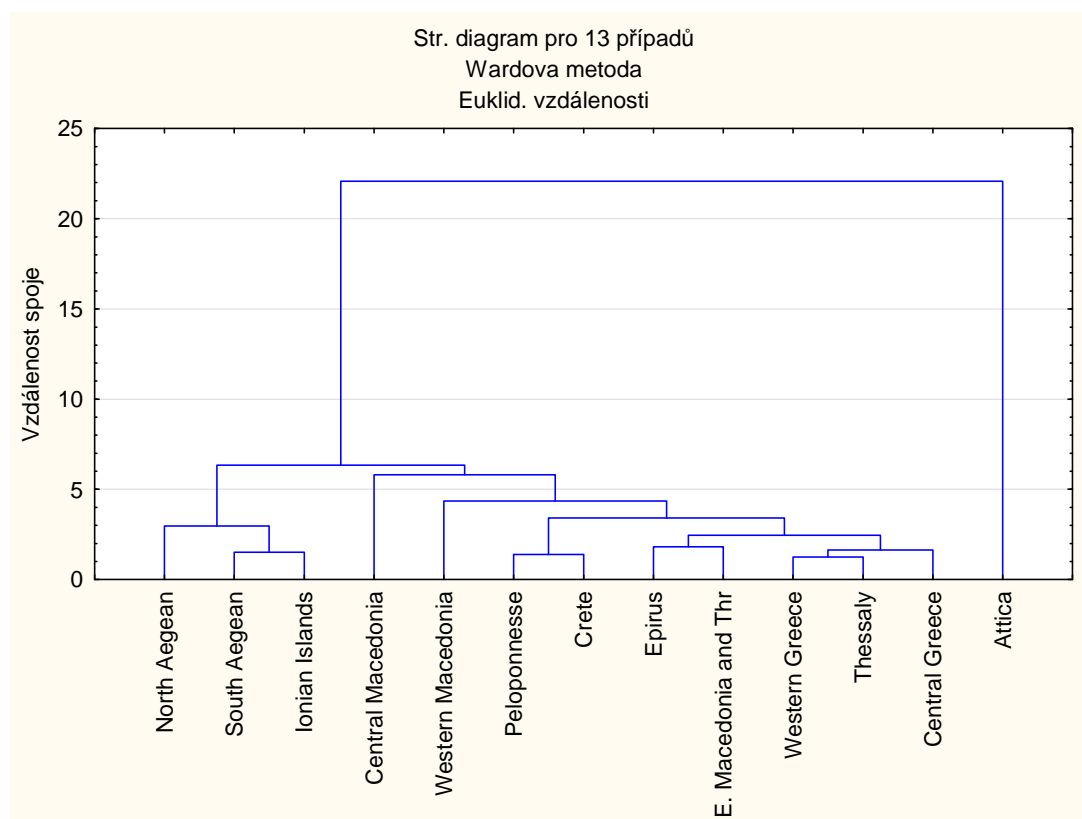
Fig. 27   Dendrogram of cluster analysis with application of Ward-method for pre-crisis years 2004-2008.
Source: Own elaboration, ELSTAT

The last and also biggest cluster is created by another 5 sub-clusters and includes nine regions in total, namely Western Macedonia, Peloponnese, Crete, Epirus, Eastern Macedonia and Thrace, Western Greece, Thessaly, Central Greece and Central Macedonia, which basically dominates all the regions in this cluster. First sub-cluster includes only one region, Central Macedonia. In comparison with other regions in this cluster, Central Macedonia recorded significantly higher levels of GDP in this observed period and after Attica was the second greatest contributor to total GDP of Greece. In the part discussing regional sector structure of Greek economy was also proved that Central Macedonia is a region with the highest share in Agriculture sector and after Attica accounts for the highest shares in all of the other sectors too. These differences can be also visible when looking at the height of the vertical line which indicates that Central Macedonia is the most different and distant from the other regions. Therefore, having Central Macedonia in separate sub-cluster can be justified. The second sub-cluster also includes only one region, Western Macedonia which was constantly facing high levels of unemployment in the pre-crisis period (almost 15% on average) when comparing with other regions.

Moreover, apart from Extractive industry and manufacturing, this region is holding one of the lowest or the lowest shares in other sectors (especially in services) out of all Greek regions. Apart from this, these dissimilarities can be also confirmed when looking at the vertical line of its cluster which is higher when compared with lines of seven remaining regions. Hence, Western Macedonia created its own separated sub-cluster. Peloponnese and Crete produce the third sub-cluster. They experience similar GDP growth rate around 2% a year on average and unemployment rate between 6.9-7.9% on average in this observed 5-year period. Besides, they also record similarities in their share in some of the sectors as Agriculture, Information and communication services, Financial and insurance activities and public administration. Fourth sub-cluster is created by Epirus and Eastern Macedonia and Thrace. For these regions is significant similarity in their values of GDP per capita in the observed period, as well as their rate of unemployment oscillating around 11% a year on average. These regions also share resembling share on Construction sector. Besides, both regions belong to the group of regions contributing to total GDP of Greece between 4 and 8 billion € a year in average. The last fifth sub-cluster includes regions Western Greece and Thessaly being closer in one cluster, and Central Greece. All of these regions oscillate around 10 billion € yearly contribution on average to total GDP of Greece and also experienced similar levels of unemployment rates between 8.5-11% on average in this observed period. However, while Thessaly and Western Greece also share similar levels of GDP per capita, GDP per capita of Central Greece is higher by approximately 3 000 € on average compared to the other two regions which can explain why Central Greece is located individually.

5.3.2   Model for years 2009-2012

Cluster analysis focusing on years in which the crisis was already present in Greece can be observed in figure 28. As mentioned above, the second model involves only 4-year long period of years 2009-2012 due to unavailability of data for year 2013. New model brings also new clusters into which regions are divided. As in the previous model, three main clusters remained also in this model however some regions shifted to other clusters or created their own cluster. Similarly to the first model, attention shouldn't be paid only to these clusters but also to the height of vertical lines of these clusters as they indicate degree of differences among regions.

        The first cluster has not experienced any changes in terms of regions included and as in the previous model consists only of region Attica. This can be explained simply by the fact that although economic performance of Attica deteriorated during the crisis period (which was confirmed in both

macroeconomic analysis and sector division of Greek economy) it still managed to maintain its position of a key region for the Greek economy with by far the highest levels of GDP and GDP per capita and also its highest shares in most of the sectors in comparison with the rest of regions. As a result, Attica created a separated cluster which has the greatest vertical line and is most distant from all the other 12 Greek regions.

Also the second cluster consists only of one region, namely Central Macedonia. Similarly to Attica's case, also Central Macedonia recorded significant decrease of its GDP and GDP per capita levels and losses in most of the sectors yet still managed to be the second greatest contributor to the total GDP of Greece. Additionally, unemployment rate experienced by Central Macedonia in the crisis years was the second highest in a country (20% a year on average) which can be considered as another reason why this region created an isolated cluster with a relatively high vertical lines compared to remaining 11 regions. It would be also good to mention at this point that on the contrary with the previous model it can be spotted that in this model all the regions are rather distant from Central Macedonia.This can imply that inequalities and differences among regions that were in the same cluster with Central Macedonia in the first model deepened and increased with the presence of the crisis more, shifting Central Macedonia further away from the others.

The third and also biggest cluster is created by two sub-clusters and includes 11 remaining regions. The first sub-cluster joins regions South Aegean, Ionian Islands, Thessaly and Crete. The dendrogram indicates that two more clusters were created within this sub-cluster: one of South Aegean and Ionian Islands and the other one of Thessaly and Crete. When looking at their vertical lines, it can be concluded that differences among these two clusters are rather small, though still present. Features that are common for all four regions are similar yearly decline of their GDP growth by 5-6.5% on average which implies that these regions responded to the newly-emerged crisis by a similar slowdown in their economies. Furthermore, another common characteristics is their yearly unemployment rate averaging between 13.5-16% in the observed crisis period. South Aegean and Ionian Islands then recorded similarities in their GDP per capita values which were the second and the third highest in a country in the crisis period. They also coincide with the decrease of their GDP per capita for both cases being approximately 17.5% in comparison with pre-crisis period. Moving to the other cluster that relates regions Crete and Thessaly, these two regions also experienced almost the same decline of their GDP per capita values which was approximately 16% in comparison to the previous period. Besides, they followed a similar trend in values of their GDP as well as an average GDP growth decrease by 5% a year. On the top of that, Crete and Thessaly reacted to

the crisis in a simialr way in terms of their rate of unemployemnt, that were during the observed period almost identical.

