Lessons from the Strukturwandel in the Ruhrgebiet: Turning Northern Greece into an Industrial Champion?*

Ansgar Belke
Ad personam Jean Monnet Professor for Macroeconomics
University of Duisburg-Essen

Nicos Christodoulakis
Professor of Economic Analysis
Athens University of Economics & Business

Daniel Gros
Director
Centre for European Policy Studies, Brussels

Essen
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Executive summary

Against the background of the (at least partially) successfully overcome structural change in the Ruhrgebiet, this project analyses whether and to what extent the current problem countries in the euro zone, here: Northern Greece, especially Central Macedonia with the city of Thessaloniki, can learn from the Ruhrgebiet when conducting the required structural reforms and coping with structural change. In the Ruhrgebiet, the process of structural change seems to be almost complete. More than half of the workforce is now employed in the service sector - at a still positive trend. But some problems such as a high proportion of educationally disadvantaged households with a migration background remain due to the missed structural change in the 1960s. This study thus analyses the structural characteristics of the Greek economy and workforce with particular emphasis on the northern regions in Greece and compares them to the Ruhrgebiet and NRW.

The key findings are first of all that there are some similarities in the problems (of the Ruhrgebiet in the 1970s and Northern Greece today). Similarities include, for example, the low level of qualifications of the workforce. But there are also notable differences, in particular the importance of industry and manufacturing, whose weight in the local economy was excessive in the Ruhrgebiet, but appears rather low in Greece.

Moreover, it appears that Greece seems to have made great progress in tertiary education, at least in quantitative terms. The proportion of the workforce with a university degree is now about the same in Germany and Greece. In this sense Greece has been quicker than the Ruhrgebiet. But the results in terms of productivity and innovation are very different.

It remains to be seen whether is this due to the quality of the university education or the fact that the universities in Greece constitute ‘cathedrals in the desert’ because there is no high-value added manufacturing base around them to make use of the graduates. This absence of a local manufacturing base in turn could be due to the fact that the middle level in terms of educational qualifications is much thinner in Greece (and in particular in the north of the country) where the proportion of the workforce without complete upper secondary education is still very large.

In Greece, and especially in Northern Greece, the key problem might thus be the absence of well-paying industrial jobs, which is both a cause and a result of a very thin industrial structure. Given that there is little industry to absorb those who do not

have a University degree, but solid competences in practical tasks, the young tend to stay out of training.

But the secondary school system in Greece seems ill suited to turn out the kind of work force needed by technologically advanced manufacturing. Greek youth tend to underperform in international tests of the knowledge of mathematics and science. This problem does not seem to be due to a lack of spending on education in general, but the quality of the school system and its management by the government.

The basic message suggested by this simple result is at the same time simple, and somewhat discouraging. If general government efficiency is the main determinant of educational achievement, it implies that partial reforms within the education sector are unlikely to improve student achievements fundamentally. Many aspects of public administration need to be overhauled and improved if one wants to improve educational outcomes. This is likely to require time and a general consensus. Partial reforms that improve, for example, the distribution of resources – by introducing more competition and greater transparency – can be designed and implemented in a rather short time and should have a positive impact.

The structural problems in the Greek educational system have of course been exacerbated by austerity. More attention should be paid by the Troika to where the money is spent, not just how much. Moreover, now might be time for EU and other institutions to help the local authorities in Northern Greece to improve the quality of the local school system and try to entice the many youth which have abandoned hope 'back to school' with the offer of a high quality practical education which does improve their chances to find a job.

Zusammenfassung

Im Rahmen des Projekts wird vor dem Hintergrund des im Ruhrgebiet (zumindest teilweise) erfolgreich bewältigten Strukturwandels analysiert, ob und inwieweit gegenwärtige Problemländer der Eurozone wie Griechenland, hier Nordgriechenland, insbesondere Zentralmazedonien mit der Stadt Thessaloniki, bei der geforderten Strukturreformen und der Bewältigung ihres Strukturwandels vom Ruhrgebiet lernen können. Dort scheint der Prozess des Strukturwandels nahezu abgeschlossen. Mehr als die Hälfte der Erwerbstätigen ist mittlerweile im Dienstleistungssektor beschäftigt - mit immer noch steigender Tendenz. Wenngleich aufgrund des verpassten Strukturwandels in den 1960er Jahren einige Probleme wie ein hoher Anteil bildungsferner Haushalte mit Migrationshintergrund verbleiben.

Diese Studie untersucht daher die strukturellen Eigenschaften der griechischen Volkswirtschaft und Arbeitskräfte mit besonderem Schwerpunkt auf den nördlichen Regionen in Griechenland und vergleicht sie mit dem Ruhrgebiet und NRW. Zu den wichtigsten Ergebnissen zählt in erster Linie, dass es bei den Problemen (des Ruhrgebiets in den 1970er Jahren und Nordgriechenland heute) viele Ähnlichkeiten gibt. Diese schließen zum Beispiel die Qualifikationen der Arbeitnehmer ein. Es gibt aber auch erhebliche Unterschiede, insbesondere bei der Bedeutung der Industrie und verarbeitender Produktion, deren Gewicht in der lokalen Wirtschaft im Ruhrgebiet zeitweise unverhältnismäßig hoch war, aber in Griechenland ziemlich gering erscheint.

Darüber hinaus scheint es, dass Griechenland zumindest in quantitativer Hinsicht große Fortschritte bei der Hochschulbildung gemacht hat. Der Anteil der Beschäftigten mit Hochschulabschluss ist in Griechenland gegenwärtig etwa der gleiche wie in Deutschland. In dieser Hinsicht war Griechenland schneller als das Ruhrgebiet. Aber die Ergebnisse in Bezug auf Produktivität und Innovation sind sehr unterschiedlich.

Es bleibt abzuwarten, ob dies auf die Qualität der Hochschulbildung oder die Tatsache, dass die Universitäten in Griechenland "Kathedralen in der Wüste" darstellen, zurückzuführen ist. "Kathedralen in der Wüste" könnten sie darstellen, da es in ihrem Umkreis keine Industriebasis mit hoher Wertschöpfung gibt, die Absolventen absorbieren könnte. Das Fehlen lokaler Produktionsstandort verarbeitender Industrie wiederum könnte daran liegen, dass die mittlere Ebene in

Bezug auf die Bildungsabschlüsse in Griechenland (und insbesondere im Norden des Landes) viel dünner erscheint, wo der Anteil der Arbeitskräfte ohne Abschluss der Sekundarstufe immer noch sehr groß ist.

In Griechenland und vor allem in Nordgriechenland könnte das Hauptproblem somit das Fehlen gut bezahlter Arbeitsplätze in der Industrie sein, das wiederum sowohl Ursache als auch Folge einer sehr dünnen Industriestruktur darstellt. Da es wenig Industrie gibt, um diejenigen zu absorbieren, die nicht über einen Hochschulabschluss verfügen, aber solide Kompetenzen in praktischen Aufgaben aufweisen, bleibt den jungen Arbeitskräften ein „Training on the job" vorenthalten. Aber das System der Mittelschulen in Griechenland scheint schlecht geeignet, die Art an Arbeitskräften hervorzubringen, die von einer technologisch fortschrittlichen Verarbeitenden Industrie benötigt wird. Die griechische Jugend neigt dazu, bei internationalen Prüfungen ihrer Kenntnisse in Mathematik und Naturwissenschaften unterdurchschnittlich abzuschneiden. Dieses Problem scheint nicht auf ein Fehlen von Ausgaben für Bildung im Allgemeinen zurückzuführen zu sein, sondern auf die unterdurchschnittliche Qualität des Schulsystems und seiner Verwaltung durch den Staat.

Die durch diese Ergebnisse vermittelte grundlegende Botschaft ist zugleich einfach und etwas entmutigend. Wenn die Effizienz des Staates die wichtigste Einflussgröße für den Erfolg der Schulbildung darstellt, impliziert dies, dass Teilreformen im Bildungssektor nur sehr unwahrscheinlich die volkswirtschaftlichen Erträge der Ausbildung grundlegend verbessern. Viele Aspekte der öffentlichen Verwaltung müssen überholt und verbessert werden, wenn man bessere Bildungsergebnisse erzielen will. Dies erfordert im Fall Griechenlands voraussichtlich viel Zeit und einen allgemeinen Konsens. Teilreformen, die beispielsweise die Verteilung von Ressourcen durch die Einführung von mehr Wettbewerb und mehr Transparenz verbessern, können in relativ kurzer Zeit konzipiert und umgesetzt werden. Dies sollte einen positiven Einfluss haben.

Die strukturellen Probleme im griechischen Bildungssystem wurden natürlich durch die jüngsten Sparmaßnahmen („austerity") verschärft. Mehr Aufmerksamkeit sollte die ehemals als Troika bezeichnete Institution darauf verwenden, wo das Geld ausgegeben wird, und nicht nur wie viel. Darüber hinaus könnte es jetzt für die EU und andere Institutionen an der Zeit sein, den örtlichen Behörden in Nordgriechenland dabei zu helfen, die Qualität der lokalen Schulsysteme zu verbessern und zu versuchen, die vielen Jugendlichen, die ihre Hoffnungen schon

aufgegeben haben, durch ein Angebot einer qualitativ hochwertigen praxisnahen Ausbildung "zurück in die Schule" zu locken, das ihre Chancen erhöht, einen Job zu finden.

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1.Introduction

The consequences of the debt crisis in Greece and the front-loaded fiscal adjustment that followed over the last five years seem to be more ominous and far-reaching than initially expected. Thus far, the country has experienced the deepest recession ever afflicting a European nation in the postwar era: output and employment in 2015 have fallen by 15-20%, relative to their levels in 2010, causing extensive social deprivation and political turmoil.[1] An equally threatening – though hardly discussed – consequence of the recession is the massive fall in overall investment activity, which has caused a reduction in net capital stock by 6.3% in real terms relative to its 2010 level, an event unprecedented in non-war times.[2]

In fact, the steep fall in investment is mirrored by a steep rise in unemployment. Fig. 1 shows that gross fixed capital formation in Greece had collapsed to just 13% of GDP, below half the level before the crisis,, while unemployment followed a symmetric explosion: it is currently running at around 25% of the workforce, more than three times higher.

[1] That was on top of the contraction by another -8% during 2008-2010 as a result of the global crisis.
[2] At the same time, Portugal's stock decreased by -3%, while Ireland's rose by 5%. Data are from Ameco; series OKND.

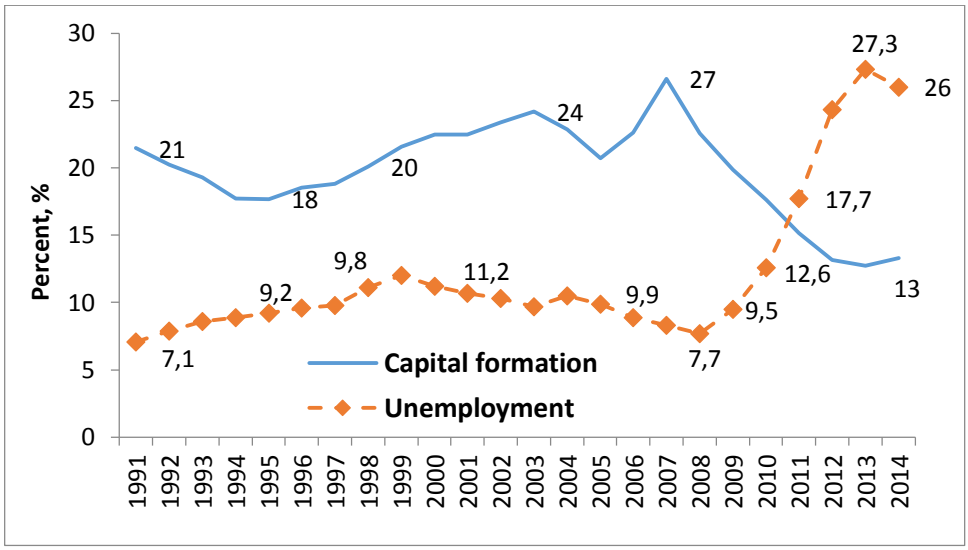

Fig. 1. Gross fixed capital formation and unemployment rate in Greece. Investment is expressed as a percent of GDP.
Source: AMECO Database. Series: ZUTN and UIGT respectively.

The collapse in investment characterizes both the private and the public sector, as displayed in Fig. 2. Private sector gross capital formation declined to slightly over 10% of GDP in 2014, while recently public investment somewhat recovered due to higher utilization of European Structural Funds (ESF).

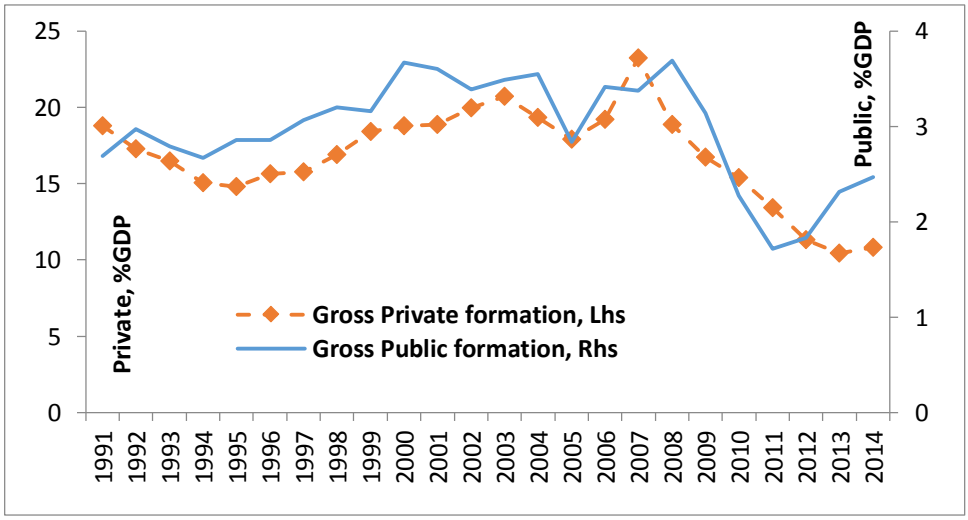

Fig. 2. Gross fixed capital formation of general Government and private sector, as a percent of GDP.
Source: AMECO Database. Series: UIGG and UIGP respectively.

The relationship between underinvestment and unemployment has been extensively researched in the economics literature (Belke and Dreger, 2011). The main finding is that restoring employment and economic activity necessitates and, at the same time, encourages, a revival of investment activity.[3] In many studies, the massive fall in investment activity is found to be both a result of, and a cause for, the sharp decline in output and employment.

The debate becomes more relevant in light of a major initiative recently approved by the European Commission. The 'Juncker package' – named after the current EU President - aims to mobilize private as well as public funds through the European Investment Bank to the tune of Euro 300 billion in order to finance investment projects in the EU. The initiative could not have been timelier for Greece and other debt-stricken economies. Greece should participate in the opportunities that lay ahead by organizing a coherent investment plan. In combination with existing Structural Funds, the new initiative can provide further funding and strategic support in enhancing competitiveness and promoting export capacity of, and job creation in, the Greek economy.

The medium to long-term consequences of underinvestment are significant, not least for the remaining manufacturing basis in Greece. It is, therefore, crucial to examine how other areas in Europe managed to exit from similar crises in the past, so as to set a realistic policy agenda for boosting the economy back on a growth and investment trajectory. A striking such example is the Ruhrgebiet – or the Ruhr district - a highly urbanised area in North Rhine-Westphalia (NRW), Germany. It experienced a serious structural crisis in the 1960s, but responded, starting in the 1970s, with a multifaceted restructuring. The crisis was gradually overcome by shifting the structure of the economy from a focus on coal mining and ancillary industries to a broader base, including services and more high-value added manufacturing (Bauer et al., 2011). This shift was made possible by a radical upgrading of the educational levels of the population.

[3] For example, Rowthorn (1999a and 1999b) showed that weaker investment activity is associated with higher unemployment and a fall in wage share; Alexiou and Pitelis (2003) found that the unemployment in 13 economies in the European Union is significantly affected by the process of capital accumulation; Karanassou et al. (2008) found strong empirical support for the investment impact on unemployment in Denmark, Sweden and Finland. Recently, Christodoulakis (2014) has employed a Diamond model with job market frictions to estimate the relationship between capital formation and unemployment in the Euro Area.

A useful – though smaller and less developed – analogy in Greece that constitutes a comparison to the Ruhrgebiet is the constellation of four regions in the northern part of the country, namely those of Thessaly, Central, West, and Eastern Macedonia including Thrace; grouped together in the present study as 'Northern Greece'. This area, especially Central Macedonia with the second largest city in Greece, Thessaloniki, represents one of the few remaining manufacturing centres in the country, and its role in the Greek economy resembles that of the Land NRW within the German economy. Moreover, Northern Greece is home to important energy resources, as is also the case in NRW. Lignite dominates power generation in Greece (as in NRW), but its contribution to the regional and local economy seems rather limited, both in NRW and in Greece.

Our project therefore looks at the regional level (Belke and Heine, 2002, 2006) and seeks to compare the Ruhr district in Germany with the four regions in Northern Greece, asking whether there are lessons which the latter can draw from the former. Put otherwise, does the successful experience of the Ruhrgebiet offer a blueprint for sectoral innovation in Northern Greece?

This paper will thus seek to analyse the structural characteristics of the Greek economy and workforce with a particular emphasis being placed on the northern regions in Greece. We will then proceed to compare these to the Ruhrgebiet district in specific and more generally NRW.

The key findings are first of all that there are some similarities in the problems both areas face. To illustrate, the qualifications of the workforce show a high degree of similarities. There are also notable differences, in particular the importance of industry and manufacturing, whose weight in the local economy was excessive in the Ruhrgebiet, but appears rather lower in Greece. Moreover, it appears that Greece seems to have made considerable progress in tertiary education, at least in quantitative terms. The proportion of the workforce with a university degree is now about the same in Germany and Greece.

But the results in terms of productivity and innovation are very different. It remains to be seen whether is this due to the quality of the university education or the fact that

the universities in Greece constitute 'cathedrals in the desert' because there is no high-value added manufacturing base around them to make use of the graduates. The absence of a local manufacturing base could be due to the fact that the middle level in terms of educational qualifications is much thinner in Greece (and in particular in the north of the country) where the proportion of the workforce without complete upper secondary education is still very large.

The rest of the present paper is organized as follows:
Section 2 describes some key characteristics of Northern Greece within the evolution of the overall Greek economy.
Section 3 compares the regional structures of NRW and Northern Greece and points to similarities and differences between the two.
Section 4 investigates the two regional labour markets and in particular the characteristics of youth unemployment.
Section 5 discusses the importance of human capital on value-added activities, while Section 6 describes the innovation structures in NRW and Northern Greece. Finally, Section 7 argues on the importance of governance in improving local performance and provides a list of priorities for regional policy.
An Annex gives more details on the importance of local energy sources (lignite stock) in Northern Greece.

2. The situation in Northern Greece

In looking on how investment can be accelerated, Greece should at the same time prioritize some sectors which have a greater potential in delivering growth and competitiveness, so as to enhance export capacity and job creation. To this effect, restructuring and renovating the Greek industrial sector should be a priority for reasons that are explained below.

2.1. The role of manufacturing investment

Industrial production in Greece faces a long period of stagnation and decline. As displayed in Fig. 3, the industry sector in the 1990s was growing at virtually the same rate as overall economic activity, but the process was halted in the aftermath of entering the Economic and Monetary Union in 2001.

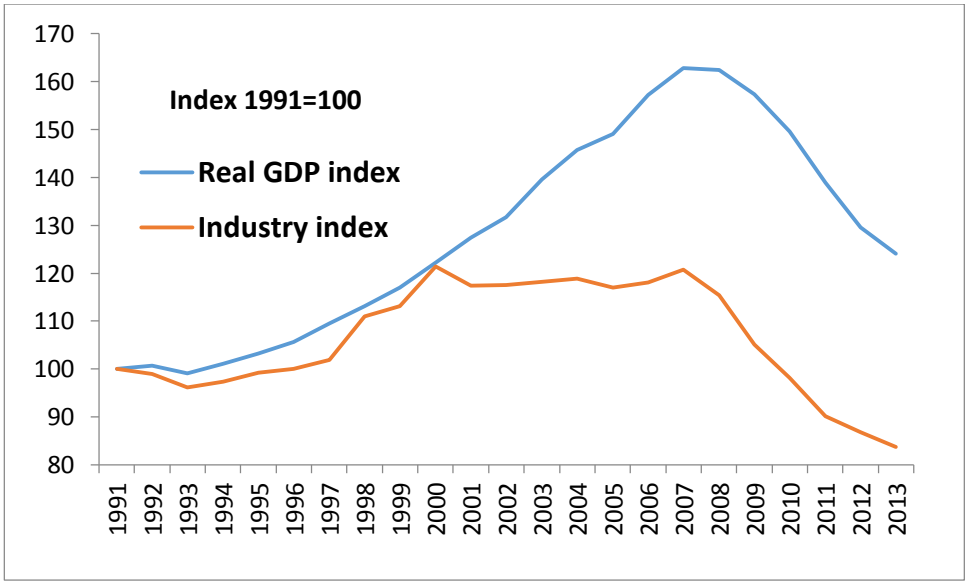

Fig. 3. Industrial production and GDP. The index takes a value of 100 at 1991.
Source: AMECO Database. Industrial production: construction excluded (VPRI).

On the eve of joining EMU, two effects were set in motion: on the one hand, manufacturing investment benefited from the reduction in the cost of money and initially rose from the anemic levels of the early 1990s. On the other, unit labour costs in manufacturing also rose and eventually hit competitiveness. This further

accelerated the reallocation of Greek companies to neighboring Balkan countries, and investment in manufacturing started to decline, as shown in Fig. 4. As a result, industrial activity stagnated despite a strong GDP expansion.