The second sub-cluster of the third cluster is bigger and includes seven regions. Two more clusters arose within this sub-cluster, one of Peloponnese and North Aegean, Epirus, Western Greece and Eastern Macedonia and Thrace and one of Western Macedonia and Central Greece. Regions Peloponnese and North Aegean, and regions Epirus, Western Greece and Eastern Macedonia and Thrace are then clustered into even closer groups.
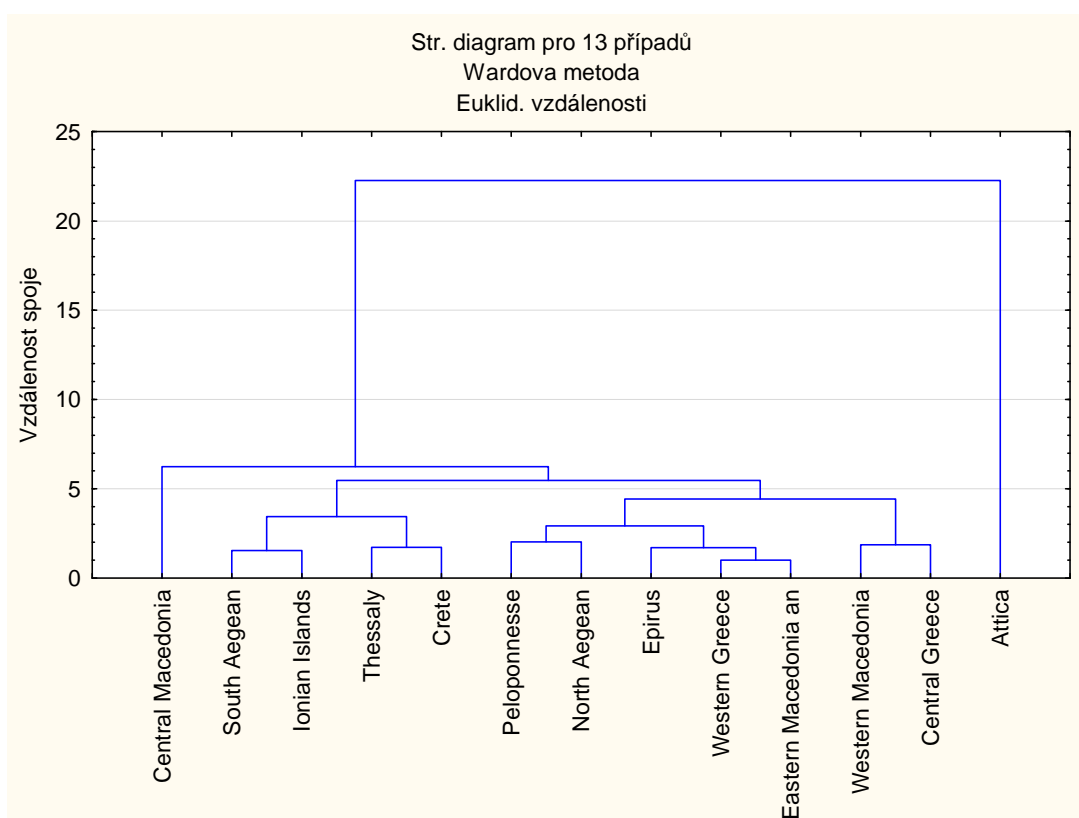
Fig. 28   Dendrogram of cluster analysis with application of Ward-method for pre-crisis years 2009-2012.
Source: Own elaboration, ELSTAT

As common feature that relates regions of Peloponnese, North Aegean, Epirus, Western Greece and Eastern Macedonia and Thrace into one cluster can be considered the fact that all of these regions tended to have similar levels of their GDP per capita values oscillating on average around 11 500-13 000 € a year in the observed 4-year period. Another mutual characteristic of these regions is also a similar respond to the crisis in terms of yearly decline of their GDP growth that indicates that their economic performance slowed down by around 4-5.5% on average. When looking at Peloponesse and North Aegean,

their proximity can be explained by a very similar downward trend in values of their GDP per capita that was followed by both regions during the whole 4-year period. This also resulted in a 11.5% decrease of their GDP per capita values when comparing the figures to a previous period. Besides, they have also recorded quite a similar decline in their GDP with respect to previous pre-crisis period which was approximately 11%. Moving to regions Epirus, Eastern Macedonia and Thrace and Western Greece, it can be seen that Epirus is slightly distant from the rest. All three regions faced a similar economic slowdown which can be visible when looking at their GDP growth values (around 6% yearly decrease on average). Besides, level of their GDP per capita recorded very similar values in years 2009-2013 and the decrease of their GDP per capita in comparison with the previous period was between 12-14%. In spite of these similarities, GDP contribution of Epirus to Greek economy is much smaller than the one made by Eastern Macedonia and Thrace and Western Greece which may clarify why Epirus creates a separated cluster with a relatively high vertical line.

The second sub-cluster of the third cluster is ended by a cluster including only two regions, namely Western Macedonia and Central Greece. They recorded almost identical GDP per capita values during the observed period, experiencing an average decrease of 6% a year. It can be also said that both of these regions struggled with the crisis more in comparison with other regions as their GDP values dropped dramatically by 17.9% in case of Central Greece and by 16.7% in case of Western Macedonia with respect to a pre-crisis period. Besides, their GDP growth recorded an average decline of 6.4% a year which was one of the highest in a country and Western Macedonia faced the highest unemployment rate in Greece.

5.3.3   Comparison of both periods

Comparing results of the cluster analyses of period before crisis and crisis period, it is evident that as the crisis occured in Greece in 2009 most of the Greek regions shifted across different clusters in years that followed. The most distant region from all the others regions, Attica, managed to keep the same position in both periods and stayed in its separated remote cluster. Although its economic performance deteriorated as a result of the crisis, the differences between Attica – a key region for Greek economy - and the rest of the regions remained large. Thus, the crisis didn't lead to convergence of Attica with the rest of the regions. The second cluster, that in the model covers pre-crisis period included regions North Aegean, South Aegean and Ionian Islands, was in the crisis period replaced by Central Macedonia. As a result of the crisis presence, Central Macedonia created an isolated cluster and became more distant from remaining 11 regions and at the same time closer to Attica. This is a significant

difference in comparison with the first model in which was Central Macedonia quite closely approached by regions located in the third cluster and also more remote from Attica. It can be also seen in the first model that the differences among Central Macedonia and the rest of the regions were smaller. This had changed with the crisis outbreak with which the differences among Central Macedonia and the rest of the regions deepened as shown in the second model. This can be also interpreted in that way that Central Macedonia diverged from the rest of the regions in this group and increased its disparities with repsect to pre-crisis model. However, these regional differences were still smaller when compared to Attica's case in which the disparities remained the same as in the pre-crisis years. This was graphically demonstrated by the height of vertical lines of Central Macedonia and Attica cluster. The third cluster underwent the greatest change and created two main sub-clusters that subsequently divided regions into closer clusters reflecting their similarities. Nevertheless, it can be spotted there that the crisis impact on these regions was rather significant as they became more distant from Central Macedonia as mentiond above, the second greatest contributor to the Greek GDP, holding the highest share in Agriculture sector and the second highest shares in all the other sectors. However, this shift also meant that regions South Aegean, North Aegean and Ionian Islands became closer to the rest of the regions and created new sub-clusters with them. Hence, in the second model, South Aegean converged to Ionian Islands and at the same became closer to Thessaly and Crete within one sub-cluster. Regions Peloponnese, North Aegean, Epirus, Western Greece and Eastern Macedonia and Thrace approached each other in other cluster. However, this shift also meant that North Aegean diverged from Ionian Islands and North Aegean with respect to the pre-crisis model. Nevertheless, the movement of North Aegean from Ionian Islands and South Aegean could be expected as it recorded different decreases of macroeconomic indicators than the other two regions in the cluster during the crisis period. Within this cluster, Western Macedonia and Eastern Macedonia and Thrace converged more to Epirus. The last cluster then revealed that Western Macedonia became much closer to Central Greece than in the first model as both of the regions reacted to the crisis in a similar way. To summarize, regions which made new convergent clusters in the second model were close to each other in their responses to the crisis, resulting in similar declines of their economic indicators and sectors. From this it can be clear that the crisis influenced convergent process of the the Greek regions and moved them across the different clusters.