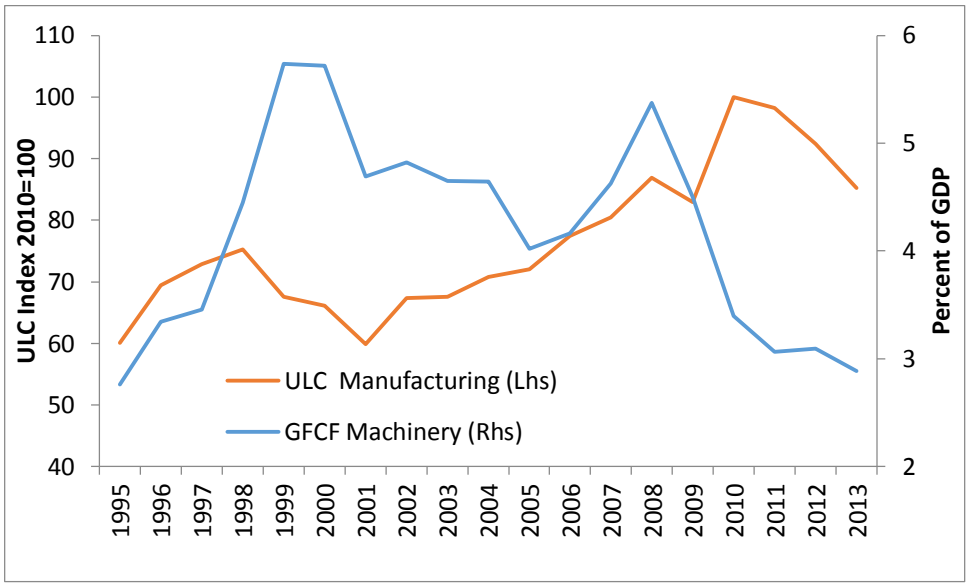

Fig. 4. Unit labour cost in manufacturing (based on hours worked) and gross fixed capital formation in Metal & Machinery as percent of GDP. ULC index 100 in 2010.
Source: AMECO Database. Investment: UIGMA. ECB database for ULC.

The situation was further aggravated by the 2008 crisis, and Greek industry was hit to an extent much stronger than overall activity. Whereas overall activity declined by -24% during 2008-2013, industrial activity declined further by a sheer -31%. At least partly, this can be attributed to the collapse of investment activity. Fig. 5 reveals a strong correlation between industrial activity and investment in manufacturing. In 2013, gross fixed capital formation in metals and machinery had fallen below 3% of GDP, the same level it had in 1995. Production capacity was severely reduced, and industry was unable to fully exploit the reduction in unit labour costs by 15% implemented by the austerity program over the last five years. In a recent survey study for Northern Greece industries, Palaskas et al (2013) have found that the reduction of labour costs was not a factor sufficient to lead to technological advancement in the area.

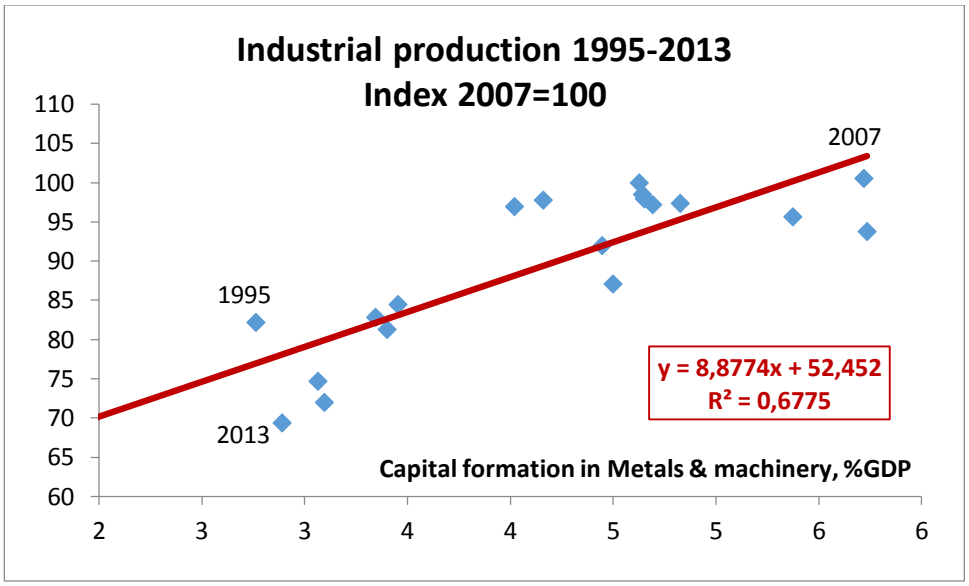

Fig. 5. Industrial production and gross fixed capital formation in Metal & Machinery. The index takes a value of 100 at 2010. Investments are percent of GDP.
Source: AMECO Database. Series: Investment: UIGMA. Industrial production: (construction excluded): VPRI.

2.2. Key economic indicators of Northern Greece

Greece encompasses a total of 13 regions comparable to the 'Länder' in Germany.[4] Northern Greece is comprised of three geographical areas, namely Macedonia, Thrace and Thessaly, which are administratively structured in four regions out of 13 in the country as a whole: West Macedonia, Central Macedonia, Eastern Macedonia & Thrace, and Thessaly. The latter was historically considered as part of central, rather than northern, Greece but its close economic links with Thessaloniki and the other regions have made it a more integral part of the area in question. Some key characteristics of Northern Greece are displayed in Table 1 and summarized as follows:

At an aggregate level, Northern Greece with 43% of national land, 33% of total population and 25% of Greek GDP represents an area less populous and developed than the rest of the country.

[4] Though regions are small compared with the average European size, their number was left untouched by the recent "Kallikratis" reform on decentralized administration. The reform reduced the number of municipalities (from 1.034 to 325), as well as enhancing them by conferring new functions to the regional and local levels and strengthening their role in the formulation and implementation of policies at both levels.

The rate of unemployment in Northern Greece stands consistently higher than the national rate, both before and after the economic crisis, as will be explained in Section 4. The intraregional dispersion of unemployment is found to be very high, between 24% and 30%, suggesting that there exist labour market enclaves and poor mobility between the prefectures in each region.

Despite the weak demographics, immigration flows are not very strong in Northern Greece. Immigration density is defined as the proportion of foreigners to total population, and in all regions of Northern Greece it appears to be substantially lower than the national average of 8.43% in 2011. In Eastern and Western Macedonia, densities are in fact below half the national level. In combination with the high dispersion mentioned above, this finding reveals that the unemployment problem has deeper structural characteristics and was not primarily caused by immigration flows. Most probably this is due to the fact that local labour force is not specialized enough so as to leave job opportunities for outsiders, as examined in Section 5.

2.3. Regional advantages

Though treated here as one area, it is crucial to note beforehand that Northern Greece is still far from being a homogeneous structure, economically or otherwise. The four regions share some uneasy characteristics of backwardness relative to national levels, but they are quite different in several aspects. Additionally, as a result of poor institutional and market integration, they show a high degree of intraregional disparities. This finding suggests that achieving intraregional and interregional convergence is a crucial prerequisite for making Northern Greece a pivotal area of new industrialization. With this caveat in mind, a number of advantages of Northern Greece in supporting a revival of industrial activity in Greece are described below.

(i)Manufacturing infrastructure: Northern Greece is hosting the majority of industrial infrastructure and a good share of the R&D capacity of the country: specifically, 15 out of 23 organized Industrial Areas, three out of five SME parks, and 18 out of 63 technology institutes are located in Northern Greece. The main infrastructure is concentrated in Thessaloniki, but some parts are allocated in the other regions as well; details are shown in Table 1.

(ii)Mineral resources. A substantial part of mineral stocks are located in Northern Greece and this can provide several opportunities for new production investment and employment. Details are in the Annex. Besides, minerals can be utilized for environmental-cleaning purposes. Synergies with local R&D can contribute to the creation of modern environmental technologies, which, in turn, can upgrade the quality standards of conventional manufacturing. A detailed description is given by Arvanitidis (1998) and, more recently, by Charalambides et al (2014).

(iii)Geography: Northern Greece hosts most of the industrial activity in the country. According to Christodoulakis and Petrakos (2000), manufacturing activity is mostly concentrated along the axis Athens-Thessaloniki, with major branches in Northern Greece, and minor ones in Eastern Greece. After 1989, the industrial geography proved to be a substantial advantage for local industries in developing trade and production links with neighboring Balkan countries.

(iv) Energy hub: Northern Greece is soon expected to upgrade the energy infrastructure. The Trans-Adriatic Pipeline (TAP) is designed to transfer natural gas on ground from Turkey to Albania and then underwater to Italy. From a total length of 850 km, 550 km would pass through the northern part of Greece. This is envisaged to create several new opportunities in construction, manufacturing and the energy sector.

(v) Technology clusters: The growth potential of Northern Greece became evident in the early 1990s as the restructuring of neighboring Balkan economies generated a multitude of opportunities for trade, investment and new employment flows. The region of Central Macedonia was in 1995-1997 awarded by a Regional Technology Plan (RTP) by the European Union, in order to foster innovation and promote productivity in the industrial sector; for a description see Tsipouri (1998). As explained by Komninos (2008), RTP proved quite successful and managed to create strong links between local industries and local technology centers. Similar initiatives were later undertaken for the region of Thessaly and more recently for the poorer regions of Western Macedonia, and Eastern Macedonia and Thrace.

Table 1. Key characteristics for the four regions in Northern Greece[1]

	Central Macedonia	Eastern Macedonia & Thrace	Western Macedonia	Thessaly	**Area total**	**GREECE**
Area, in km^2	18,811	14,158	9,451	14,037	56,457	131,957
As % of total	14.26%	10.73%	7.16%	10.64%	42.78%	
Population 2011, '000	1,882	608	284	733	3,507	10,815
As % of total	17.40%	5.62%	2.62%	6.78%	32.42%	
Real GDP, in 2005 € bn	24,201	7,087	4,627	8,533	44,448	179,625
Regional share %	13.47%	3.95%	2.58%	4.75%	24.74%	
Immigration density, %	6.22	3.61	4.09	6.08		8.43
Industrial Zones [2]	4	6	1	4	15	23
Land m^2	13,109,311	12,632,856	1,104,009	7,602,483	34,448,659	
Companies	811	307	15	243	1,376	
% of total	16.03%	34.53%	6.67%	16.87%	20.20%	
Turnover 2013, € mn	3,942	879	19	1,119	5,958	
Per firm, € mn	5.857	4.775	1.474	5.826	5.610	

Source: (1) ELSTAT, Greek Statistical Service. Regional Tables, unless otherwise stated.
(2) ETVA. Note: Company data for the Kilkis prefecture not available. The turnover of the industrial area in Volos A, Thessaly, not available, and is assumed to have the same average per company as in the Volos B area.