5.4 β-convergence analysis

This subchapter is dedicated to β-convergence analysis. For formulation of econometric model, the β-convergence approach is applied, analyzing the development of 13 Greek regions covering 10-year-period from 2004 to 2013. The time period is divided into two 5-year period, focusing on pre-crisis years 2004-2008 and years during the crisis 2009-2013. The rationale of using this approach as well as its theoretical foundation, methodology and possible limitations are discussed in more detail in the subchapter 3.3 and chapter 4.

5.4.1   Model for years 2004-2008

To determine whether the Greek regions experienced divergence or convergence, it is essential to test regional evolution for the period before the crisis actually erupted in Greece. This econometric estimation provides a better picture of what was the economic performance of the Greek regions before the crisis broke out in 2009. As mentioned in chapter 4, as dependent variable is used variable national GDP per capita. This variable stands for the steady-state of the β-convergence to which the regions tend to converge. As the depending variables (exogenous) are then used yearly values of regional GDP per capita. Thus, the first model is estimated for the years 2004-2008 with dependent variable in the form of natural logarithm using panel least squares with robust standard errors. This prevents from issues related to autocorrelation and heteroscedasticity. Yet the econometric assumptions such are multicollinearity and normality of residuals needs to be tested. Variance Inflation Factors test was employed for testing multicollinearity. The test proved there is no issue related with too high level of collienarity among variables as almost all values were lower than 10. The exception was value of the test for variable GDP per Capita of Greece but one should be aware that this variable is actually expected to be correlated. The test for collinearity can be observed in table 12 in appendix 2. While testing normality of residuals rejection of the null hypothesis of normal distribution of residuals wasn't possible. Hence, there is not a problem with normality of residuals. The test for normality of residuals can be observed in figure 32 in appendix 2. The model was found to be statistically significant on 1% level of statistical significance together with all explanatory variables included into the model. The model explains 76% of variability of dependent variable and with regard to values of p-values of variables can be claimed as significant.

The estimation of the model for the years 2004-2008 can be observed in the figure 28. Following interpretation of the variables shows the difference between GDP per capita of Greece and GDP per capita of its 13 regions in

observed period. The higher is the absolute value of the coefficient the more region diverges from the steady-state (GDP per capita of Greece). On the other hand, the smaller the coefficient in absolute value is the more the region tends to converge to its steady-state. In other words, the higher is the absolute value of coefficient, the further is the respective region from the GDP per capita of Greece and vice versa. The variables are presented from the lowest values of their GDP per capita to the highest values of their GDP per capita in comparison with GDP per capita of Greece, the steady-state. Depending on the level of GDP per capita of these regions, four groups of regions have been created within this observed period.

In comparison with GDP per capita of Greece, the lowest level of GDP per capita is within this 5-year time-period observed in region Eastern Macedonia and Thrace. The GDP per Capita of Eastern Macedonia and Thrace is 33% smaller which ranks it among the most divergent regions. It can be also said that the region Eastern Macedonia and Thrace struggled the most out of all 12 remaining regions to reach the level of GDP per capita of Greece (the steady-state) in years 2004-2008. The region that slightly lags behind Eastern Macedonia and Thrace is Epirus which GDP per capita is 31% smaller than the GDP per Capita of Greece. Epirus is followed by Thessaly (26% smaller), Western Greece (25% smaller) and North Aegean (25% smaller). The last two regions that conclude the first group and which have rather similar level of GDP per capita are regions Peloponnese (22% smaller) and Central Macedonia (22% smaller). It implies that regions of the first group tend to have similar level of GDP per capita in the observed period.

The second group includes only two regions, namely Crete (11% smaller) and Western Macedonia (11% smaller). These regions narrow to the level of GDP per capita of Greece more than the regions in the first group but they are still quite distant from the steady-state. For these regions it can be stated that they tend to have similar levels of GDP per capita in the observed period as well.

Regions which reached almost the same level of GDP per capita of Greece and which create the third group are the regions Central Greece (7% smaller) and Ionian Islands. The region Ionian Islands was a region which almost converged upon the steady-state, being only 1% behind GDP per capita of Greece. Thus, in years 2004 to 2008 this region tended to be, out of all regions, the closest to the country's GDP per capita, the steady-state.

The last fourth group consists of only two regions as well. On the contrary, regions which have in comparison with the GDP per capita of Greece higher GDP per capita values are regions South Aegean (12% higher) and Attica (25 % higher). These regions thus belong among most divergent regions as well, though from the opposite side (when comparing to the first group). Similarly to

the previous groups, these regions tend to have alike values of GDP per capita that were above the level of GDP per capita of Greece.

```
Model 2: Pooled OLS, using 70 observations
Included 14 cross-sectional units
Time-series length = 5
Dependent variable: l_GDP_PER_CAPITA_GREECE
Robust (HAC) standard errors

                      coefficient  std. error   t-ratio   p-value
  ---------------------------------------------------------------------
  const                0.434944     0.970953     0.4480   0.6559
  l_GDP_PER_CAPITA     0.955788     0.0986981    9.684    1.74e-013  ***
  Attica              -0.250509     0.0258685   -9.684    1.74e-013  ***
  CentralGreece        0.0702490    0.00725417   9.684    1.74e-013  ***
  CentralMacedonia     0.217185     0.0224274    9.684    1.74e-013  ***
  Crete                0.112821     0.0116503    9.684    1.74e-013  ***
  EasternMacedonia~    0.330752     0.0341546    9.684    1.74e-013  ***
  Epirus               0.325518     0.0336142    9.684    1.74e-013  ***
  IonianIslands        0.0111888    0.00115540   9.684    1.74e-013  ***
  NorthAegean          0.247716     0.0255800    9.684    1.74e-013  ***
  Peloponnesse         0.220690     0.0227893    9.684    1.74e-013  ***
  SouthAegean         -0.120056     0.0123974   -9.684    1.74e-013  ***
  Thessaly             0.259264     0.0267726    9.684    1.74e-013  ***
  WesternGreece        0.249645     0.0257792    9.684    1.74e-013  ***
  WesternMacedonia     0.105664     0.0109112    9.684    1.74e-013  ***

Mean dependent var    9.837601    S.D. dependent var    0.038522
Sum squared resid     0.024525    S.E. of regression    0.021117
R-squared             0.760477    Adjusted R-squared    0.699508
Log-likelihood      179.1531      Akaike criterion    -328.3063
Schwarz criterion  -294.5789      Hannan-Quinn        -314.9093
rho                   0.272612    Durbin-Watson         1.080561
```

Fig. 29   Estimation of panel data set for years 2004-2008.
Source: Own elaboration, ELSTAT

From the estimation of panel data of the first model which is presented above can be observed how regions of Greece were doing without impact of the crisis. The findings of the analysis reveal following result. The closest and thus most convergent region to the country's GDP per capita, thus the steady-state, was during the observed period 2004 to 2008 region Ionian Islands. On the other hand, the region that was the and thus most divergent from the steady-state was Eastern Macedonia and Thrace. Thus, region Eastern Macedonia and Thrace found it most difficult in comparison with other regions to catch up with country's GDP per capita and recorded in the pre-crisis period the lowest GDP per capita values.

5.4.2   Model for years 2009-2013

To determine whether the Greek regions experienced divergence or convergence, it is necessary to test regional evolution for the period when the crisis already hit the Greek economy as well. As discussed in chapter 4, as dependent variable is used variable national GDP per capita. This variable stands for the steady-state of the β-convergence to which the regions tend to converge. As the depending variables (exogenous) are then used yearly values of regional GDP per capita. Hence, in this part of the diploma thesis, the second observed model is estimated. The second model covers period between years 2009 and 2013 and captures economic performance and development of Greek regions during the time of the crisis. The period for which the second model is calculated is actually a combination of the crisis period and the respective period after the crisis. The reason for joining these two periods is discussed at the beginning of the chapter 5.2. Thus, the second 5-year model was estimated with dependent variable in the form of natural logarithm using panel least squares with robust standard errors. This prevents from issues related to autocorrelation and heteroscedasticity. Similarly to the first model, the second model needs to be tested for econometric assumptions such as multicollinearity and normality of residuals as well. Multicollinearity was tested using Variance Inflation Factors test. The test proved there is no issue related with too high level of collienarity among variables as almost all values were lower than 10. The test for collinearity can be observed in table 13 in appendix 2. Testing of normality of residuals shows that the null hypothesis of normal distribution of residuals is rejected so there is no problem with normality of residuals. The test verifying normality of residuals can be observed in figure 33 in appendix 2. The model was found to be statistically significant on 1% level of statistical significance together with all explanatory variables included into the model. The model explains 83% of variability of dependent variable and with regard to values of p-values of variables can be claimed as significant.

The estimation of the model for years 2009-2013 can be observed in figure 29. Similarly to the previous model, interpretation of the variables presents the difference between GDP per capita of Greece and GDP per capita of its 13 regions in observed period. The higher is the absolute value of the coefficient the more region divergences from the steady-state (GDP per capita of Greece). On the contrary, the smaller the coefficient in absolute value is the more the region tends to convergence to its steady-state. In other words, the higher is the absolute value of coefficient, the further is the respective region from the GDP per capita of Greece and vice versa. The variables are classified from the smallest to the highest values of their GDP per capita in comparison

with GDP per capita of Greece, the steady-state. Depending on the level of GDP per capita of NUTS 2 regions, four groups have been formulated. Groups remained in almost the same logic as in the first model which estimated the pre-crisis period.

Comparing with the steady-state, the lowest level of GDP per capita is in this 5-year time-period observed in region Epirus. It's GDP per capita was 30 % smaller than the one of Greece. This finding ranks Epirus among the most divergent regions in Greece. It can be also said that this region experienced the greatest difficulties out of all 12 remaining regions to reach the level of GDP per capita of Greece (the steady-state) in years 2004-2008. Regions that negligibly lag behind Epirus are Eastern Macedonia and Thrace whose GDP per capita is 29% smaller than the GDP per capita of Greece. Eastern Macedonia and Thrace is followed by Thessaly (27% smaller) and Western Greece (24% smaller). The first group is then concluded with the regions Central Macedonia (21% smaller) and North Aegean (21% smaller) that have quite a similar level of their capita GDP. This observation qlso implies that regions belonging to the first group tend to have similar level of GDP per capita in the years 2009-2013.

In the period 2009-2013, the second group consists of four regions, namely Peloponnese (19% smaller), Crete (14% smaller), Central Greece (12% smaller), and Western Macedonia (10% smaller). Like in the first model, although these regions are not particularly close to the country's GDP, they align to the level of GDP per capita of Greece more than the regions included in the first group. However these regions tend to converge, they are still quite far from the steady-state. Once again it should be mentioned that the factor that brings these regions together to the same group is similar level of their GDP per capita in the observed.

```
Model 4: Pooled OLS, using 70 observations
Included 14 cross-sectional units
Time-series length = 5
Dependent variable: l_GDP_PER_CAPITA_GREECE
Robust (HAC) standard errors

                      coefficient   std. error   t-ratio    p-value

  const                1.37254      0.748912       1.833    0.0723      *
  l_GDP_PER_CAPITA     0.858489     0.0772144     11.12     1.09e-015 ***
  Attica              -0.258455     0.0232460    -11.12     1.09e-015 ***
  CentralGreece        0.120374     0.0108267     11.12     1.09e-015 ***
  CentralMacedonia     0.212819     0.0191414     11.12     1.09e-015 ***
  Crete                0.138075     0.0124188     11.12     1.09e-015 ***
  EasternMacedonia~    0.288585     0.0259559     11.12     1.09e-015 ***
  Epirus               0.297654     0.0267716     11.12     1.09e-015 ***
  IonianIslands        0.0596123    0.00536167    11.12     1.09e-015 ***
  NorthAegean          0.209098     0.0188067     11.12     1.09e-015 ***
  Peloponnesse         0.190550     0.0171385     11.12     1.09e-015 ***
  SouthAegean         -0.00274929   0.000247277  -11.12     1.09e-015 ***
  Thessaly             0.267439     0.0240540     11.12     1.09e-015 ***
  WesternGreece        0.237046     0.0213204     11.12     1.09e-015 ***
  WesternMacedonia     0.0986407    0.00887196    11.12     1.09e-015 ***

Mean dependent var    9.699132    S.D. dependent var    0.092751
Sum squared resid     0.102103    S.E. of regression    0.043086
R-squared             0.827991    Adjusted R-squared    0.784207
Log-likelihood      129.2339      Akaike criterion   -228.4677
Schwarz criterion  -194.7403      Hannan-Quinn       -215.0708
rho                  -0.299044     Durbin-Watson         2.214336

Test for normality of residual -
  Null hypothesis: error is normally distributed
  Test statistic: Chi-square(2) = 45.9357
  with p-value = 1.05972e-010
```

Fig. 30   Estimation of panel data set for years 2009-2013.
Source: Own elaboration, ELSTAT

As follows, the third group includes two regions, namely Ionian Islands (6% smaller) and South Aegean. In this observed period, the region South Aegean was a region that almost reached the steady-state, and in comparison of its per capita GDP to GDP per capita of Greece was only 1% smaller. Thus, it implies that in years 2009 to 2013 this region tended to be, out of all regions, the closest to the country's GDP per capita. This makes the South Aegean the most convergent region of Greece in relation to the steady-state, with Ionian Islands slightly lagging behind.

The last fourth group includes only region Attica (26% higher). Attica was once again a region that belonged to the more divergent and remote regions, but from the opposite side than the other regions. Attica maintained to keep its level

of GDP per capita above the national GDP per capita level even in the period that was already hit by the crisis. However Attica's values due to the drisis deteriorated, Attica still maintained to be a region which is significantly different from the others.

From the estimation of the second model that focuses on the period already affected by the crisis can be concluded following. As the closest and thus most convergent region upon the country´s GDP was during years 2009-2013 observed region South Aegean. Although hit by the crisis, this region seemed to cope quite well with the situation that occurred in 2009 and managed to keep its economic performance on the national level. On the contrary, as the furthest and hence most divergent region was placed region Epirus. Out of all Greek regions, this region struggled the most to catch up with country's GDP per capita. It can be argued that it was the impact of the present crisis that shifted region Epirus to this position.

5.4.3   Comparison of both periods

This part aims to compare the results of both models and subsequently reveal whether regions in Greece tended to converge or diverge after the crisis outbreak in 2009. The first model which examines pre-crisis period 2004-2008 is thus compared with the second model that focuses on period 2009-2013, in which crisis erupted and sharply unfolded in the Greek economy in the years that followed.

Table 11 is capturing the process of change that each of 13 Greek regions experienced between years 2004 and 2013. This change is presented by estimates of γ coefficients of all 13 Greek regions in both 5-year periods. Comparisons of values of γ coefficients between these two periods needs to be done in order to state whether a respective region tends to converge or diverge to Greek GDP per capita in the years 2009-2013 with respect to the previous period. After comparing two absolute values of γ coefficients (absolute value of γ coefficient for period 2004-2008 and absolute value of γ coefficient for period 2009-2013, both coefficients belonging to the same region), it can be revealed whether the region converged or diverged from the steady-state as a result of the crisis with respect to the pre-crisis period. If the absolute value of γ coefficient is lower in the pre-crisis time-period than in the period that includes years of the crisis it can be concluded that the region diverged from the steady-state after the crisis outbreak in Greece. This comparison needs to be done for each of 13 regions separately.