3. Regional economic structures compared

The Ruhrgebiet does not correspond to any formal administrative region. It is the name given to a tightly integrated group of cities and other communes which straddle three regions or Bezirke of NRW, namely Düsseldorf, Münster and Arnsberg. Northern Greece constitutes an important part of the overall Greek economy, much in a similar way as NRW does in Germany. Both geographical entities contribute roughly between one-fifth and one-quarter of total national output. But the economy of northern Greece is small, compared to the major regions of Germany. This applies even more if one looks at sub-units within northern Greece, compared to NRW. For example, Central Macedonia (with the city of Thessaloniki as its main centre) is the largest region in northern Greece, as can be seen in Table 1. Its annual value added is below 30 billion euro, less than one half of Münster, which constitutes the smallest region within NRW. The Bezirk (NUTS 2 region, in the 'Nomenclature for Units in Territorial Statistics) of Düsseldorf alone produces a value added that is almost as large as that of all of Greece.

The three other northern regions in Northern Greece (Eastern and Western Macedonia, and Thessaly) each produce a value added of less than 10 billion euro annually, comparable to medium-sized cities in NRW, or Germany in general. This relatively small size of regional economies in Greece, coupled with the absence of other manufacturing centres in neighbouring countries, means that it would be very difficult for manufacturing to become a key driver of a new growth strategy for northern Greece unless it is restructured and specialised in specific niches sectors.

The Land NRW has reached an income per capita that is very close to the German average. By contrast northern Greece is considerably less productive than the rest of the country. Table 2 below shows the variations in the regional GDP per capita relative to the respective national average for the year 2011 (latest available data). There are some variations within NRW, with the Bezirk Münster 10% below the German average and Düsseldorf (Bezirk in the core of the Ruhrgebiet) 12% above, but the average for NRW is almost exactly equal to the German average.

Table 2. Regional GDP per capita relative to national average

Germany		**Greece**	
Nordrhein-Westfalen	1.01	Northern Greece	0.77
Düsseldorf	1.12	Eastern Macedonia & Thrace	0.71
Köln	1.05	Central Macedonia	0.78
Münster	0.90	Western Macedonia	1.00
Detmold	0.98	Thessaly	0.70
Arnsberg	0.92		

Source: Own elaboration on Eurostat data (Regio database).

By contrast the entire northern region of Greece has an income level, which is 23% below the national average, with the eastern part being considerably poorer and the western part apparently better off. However, as will become clearer later, this higher GDP in Western Macedonia is a statistical artefact resulting from the importance of the lignite mining (and power generating) operations whose value added impacts on the regional value added. Northern Greece thus constitutes one of the poorer parts of a country.

There are also important differences in the structures of both regions. Industry contributes today about one-quarter of value added in NRW (with construction and services accounting for the remainder). The proportion of industry was much higher in the past, when coal mining and associated industries dominated the regional economy. This mono-centric structure led to a serious crisis starting during the 1960s. It seems that the structural change has mostly been accomplished in NRW as the contribution of industry has been rather stable over the last two decades (with some cyclical variations, see below) and the average for NRW is very close to the overall German average. There are only two Bezirke (Detmold and Arnsberg) within NRW where industry is more important, contributing 30% of overall value added.

Map 6a

Map 6b

Fig. 6. The regional structure of North-Rhine-Westphalia (NRW)

NRW, Map 6a, is the largest Land in Germany with about 16 million inhabitants. It has as administrative subdivisions 5 Bezirke (=NUTS2 regions). The Ruhrgebiet does not exist as an official administrative entity. It is usually defined as a grouping of cities and other areas with a total population of about 5 million grouped around the intersection of three 'Bezirke' (Düsseldorf, Münster and Arnsberg) as shown in map 6b.

Source:http://www.google.Be/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRw&url=http%3A%2F%2Fwww.waldbauernverband.de%2F2010%2Fcms%2Ffront_content.php%3Fidcat%3D15&ei=aHJuVNiuJsHfParQgPAC&bvm=bv.80185997,d.ZWU&psig=AFQjCNEUK2wbMmVEB7FI6-Iw_s0R-5wr9g&ust=1416610588906444

Northern Greece is often taken to constitute a regional manufacturing centre. However, the contribution of industry to regional value-added creation is, on average only 16%; which is higher than the Greek average of 12%, but 10 percentage points lower than the value for NRW. Northern Greece is thus more industrialised than the rest of Greece, but much less so than NRW.

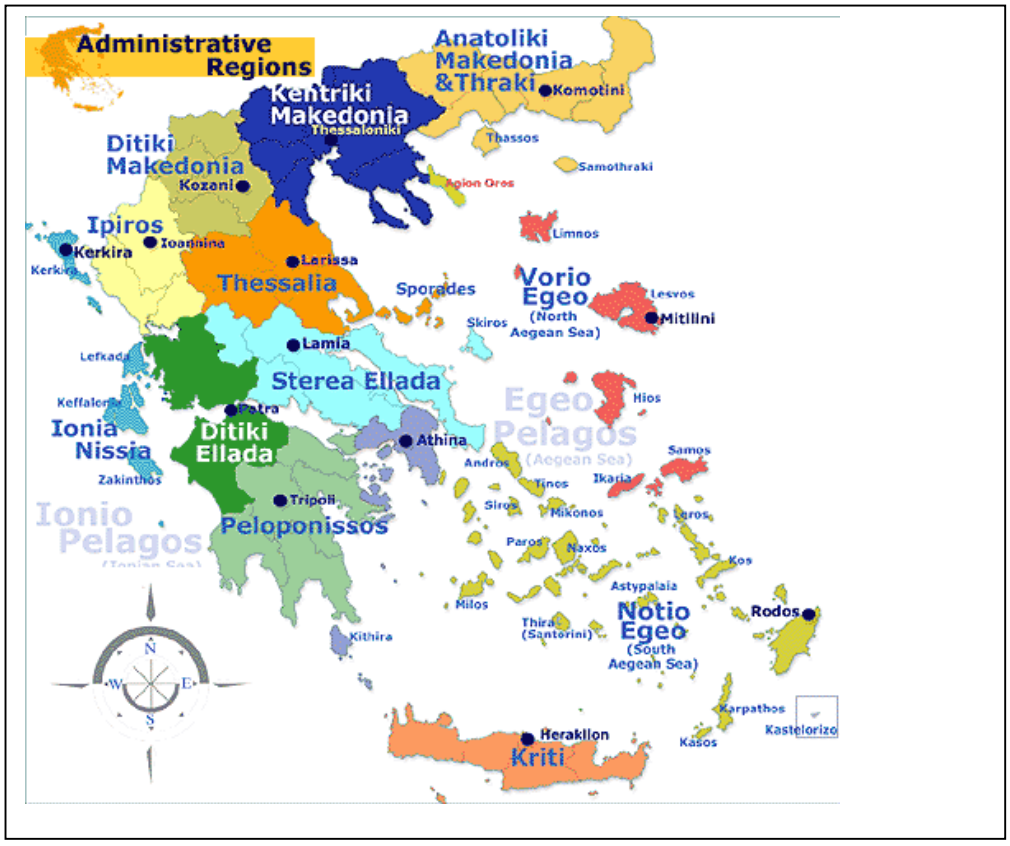

Fig. 7. The regional structure of Northern Greece

The four main subdivisions of Northern Greece comprise essentially Western (Ditiki) Macedonia, Central (Kentriki) Macedonia, Eastern (Anatoliki) Macedonia (which also comprises Thrace), and Thessaly. Source: http://www.google.Be/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRw&url=http%3A%2F%2Fwww.athensinfoguide.com%2Fbusinessgreeceintheeu.htm&ei=6HNuVOeeB4idPYingLgO&bvm=bv.80185997,d.ZWU&psig=AFQjCNGTC47h8X797rqVO2ZVif6WFCR-1w&ust=1416611117965935.

Within northern Greece, Western Macedonia constitutes an outlier with industrial value added contributing to over 40% of the total local economy in 2011.Over time this has risen to close to 50%, indicating that this region depends almost completely on industry. This elevated value for Western Macedonia is chiefly due to one key

industrial activity, namely the large lignite mining and power generation complex around Ptolemais.

Industry comprises both manufacturing and mining. It is not always possible to obtain data separately between these two sub-sectors. But for Greece these data are available at the regional level. If one separates manufacturing from mining (see Table 3 below), a clear picture emerges since the value added created by manufacturing is less than 5% in Western Macedonia, leaving 45% to mining. Given that another 5% is derived from agriculture, one finds a region whose value-added structure resembles more that of an emerging raw material-centred economy than that of the average EU member state.

Table 3. Sectoral contributions to regional value added in northern Greece

	Manufacturing	**Industry (= manufacturing plus mining)**	**Mining**	**Agriculture**
EL - Greece	9.18	13.32	4.15	3.37
EL1 – Northern Greece	11.48	18.51	7.04	6.11
EL11 - Eastern Macedonia & Thrace	11.04	15.04	4.00	6.57
EL12 - Central Macedonia	12.20	14.74	2.54	5.19
EL13 - Western Macedonia	4.51	49.51	45.00	4.90
EL14 - Thessaly	13.58	15.29	1.71	9.00

Source: own elaboration on Eurostat data (Regio database).

Manufacturing contributes even for the Greek average less than 10% of GDP and agriculture remains relatively important, in value added terms as well as employment levels. This is especially the case in the north part of the country where its contribution averages about 6% (in value added terms) and its share of employment is above 10%. Thus, the economy of northern Greece remains characterised much more by the primary sectors, agriculture and mining, than NRW, where agriculture plays only a negligible role.

Except for Western Macedonia there are thus more differences than parallels between Northern Greece and NRW. Only Western Macedonia looks superficially like the Ruhrgebiet during the 1960s in that industry contributes to one half of value added. But this is due to the lignite mining and power generation complex located there.

The large lignite mining operations in Western Macedonia constitute a surprising parallel between NRW and northern Greece. However, it seems that little manufacturing has been spawned by lignite mining, which is usually done in open-cast operations using very large machinery but few workers. In this sense lignite mining seems quite different from underground (black) coal mining. Given that lignite can be used only for power generation purposes, lignite mining does not foster the emergence of a local manufacturing complex.

In NRW the manufacturing complex has sprung up around the (black) coal mines. This was not the case around the lignite deposits and their associated power generation stations, which seem somewhat isolated from the local economy. The reason is that, unlike lignite, (black) coal can be used to make iron and steel, which can then be transformed and worked in a wide variety of sectors.

It is thus not surprising that the economy of Northern Greece depends much less on manufacturing than that of NRW or the Ruhrgebiet in particular. Table 3 (above) shows that mining constitutes a relatively important part (7%) of the local economy. Agriculture and mining are together more important than manufacturing.

Central Macedonia with the city of Thessaloniki has somewhat more manufacturing and relatively less mining and agriculture. But even here, manufacturing contributes only 12% to the local value-added creation. Construction used to play a relatively important part of the economy during the boom years up to 2008, but its part has shrunk also to less than 4%. This implies that services of various forms contribute over 80% of local value added. This is higher than the corresponding value for NRW. Superficially the economy of most of northern Greece has thus a more modern economic structure from this point of view.