According to the results of comparison that are presented in Table 11, eight out of thirtheen Greek regions converged to the steady-state after the crisis evolution in 2009. These regions namely include regions Central Macedonia,

Eastern Macedonia and Thrace, Epirus, North Aegean, Peloponnese, South Aegean, Western Greece and Western Macedonia. On the contrary, regions that experienced divergent trend from the steady-state are Attica, Central Greece, Crete, Ionian Islands and Thessaly.

Tab. 11   Comparison of both models and stating convergence or divergence.

Region	2004- 2008 γ coefficient	2009-2013 γ coefficient	Convergence/ Divergence
Attica	−0.250509	−0.258455	Divergence
Central Greece	0.070249	0.120374	Divergence
Central Macedonia	0.217185	0.212819	Convergence
Crete	0.112821	0.138075	Divergence
E. Macedonia and Thrace	0.330752	0.288585	Convergence
Epirus	0.325518	0.297654	Convergence
Ionian Islands	0.0111888	0.0596123	Divergence
North Aegean	0.247716	0.209098	Convergence
Peloponnese	0.22069	0.19055	Convergence
South Aegean	−0.120056	−0.00274929	Convergence
Thessaly	0.259264	0.267439	Divergence
Western Greece	0.249645	0.237046	Convergence
Western Macedonia	0.105664	0.0986407	Convergence

Source: Own elaboration, data ELSTAT

When comparing both models, it can be also seen how the convergent positions of particular regions changed with the presence of the crisis. Looking at the division of regions into particular groups, almost all the regions remained in the first group after the crisis outbreak, apart from the region Peloponnese that shifted to the second group as a result of its better catching up process with the steady-state in this period. It is also interesting to notice here that although the remaining regions did not manage to shift to the second group, some of them still slightly improved their process of convergence compared to the previous observed period. For example, regions Epirus, Western Greece and Central Macedonia moved up by 1 percentage point, the regions Eastern Macedonia and Thrace and North Aegean by 4 percentage points. On the other hand, the region Thessaly worsened its convergent process by 1 percentage point.

Regions that belonged to the second group in the first model experienced certain changes as well. From those that strengthened their process of convergence can be stated region Peloponnese (improved by three percentage points) and Western Macedonia region (improved its position by one

percentage point). The catching-up process of the rest of the regions in this group deteriorated as the crisis hit Greece. Between these regions belong Crete which worsened convergence process by three percentage points. This is also case of Central Greece that deteriorated by five percentage points which shifted it from the third group to the second group.

Focusing on the third group of regions, it can be nicely seen how the convergent process of the Greek regions changed again. The Ionian Islands region deteriorated its catching-up process by five percentage points. On the other hand, the region of South Aegean converged more to the steady-state when compared to its position in the first observed period. It should be also noted that GDP per capita of South Aegean region dropped significantly after 2009. Thus, although the region converged to the steady-state, its overall economic performance actually deteriorated. This might be explained by the fact that GDP per capita of Greece declined significantly as well after the crisis erupted. As a result, South Aegean diverged from Attica and shifted from the fourth group to the third group. However Attica's GDP deteriorated as well, it still managed to keep its levels of GDP per capita significantly above the national figures in spite of the crisis presence.

Thus, for the reasons just mentioned, the last fourth group of the second model included only Attica, however in the first one was present also South Aegean. Attica was once again a region that belonged to the more divergent regions, but from the opposite side than the other regions. Attica maintained to keep its level of GDP per capita above the national GDP per capita level even in the period that was already hit by the crisis and in its economic performance stayed remote from the other regions.

6 Discussion and results

In this chapter, comparison of the results that were observed in this diploma thesis will be presented and further discussed. As the literature review revealed, the Greek economy was coutgh in quite a diffucult situation many years before the crisis hit Greece. Several endogenous factors that had been weakening Greek economy for many years were indentified, namely public finance mismanagement, lack of competitiveness, ineffectiveness of public sector and high share of grey economy and tax exasion. On the top of that, exogenous factors such late timing of bailout caused by reluctancy of ECB and Eurozone governments, lack of solidarity funds and benevolent conditions in financial markets in years prior to the crisis also did not contribute to development of Greek economy. Hence, combination of both endogenous and exogenous factors determined the immense impact of the crisis on Greece. This impact was then confirmed by evaluating several economic indicators during the researched years 2004-2013 on the national level which recorded a strong deteriorating trend as soon as the crisis entered Greece. Initially, in this part of the thesis was supposed to be included macroeconomic analysis of economic indicators on their regional level however available literature did not provide useful information to cover this topic. The last chapter of literature review touched the issue of convergence on both national and regional levels. Focusing on findings related to convergent process of Greece over different time-periods, a number of empirical studies confirmed either existence of convergence among Greek prefectures or regions or economic dualism across southern and northern Greek regions.

   The practical part of the thesis then focused on regional economic performance and process of convergence or divergence among Greek regions in period before and after the crisis. However the initial aim was to evaluate economic performance and convergent processes of Greek regions in periods before the crisis, during the crisis and after the crisis, this approach was abondoned due to two reasons: unavailability of the data for years 2014 and 2015 that were supposed to cover the period after the crisis and also strong negative values of all the economic indicators in year 2013, indicating that Greek economy was still in reccession. At first, macroeconomic analysis of important economic indicators that were available on a regional level, namely GDP, GDP per capita, GDP growth and unemployment rate was made for both pre-crisis and crisis period. The analyses revealed that some of the regions slightly declined their GDP and GDP per capita already in 2008, however this decline was rather small, and unemployment rate decreased in 2008 to year

2007. For these reasons, year 2009 was kept as an initial year of the crisis in Greece for the following analysis. The macroeconomic analyses also brought some interesting insights into regional economies. A pole of development for Greece was in both periods region Attica, which significantly exceeded the GDP levels of all the remaining regions in the whole observed period. Attica was followed by Central Macedonia, however its GDP contribution was approximatelly three times smaller and the rest of the regions then significantly lagged behind. Although all of the regions deteriorated their GDP levels and followed a downward trend in the years during the crisis, their order as to the contribution to the total GDP remained almost the same as in the pre-crisis period also in the years following the crisis. Analyzing GDP per capita values revealed that Attica recorded the highest levels of this indicator however was quite closely followed by South Aegean and Ionian Islands and also the gap among the rest of the regions was not as large as in the case of GDP which can indicate lower disparities among Greek regions in terms of living standards of their inhabitants. The same situation occurred also in the crisis period, although the order of some of the regions slightly changed and all of the regions recorded declining trend in all the years following 2009. As to the level of unemployment, the highest rates were recorded by Western Macedonia in both pre-crisis and crisis period, in 2013 reaching alarming 32%, twice as much as 10 years ago. This can be related with a dramatic decrease of both private consumption and invesmets which occured in Greece as soon as the crisis erupted and which most likely led to decrease of employmwnt. When both pre-crisis and crisis periods should be compared, the greatest loss as to the level of GDP was recorded by Central Greece and Ionian Islands which decreased their GDP by almost 18%, on the contrary the best results recorded Attica (-11%) and Peloponnese (-12%). As to the GDP per capita regions Central Greece and Ionian Islands faced the greates losses at almost 18% level, on the other hand the least affected was again Attica (-9%) and North Aegean (-11%). As the year which was worst for all the thirteen regions in terms of the greatest decline of all of the indicators can be considered year 2011. This analyses revealed quite a high regional disparities among regions as to ther GDP levels. The macroeconomic analyses thus provided an evidence of crisis presence on the regional level in Greece and also grouped regions according to their similarities which are essential for process of convergence. It also provided valuable information about regional economic evolution for both Cluster and β-convergence analyses in researched years, suggesting that Attica might be a region tha can influence their results due to its extreme values of GDP in comparison with the remaining regions.