Unfortunately, no comparable data are available on the split within industry between manufacturing and mining for the regions within NRW.

The data available for the Land NRW shown in Figure 8 below follow an interesting cycle, with the weight of industry falling from 30% of GDP in 1991 during most of the 1990s to below 25% during the recession of 2002-2003. There has since been a partial recovery of industry to about 26%. It is also apparent that mining was already marginal in 1991 (contributing less than 1.5% to GDP) and has since become negligible. Agriculture was also already negligible at the beginning of the 1990s. This implies that even 20 years ago the economy of NRW was dominated by services, which accounted already then for about 70% of GDP.

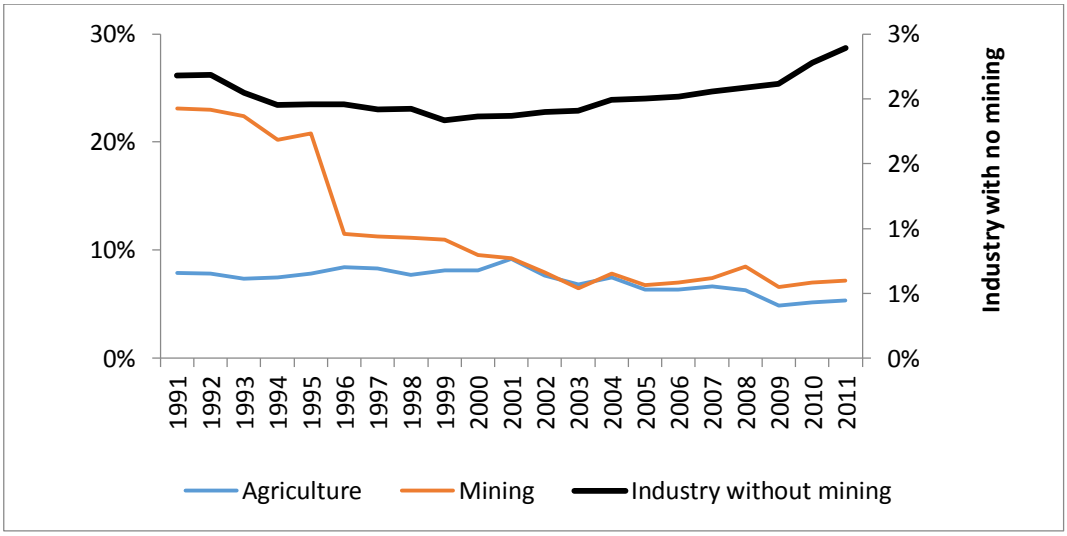

Fig. 8. Sectoral contribution to GDP in NRW

The low weight of manufacturing in the Greek economy suggests that any increased expenditure in Germany is unlikely to have a noticeable impact on employment in Greece. Apart from agriculture, there is no local base for exports of goods that German households or businesses might want to buy. The same is likely to apply to infrastructure investment in Germany, which stimulates directly only the local labour market.

It is remarkable that northern Greece has a higher share of industry and manufacturing than the rest of the country, but income per capita is also lower in the north. This suggests that in Greece manufacturing and mining do not constitute areas where the value added per worker is particularly high. This does not seem to be the case in NRW, where the value added per worker in manufacturing is not lower than in the rest of the economy.

4. Regional labour supply and employment

A first key variable in any structural adjustment process is the regional potential in terms of the quality of the workforce. The overall impression is that the quality of the workforce in Greece, and in particular in its northern regions, is rather low and that the limited potential is underemployed. While the multi-year recession in Greece is a determining factor it is not the single most important explanatory variable. Underlying structural factors that characterize the evolution of the real economy in Greece during the past three decades have to be taken into consideration.

The innovation potential seems limited. Expenditure on innovation, such as R&D is very low, but the key to a re-launch of the regional economy should be sought rather in an upgrading of the skills set of the local work force, rather than trying to foster R&D expenditure, the basis for which seems to be lacking at present, in particular given fiscal consolidation efforts of the central government, which impact on public investment capacity.

4.1. Unemployment

The evolution of unemployment in Greece over the past decade suggests that the problem is ingrained throughout the country, as shown in Table 3, without clear regional patterns. The national unemployment rate was already at 12% when the country entered the euro in 2001, higher than the EU or Euro Area average, and three percentage points higher than the German average.

By 2008, unemployment in Greece had converged to the EU average. However, this convergence process proved to be fleeting. As shown in Fig. 1, the ensuing sovereign debt and economic crisis led to a tripling of the unemployment rate to over 27% in early 2013, almost six times the corresponding German value. This level of underutilization of human resources constitutes the key policy challenge for Greece today.[5]

[5]At the time of writing, November 2014 the latest available unemployment data for Greece is August 2014 when registered joblessness stood at 25.9%. This level was the first time in two years that unemployment declined below the threshold of 26%.

Table 4. Unemployment rates

GEO/TIME	1999	2009	2010	2011	2012	2013
European Union (28 countries)		9.0	9.6	9.7	10.5	10.8
Germany (until 1990 former territory of the FRG)	8.9	7.7	7.1	5.9	5.5	5.3
Nordrhein-Westfalen	7.5	7.8	7.5	6.4	5.9	6.0
Düsseldorf	7.7	7.7	7.7	6.9	6.6	6.4
Köln	6.8	7.1	7.1	6.0	5.4	5.9
Münster	7.6	7.3	6.7	5.3	5.0	5.1
Detmold	6.4	7.7	7.1	5.6	4.8	5.1
Arnsberg	8.3	9.2	8.4	7.3	6.9	6.8
Greece	11.9	9.6	12.7	17.9	24.4	27.3
Eastern Macedonia & Thrace	13.0	11.1	14.5	20.2	22.8	26.8
Central Macedonia	11.8	10.1	13.7	19.7	26.2	30.2
Western Macedonia	14.4	12.4	15.4	23.1	29.7	31.6
Thessaly	13.1	9.2	12.1	16.8	22.6	25.4

Source: European Commission, Regio dataset.

Within Germany, the Ruhr area had in the year 2000 a lower unemployment rate than the national average, but this changed over time and by 2013 the unemployment rate throughout the region was slightly above the national average of 5%.

The regional pattern within Greece was different. Unemployment fell in almost all regions as long as the credit financed spending boom lasted and all regions suffered greatly from the severe fiscal adjustment process that followed after 2009. However, there is some regional variation. For example, the region of Thrace went from having the highest unemployment rate to one, which is somewhat below the national average.

However, the degree of regional dispersion within Greece has remained remarkably low given the high average level of registered unemployment since the onset of the crisis. According to Eurostat data (2014), the standard deviation across regions in Greece reached a level of 10.3% in 2011. However, as Eurostat concludes, "low dispersion should not be interpreted as a positive sign for labour markets per se. In

the case of Greece, which has quite small regional disparities in unemployment rates, all NUTS 2 regions recorded high unemployment rates over 14 % in 2011. This shows that dispersion only indicates the disparities between regions and not the overall level of unemployment."[6] The coefficient of variation, which takes into account the average is, however, much lower.

4.2. Youth unemployment

A particular problem for Greece is youth unemployment (Belke 2013). Figure 9 below shows the evolution of youth unemployment rates throughout the regions of Northern Greece. There is considerable co-movement among the Greek regions, only Western Macedonia stands out with rates, which are even higher than normal for Greece. At present the youth unemployment rate is close to 70% in this region, against a national average of 49.3% (August 2014) and only 10%, or one sixth of this level, for NRW. Greek and German levels of youth unemployment are of a completely different magnitude with about 10% in Germany and generally close to or over 50% in various parts of Greece.

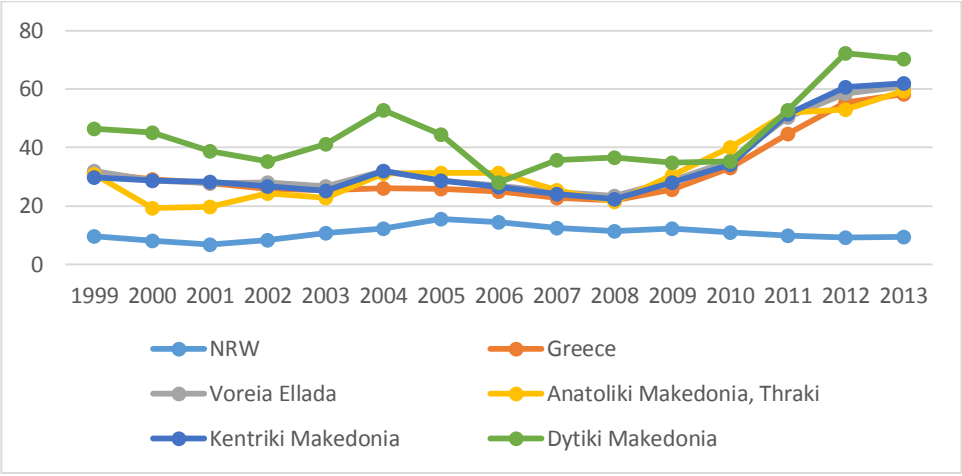

Fig. 9. Youth unemployment in Germany and Greece, 1999-2013
Source: European Commission, Regio_dataset.

Moreover, the two countries have followed the opposite path: during the demand boom in the pre-crisis period of 2001-2008, youth unemployment rates declined

[6]See http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Regional_labour_market_disparities, October 7th 2014.

somewhat in Greece, but increased in Germany. Since the start of the crisis in Greece, unemployment has skyrocketed there, but fallen somewhat in Germany.

One reason why the measured youth unemployment rates are so high in Greece is that only a small part of the young population is economically active (Barslund and Gros (2013). The unemployment rate is measured by dividing the number of those looking for a job by those economically active (employed plus unemployed).

In Greece only a small part of the young population is economically active as shown in the Table 5a below. In Germany about one half of the young population (15-24) is economically active, but in Greece this proportion is much lower at 28.4% for the national average. In Northern Greece this percentage is at 26% somewhat lower still, almost one half of the German value. Western Macedonia constitutes again an outlier with a youth activity rate of only 21%; one of the lowest levels among the 200 NUTS 2 regions in the EU.

An unemployment rate of 50% among the youth implies that the 'economic activity' of the young in Western Macedonia consists essentially of being unemployed. It is understandable that only very few engage in this 'activity'.

Table 5a. Activity rates of youth

Germany	**50.9**	**Greece**	**28.4**
Nordrhein-Westfalen	46.1	Northern Greece	26.2
Düsseldorf	45.7	Eastern Macedonia & Thrace	29.6
Köln	44.1	Central Macedonia	24.2
Münster	49.3	Western Macedonia	20.9
Detmold	47.4	Thessaly	30.5

Source: European Commission, Regio dataset.