Subsequently, setor divison of Greek regions was made by employing average sector GVA values for both pre-crisis period and period during the

crisis, demonstrating once again dependency of Greek economy on Attica. In the pre-crisis period Attica dominated all of the fourteen sectors in Greece (apart from Agriculture in which held the highest share Central Macedonia) leaving the rest of the regions far behind. This remained same when the crisis entered Greece, however values of all the regions in most of the sectors dropped significantly and the greatest loss was recorded by construction sector which in the most of the regions declined by approximately half, showing a massive impact of the crisis on all the regions. Nevertheless, this did not apply for real estate activities sector, which increased in the crisis period by approximately 30%. This can be explained by high dependecy of Greece on tourism as most of the incomes came from sub-sectors renting and operating of real estates. The same implies for public sectors such public administration and education which both increased in the period after the crisis in most of the regions, however the increase was quite small. The analyses also revealed that the most important sector for Greek economy are services (accounted for approximately two-thirds of Greek GVA), followed by industry (12%) and agriculture (4%) as to their contribution to the total GVA. While services sector did not face a sharp decline after the crisis outbreak, both industry and agriculture sector experienced a downward trend after the crisis spread out in Greece and decreased by more than 20% with repsect to the pre-crisis period. The sector division of Greek regions also once again proved which was already indicated by the macroeconoic analyses. As Attica was in the most of the cases recording significantly higher values and standing out from the rest of the regions, there is a possibility of influencing and limiting results of the Cluster analyses.

The cluster analyses that followed brought an evidence of convergence and divergence among Greek regions as it grouped Greek regions into several clusters according to their common features by employing macroeconomic indicators (GDP, GDP per capita, GDP growth and unemployment rate) and sector GVA data. Cluster analyses was run in two models for 5-year period before the crisis and for 4-year period during the crisis. Year 2013 was not included in this analyses due to unavailability of the data. Greek regions were divided into three main clusters in both periods, however distribution within these clusters changed with the crisis presence and most of the regions shifted across different clusters.

The most distant region from all the others regions, Attica, kept the same position in both periods and stayed in its separated remote cluster during the whole observed period. Although its economic performance deteriorated as a result of the crisis, the differences between Attica and the rest of the regions remained large. This can be explained by significant disparities between Attica and the rest of the regions as demonstrated in the macroeconomic analyses and

sector structure of the Greek economy. As mentioned above, the extreme values Attica was recording throughout the whole observed period in comparison with rest of the regions might have limited the results of the cluster analyses. The crisis didn't lead to convergence of Attica with the rest of the regions, however, region Central Macedonia got closer to Attica in the second model a bit more than in the first model.

The second cluster of the pre-crisis period included regions North Aegean, South Aegean and Ionian Islands, that were in this period converging to each other. This cluster was in the crisis period replaced by Central Macedonia. As a result of the crisis presence, Central Macedonia created an isolated cluster and became more distant from remaining 11 regions and at the same time closer to Attica as mentioned above. This is a significant difference in comparison with the pre-crisis model in which was Central Macedonia quite closely approached by regions located in the third cluster that were cacthing up on it as the differences among Central Macedonia and the rest of the regions were smaller. This had changed in the years following 2009 in which the differences among Central Macedonia and the rest of the regions deepened. This can be also interpreted in that way that Central Macedonia diverged from the rest of the regions in this group and increased its disparities with repsect to pre-crisis model. It can be explained by the fact that the crisis hit significant sectors of these regions which as a result stopped the process of convergence.

The third cluster underwent the greatest change and created two main sub-clusters that subsequently divided regions into closer clusters reflecting their similarities. Nevertheless, it was evident that the crisis impact on these regions was rather significant as they became more distant from Central Macedonia as mentiond above. However, this shift also meant that regions South Aegean, North Aegean and Ionian Islands, which in the pre-crisis model created an isolated cluster, became closer to the rest of the regions and created new sub-clusters with them. Hence, in the second model, South Aegean converged to Ionian Islands and at the same time became closer to Thessaly and Crete within one sub-cluster. Regions Peloponnese, North Aegean, Epirus, Western Greece and Eastern Macedonia and Thrace got closer to each other in other cluster within which Western Macedonia and Eastern Macedonia and Thrace converged more to Epirus. However, this movement also meant that North Aegean diverged from Ionian Islands and North Aegean with respect to the pre-crisis model. This shift of North Aegean from Ionian Islands and South Aegean was though expected as it in the crisis years recorded different decreases of its macroeconomic indicators than the other two regions in this cluster. The last cluster then revealed that Western Macedonia became much closer to Central Greece than in the first model as both of the regions reacted to the crisis

in a similar way and most of their indicators experienced very negative trend. Thus it can be summarized that regions which created new convergent groups in the model during the crisis were close to each other in their responses to the crisis, which resulted in similar declines of their economic indicators and sectors. From this it can be clear that the crisis influenced convergent process of the Greek regions and moved them across the different clusters.

However, it should be borne in mind that results of this cluster analyses are highly dependent on selection and availability of the dataset used. As it was mentioned in the Methodology, involving a broad spectrum of variables which reflect not only economic, but also social and demographic development of regions would probably bring more relevant results and address the inequalities among Greek regions more precisely. Moreover, it is also reccommended to apply smaller geographical units (in case of Greece it would be prefectures) as large geographical units are not always of the same kind in terms of their socio-economic performance, which is in particular relevant for a small country like Greece (Rovan, Sambt, 2003). Unfortunatelly, even in this case these data were not available for public use for the required time-period, thus neither social and demographic variables nor smaller geographical units could be implemented in the analyses.

The last analyses used for the purpose of this diploma thesis was β-convergence analysis, examining convergent process of the Greek regions in two time-periods, pre-crisis one involving years 2004-2008 and one during the crisis involving years 2009-2013. This analysis is commonly used as a tool of the European Union to measure regional disparities and covergence of regions. The analyses in this diploma thesis followed methodology of Melecký and Nevima (2011) and provided a different perspective on this issue. Within this analyses, only two variebles were employed, namely GDP per capita of all 13 regions and GDP per capita of Greecce, which was also determined as a steady-state. In the pre-crisis model, regions were divided into four different groups according to their cacthing-up process on the steady-state. The thirst group included regions Eastern Macedonia and Thrace, Epirus, Thessaly, Western Greece and North Aegean, Peloponnese and Central Macedonia which were the most distant from the steady-state and thus also most divergent regions in this time-period. The second group consisted of only two regions, Crete and Western Macedonia, which were cacthing-up on the steady-state more than the regions in the previous group. The third group then included Central Greece and Ionian Islands which reached almost converged upon the steady-state and thus could be stated as most convergent out of all the others in the pre-crisis period. The last fourth group was concluded by only two regions as well, South Aegean and

Attica. These regions diverged from the-steady state as their GDP per capita values were significantly above national level.

The model capturing regions in the years of the crisis then shows how was the catching-up process on the steady-state influenced by the crisis. In here, four groups were created again however some regions shifted to oher groups and thus changed their process of convergence. The first group remained almost the same as in the previous period and included Epirus at the first place, followed by Eastern Macedonia and Thrace, Thessaly, Western Greece, Central Macedonia and North Aegean. These regions remained the most remote from the-steady state and hence the most divergent as their GDP per capaita levels were significantly below national level. Region Peloponesse shifted to the second group and joined there Crete, Central Greece and Western Macedonia. These regions managed to catch-up on the steady-state more than the regions in the first group. In this time-period, Central Greece shifted from second to the third group and thus worsened its convergent process with a respect to the crisis. The third goup then consisted of only two regions, Ionian Islands and South Aegean, which almost converged to the-steady state in the crisis period and thus were the most convergent out of other Greek regions. In here, South Aegean moved from the fourth to the third group and beame closer to the steady-state, however deteriorated its GDP per capita levels. This might be explained by the fact that GDP per capita of Greece declined significantly as well after the crisis erupted. The last fourth group included in the crisis period only region Attica, Attica was once again a region that belonged to the more divergent and remote regions from the steady-state as its GDP per capita values remained significantly above national level.