The unemployment rates of 50% or more observed in Greece thus do not imply that over one half of the young are unemployed. The proportion of the youth looking for a job is measured by the unemployment *ratio,* i.e. the number of young unemployed

relative to the total number of youth. This measure is much lower because, as mentioned, so few Greek youth are looking for a job. Table 5b below compares the unemployment ratios in Germany and Greece.

In Germany only about 4% of the young cohorts (between 15 and 24 years old) are looking for a job without finding one. In Greece this proportion is almost 4 times higher, with relatively little variation across regions. It seems that beyond a certain level of unemployment the young simply give up looking for a job.

Table 5b. Unemployment ratio

Germany	**4.0**	**Greece**	**16.6**
Nordrhein-Westfalen	4.3	Northern Greece	16.0
Düsseldorf	4.6	Eastern Macedonia & Thrace	17.6
Köln	3.8	Central Macedonia	15.0
Münster	4.2	Western Macedonia	14.7
Detmold	4.2	Thessaly	17.5

Source: European Commission, Regio dataset.

5. Human capital formation

One key indicator of the quality of the regional workforce is its level of education.

5.1. Lack of secondary schooling as an indicator of structural problems

Modern manufacturing and services require in general at least some secondary education (in Germany '*Abitur*' or equivalent, in Greece the '*Απολυτήριο*').[7] One key indicator for the problems a region might encounter to develop a competitive economy is the proportion of the working age population which has not completed secondary education.

[7]High school education and degrees in Greece are unified and harmonized nationwide. In difference to Germany, where every *Land* (region) has authority over education, in Greece the process is centralized by the education ministry in Athens.

Today the share of this type is only one fourth of the working age population of the EU. For Germany the proportion is considerably lower, at about 14%.Within Germany the Ruhr area fares much worse, with a share of these undereducated of about 20%, or 6 percentage points higher than the national average.

Greece is clearly in a different league, with a national average value of about 33% still today. But the country has made important progress, both absolute and relative to the EU average and Germany. In the year 2000 almost 50% of the Greek workforce did not have secondary education. This was 17 percentage points more than today. The difference to the EU average has thus considerably narrowed in a little over one half generation.

The reason for this quick progress is that the younger generation in Greece is very different in terms of educational level than the older ones. This difference is much more marked in Greece than in Europe in general and in particular in Germany.

Figure 10 below shows the proportion of each 5 years cohort (indicated by age limit) that has completed secondary education. This percentage is now close to 90 for the 25-29 year olds in Germany. In Greece it is about 10 percentage points lower. The chart also includes for comparative purposes Portugal, which had traditionally even lower educational rates, but has caught up more recently to Greece.

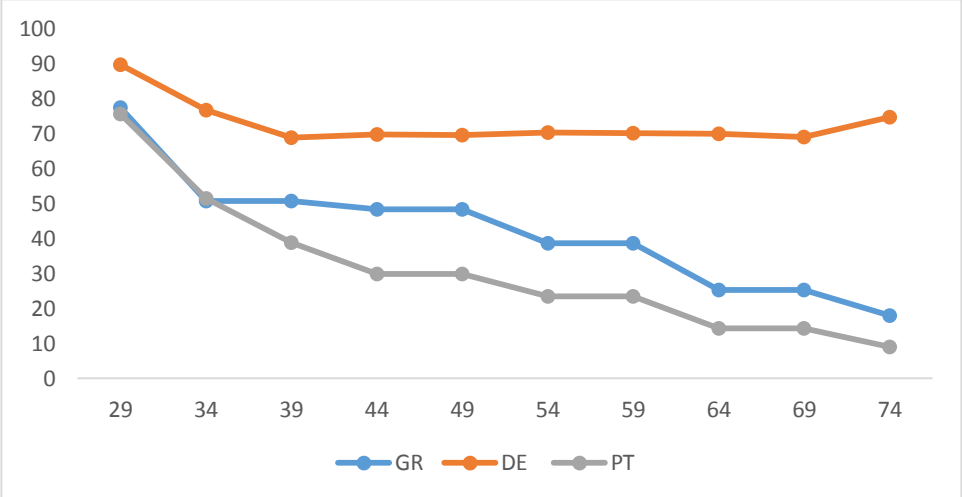

Fig. 10. Proportion of cohort with completed secondary education.
Source: Barro Lee dataset.

The differences in educational attainment used to be much higher. For example, among the 50-54 age cohort the difference was over 30 percentage points. For those born during the early 1960s the proportion with a completed secondary education was almost two times higher in Germany (70%) than in Greece (38%). The chart shows for a comparison also Portugal, which had traditionally even lower educational rates, but has caught up more recently to Greece.

The regional variations in Greece are also rather marked, as shown in Table 6. In the Northern regions the proportion of the undereducated is generally much higher. In 2000, with a national average below 50%, two of the Northern regions had values of 60%.Some regions have been able to reduce the distance to the national average, but Thrace, which had the highest value (62% in 2000) has made less progress than others and has now a value of 50%, which is worse than the country's average 14 years ago.

Table 6. Percent of adult population without completed secondary education

GEO/TIME	**2000**	**2009**	**2010**	**2011**	**2012**	**2013**
European Union (28 countries)		28,0	27,3	26,6	25,8	24,8
Germany (until 1990 former territory of the FRG)	18,7	14,5	14,2	13,7	13,7	13,7
Nordrhein-Westfalen	21,7	18,7	18,7	18,3	18,2	18,4
Düsseldorf	23,3	19,1	19,2	18,6	18,9	19,6
Köln	21,5	18,4	18,2	18,4	18,1	18,8
Münster	20,5	17,2	16,7	16,3	16,5	16,0
Detmold	20,5	17,3	17,2	16,9	16,5	16,6
Arnsberg	21,0	20,4	20,6	19,8	19,6	19,0
Greece	48,4	38,5	37,3	35,4	34,2	32,8
Eastern Macedonia & Thrace	62,1	51,0	50,2	50,3	51,7	51,3
Central Macedonia	49,5	40,6	38,4	36,0	35,6	34,5
Western Macedonia	59,8	47,9	46,3	44,4	45,3	42,8
Thessaly	58,6	40,6	40,9	39,2	37,8	37,0

Source: European Commission, Regio dataset.

The Central Macedonian region with the city of Thessaloniki has always been close to the national average and Western Macedonia seems to be catching up, its ratio of persons without completed secondary education fell from almost 60 to 42%.
Within NRW there is much less variation, with all sub regions below 20%, but considerably above the German national average of now below 14%.

In terms of the proportion of the youth without secondary education Greece today, and particularly its northern area appears similar to NRW about 40 years ago. Figure 11 below shows for the Land NRW the proportion of early school leavers (those not finishing even Hauptschule in the German system), those who have completed the minimum obligatory schooling (Hauptschule) and those with a completed secondary degree which grants access to University level education.

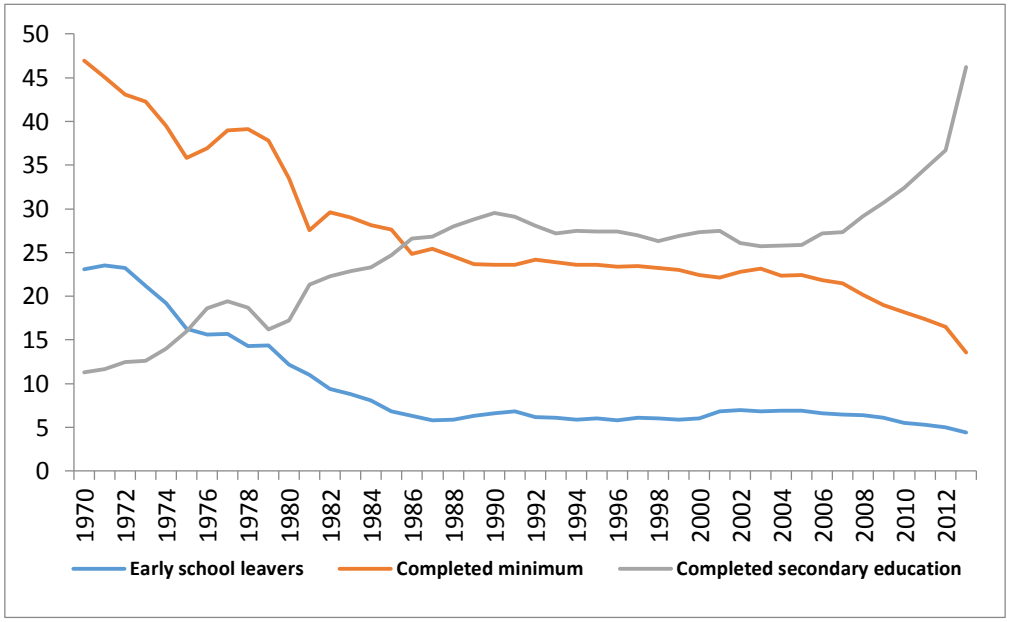

Fig. 11. Distribution of schooling levels in NRW

It is apparent that there has been a complete change since 1970. At the beginning of this period only less than 10% of all students finished secondary education whereas today that proportion is close to 40%.[8] On the other side of the scale one finds that in 1970 almost one fourth did not even finish the minimum schooling with a degree and over 45% had finished only the minimum.

[8]The 2013 data point might be somewhat distorted by the fact that this is the year with two cohorts in the 'Abitur' level as the duration of the cycle leading to this level was shortened from 13 to 12 years.

These numbers based on the German system are not directly comparable to those in Table 6 above, which is based on an international classification. However, a broad impression appears clearly that at the beginning of the 1970s the Land NRW was in an even worse position than the Greek average and close to the Northern Greek regions. A large part of the structural change that happened in NRW and in particular in the Ruhrgebiet was based on the radical improvement in the level of schooling of the local (young) population.

5.2. Education and employment

Employment rates vary greatly by the level of education. In most EU Member States (as in most OECD countries) persons with a higher level of education have a much higher propensity to be employed. This is the case in Greece as well, but the employment rates are much lower than elsewhere.

For example, the employment rates of persons with a completed tertiary education, i.e. those with a University degree, are usually around 80% in most EU countries. In Germany, this rate is now, at 88% unusually high, but the EU average is still 82%. In Greece the corresponding rate is only 68%, which is one of the lowest in the EU and 20 points lower than the German rate. This low value is due to the extraordinary depth of the recession. (Unfortunately it is not possible to find data on employment rates by education at the regional level).

Table 7. Employment rates by educational attainment in Germany, Greece and Portugal

	Tertiary education	**Below secondary**
European Union (15 countries)	82	46
Germany (until 1990 former territory of the FRG)	88	53
Greece	68	39
Portugal	77	55

Source: Eurostat data.

5.3. Neither in education nor employment

A key indicator of the outlook for the young generation is the proportion of those who are neither in employment, education nor training (NEET).

Here there are also striking differences between the countries. Already at the start of EMU the percentage of youth without a job and neither in education, nor in training was at about 17%, on average for Greece, more than two times higher than the corresponding German value of 7.7%.Within Germany the Ruhr area had a significantly higher proportion of NEETs, with an average for NRW of 8.70% and over 10% in Düsseldorf.