Hence, as the distribution of some of the regions in the groups changed, it can be said that their convergent process was influenced by the crisis, however the impact was not that remarkable as it was visible in the case of Cluster analyses. Subsequently, γ values of pre-crisis and crisis models were compared, which brought an interesting results. It turned out that eight out of thirteen Greek regions recorded better γ values than in the pre-crisis period and thus converged in the crisis period with respect to the pre-crisis one. These regions included Central Macedonia, Eastern Macedonia and Thrace, Epirus, North Aegean, Peloponnese, South Aegean, Western Greece and Western Macedonia. On the contrary, regions that experienced divergent trend from the steady-state are Attica, Central Greece, Crete, Ionian Islands and Thessaly. This can be considered as quite an interesting finding as it would be expected that regions would diverge after such a great intervetion of the crisis to their economies. However, in case of Greece, most of its regions recorded convergent trend which might be explained by the selection of the steady-state. The regions experienced

a decrease in their GDP per capita values in a similar way as the-steady state (decreased by approximately 13% in comparison with the pre-crisis period) and thus their tendency to catch-up on it was obvious. Moreover, regions that experinced divergent trend were regions, that either significantly exceeded national GDP per capita level, namely Attica, or regions that experienced the greatest losses in comparison with the other regions in their GDP per capita, namely Central Greece, Ionian Islands, Crete and Thessaly (lost approximately around 17% in comparison with years without crisis). Thus, it can be concluded that as a result of the crisis, these regions changed the pace of their convergent process and economic evolution. The crisis deepened the gap among regions and thus some diverged from the others. To point out, the regions that diverged belonged in the pre-crisis period to the wealthiest ones in terms of their GDP per capita, thus their divergence can influence the growing trend of whole Greece. It should be underlined here that Attica, despite of diverging from the other regions, was doing better than the others and experienced the lowest decrease of its GDP per capita in Greece when compared with the previous period and rest of the regions. However, although the most of the regions converged, it does not neccessarily mean that this is a step forward in terms of improvment of their economic performace, which with the crisis significantly deteriorated. In this case it more likely implies that although the regions converged to each other, they converged due to the fact that their GDP per capita recorded similar losses as a result of the crisis presence, although these losses were smaller that the ones of regiones that diverged (apart from Attica).

Similarly to the cluster analyses, results of β-convergence are dependent on the dataset used. Determination of the steady-state is crucial for the whole analyses in particular as it can significantly influence the results. Hence, by choosing else steady-state, the analyses would most likely lead to different results. Additionally, to increase explanatory power of the models reflecting process of convergence of the Greek regions, it would be useful to increase the number of observations by either application of quarterly data or by including also recent years (2014,2015) to the analyses. The best result would be probably given by combination of both. It would be also good to test the presence of σ-convergence, which is another commonly used approach when testing convergence and if data allows, to focus on Greek prefectures rather than regions as divison of Greece in regions has rather administrative character. Hence, by presenting methodological critique and shortcomings of both Cluster and β-convergence analyses, it is evident that there is a room for further testing of convergence in future research. Moreover, some of the inconsistencies of cluster and β-convergence analyses can be also explained by the variable

selection and it should be borne in mind that their results are highly determined by these used variables.

As for the reccomendations on how to improve the current situation of Greek regions, several suggestions can be proposed that support the process of convergence and slow down process of divergence in some of regions mentioned above. To reduce peristently high level of unemployment in Greece, with youth being affected the most, Greek governmnet should support companies to employ young people and implement welfare reforms, focusing mostly on regions which crisis has left with unemployment reaching particularly high levels (Western Macedonia, Central Macedonia, Attica). Along with this, it was indicated in the Literature review that there exist high barriers preventing people from seting up new business in Greece in comparison with other OECD countries. These barriers are related to administrative burdens, complex licensing procedures, inefficiency of public sector or obstacles related to use of land. However Greek government has already taken a certain steps to address this issue, it is reccommended to simplify the whole process even more and increase efficiency of the public sector to encourage people to start their own business. Raised efficiency of the public sector could also result in a more efficient tax collection, another issue that was previously identified as a serious long-lasting problem of the Greek economy which can also increase disparities among regions. This could help to boost competitiveness and productivity as a proper tax collection might ensure a fair competition among Greek regions and their inhabitants. An important factor that is crucial for development of a small economy such Greece – investments (household, public and business) – should not be ommitted at this point either. It was found out in the Literature review that investments in Greece decreased by more than a half due to an ongoing recession with transport, construction, agriculture and extractive industry being the most affected. The Greek government should support investements and particularly focus on sectors and regions hit by the crisis the most to revive their economy (see chapter 5.2 for detailed data about regional sector structure). Moreover, the macroeconomic analyses revealed that Greek economy is too centralized. As majority of economic activities are being held in Attica, it results in high disparities among Attica and rest of the regions. To decrease these inequalities among regions, further distribution and decentralization of industries across all regions would be beneficial and could guarantee that Attica would not diverge from the others. This could be achieved with financial support of European Regional Development Fund and implementing regional policies promoting local business. On the top of that, it would be also good for Greek economy to diversify its sector structure as so far its economy is one of the least diversified within the European Union. Hence, many steps can be done

in order to improve the overall state of Greek economy and support convergent trend among Greek regions. As convergence among countries, being conditional on convergence across their regions, is one of the main operational priorities of the European Union to achieve united Europe, all member states including Greece should be aiming to reduce regional disparities.

7 Conclusion

The diploma thesis provides an evidence about the impact of the financial and economic crisis on the thirteen Greek regions. This evidence was gathered from research of literature, macroeconomic analyses of Greek regions, sector structure of Greek economy and application two crucial econometric analyses, Cluster and β-convergence analyses. One thing should be highlighted here. However the initial aim of the thesis was to evaluate economic performance and convergent processes of Greek regions in periods before the crisis, during the crisis and also after the crisis, this approach was abondoned and evaluated were only periods before and during the crisis. This was caused by basically two reasons, unavailability of some of the data for years 2014 and 2015 that were supposed to cover the period after the crisis and also strong negative values of all economic indicators in year 2013, indicating that Greek economy was still in reccession.

        The literature review to a certain extent proved that the tradegy that hit the Greek economy in late 2009 was actually waiting to happen. Greek economy had been weakened for many decades prior to the crisis mainly due to irresponsibility of governments which brough the country high indebtedness, low competitiveness and ineffective public sector. Thus, when these were combined with turmoil that happened on financial markets in 2007 and rapidly spread around the world economies, it became clear that Greece and its economy would be caught in a deadlock. The part dedicated to Greek economy in the years surrounding the crisis then outlined economic activity on a national level, indicating strong impact of the crisis since 2009 on economic indicators examined, namely GDP and its growth and components, debt development along with current revenues and expenditures, real disposable incomes, private expenditure, labour market indicators and others.

        Previous was also confirmed in the practical part. As was demonstrated in the macroeconomic analyses focusing on years 2004-2013, economic situation of all Greek regions had been deteriorating since 2009 and kept a strong negative trend onwards in all of four economic indicators observed, namely GDP, GDP per capita, GDP growth and unemployment rate. The analyses showed that the most difficut year for all Greek regions was year 2011 in which all indicators recorded the greatest downsings. The macroeconomic analyses also provided first evidence of rather high disparities among Greek regions as for their GDP levels. Attica turned out to be a key region for Greek economy contributing to Greek GDP by almost 50% and was followed by Central Macedonia with approximatelly three times smaller GDP contribution. The rest

of the regions then lagged behind significantly. The highest unemployment rates were recorded by Western Macedonia during the whole observed period, in 2013 reaching alarming 32%. The greatest loss as to the level of GDP was recorded by Central Greece and Ionian Islands, on the contrary the best results recorded Attica and Peloponnese. As to the GDP per capita regions Central Greece and Ionian Islands faced the greates losses, on the other hand the least affected was Attica and North Aegean. The macroeconomic analyses thus provided an evidence of crisis presence on the regional level in Greece and also grouped regions according to their similarities which are essential for process of convergence.

Sector structure of Greek economy supported Attica's strong economic position too. It showed that apart from agriculture Attica dominated all the sectors during the whole observed period, leaving rest of the regions far behind in all the sectors. Attica can be then considered as a pole of development in Greece, on which is Greek economy highly dependent.

Additionaly, Cluster analyses was applied based on macroeconomic and sector data of Greek regions and run in two different periods. In both pre-crisis period (2004-2008) and crisis period (2009-2012) were regions divided into three clusters according to their common features. In both periods, region Attica was the most distant from the remaining regions due to its significantly better economic performance which was also proved in macroeconomic analyses. However, the presence of the crisis shifted most of the remaining regions across different clusters. Distribution of both second and third cluster changed significantly which implies that these regions changed their pace of convergence as a result of the crisis. In the pre-crisis model, several regions of the third group were catching up on a better performing Central Macedonia. However, in the crisis model Central Macedonia shifted and created an isolated distant cluster as a result of deepening disparities, leaving the rest of the Greek regions in the third cluster. From this it can be clear that the crisis influenced convergent process of the the Greek regions, moving majority of them across different clusters.