Table 8. Percent of young population (15-24 years) not in employment, education nor training (NEET)

GEO/TIME	2000	2008	2009	2010	2011	2012	2013
Germany (until 1990 former territory of the FRG)	**7.7**	**8.4**	**8.8**	**8.3**	**7.5**	**7.1**	**6.3**
Nordrhein-Westfalen	8.7	9.1	9.7	9.3	8.4	8.2	7.2
Düsseldorf	10.2	10.1	10.3	10.4	10.1	8.8	8.2
Köln	8.8	8.5	8.8	8.7	8.4	7.0	6.5
Münster	5.5	8.7	9.2	8.3	6.7	7.9	6.2
Detmold	7.6	8.6	9.0	8.6	7.5	7.4	6.2
Arnsberg	9.6	8.9	10.9	9.6	7.9	9.3	8.0
Greece	**16.9**	**11.4**	**12.4**	**14.8**	**17.4**	**20.2**	**20.4**
Eastern Macedonia & Thrace	21.5	15.3	16.5	21.5	27.4	28.1	28.3
Central Macedonia	15.2	10.5	11.1	12.8	16.1	18.8	19.4
Western Macedonia	22.2	13.1	11.4	12.2	18.5	23.3	22.1
Thessaly	20.2	11.9	13.0	16.9	19.7	21.3	19.6

Source: European Commission, Regio dataset.

But this value was only one half of the one for most Northern regions in Greece (e.g. 21.5% for Thrace). During the boom years the proportion of youth without job and not in education or training declined significantly throughout Greece, reaching 11.4% in 2008. But it then doubled until 2013 as the youth apparently did not chose to go

into training or education when it became next to impossible to find a job. Thrace is again the region hardest hit. Here the NEETs ratio increased to 28%.

The key conclusion to draw from this observation is twofold. On the one hand we see that an ever increasing number of young people in Greece are 'voting with their feet', i.e. migrating abroad in order to find employment opportunities (the German *Migration Report for 2013* highlights this exodus of human capital). On the other hand the medium to longer-term issue concerns the risks of leaving a 'lost generation' behind in Greece, a generation that is well educated, multi-lingual but unemployed or employed in jobs for which they have not studied and that hardly pay decent wages.

6. Investment in innovation

The EU has a target (or rather a benchmark) of 3% of R&D investment in GDP. This benchmark was originally established in 2000 in the framework of the Lisbon Strategy. It has since been kept in the context of the Europe 2020 strategy, which constitutes the current growth strategy for the EU. Germany on average just about reaches this target, but NRW does not as R&D expenditure amounts to only about 2% of GDP. Within NRW there are considerable differences with Köln slightly above the German average, but Münster with a value of only 1%, equal to about one third of the German average; see Table 9.

Table 9. R&D expenditure as % of regional GDP

Germany	**3.0**	**Greece**	**0.6**
Nordrhein-Westfalen	2.1	Northern Greece	0.5
Düsseldorf	1.9	Eastern Macedonia & Thrace	0.5
Köln	3.2	Central Macedonia	0.6
Münster	1.1	Western Macedonia	0.2
Detmold	1.9	Thessaly	0.4
Arnsberg	1.6		

Source: European Commission, Regio dataset.

However, these regional differences pale when compared with the differences between Germany and Greece overall. The average for Greece is only one fifth of the

average for Germany and Northern Greece is in general below the Greek average. Western Macedonia (where the lignite operations are) shows almost no R&D expenditure (only 0.2% of GDP).

The huge differences in the rate of expenditure on R&D do not seem to be the result of a lack of personnel as the differences in the availability of R&D personnel appears to be minor, relative to the differences in expenditure. Table 10 below shows that about 2% of the German active population is in the R&D sector. This percentage is somewhat lower in NRW, with the same regional variation as above (Köln is much more R&D intensive than Münster).

Table 10. R&D personnel as % of active population

Germany	**1.97**	**Greece**	**1.41**
Nordrhein-Westfalen	1.63	Northern Greece	1.47
Düsseldorf	1.32	Eastern Macedonia & Thrace	1.37
Köln	2.61	Central Macedonia	1.44
Münster	1.04	Western Macedonia	1.25
Detmold	1.54	Thessaly	1.74
Arnsberg	1.35		

Source: European Commission, Regio dataset.

The regional variations illustrated here have been very stable over time. There is no sign that R&D spending is systematically increasing in the laggard regions of both countries.

In per capita terms the differences are even starker. With the average expenditure on R&D for Germany over 900 Euros per capita (and 650 for NRW), which is 8 times higher than the averages for Greece and Northern Greece (125 and 80 Euros per capita, respectively). The intra-regional variations show the same pattern as above: very little expenditure on R&D in the regions dominated by lignite mining and more in University cities, like Köln in Germany and Thessaloniki in northern Greece.[9]

[9] Münster here is a negative outlier within NRW, with an expenditure on R&D of only 300 euros despite its tradition as a university city.

The observation that R&D expenditure is not limited by the availability of University graduates is confirmed by the fact that there is today almost no difference in the proportion of the work force with tertiary education. This proportion is now about 28% on average for Germany as for Greece. University graduates are somewhat less numerous in NRW as in Northern Greece, amounting in both regions to about 25% of the working age population as shown in Table 11 below.

Table 11. Working age population with tertiary education

Germany (until 1990 former territory of the FRG)	**28.5**	**Greece**	**27.4**
Nordrhein-Westfalen	25.0	Northern Greece	24.8
Düsseldorf	24.4	Eastern Macedonia & Thrace	19.5
Köln	29.1	Central Macedonia	27.1
Münster	24.6	Western Macedonia	20.1
Detmold	23.1	Thessaly	25.1
Arnsberg	21.9		

Source: Eurostat.

In both Germany and Greece the prevalence of academic qualification has increased over the last decades, but much more so in the latter, than in the former. In NRW the proportion of the working age population with a tertiary degree has increased by about 5 percentage points, but in Northern Greece the increase was about 10 percentage points. At the start of EMU an 'academic gap' existed between Germany and Greece. Two decades later this gap no longer exists.

R&D spending is of course not the only way to foster innovation capacity. Corrado, Hulten and Sichel (2005, 2006) look at innovation in broader terms and identify several other elements fostering innovation, such as:

i) software and computerized information,
ii) scientific and non-scientific R&D and
iii) economic competencies.

This arrangement has also been called 'intangible capital' and comprises more elements than only investment in physical capital and R&D proper; see also Roth (2010), and Roth and Thun (2010).

Figure 12 shows the single dimensions of economic competencies in the EU15 in comparison to the Europe 2020 indicator of R&D expenditure.

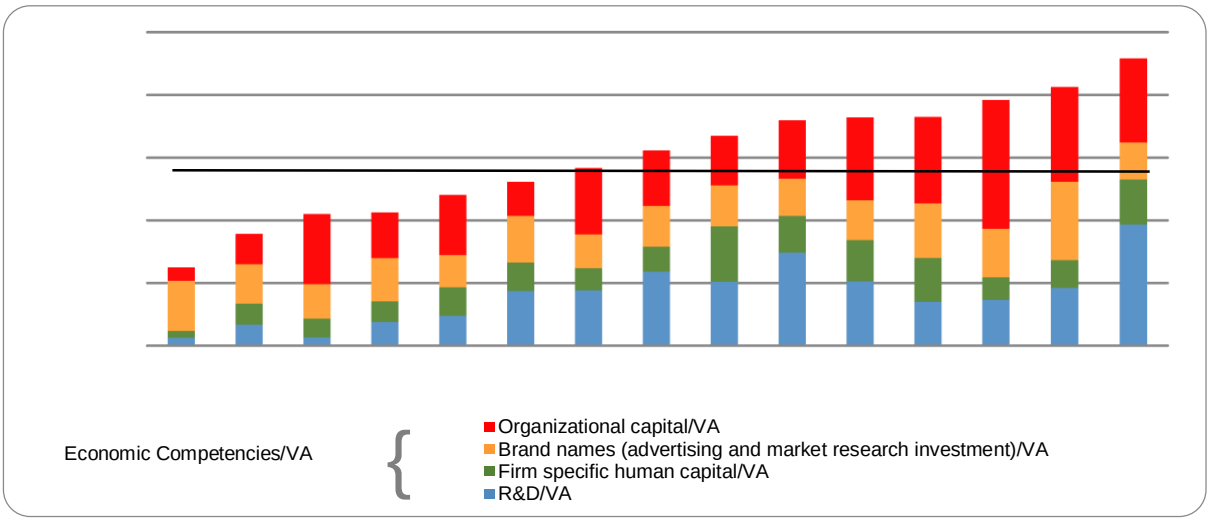

Fig. 12. Investment in Intangible Capital by Businesses in the EU15 Compared to R&D. Source: INNODRIVE data.

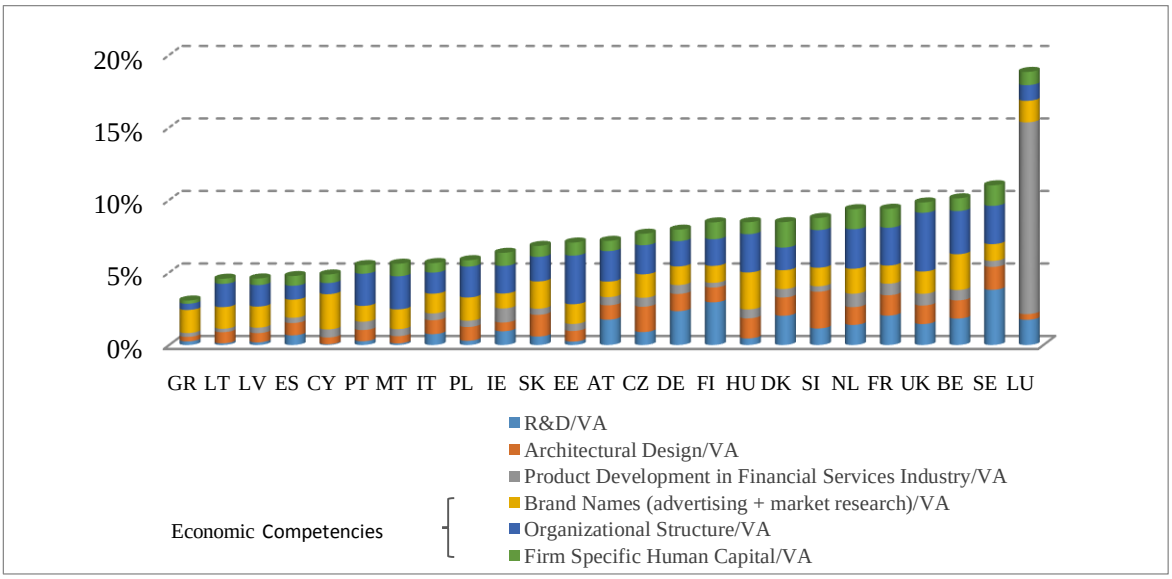

Fig. 13. Investment in new intangible capital10 by businesses in the EU-25 compared to R&D (1995-2005) Source: Author's own estimation with INNODRIVE data.