In the end, β-convergence analysis was estimated and calculated for two time periods, covering years before and after the crisis outbreak, and brought new insights into the issue of regional convergence. It is a commonly used method of the European Union which examines existence of covergence among regions. This analyses was run with use of GDP per capita of all thirteen regions and GDP per capita of Greece which determined steady-state. Also β-convergence analyses grouped regions in both models, however its groups differed from the cluster analyses and the crisis redistribution was not that different from the pre-crisis period as it was in the case of Cluster analyses. β-

convergence analyses revealed that majority, precisely eight out of thirteen regions, tended to converge to the steady-state as a result of the crisis that hit Greece in 2009. Among these regions belonged Central Macedonia, Eastern Macedonia and Thrace, Epirus, North Aegean, Peloponnese, South Aegean, Western Greece and Western Macedonia. On the contrary, regions that experienced divergent trend from the steady-state were Attica, Central Greece, Crete, Ionian Islands and Thessaly. This can be considered as quite an interesting finding as it would be expected that all the regions would follow diverging trend after such a great intervetion to their economies. Thus, it can be concluded that as a result of the crisis, these regions changed the pace of their convergent process and economic evolution. The crisis made a gap among regions deeper and as a consequence, some of them diverged from the others and increased regional disparities. However, for further research is recommended to involve also recent years 2014 and 2015 in order to examine a connection between regional convergence and the financial and economic crisis in a broader context.

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9 Appendices

9.1 Appendix 1
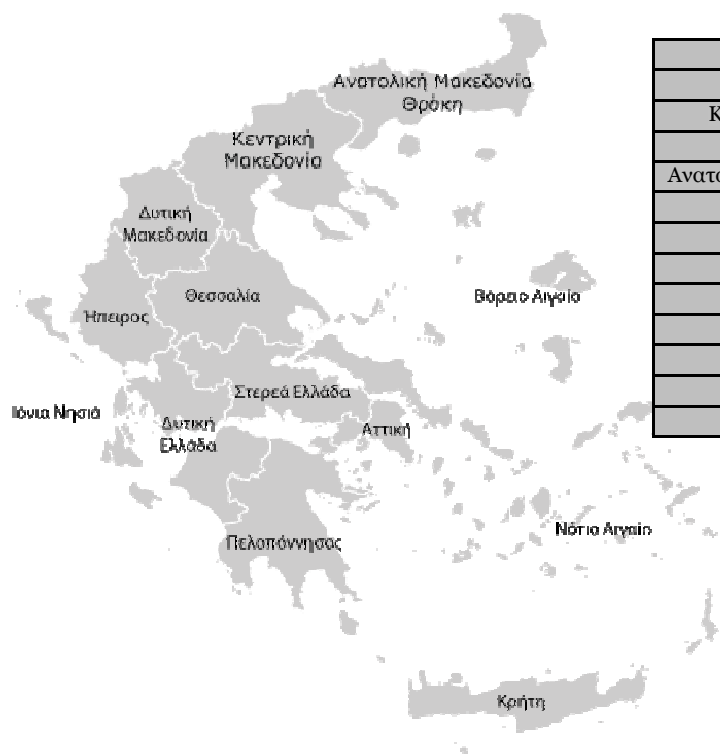
Αττικη	Attica
Στερεα Ελλαδα	Central Greece
Κεντρικι Μακεδονια	Central Macedonia
Κριτι	Crete
Ανατολικι Μαδεδονια Θρακη	E. Macedonia and Thrace
Ηπειροσ	Epirus
Ιονια νησια	Ionian Islands
Βορειο Αιγαιο	North Aegean
Πελοποννησοσ	Poloponnese
Νοτιο Αιγαιο	South Aegean
Θεσσαλια	Thessaly
Διτικι Ελλαδα	Western Greece
Διτικι Μακεδονια	Western Macedonia

Fig. 31   Maps of NUTS 2 regions of Greece with legend.
Source: The Committee of the Regions Greece, own elaboration.

9.2   **Appendix 2: β-convergence analysis**

Tab. 12   Testing multicollinearity for Model 1.

Region	VIF*
ln GDP per capita	25.523
Attica	5.599
Central Greece	2.151
Central Macedonia	4.670
Crete	2.616
Eastern Macedonia and Thrace	8.380
Epirus	8.175
Ionian Islands	1.865
North Aegean	5.516
Peloponnese	4.761
South Aegean	2.717
Thessaly	5.865
Western Greece	5.573
Western Macedonia	2.523

Source: Own elaboration, ELSTAT, * Variance Inflation Factor
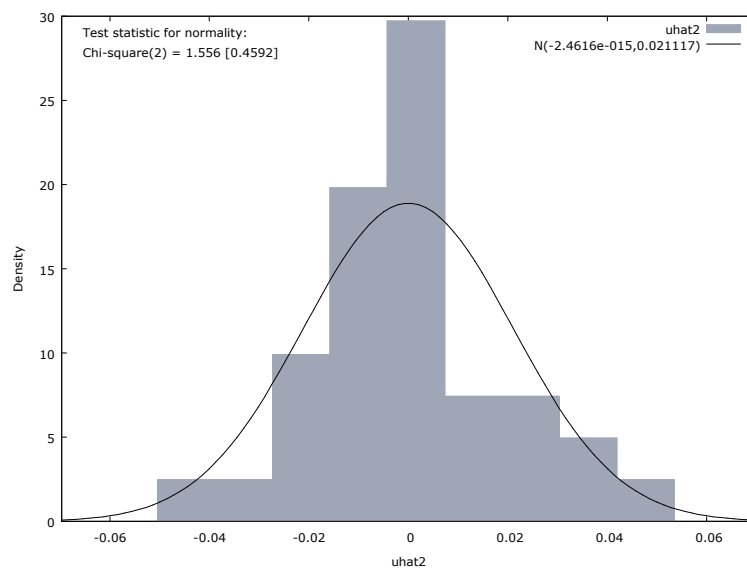

Fig. 32   Testing normality of residuals for Model 1.
Source: Own elaboration, ELSTAT

Tab. 13   Testing multicollinearity for Model 2.

Region	VIF*
ln GDP per capita	3.968
Attica	2.488
Central Greece	1.994
Central Macedonia	2.285
Crete	2.037
Eastern Macedonia and Thrace	2.644
Epirus	2.694
Ionian Islands	1.891
North Aegean	2.270
Peloponnese	2.200
South Aegean	1.857
Thessaly	2.533
Western Greece	2.388
Western Macedonia	1.949

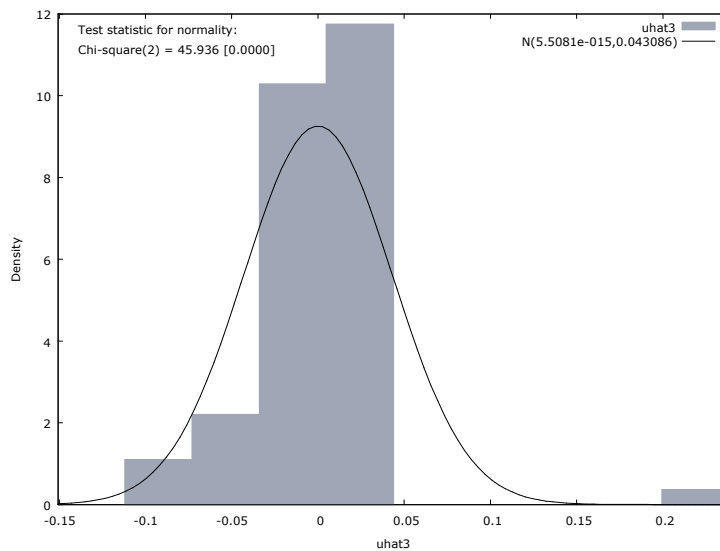Source: Own elaboration, ELSTAT, *Variance Inflation Factor

Fig. 33   Testing normality of residuals for Model 2.
Source: Own elaboration, ELSTAT