[10] Excluding product development in financial services industry.

In all 15 European economies investment in economic competencies in general exceeds in importance R&D. Greece stands out as the country investing less in intangible capital and thus innovation broadly defined.

Thus an indicator purely based on manufacturing seems to be flawed for those economies, which are strongly based on the service sector and with SMEs as the corporate backbone.

The key issue for a laggard in terms of innovation would thus seem to be not simply increasing investment in R&D, but to create an environment which fosters a high rate of investment in intangible capital. This applies in particular to economies dominated by services since R&D seems to be particularly intensive in the manufacturing sector.

One reason for the absence of investment in intangible capital might the fact that the middle level in terms of education is missing in Greece. Combining the data on the working age population with a tertiary education with the data on those without a completed secondary education illustrates the proportion of the work force which is in the middle. Table 12 below shows the 'middle class' in terms of education, i.e. those without a university degree, but having completed at least secondary education.

Table 12. The 'middle class' in terms of education

Germany	**57.8**	**Greece**	**39.8**
Nordrhein-Westfalen	56.6		
Düsseldorf	56.0	Eastern Macedonia & Thrace	29.2
Köln	52.1	Central Macedonia	38.4
Münster	59.4	Western Macedonia	37.1
Detmold	60.3	Thessaly	37.9
Arnsberg	59.1		

Source: Eurostat.

It is apparent that in Germany this 'middle class' dominates, with between 50 and 60% of the work force, whereas in Greece it is much less important amounting to only between 30 and 38%.

7. The importance of good governance

A key element in any structural reform effort is the quality of governance of the local administration and the public sector in general (Belke 2013). Gros and Roth (2012) also show that R&D efforts depend not only on economic variables, but also strongly on the quality of the public administration. That the quality of the state administration has an important impact on the performance of the school system should be almost self-evident. Gros (2006) shows that, indeed, the quality of schools as measured by the PISA results of high school students depends less on the amount spent on education and more on the absence of corruption.

Very recently some data on the quality of governance has been published which allows one to measure this aspect at the regional level.[11] The results at the national level confirm those obtained with other sources, such as the indicators from the World Bank, or the World Economic Forum. However, one finds considerable diversity within Germany, but much less within Greece.

To illustrate, the German average ranks with a value of +0.9 in sixty-second position among all the 200 plus EU regions and NRW ranks with a value of 0.76 at level 76. But other German Länder display a much better result. By contrast, all the Greek regions have a value close to –1.0 and are clustered between 195-199 positions.

There is thus a wide gap in terms of the quality of governance between Germany and Greece and also between NRW and Northern Greece. This gap is likely to have a profound impact on regional economies as well since inadequate governance impedes human capital formation and investment in intangible capital.

The conclusions of Gros (2006) still stand today:

"The basic message suggested by this simple result is at the same time simple, and somewhat discouraging. If general government efficiency is the main determinant of educational achievement, it implies that partial reforms within the education sector are unlikely to improve student achievements fundamentally. Many aspects of public

[11] http://ec.europa.eu/regional_policy/sources/docgener/work/2012_02_governance.pdf

administration need to be overhauled and improved if one wants to improve educational outcomes as measured by the PISA results. This is likely to require time and a general consensus.

Partial reforms that improve, for example, the distribution of resources – by introducing more competition and greater transparency – can be designed and implemented in a rather short time and should have a positive impact. But they have to be implemented by the existing public administration, whose quality cannot be improved overnight. Hence even the best designed reforms are likely to have only a limited impact, as long as the overall quality of public administration does not improve. This should be the ultimate aim of all reforms, but it is more difficult to achieve as it requires a 'long march' through the institutions."

7.1. Structural Funds: Greater financial autonomy for regions in Greece

Given the large differences in development across regions the question arises whether the Structural Funds of the EU can contribute to the development of Greece in general and its northern regions in particular.

Greece will receive a total of € 20.8 billion of funds from the new *National Strategic Reference Framework* (NSRF) for the new programming period 2014-2020 that was approved in May 2014 by the European Commission.

The Greek authorities plan to invest these financial resources in the priority areas of competitiveness, entrepreneurship and Innovation; transport, environment and sustainable development; human resources, training and lifelong learning; and restructuring of the public sector.

Twenty-five percent of the total NSRF funds – some four billion Euros – for 2014-2020 will be allocated to the operational program "Competiveness, Entrepreneurship and Innovation" and directed to the sectors of tourism**,** food and agriculture, the supply chain, the environment, health-pharmaceutical industry, energy, materials-constructions, information and communication technologies and creative-cultural industries.

The new NSRF funding framework also gives regional entities added autonomy in the decision-making and allocation process of structural funds resources. Regional authorities in Greece will have the power to self-administer funds amounting to seven billion Euros from the new NSRF programme. This is the first time that the handling of parts of E.U. Structural Funds has been put in the hands of the heads of regional authorities. Previously, funds granted to regions were administered by central government ministries in Athens.

It remains to be seen whether this change will increase the efficiency with which the Structural Funds are being spent. The large differences in the quality of regional administrations documented above (and, in particular, the low levels of efficiency in Northern Greece) indicate that at least some ex post control might be needed.

7.2. Defining a new growth agenda

As Greece is slowly starting to exit its six-year recession the focus of political authorities in Athens and regional policy makers turns to the issue how sustainable growth can be achieved over time. Part of this inquiry includes the formulation of a new growth agenda for the real economy. Some elements of this agenda have to address:

- Greater jurisdiction enhanced administrative competences and fiscal autonomy for municipalities and regions. The rationale would be to strengthen pro-growth stakeholders who cooperate with the new Partnership Agreement of the European Commission for the financing period 2014-2020.

- In the area of education the four key regions in Northern Greece partner with selected districts in NRW to identify, formulate and implement targeted policies in areas such vocational training, life-long learning, micro finance and linking universities with local business councils. The networks established in NRW can serve as a roadmap for such cooperation agreements.

- Enhance manufacturing infrastructures by modernizing existing Industrial Zones and building new ones with up-to-date technology.

- Equally, the expertise of the Greek-German Assembly (http://www.grde.eu/de/) should be mobilized and integrated into such endeavors. The so-called *Deutsch-Griechische Versammlung* (DGV) focuses on partnership agreements at the municipal and regional level, linking technical expertise in areas such as export capacity, financial engineering, training opportunities and technological knowhow. The DGV has a representative office in Thessaloniki.

- Since 2012 various German political foundations of parties represented in the *Bundestag* are active in Greece. They focus on enhancing bilateral cooperation, creating information exchange platforms and thematic pilot projects. The accumulated expertise and network of stakeholders is a rich reservoir for regional cooperation initiatives that has on the ground and hands on experience.

Annex.

Lignite – technical information

Greece is a major producer of lignite. In Europe its output comes second only to Germany (and close to that of Poland). On a per capita basis its output is three to four times as important as for these other two countries. Comparing only NRW to Greece one finds that the production per capita is about the same: 60-70 million tons for Greece with 10 million inhabitants versus 90-100 million tons for NRW with its 16 million inhabitants.

Geological accessibility makes lignite Germany's least expensive fuel at 1.1 euro/GJ, or about $1.70/MBtu, which is less than half the price of imported coal. The low energy content precludes it from being profitably exported, effectively stabilizing domestic prices.

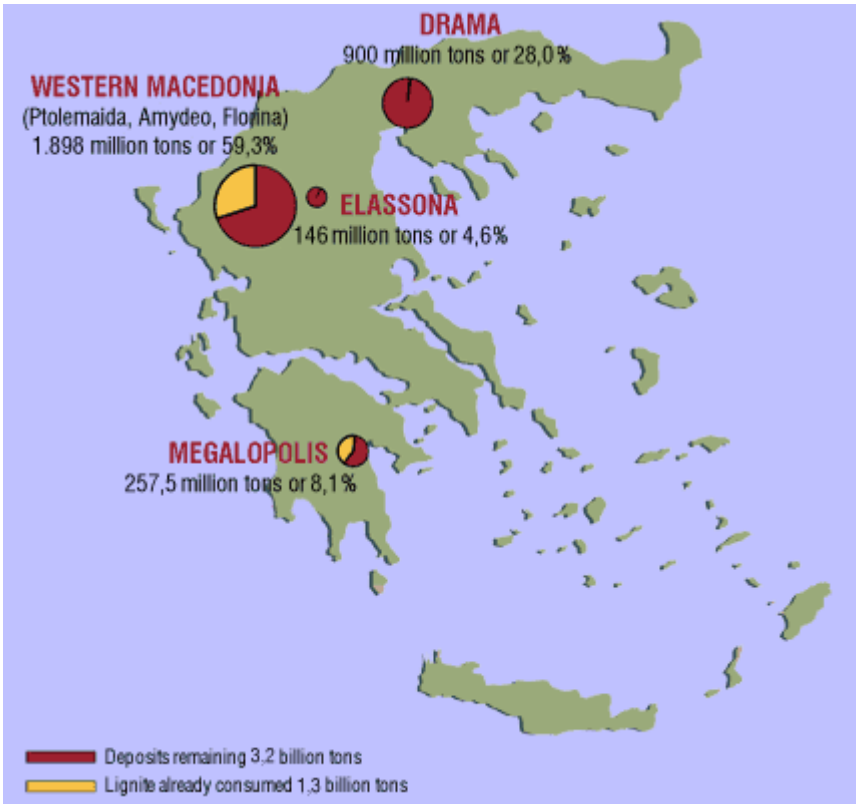

Fig. 14. Lignite deposits in Greece

Source: http://www.dei.gr/Images/mining-map-large_en.gif. http://en.wikipedia.org/wiki/Lignite.

Table A1. Lignite mined in millions of metric tons[11]

Country	1970	1980	1990	2000	2001	2010
Australia	24.2	32.9	46.0	65.0	67.8	67
China	13.0	22.0	38.0	40.0	47.0	?
Czech Republic	—	—	—	50.1	50.7	44
Czechoslovakia	67.0	87.0	71.0	—	—	—
Germany	369.3	388.0	356.5	167.7	175.4	169
Greece	8.1	23.2	51.7	63.3	67.0	56
India[12]	?	?	?	?	22.121	?
Indonesia	?	?	?	?	?	163
North Korea	5.7	10.0	10.0	26.0	26.5	?
Poland	32.8	36.9	67.6	61.3	59.5	56

Mined lignite consists of about one-third elemental carbon that is permeated with residual groundwater, mineral impurities, and sulphur deposited by prehistoric volcanoes. The bonding of two oxygen atoms at combustion results in carbon dioxide emissions weighing as much as the fuel itself. The energy lost in burning damp lignite and scrubbing sulphur from the flue gases limits power generating efficiency to between 35 percent for older plants and 43 percent in advanced designs. The resulting CO2 emissions per kWh are approximately three times those of clean-burning natural gas.

See more at: http://www.energytribune.com/2722/lignite-impedes-german-climate-policy#sthash.h0JxQay9.dpbs

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